**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Affirmative Action Plan

Pursuant to Section 3.03 of the Kentucky Retirement Systems Personnel Policies, the Kentucky Retirement Systems has implemented an Affirmative Action Plan to promote and assure equitable treatment of all persons who are now employed, being considered for employment, seeking employment, and who will be recruited for employment in the future. The Kentucky Retirement Systems has already taken substantial steps towards fulfilling the requirements of the Affirmative Action Plan, as described in Section 3.03(3) of the Personnel Policy.

The Kentucky Retirement Systems provides periodic training to its leadership team to ensure compliance with federal and state laws. Such training covers harassment based on all legally protected categories (race, color, sex, religion, national origin, age, and disability), anti discrimination laws in general, and reasonable accommodation and inquiries under the ADA.

The Kentucky Retirement Systems continues to seek appropriate recruitment sources for females and minorities.

The current employment statistics for the Kentucky Retirement Systems show that as of March 31, 2015, there are 259 full-time employees. There are 156 female employees, representing 60.23 % of the staff, and 25 employees who are members of minority groups, representing approximately 9.65% of the staff. Females make up 56.86% of the leadership positions in the Kentucky Retirement Systems, while employees who are members of minority groups hold 5.88% of the leadership positions in the Kentucky Retirement Systems.

In order to establish clear long term-hiring goals for minorities and females, Kentucky Retirement Systems will follow the goals provided by the Commonwealth of Kentucky's Personnel Cabinet. The current goal for minority employment in State Government is 11.7% through June 30, 2015.

**RECOMMENDATION:** This memorandum is presented for informational purposes only.

**KENTUCKY RETIREMENT SYSTEMS**

OVERALL AND MINORITY FULL TIME EMPLOYMENT
BY TYPE OF EMPLOYMENT AND DIVISION
AS OF MARCH 31, 2015

| KRS AREA/DIVISION | KRS EMPLOYMENT CATEGORY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LEADERSHIP | | | PROFESSIONAL | | | SUPPORT | | | TOTALS | | |
| | Total | Minor. | (%) | Total | Minor. | (%) | Total | Minor. | (%) | Total | Minor. | (%) |
| Executive Staff | 5 | 0 | 0.0% | 0 | 0 | 0.0% | 2 | 0 | 0.0% | 7 | 0 | 0.0% |
| Communications | 1 | 0 | 0.0% | 5 | 0 | 0.0% | 0 | 0 | 0.0% | 6 | 0 | 0.0% |
| Legal | 3 | 1 | 33.3% | 6 | 0 | 0.0% | 6 | 0 | 0.0% | 15 | 1 | 6.7% |
| Human Resources | 1 | 0 | 0.0% | 3 | 1 | 33.3% | 0 | 0 | 0.0% | 4 | 1 | 25.0% |
| Internal Audit | 1 | 0 | 0.0% | 2 | 1 | 50.0% | 0 | 0 | 0.0% | 3 | 1 | 33.3% |
| Enterprise Strategy & Information Security | 1 | 0 | 0.0% | 6 | 0 | 0.0% | 0 | 0 | 0.0% | 7 | 0 | 0.0% |
| **Administration** | **12** | **1** | **8.3%** | **22** | **2** | **9.1%** | **8** | **0** | **0.0%** | **42** | **3** | **7.1%** |
| **Accounting** | 4 | 0 | 0.0% | 10 | 0 | 0.0% | 0 | 0 | **0.0%** | 14 | 0 | 0.0% |
| **Disability & Death** | 4 | 0 | 0.0% | 18 | 1 | 5.6% | 4 | 0 | **0.0%** | 26 | 1 | 3.8% |
| **Employer Reporting Compliance & Education** | 3 | 0 | 0.0% | 18 | 2 | 11.1% | 0 | 0 | 0.0% | 21 | 2 | 9.5% |
| **Information Technology** | 5 | 0 | 0.0% | 23 | 4 | 17.4% | 5 | 0 | 0.0% | 33 | 4 | 12.1% |
| **Investments** | 3 | 0 | 0.0% | 5 | 1 | 0.0% | 1 | 0 | 0.0% | 9 | 1 | 11.1% |
| **Member Services** | 7 | 0 | 0.0% | 34 | 3 | 8.8% | 2 | 0 | 0.0% | 43 | 3 | 7.0% |
| **Membership Support** | 4 | 1 | 25.0% | 20 | 1 | 5.0% | 5 | 1 | 20.0% | 29 | 3 | 10.3% |
| **Procurement & Office Services** | 4 | 1 | 25.0% | 0 | 0 | 0.0% | 11 | 3 | 27.3% | 15 | 4 | 26.7% |
| **Retiree Health Care** | 3 | 0 | 0.0% | 15 | 2 | 13.3% | 1 | 0 | 0.0% | 19 | 2 | 10.5% |
| **Retiree Services (Payroll)** | 2 | 0 | 0.0% | 6 | 2 | 33.3% | 0 | 0 | 0.0% | 8 | 2 | 25.0% |
| **TOTALS** | **51** | **3** | **5.88%** | **171** | **18** | **10.53%** | **37** | **4** | **10.81%** | **259** | **25** | **9.65%** |

**KENTUCKY RETIREMENT SYSTEMS**

OVERALL AND MINORITY (FEMALE) FULL TIME EMPLOYMENT
BY TYPE OF EMPLOYMENT AND DIVISION
AS OF MARCH 31, 2015

| KRS AREA/DIVISION | KRS EMPLOYMENT CATEGORY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LEADERSHIP | | | PROFESSIONAL | | | SUPPORT | | | TOTALS | | |
| | Total | Female | (%) | Total | Female | (%) | Total | Female | (%) | Total | Female | (%) |
| Executive Staff | 5 | 2 | 40.0% | 0 | 0 | 0.0% | 2 | 2 | 100.0% | 7 | 4 | 57.1% |
| Communications | 1 | 1 | 100.0% | 5 | 3 | 60.0% | 0 | 0 | 0.0% | 6 | 4 | 66.7% |
| Legal | 3 | 2 | 66.7% | 6 | 4 | 66.7% | 6 | 6 | 100.0% | 15 | 12 | 80.0% |
| Human Resources | 1 | 1 | 100.0% | 3 | 3 | 100.0% | 0 | 0 | 0.0% | 4 | 4 | 100.0% |
| Internal Audit | 1 | 1 | 100.0% | 2 | 2 | 100.0% | 0 | 0 | 0.0% | 3 | 3 | 100.0% |
| Enterprise Strategy & Information Security | 1 | 0 | 0.0% | 6 | 2 | 33.3% | 0 | 0 | 0.0% | 7 | 2 | 28.6% |
| **Administration** | **12** | **7** | **58.3%** | **22** | **14** | **63.6%** | **8** | **8** | **100.0%** | **42** | **29** | **69.0%** |
| **Accounting** | 4 | 3 | 75.0% | 10 | 9 | 90.0% | 0 | 0 | **0.0%** | 14 | 12 | 85.7% |
| **Disability & Death** | 4 | 4 | 100.0% | 18 | 15 | 83.3% | 4 | 4 | **100.0%** | 26 | 23 | 88.5% |
| **Employer Reporting Compliance & Education** | 3 | 2 | 66.7% | 18 | 11 | 61.1% | 0 | 0 | 0.0% | 21 | 13 | 61.9% |
| **Information Technology** | 5 | 1 | 20.0% | 23 | 8 | 34.8% | 5 | 1 | 20.0% | 33 | 10 | 30.3% |
| **Investments** | 3 | 0 | 0.0% | 5 | 1 | 0.0% | 1 | 1 | 0.0% | 9 | 2 | 22.2% |
| **Member Services** | 7 | 5 | 71.4% | 34 | 18 | 52.9% | 2 | 2 | **100.0%** | 43 | 25 | 58.1% |
| **Membership Support** | 4 | 1 | 25.0% | 20 | 8 | 40.0% | 5 | 4 | 80.0% | 29 | 13 | 44.8% |
| **Procurement & Office Services** | 4 | 2 | 50.0% | 0 | 0 | 0.0% | 11 | 9 | 81.8% | 15 | 11 | 73.3% |
| **Retiree Health Care** | 3 | 3 | 100.0% | 15 | 7 | 46.7% | 1 | 1 | 100.0% | 19 | 11 | 57.9% |
| **Retiree Services (Payroll)** | 2 | 1 | 50.0% | 6 | 6 | 100.0% | 0 | 0 | 0.0% | 8 | 7 | 87.5% |
| **TOTALS** | **51** | **29** | **56.86%** | **171** | **97** | **56.73%** | **37** | **30** | **81.08%** | **259** | **156** | **60.23%** |

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen, Esq.
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Quarterly Reports of the Audit Committee

The Audit Committee held its quarterly meeting on May 7, 2015. The purpose of the meeting was to review and discuss, among other miscellaneous audit related items, the following:

- *Review of Auditor of Public Accounts (APA) Audit Follow-up Audit 2015*

  *FINDING*

  ***(1.) Anonymous reporting process and hotline number is not included in KRS' Member Newsletters.***
  ***Level of Severity: Low***

  *RECOMMENDATION*

  *The link of direct email of anonymous reporting to Internal Audit is located on KRS' website under Governance/Transparency-Report Fraud, Waste, and Abuse Anonymously. The anonymous reporting hotline number is posted under Governance/Transparency-Report Fraud, Waste, and Abuse Anonymously on the KRS website. In addition, anonymous reporting process and hotline number should also be in KRS' Member Newsletters. KRS' website and Member Newsletters are the resources where members/retirees would seek anonymous reporting process and hotline number information. Posting the anonymous reporting information in prominent places helps members/retirees to access information easily.*

  ***Note: Anonymous reporting process and hotline number is now included in KRS' current Newsletter February 2015.***

*MANAGEMENT'S RESPONSE*
*(Mr. William A. Thielen, Executive Director)*

*Management agrees with the recommendation. Future issues of the member newsletter will contain the anonymous hotline number and process.*

*FINDING*

***(2.) The Conflict of Interest Statements were not completed by the employees for 2014.***
***Level of Severity: Low***

*RECOMMENDATION*

*Employees should complete the Conflict of Interest Statements annually. The policy may need to be changed to include the responsible party of guaranteeing that the statements are completed, and filed in the employees Human Resource File, or another appropriate location.*

***Note: Management had the employees attest to the fact that they had no conflicts of interest during 2014 in March/April 2015. Management also had the employees complete the Conflict of Interest Statement for 2015 in March/April 2015.***

*MANAGEMENT'S RESPONSE*
*(Mr. William A. Thielen, Executive Director)*

*Management agrees with the recommendation and will have employees sign the appropriate conflict of interest statement for 2014 and annually thereafter.*

***The Audit Committee approved the report of the Auditor of Public Accounts (APA) Audit Follow-up Audit 2015***

- *Review of Employer Reporting – KRS*

*FINDING*

***(1.) Division employer reporting processes are not documented in a procedure manual.***
***Level of Severity: Low***

*During the testing of the employer reporting process for KRS, the auditor noted that the Human Resource (HR) division does not have a documented procedure manual for the payroll and employer reporting process. The KRS website does contain an employer reporting manual on the website for employer reference. It was also noted that the Employer Reporting and Compliance Education (ERCE) Division did not have a procedure manual for the old error correction process. However, for the new process taking effect February 2015 has been documented in a PowerPoint presentation with the intention of transferring this into a procedure manual.*

*Good internal controls dictate that procedures be in place and documented for future reference by staff to ensure that proper procedures are followed for accurate reporting.*

*RECOMMENDATIONS*

*Internal audit recommends that the:*

a. *HR Division should document the payroll and employer reporting process.*
b. *ERCE Division should transfer the new error correction process into a procedure manual in a timely manner.*

*MANAGEMENT'S RESPONSES*
*(Ms. Marlane Robinson, Director of Human Resources)*

*In response to the finding and recommendation 1a, the Human Resources Division has updated the current payroll manual to include a section on Employer Reporting. This new section documents the steps necessary to process the monthly retirement file for employer reporting purposes.*

*(Ms. Sarah A. Webb, Director of Employer Reporting, Compliance & Education)*

*In response to the finding and recommendation 1b, the Employer Reporting, Compliance and Education Division is in the process of fine tuning our error correction process which is currently documented in a Power Point Presentation that is currently being used to train the Division. Upon completion of training, ERCE will put this information in a procedure manual that staff can utilize.*

*FINDING*

***(2.) Two employees did not have a Membership Information form (2001) and/or a Beneficiary Designation form (2035) on file.***
***Level of Severity: Low***

*During the testing of a sample of KRS employees it was noted that one employee with a participation date of 11/1/13 did not have a Member Information form (2001) or a Beneficiary Designation form (2035) on file and one employee with a participation date of 2/1/13 did not have a Member Information form (2001) on file. A welcome letter is sent to new members informing them to complete and return the attached form 2001, Membership Information. The letter also states that the agency should have provided them with form 2035, Beneficiary Designation, if not then they can obtain the form from our website or by calling our office.*

*If a member passes prior to retirement and there is no form 2001 or 2035 on file we still process a benefit to the member's estate. KRS does not currently have a process in place to follow-up with members who fail to submit either forms 2001 or 2035. There are reports available to identify accounts that do not have a 2001 on file, however they are not being utilized and actually may not even be fully developed. Counselors are advised to make members aware of the missing documents if they talk to or see them in the office.*

*According to Kentucky Administrative Regulation 105 KAR 1:170, Membership form requirements section 2: Within thirty (30) days of participation, an employee who is required to participate or who elects to participate shall complete a "Form 2001, Membership Information". The membership form shall be kept on file in the*

*retirement office. According to Kentucky Administrative Regulation 105 KAR 1:200, Retirement procedures and forms Section 10(1a): The retirement office shall not process a monthly retirement allowance until the member has filed at the retirement office a Form 2001, Membership Information.*

*Good internal controls dictate that policy and procedures be in place and followed for membership documentation to ensure that all required documentation is on file with the retirement system.*

*RECOMMENDATIONS*

*Internal audit recommends that:*

a. *A process be adopted and documented to follow-up on members who fail to return required documentation.*
b. *This process should be completed at least semi-annually.*

***Auditor note: The KRS HR department has contacted these employees to get the forms submitted.***

*MANAGEMENT'S RESPONSE*
*(Ms. Shauna Miller, Director of Member Services)*

*In response to the finding, Member Services and Membership Support ensures that members have a valid 2001 on file prior to processing a final retirement or refund. A Form 2035 is not required to process either. Historically, KRS has not monitored the receipt of the Form 2001 or Form 2035 upon a member's initial participation. Each member is advised to submit both forms and if they fail to do so we will request it when they have contact with KRS.*

*With the implementation of START reports were designed to identify Member accounts with missing forms. However, as of now those reports are not functional. I have logged PIR 32936 to resolve the remaining issues with the reports. Once functional, I will devise a procedure to contact members to obtain missing Form 2001 and Form 2035.*

***The Audit Committee approved the Employer Reporting – KRS Audit Report.***

- *Election of Audit Committee Vice Chair*

***The Audit Committee elected David Rich as Vice Chair of the Committee***

- *Review of Quarterly Financial Statements 03/31/2015*
- *Review of Management Follow up on Audit Findings and Recommendations Summary Dashboard*
- *Review of Statewide Single Audit of the Commonwealth of Kentucky for the Fiscal Year Ended June 30, 2014*
- *Review of Outstanding Invoices*
- *GASB 68*
- *Review of Internal Audit Budget 3/31/2015 and approval of FYE 2016 Internal Audit Budget*

***The Audit Committee approved the FYE 2016 Internal Audit Budget.***

- *Review of Anonymous Reporting Spreadsheet*
- *Review of Investment Compliance Report*
- *Review of Equity – Stock International Audit Memo*

***The Audit Committee approved the Equity – Stock International Audit Memo.***

- *Annual Audit Plan for Fiscal Years 2016, 2017, and 2018*

***The Audit Committee approved the Annual Audit Plan for Fiscal Years 2016, 2017, and 2018.***

- *Status of Current Audits Memoranda*
- *State Police Employee Retirement System Board Election Memoranda*

***The Audit Committee accepted the External Auditor's certification letter of the SPRS Board election, and declared the election final.***

- *Review of KRS Administrative Structure, Costs Audit Request for Proposals*

- *Member Data Security*

**RECOMMENDATION:** The Audit Committee requests that the Board ratify the actions taken by the Audit Committee.

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**MEMORANDUM**

**DATE:** April 29, 2015

**TO:** Connie Davis
Director of Internal Audit

**FROM:** Todd Coleman
Controller

**RE:** Third Quarter Financial Highlights

## PENSION FUND

The Pension Fund had a slight decrease in Total Net Position as assets fell from $11.7 billion in FY14 to $11.6 billion in FY15. The decrease was a result of liquidating assets in KERS (Kentucky Employees Retirement Systems), KHAZ (Kentucky Employees Hazardous Retirement System), and SPRS (State Police Retirement System) in order to pay benefits.

Although KRS as a whole experienced a net decrease in net position, CERS (County Employees Retirement System) and CHAZ (County Employees Hazardous Retirement System) experienced an increase in overall assets as noted below:

| KENTUCKY RETIREMENT SYSTEMS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Statements of Plan Net Assets as of March 31, 2015 | | | | | | | |
| | | | | | | | |
| | **KERS** | **KHAZ** | **CERS** | **CHAZ** | **SPRS** | | **Total Pension** |
| **FY 2015** | $2,372,564,622 | $547,600,747 | $6,434,932,03 | $2,074,829,482 | $244,554,399 | | $11,674,481,280 |
| | | | | | | | |
| **FY 2014** | $2,625,580,076 | $552,583,419 | $6,330,924,097 | $2,024,262,990 | $261,198,476 | | $11,794,549,058 |
| | | | | | | | |
| **Net Increase (Decrease)** | **$(253,015,454)** | **$(4,982,672)** | **$104,007,933** | **$50,566,492** | **(16,644,077)** | | **$(120,067,778)** |

| KENTUCKY RETIREMENT SYSTEMS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Change in Net Positions Comparison - Pension Fund as of March 31, 2015 compared to Prior Year | | | | | | | |
| | | | | | | | |
| | **KERS** | **KHAZ** | **CERS** | **CHAZ** | **SPRS** | | **Total Pension** |
| **FY 2015** | ($205,726,423) | ($13,882,980) | ($93,214,323) | ($12,172,779) | ($16,419,860) | | ($341,416,365) |
| | | | | | | | |
| **FY 2014** | ($135,173,772) | $37,992,835 | $535,356,250 | $190,692,432 | $12,498,966 | | $641,366,712 |
| | | | | | | | |
| **Net Increase (Decrease)** | **$(70,552,651)** | **$(51,875,815)** | **$(628,570,573)** | **(202,865,211)** | **$(28,918,826)** | | **$(982,783,077)** |

## INSURANCE FUND

The Insurance Fund had an increase in Total Net Position as assets rose from $3.9 billion in FY14 to $4.2 billion in FY15. The increase is largely due to the growth of the asset base. Even though contributions declined and expenses rose creating less of an increase in Net Position than in FY 2014, all but one system SPRS, experienced growth within the asset base.

| KENTUCKY RETIREMENT SYSTEMS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Statements of Plan Net Assets as of March 31, 2015 | | | | | | | |
| | | | | | | | |
| | KERS | KHAZ | CERS | CHAZ | SPRS | | Total Insurance |
| FY 2015 | $661,754,775 | $437,011,092 | $1,907,584,321 | $1,049,491,456 | $164,476,181 | | $4,220,317,825 |
| | | | | | | | |
| FY 2014 | $612,784,244 | $416,552,211 | $1,808,533,531 | $993,465,041 | $159,208,368 | | $3,990,543,395 |
| | | | | | | | |
| Net Increase (Decrease) | $48,970,531 | $20,458,881 | $99,050,790 | $56,026,415 | $5,267,813 | | $229,774,430 |

| KENTUCKY RETIREMENT SYSTEMS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Change in Net Positions Comparison Insurance Fund as of March 31, 2015 | | | | | | | |
| | | | | | | | |
| | KERS | KHAZ | CERS | CHAZ | SPRS | | Total Insurance |
| FY 2015 | $14,850,592 | $3,486,503 | $28,873,141 | $19,187,668 | ($480,850) | | $65,917,054 |
| | | | | | | | |
| FY 2014 | $116,745,916 | $43,671,053 | $189,574,081 | $102,145,332 | $16,518,209 | | $468,654,592 |
| | | | | | | | |
| Net Increase (Decrease) | $(101,895,324) | $(40,184,550) | $(160,700,940) | $(82,957,664) | $(16,999,059) | | $(402,737,538) |

**KENTUCKY RETIREMENT SYSTEMS**
**COMBINING STATEMENTS OF PLAN NET ASSETS**
**PENSION FUNDS**
**As of March 31, 2015**
**(Unaudited)(In Whole Dollars)**

| | KERS | CERS | SPRS | CHAZ | KHAZ | 2015 | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|
| ASSETS | | | | | | | | | |
| Cash and Short-term Investments | | | | | | | | | |
| Cash Deposits | $518,558 | $577,235 | $50,719 | $79,374 | $84,221 | $1,310,106 | $1,654,085 | -21% | 1 |
| Short-term Investments | $110,635,490 | $201,964,052 | $8,268,368 | $72,757,045 | $18,539,390 | $412,164,344 | $485,001,413 | -15% | 2 |
| Total Cash and Short-term Investments | $111,154,048 | $202,541,287 | $8,319,087 | $72,836,418 | $18,623,611 | $413,474,451 | $486,655,498 | -15% | |
| RECEIVABLES | | | | | | | | | |
| Accounts Receivable | $57,615,784 | $43,954,851 | $3,179,261 | $14,619,570 | $4,805,744 | $124,175,209 | $101,898,460 | 22% | 3 |
| Accounts Receivable - Investments | $58,299,058 | $148,124,960 | $5,522,432 | $47,271,029 | $12,496,724 | $271,714,202 | $630,280,193 | -57% | 4 |
| Accounts - Alternate Participation | | | | $107,629 | | $107,629 | $113,526 | -5% | |
| Total Receivables | $115,914,842 | $192,079,811 | $8,701,693 | $61,998,227 | $17,302,468 | $395,997,040 | $732,292,179 | -46% | |
| INVESTMENTS, AT FAIR VALUE | | | | | | | | | |
| Fixed Income | $580,622,863 | $1,529,866,724 | $54,089,276 | $489,370,846 | $127,968,093 | $2,781,917,803 | $2,943,123,967 | -5% | |
| Public Equities | $884,097,344 | $3,000,505,471 | $110,725,473 | $963,130,667 | $244,901,911 | $5,203,360,867 | $5,324,892,001 | -2% | |
| Private Equities | $362,338,641 | $646,379,803 | $27,853,960 | $213,976,241 | $63,645,543 | $1,314,194,188 | $1,290,076,246 | 2% | |
| Derivatives | $1,782,977 | $4,938,970 | $186,770 | $1,589,112 | $414,906 | $8,912,735 | $2,988,613 | 198% | 5 |
| Absolute Return | $279,908,213 | $707,950,192 | $28,655,223 | $224,791,935 | $60,549,757 | $1,301,855,320 | $1,297,197,320 | 0% | |
| Real Estate | $105,090,171 | $327,236,252 | $12,843,155 | $104,867,233 | $30,761,642 | $580,798,453 | $383,004,528 | 52% | 6 |
| Total Investments, at Fair Value | $2,213,840,208 | $6,216,877,413 | $234,353,858 | $1,997,726,035 | $528,241,853 | $11,191,039,367 | $11,241,282,675 | 0% | |
| Security Lending Collateral Invested | $142,130,848 | $392,379,588 | $14,846,529 | $126,568,221 | $33,432,334 | $709,357,521 | $1,079,073,114 | -34% | |
| FIXED/INTANGIBLE ASSETS | | | | | | | | | |
| Fixed Assets | $821,864 | $1,518,647 | $8,782 | $137,744 | $82,214 | $2,569,251 | $2,480,247 | 4% | |
| Intangible Assets | $5,559,575 | $9,363,350 | $91,632 | $775,454 | $464,278 | $16,254,290 | $16,254,290 | 0% | |
| Accumulated Depreciation | ($762,376) | ($1,406,607) | ($8,288) | ($127,415) | ($76,129) | ($2,380,816) | ($2,337,483) | 2% | |
| Accumulated Amortization | ($2,474,290) | ($4,094,122) | ($48,202) | ($341,684) | ($196,692) | ($7,154,990) | ($5,529,561) | 29% | |
| Total Fixed Assets | $3,144,773 | $5,381,268 | $43,924 | $444,099 | $273,672 | $9,287,735 | $10,867,492 | -15% | 7 |
| Total Assets | $2,586,184,719 | $7,009,259,366 | $266,265,090 | $2,259,573,000 | $597,873,937 | $12,719,156,113 | $13,550,170,959 | -6% | |
| LIABILITIES | | | | | | | | | |
| Accounts Payable | $2,033,732 | $4,098,303 | $395,139 | $1,403,490 | $1,906,762 | $9,837,426 | $7,793,717 | 26% | 8 |
| Investment Accounts Payable | $69,455,517 | $177,849,433 | $6,469,033 | $56,771,806 | $14,934,096 | $325,479,886 | $668,755,069 | -51% | 9 |
| Securities Lending Collateral | $142,130,848 | $392,379,588 | $14,846,529 | $126,568,221 | $33,432,334 | $709,357,521 | $1,079,073,114 | -34% | 10 |
| Total Liabilities | $213,620,097 | $574,327,324 | $21,710,701 | $184,743,518 | $50,273,192 | $1,044,674,832 | $1,755,621,901 | -40% | |
| Total Plan Net Position | $2,372,564,622 | $6,434,932,042 | $244,554,389 | $2,074,829,482 | $547,600,746 | $11,674,481,281 | $11,794,549,058 | -1% | |

**NOTE - Variance Explanation**

1 *Goal is to keep minimal cash on hand at all times in order to increase return.*
2 *Cash is being invested in longer term vehicles through New Managers and Capital Calls*
3 *Increase in Employer Contributions Rate for FY 2015*
4 *Variance is a result of transactions activity which is based on each individual manager*
5 *Derivatives include currency forwards/futures as permitted by KRS investment policy. Derivative income increases as the hedging investment offsets the strong USD.*
6 *Additional Funding has been placed in the Real Estate Asset class through a reduction in TIPS.*
7 *In FY 2014 a review of the Fixed Asset Policy was done which resulted in an increase in the individual threshold from $750 to $3,000 per item. A clean up was done to remove any items that were below the threshold.*
8 *Increase in Outstanding Credit Invoice*
9 *Variance is a result of transactions activity which is based on each individual manager*
10 *Removal of PIMCO as a participating manager of the Securities Lending Program*

**KENTUCKY RETIREMENT SYSTEMS**
**COMBINING STATEMENTS OF CHANGES IN NET POSITIONS**
**PENSION FUNDS**
**For the Nine Months Ending March 31, 2015**
**(Unaudited)(In Whole Dollars)**

| | KERS | CERS | SPRS | CHAZ | KHAZ | 2015 | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|
| ADDITIONS | | | | | | | | | |
| Member Contributions | $75,924,487 | $98,384,451 | $3,562,683 | $34,574,609 | $9,388,618 | $221,834,848 | $204,887,891 | 8% | |
| Employer Contributions | $387,265,413 | $219,148,528 | $19,042,554 | $81,320,681 | $16,642,718 | $723,419,895 | $571,917,397 | 26% | 1 |
| Pension Spiking Contributions | $519,409 | $579,276 | $234,427 | $302,764 | $130,916 | $1,766,792 | | | 2 |
| Bank of America Settlement | $8,442,347 | $10,280,391 | $644,756 | $2,865,365 | $767,141 | $23,000,000 | | | 3 |
| Health Insurance Contributions (HB1) | $3,117,761 | $4,956,175 | $67,680 | $787,260 | $395,699 | $9,324,575 | $9,567,488 | -3% | |
| Total Contributions | $475,269,417 | $333,348,821 | $23,552,100 | $119,850,680 | $27,325,092 | $979,346,109 | $786,372,777 | 25% | |
| INVESTMENT INCOME | | | | | | | | | |
| From Investing Activities | | | | | | | | | |
| Net Appreciation in FV of Investments | ($13,568,603) | ($16,469,463) | ($1,790,923) | ($3,945,625) | ($2,490,651) | ($38,265,264) | $1,020,112,449 | -104% | 4 |
| Interest/Dividends | $48,111,180 | $113,255,130 | $4,586,161 | $36,029,455 | $9,856,209 | $211,838,135 | $245,068,702 | -14% | |
| Total Investing Activities Income | $34,542,577 | $96,785,668 | $2,795,238 | $32,083,831 | $7,365,558 | $173,572,871 | $1,265,181,150 | -86% | |
| Investment Expense | $14,445,970 | $35,075,691 | $1,391,693 | $11,163,821 | $3,219,066 | $65,296,241 | $35,012,572 | 86% | 5 |
| Net Income from Investing Activities | $20,096,607 | $61,709,976 | $1,403,545 | $20,920,010 | $4,146,492 | $108,276,630 | $1,230,168,579 | -91% | |
| From Securities Lending Activities | | | | | | | | | |
| Securities Lending Income | $424,666 | $1,218,402 | $43,535 | $392,001 | $99,508 | $2,178,113 | $3,277,886 | -34% | |
| Securities Lending Expense | | | | | | | | | |
| Securities Lending Borrower Rebates | $69,073 | $153,498 | $6,104 | $49,237 | $13,281 | $291,193 | $4,377 | 6552% | |
| Security Lending Agent Fee | $48,820 | $168,387 | $5,850 | $53,746 | $13,415 | $290,218 | $453,181 | -36% | |
| Security Lending Commission Expense | | | | | | | | | |
| Net Income from Securities Lending | $306,774 | $896,517 | $31,582 | $289,017 | $72,812 | $1,596,702 | $2,820,327 | -43% | 6 |
| Total Investment Income | $20,403,380 | $62,606,494 | $1,435,127 | $21,209,027 | $4,219,304 | $109,873,332 | $1,232,988,905 | -91% | |
| Total Additions | $495,672,798 | $395,955,314 | $24,987,227 | $141,059,706 | $31,544,396 | $1,089,219,441 | $2,019,361,682 | -46% | |
| DEDUCTIONS | | | | | | | | | |
| Benefit Payments | $678,783,105 | $458,901,391 | $41,024,722 | $149,159,984 | $42,436,512 | $1,370,305,714 | $1,323,628,743 | 4% | |
| Refunds | $11,052,746 | $10,947,651 | $44,279 | $2,417,864 | $2,097,915 | $26,560,455 | $25,172,830 | 6% | |
| Administrative Expenses | $11,220,509 | $18,751,489 | $330,113 | $1,605,799 | $865,042 | $32,772,953 | $29,193,398 | 12% | 7 |
| Capital Project Expenses | $342,859 | $569,107 | $7,973 | $48,838 | $27,907 | $996,684 | | | 8 |
| Total Deductions | $701,399,220 | $489,169,638 | $41,407,087 | $153,232,485 | $45,427,376 | $1,430,635,806 | $1,377,994,970 | 4% | |
| Net Increase(Decrease) in Plan Net Position | ($205,726,423) | ($93,214,323) | ($16,419,860) | ($12,172,779) | ($13,882,980) | ($341,416,365) | $641,366,712 | -153% | |
| PLAN NET ASSETS HELD IN TRUST FOR PENSION BENEFITS | | | | | | | | | |
| Beginning of Period | $2,578,291,044 | $6,528,146,353 | $260,974,259 | $2,087,002,261 | $561,483,727 | $12,015,897,645 | $11,153,182,356 | | |
| End of Period | $2,372,564,622 | $6,434,932,030 | $244,554,399 | $2,074,829,482 | $547,600,747 | $11,674,481,280 | $11,794,549,068 | | |

**NOTE - Variance Explanation**

1 *Increase in Employer Contribution Rate*
2 *Effective date 1/1/15*
3 *Funds Received in FY15*
4 *Unfavorable Market Conditions*
5 *Increase in Manager Fees from Private Equity as the Funds Mature*
6 *PIMCO was a large contributor to the Program and they are no longer participating in the SL program*
7 *Increase in overall budget creates an increase in total amount transferred each month.*
8 *Completion of the Final Phase of the START Project - Upgrade of the Filenet System*

**KENTUCKY RETIREMENT SYSTEMS**
**COMBINING STATEMENTS OF NET POSITIONS**
**INSURANCE FUNDS**
**As of March 31, 2015**
**(Unaudited)(In Whole Dollars)**

| | KERS | CERS | SPRS | CHAZ | KHAZ | 2015 | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|
| ASSETS | | | | | | | | | |
| Cash and Short-Term Investments | | | | | | | | | |
| Cash Deposits | $103,089 | $127,901 | $12,136 | $18,085 | $23,159 | $284,370 | $936,118 | -70% | 1 |
| Short-term Investments | $31,415,966 | $62,307,621 | $6,819,715 | $33,326,281 | $16,316,715 | $150,186,298 | $205,005,112 | -27% | 2 |
| Medicare Drug Deposit | | | | | | | $100,029 | -100% | 3 |
| Total Cash and Short-term Investments | $31,519,055 | $62,435,522 | $6,831,851 | $33,344,367 | $16,339,874 | $150,470,668 | $206,041,259 | -27% | |
| RECEIVABLES | | | | | | | | | |
| Accounts Receivable | $12,819,910 | $12,697,514 | $837,762 | $6,141,099 | $1,289,409 | $33,785,695 | $35,837,178 | -6% | |
| Investment Accounts Receivable | $15,937,924 | $46,593,301 | $4,029,399 | $25,814,619 | $10,895,307 | $103,270,551 | $232,982,747 | -56% | 4 |
| Total Receivables | $28,757,835 | $59,290,816 | $4,867,161 | $31,955,718 | $12,184,717 | $137,056,246 | $268,819,925 | -49% | |
| INVESTMENTS, AT FAIR VALUE | | | | | | | | | |
| Security Lending Collateral Invested | $33,914,107 | $99,037,966 | $8,553,109 | $54,533,610 | $22,774,013 | $218,812,806 | $347,456,000 | -37% | 5 |
| Fixed Income | $210,582,607 | $619,513,975 | $52,587,537 | $340,846,465 | $141,402,309 | $1,364,932,893 | $1,296,561,758 | 5% | |
| Public Equities | $267,451,447 | $764,559,289 | $63,653,614 | $418,562,761 | $177,418,870 | $1,691,645,981 | $1,650,200,332 | 3% | |
| Derivatives | $510,800 | $1,489,715 | $128,013 | $821,391 | $342,046 | $3,291,964 | $1,084,059 | 204% | 6 |
| Private Equities | $41,324,449 | $159,011,729 | $14,672,402 | $88,470,528 | $32,678,967 | $336,158,074 | $262,789,512 | 28% | 7 |
| Absolute Return | $70,578,256 | $199,460,709 | $17,979,008 | $112,604,049 | $47,099,342 | $447,721,364 | $426,113,313 | 5% | |
| Real Estate | $31,514,921 | $101,857,605 | $8,934,874 | $56,017,046 | $23,480,112 | $221,804,558 | $132,413,588 | 68% | 8 |
| Total Investments, at Fair Value | $621,962,479 | $1,845,893,022 | $157,955,447 | $1,017,322,239 | $422,421,645 | $4,065,554,834 | $3,769,162,560 | 8% | |
| Total Assets | $716,153,476 | $2,066,657,326 | $178,207,568 | $1,137,155,934 | $473,720,249 | $4,571,894,554 | $4,591,479,744 | 0% | |
| LIABILITIES | | | | | | | | | |
| Accounts Payable | $4,965 | $20,065 | | $2,829 | | $27,859 | $6,229,098 | -100% | 9 |
| Investment Accounts Payable | $20,479,618 | $60,014,973 | $5,178,279 | $33,128,038 | $13,935,144 | $132,736,052 | $247,251,251 | -46% | 10 |
| Securities Lending Collateral | $33,914,107 | $99,037,966 | $8,553,109 | $54,533,610 | $22,774,013 | $218,812,806 | $347,456,000 | -37% | 11 |
| Total Liabilities | $54,398,691 | $159,073,003 | $13,731,388 | $87,664,478 | $36,709,158 | $351,576,718 | $600,936,349 | -41% | |
| Total Plan Net Position | $661,754,785 | $1,907,584,322 | $164,476,180 | $1,049,491,456 | $437,011,092 | $4,220,317,836 | $3,990,543,395 | 6% | |

**NOTE - Variance Explanation**

1 *Cash is being invested in longer term vehicles through New Managers and Capital Calls*
2 *Cash is being invested in longer term vehicles through New Managers and Capital Calls*
3 *KRS was able to close the required Medicare Drug Deposit Account with the closing of the self funding program*
4 *Variance is a result of transactions activity which is based on each individual manager*
5 *PIMCO was a large contributor to the Program and they are no longer participating in the SL program*
6 *Derivatives include currency forwards/futures as permitted by KRS investment policy. Derivative income increases as the hedging investment offsets the strong USD.*
7 *Additional Funds placed in Private Equity*
8 *Additional Funds placed in Real Estate*
9 *The move from self insured insurance program*
10 *Variance is a result of transactions activity which is based on each individual manager*
11 *PIMCO was a large contributor to the Program and they are no longer participating in the SL program*

**KENTUCKY RETIREMENT SYSTEMS**
**COMBINING STATMENTS OF CHANGES IN NET POSITIONS**
**INSURANCE FUNDS**
**For the Nine Months Ending March 31, 2015**
**(Unaudited)(In Whole Dollars)**

| | KERS | CERS | SPRS | CHAZ | KHAZ | 2015 | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|
| ADDITIONS | | | | | | | | | |
| Employer Contributions | $99,606,055 | $85,335,812 | $7,828,420 | $54,050,028 | $10,587,315 | $257,407,630 | $296,312,017 | -13% | 1 |
| Insurance Premiums | $214,417 | $438,244 | $599 | $5,138 | $9,587 | $667,984 | $2,300,786 | -71% | 2 |
| Retired Reemployed Healthcare | $2,830,524 | $2,863,553 | | $567,619 | $508,095 | $6,769,791 | $4,314,634 | 57% | 3 |
| Total Contributions | $102,650,995 | $88,637,609 | $7,829,019 | $54,622,784 | $11,104,997 | $264,845,405 | $302,927,437 | -13% | |
| INVESTMENT INCOME | | | | | | | | | |
| From Investing Activities | | | | | | | | | |
| Net Appreciation in FV of Investments | ($2,759,514) | $3,638,673 | ($18,080) | $2,092,013 | ($3,452) | $2,949,640 | $327,887,086 | -99% | 4 |
| Interest/Dividends | $11,151,866 | $30,621,409 | $2,759,724 | $16,658,469 | $7,243,107 | $68,434,576 | $70,705,095 | -3% | |
| Total From Investing Activities | $8,392,352 | $34,260,082 | $2,741,645 | $18,750,482 | $7,239,655 | $71,384,215 | $398,592,181 | -82% | |
| Investment Expense | $3,118,280 | $10,155,965 | $937,890 | $5,544,143 | $2,212,073 | $21,968,351 | $11,987,745 | 83% | 5 |
| Net Income from Investing Activities | $5,274,072 | $24,104,117 | $1,803,755 | $13,206,339 | $5,027,582 | $49,415,865 | $386,604,436 | -87% | |
| From Securities Lending | | | | | | | | | |
| Securities Lending Income | $108,209 | $322,847 | $27,302 | $178,891 | $73,676 | $710,923 | $1,088,005 | -35% | |
| Securities Lending Expense | | | | | | | | | |
| Security Lending Borrower Rebates | ($11,364) | ($32,952) | ($3,118) | ($18,357) | ($7,608) | ($73,398) | ($157,395) | -53% | |
| Security Lending Agent Fees | $14,938 | $44,589 | $3,753 | $24,520 | $10,135 | $97,935 | $142,604 | -31% | |
| Net Income from Securities Lending | $104,635 | $311,210 | $26,667 | $172,727 | $71,148 | $686,387 | $1,102,796 | -38% | 6 |
| Total Net Income from Investments | $5,378,706 | $24,415,327 | $1,830,422 | $13,379,066 | $5,098,730 | $50,102,251 | $387,707,232 | -87% | |
| Total Additions | $108,029,702 | $113,052,936 | $9,659,441 | $68,001,850 | $16,203,727 | $314,947,656 | $690,634,669 | -54% | |
| DEDUCTIONS | | | | | | | | | |
| Healthcare Premiums Subsidies | $91,618,379 | $81,475,970 | $10,123,825 | $48,679,116 | $12,611,215 | $244,508,506 | $213,722,627 | 14% | 7 |
| Administrative Expense | | | | | | | $910,688 | -100% | 8 |
| Self Funded Healthcare Costs | $1,557,548 | $2,698,205 | $16,418 | $134,858 | $105,874 | $4,512,903 | $7,306,423 | -38% | 9 |
| Excise Tax Insurance | $3,182 | $5,620 | $48 | $208 | $136 | $9,194 | $40,340 | -77% | 10 |
| Total Deductions | $93,179,110 | $84,179,795 | $10,140,291 | $48,814,183 | $12,717,225 | $249,030,603 | $221,980,077 | 12% | |
| Net Increase(Decrease) in Plan Net Position | $14,850,592 | $28,873,141 | ($480,850) | $19,187,668 | $3,486,503 | $65,917,053 | $468,654,592 | -86% | |
| NET PLAN POSITION HELD IN TRUST FOR | $646,904,183 | $1,878,711,180 | $164,957,032 | $1,030,303,789 | $433,524,589 | $4,154,400,773 | $3,521,888,793 | | |
| INSURANCE BENEFITS | $661,754,775 | $1,907,584,321 | $164,476,181 | $1,049,491,456 | $437,011,092 | $4,220,317,826 | $3,990,543,385 | | |

**NOTE - Variance Explanation**

1 *Reduction in Employer Contribution Rates for the Insurance Fund*
2 *Move from Self Funding Insurance Program to Premiums Based Program*
3 *Increase in both retired reemployed and premiums charged*
4 *Unfavorable Market Conditions*
5 *Increase in Manager Fees from Private Equity as the Funds Mature*
6 *PIMCO was a large contributor to the Program and they are no longer participating in the SL program*
7 *Increase in Premiums paid to Humana*
8 *Move from Self Funding Insurance Program to Premiums Based Program*
9 *A large refund was received last year that offset expenditures*
10 *This charge is based on the number of insurance policies administered by KRS. There are far less since the move from the self-funded insurance program*

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board of Trustees

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** KRS Administrative Budget-to-Actual Expenditure Update

Accompanying this memorandum, you will find the spreadsheets showing KRS Administrative budget-to-actual expenditures for the Fiscal Year 2014-15. Key informational items for this period include:

- Total 2014-15 Annual Budget = $40.9 million
- Expenditures through March 31, 2015 totaled $22.9 million (44% of total budget) resulting in a favorable variance to Plan.
- Administrative expenses are lower than prior year same period by $1.3 million (Seven Counties, printing, and investment consulting).
- We anticipate being favorable to Budget for the fiscal year. Quarter 4 expenses will trend higher in the remaining three month period related to overtime (reducing service purchase and post retirement audit backlogs), actuarial audit fees for May and June, investment costs (Asset Liability study, full staffing, travel), GASB 68 audit expenses (APA and external auditor), and technology refresh expenses.
- Additional information includes two ancillary reports showing the split out of Internal Audit and Investments.

**RECOMMENDATION:** None. This item is presented for information purposes only.

**KRS ADMINISTRATIVE BUDGET 2014-2015**
**THIRD QUARTER BUDGET-TO-ACTUAL ANALYSIS**
**As of March 31, 2015**

| Acc't # | Account Name | Budgeted | Actual Expenditures | Remaining | % Remaining |
|---|---|---|---|---|---|
| | **PERSONNEL** | | | | |
| 111 | Salaries | $14,426,125 | $11,285,559 | $3,140,566 | 21.77% |
| 120 | Benefits | $8,842,352 | $6,789,912 | $2,052,440 | 23.21% |
| 131 | Workers Compensation | $34,000 | $32,365 | $1,635 | 4.81% |
| 132 | Unemployment | $10,000 | $0 | $10,000 | 100.00% |
| 133 | Tuition Assistance | $35,000 | $30,286 | $4,714 | 13.47% |
| 133I | Investment Tuition Assistance | $5,000 | $0 | $5,000 | 100.00% |
| 133T | Audit Tuition Assistance | $2,500 | $0 | $2,500 | 100.00% |
| 135 | Bonds | $3,000 | $204 | $2,796 | 93.21% |
| 141 | **LEGAL & AUDITING SERVICES** | | | | |
| 141A | Legal Hearing Officers | $344,000 | $177,484 | $166,516 | 48.41% |
| 141B | Legal (Stoll, Keenon) | $225,000 | $85,961 | $139,039 | 61.80% |
| 141C | Polsinelli Shugart | $100,000 | $18,196 | $81,804 | 81.80% |
| 141E | Reinhart | $350,000 | $87,789 | $262,211 | 74.92% |
| 141F | Ice Miller | $1,200,000 | $145,643 | $1,054,357 | 87.86% |
| 142 | Auditing | $70,000 | $50,877 | $19,123 | 27.32% |
| 146 | **CONSULTING SERVICES** | | | | |
| 146A | Medical Reviewers | $380,000 | $222,893 | $157,107 | 41.34% |
| 146B | Medical Reports | $10,000 | $16 | $9,984 | 99.84% |
| 146C | Medical Exams | $20,000 | $16,256 | $3,744 | 18.72% |
| 150 | **CONTRACTUAL SERVICES** | | | | |
| 150C | Miscellaneous Contracts | $205,000 | $211,541 | ($6,541) | -3.19% |
| 150D | Health Consultant | $125,000 | $61,170 | $63,830 | 51.06% |
| 150E | Banking | $9,000 | $0 | $9,000 | 100.00% |
| 150F | PBI | $9,000 | $0 | $9,000 | 100.00% |
| 150G | Human Resources Consulting | $100,000 | $0 | $100,000 | 100.00% |
| 150H | Health Insurance Admin Fee | $1,867,700 | $1,546,863 | $320,837 | 17.18% |
| 150I | Investment Consulting | $1,600,000 | $0 | $1,600,000 | 100.00% |
| 150J | Medical Claims TPA | $2,841,997 | $0 | $2,841,997 | 100.00% |
| 150K | Pharmacy Claims TPA | $2,773,369 | $0 | $2,773,369 | 100.00% |
| 159 | Actuarial Services | $500,000 | $166,839 | $333,161 | 66.63% |
| 162 | Facility Security Charges | $3,000 | $1,034 | $1,967 | 65.55% |
| | **PERSONNEL SUBTOTAL** | **$36,091,043** | **$20,930,887** | **$15,160,156** | **42.01%** |

**KRS ADMINISTRATIVE BUDGET 2014-2015**

**THIRD QUARTER BUDGET-TO-ACTUAL ANALYSIS**

| Acc't # | Account Name | Budgeted | Actual Expenditures | Remaining | % Remaining |
|---|---|---|---|---|---|
| | **OPERATIONAL** | | | | |
| 211 | Natural Gas | $25,000 | $17,725 | $7,275 | 29.10% |
| 212 | Electric | $187,800 | $125,638 | $62,162 | 33.10% |
| 221 | Rent-NonState Building | $33,500 | $24,516 | $8,984 | 26.82% |
| 222 | Rent -State Owned Building | $686,300 | $514,788 | $171,512 | 24.99% |
| 223 | Equipment Rental | $5,000 | $2,990 | $2,010 | 40.20% |
| 224 | Copier Rental | $86,000 | $43,756 | $42,244 | 49.12% |
| 226 | Rental Carpool | $0 | $0 | $0 | |
| 232 | Vehicle/Equip. Mainten. | $29,000 | $254 | $28,746 | 99.13% |
| 241 | Postage | $525,000 | $224,390 | $300,610 | 57.26% |
| 242 | Freight | $1,200 | $610 | $590 | 49.13% |
| 251 | Printing (State) | $1,000 | $0 | $1,000 | 100.00% |
| 252 | Printing (non-state) | $300,000 | $36,045 | $263,955 | 87.99% |
| 254 | Insurance | $81,300 | $2,352 | $78,948 | 97.11% |
| 256 | Garbage Collection | $12,300 | $8,700 | $3,600 | 29.27% |
| 259 | Conference Expense | $40,000 | $7,303 | $32,697 | 81.74% |
| 259I | Conference Exp. Investment | $12,600 | $2,717 | $9,883 | 78.43% |
| 259T | Conference Exp. Audit | $1,500 | $1,253 | $247 | 16.47% |
| 300 | MARS Usage | $25,000 | $20,325 | $4,675 | 18.70% |
| 321 | Office Supplies | $96,300 | $48,873 | $47,427 | 49.25% |
| 331 | Data Processing Supplies | $45,000 | $7,490 | $37,510 | 83.35% |
| 343 | Motor Fuels & Lubricants | $2,707 | $2,146 | $561 | 20.74% |
| 346 | Furniture & Office Equipment | $50,000 | $3,915 | $46,085 | 92.17% |
| 361 | Travel (In-State) | $109,000 | $53,905 | $55,095 | 50.55% |
| 361I | Travel (In-State) Investment | $1,500 | $0 | $1,500 | 100.00% |
| 361T | Travel (In-State) Audit | $500 | $116 | $384 | 76.83% |
| 362 | Travel (Out of State) | $40,000 | $4,673 | $35,327 | 88.32% |
| 362I | Travel (Out of State) Invest | $51,050 | $18,593 | $32,457 | 63.58% |
| 362T | Travel (Out of State) Audit | $2,500 | $1,746 | $754 | 30.15% |
| 381 | Dues & Subscriptions | $37,000 | $31,264 | $5,736 | 15.50% |
| 381I | Dues & Subscriptions Invest | $42,000 | $6,039 | $35,961 | 85.62% |
| 381T | Dues & Subscriptions Audit | $1,000 | $675 | $325 | 32.50% |
| 399 | Miscellaneous | $2,500 | $16,746 | ($14,246) | -569.83% |
| 399I | Miscellaneous Investment | $16,700 | $4,660 | $12,040 | 72.10% |
| 399T | Miscellaneous Audit | $500 | $71 | $429 | 85.81% |
| 601 | Capital Outlay | $300,000 | $0 | $300,000 | 100.00% |
| 802 | COT Charges | $90,000 | $65,213 | $24,787 | 27.54% |
| 814 | Telephone - Wireless | $8,000 | $3,630 | $4,370 | 54.62% |
| 815 | Telephone - Other | $150,000 | $71,492 | $78,508 | 52.34% |
| 847 | Computer Equip./Software | $1,550,000 | $534,044 | $1,015,956 | 65.55% |
| 847I | Comp. Equip./Software Invest | $190,000 | $21,305 | $168,695 | 88.79% |
| 847T | Comp. Equip/Software Audit | $1,000 | $0 | $1,000 | 100.00% |
| | | | | | |
| | **OPERATIONAL SUBTOTAL** | **$4,839,757** | **$1,929,959** | **$2,909,798** | **60.12%** |
| | | | | | |
| | **TOTALS** | **$40,930,800** | **$22,860,846** | **$18,069,954** | **44.15%** |

## KRS ADMINISTRATIVE BUDGET 2014-15

### INTERNAL AUDIT - THIRD QUARTER BUDGET-TO-ACTUAL ANALYSIS

**As of March 31, 2015**

| Acc't # | Account Name | Budgeted | Actual Expense | Remaining | % Remaining |
|---|---|---|---|---|---|
| | **PERSONNEL (1)** | | | | |
| 133T | Audit Tuition Assistance | $2,500 | $0 | $2,500 | 100% |
| | **PERSONNEL SUBTOTAL** | **$2,500** | **$0** | **$2,500** | **100%** |
| | **OPERATIONAL** | | | | |
| 259T | Conference Exp. Audit | $1,500 | $1,253 | $247 | 16% |
| 361T | Travel (In-State) Audit | $500 | $116 | $384 | 77% |
| 362T | Travel (Out of State) Audit | $2,500 | $1,746 | $754 | 30% |
| 381T | Dues & Subscriptions Audit | $1,000 | $675 | $325 | 33% |
| 399T | Miscellaneous Audit | $500 | $71 | $429 | 86% |
| 847T | Comp. Equip/Software Audit | $1,000 | $0 | $1,000 | 100% |
| | | | | | |
| | **OPERATIONAL SUBTOTAL** | **$7,000** | **$3,861** | **$3,139** | **45%** |
| | | | | | |
| | **TOTALS** | **$9,500** | **$3,861** | **$5,639** | **59%** |

### INVESTMENT AUDIT - THIRD QUARTER BUDGET-TO-ACTUAL ANALYSIS

**As of March 31, 2015**

| Acc't # | Account Name | Budgeted | Actual Expense | Remaining | % Remaining |
|---|---|---|---|---|---|
| | **PERSONNEL (1)** | | | | |
| 133I | Investment Tuition Assistance | $5,000 | $0 | $5,000 | 100% |
| | **CONTRACTUAL SERVICES** | | | | |
| 141E | Reinhart | $350,000 | $87,789 | | |
| 150I | Investment Consulting | $1,600,000 | $0 | $1,600,000 | 100% |
| | **PERSONNEL SUBTOTAL** | **$1,955,000** | **$87,789** | **$1,605,000** | **82%** |
| | **OPERATIONAL** | | | | |
| 259I | Conference Exp. Investment | $12,600 | $2,717 | $9,883 | 78% |
| 361I | Travel (In-State) Investment | $1,500 | $0 | $1,500 | 100% |
| 362I | Travel (Out of State) Investment | $51,050 | $18,593 | $32,457 | 64% |
| 381I | Dues & Subscriptions Invest | $42,000 | $5,916 | $36,084 | 86% |
| 399I | Miscellaneous Investment | $16,700 | $4,660 | $12,040 | 72% |
| 847I | Comp. Equip./Software Investment | $190,000 | $21,305 | $168,695 | 89% |
| | | | | | |
| | **OPERATIONAL SUBTOTAL** | **$313,850** | **$53,191** | **$260,659** | **83%** |
| | | | | | |
| | **TOTALS** | **$2,268,850** | **$140,980** | **$1,865,659** | **82%** |

(1) Staff salaries are included in total KRS Budget reporting.

# KENTUCKY RETIREMENT SYSTEMS
INVESTMENTS

TO: Kentucky Retirement System Board of Trustees

FROM: David Peden, Chief Investment Officer

DATE: May 21, 2015

SUBJECT: Investment Committee Quarterly Report

The Investment Committee held its regularly scheduled meeting on May 5, 2015. The purpose of the meeting was to evaluate investment activities, program structure, management, controls, and performance results of the Pension and Insurance Funds, for the quarter ending March 31, 2015, along with various other subjects.

The meeting began with approval of the minutes for the previous Investment Committee meeting held on February 3, 2015.

Connie Davis presented the Quarterly Compliance Report. The Management Update was given by David Peden, CIO, which included a review of some of the standard quarterly reports. These reports included the: Monthly Performance Update, Investment Division Budget Report, the quarterly Manager Meeting and Related Expense Tracking Report, the Internally Managed Portfolio Asset Report, Internally Managed Portfolio Transactions Report, Securities Lending Report, Domestic Equity Commissions Report, Global Equity Commissions Report, and the Securities Litigation Report were provided for informational purposes.

The Standing Quarterly Committee Topics, Potential Future Topics List, and an overview of the supplied articles of interest were reviewed. Questions were encouraged and addressed throughout the reports.

KRS Investment Staff and consultant PCA recommended a capital commitment of 20 million euro to Keyhaven Capital Partners IV, L.P. and 20 million euro to a co-investment entity that will invest along side the fund, both having a European private equity focus. The investment committee approved this investment. All Pension systems except for KERS Non-Hazardous and all five insurance systems will participate in this investment. The investment manager in the marketing and due diligence process used no placement agents.

KRS Investment Staff and consultant Albourne recommended a Real Return investment of one percent of the aggregate KRS portfolio, with an initial investment of $100 million, to be managed by AMERRA Capital Management, LLC in their agricultural lending strategy. The investment

committee approved this investment. All five Pension systems and all five insurance systems will participate in this investment. The parent company of AMERRA did describe their marketing person as a placement agent in the placement agent disclosure form presented to the investment committee. KRS has asked the fund to not pay this individual a placement fee based on KRS' investment and the fund has agreed.

KRS Investment Staff and consultant Albourne recommended a capital commitment of $50 million to a Real Return investment called MTP Energy Opportunities Fund II managed by Magnetar. The investment committee approved this investment. All five Pension systems and all five insurance systems will participate in this investment. The investment manager in the marketing and due diligence process used no placement agents.

Staff recommended hiring PRISMA Capital Partners on a trial basis for a Strategic Partnership to help to continue to build out the direct hedge fund portfolio. The investment committee approved this recommendation. There are no expenses or obligations to KRS associated with this arrangement.

Staff recommended acquiring a technological platform called Burgis Private I via BNY Mellon (KRS' Custodial Bank) that is used for improving the accounting, transparency, performance analysis, and data aggregation of the KRS Private Equity and other closed-end limited partnerships. The investment committee approved this recommendation. There is an annual fee associated with this software and service of $150,000 that will be added to our quarterly BNY Mellon custodial fees. It should be noted that a formal RFP process was not conducted to choose this provider because staff had reviewed the technological capabilities of multiple providers over the course of a number years and had previously identified the Burgis software to be the system most beneficial to the KRS investment program. In addition, there are efficiencies gained via BNY Mellon since this is the technological platform they utilize and much of the data entry will be conducted by BNY Mellon at no cost to KRS dollar wise or in terms of staff time. The expense will not be part of the administrative budget, which has to be appropriated, and instead will be treated as a variable expense just as the BNY Mellon custodial fee is currently. The effect of this fee will be to reduce the gross and net performance of the aggregate KRS portfolios by 0.001% annually.

Staff discussed the engagement of CEM in an investment fee benchmarking study and the output and use of such a study. Staff discussed with the investment committee the fact that CEM was uniquely qualified to perform such a study. This was for informational purposes only and no action was taken.

Consultant RV Kuhns presented the results of the asset/liability studies for the five pension systems. Questions were encouraged and asked throughout the presentation. This was for informational purposes only and no action was taken.

***Please see the next page for a summary of the Pension and Insurance performance information ending March 31, 2015.***

| Pension Funds Performance Overview<br>Rates of Return (%) as of March 31, 2015 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | One Year | | Three Years | | Five Years | | Ten Years | |
| | Fund | Index | Fund | Index | Fund | Index | Fund | Index |
| **Equity** | 4.82 | 5.35 | 10.84 | 10.80 | 9.08 | 9.48 | 6.49 | 6.26 |
| **Fixed Income** | 4.80 | 5.33 | 4.66 | 3.49 | 5.92 | 4.88 | 5.28 | 5.08 |
| **Private Equity** | 8.77 | 8.77 | 14.80 | 14.80 | 13.96 | 14.28 | 9.51 | 10.67 |
| **Real Estate** | 8.04 | 11.46 | 9.28 | 11.38 | 11.56 | 12.86 | 6.18 | 6.11 |
| **Absolute Return** | 3.53 | 4.46 | 7.51 | 5.45 | N/A | | N/A | |
| **Real Return** | 1.09 | 1.90 | 2.20 | 3.12 | N/A | | N/A | |
| **Cash Equivalents** | 0.16 | 0.03 | 0.37 | 0.05 | 0.44 | 0.07 | 1.99 | 1.41 |
| **Total Fund** | 4.78 | 6.06 | 8.55 | 9.17 | 8.05 | 8.48 | 6.24 | 6.44 |

| Insurance Funds Performance Overview<br>Rates of Return (%) as of March 31, 2015 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | One Year | | Three Years | | Five Years | | Ten Years | |
| | Fund | Index | Fund | Index | Fund | Index | Fund | Index |
| **Equity** | 5.11 | 5.39 | 10.85 | 10.68 | 8.79 | 9.28 | 6.19 | 5.94 |
| **Fixed Income** | 3.37 | 5.33 | 4.00 | 3.49 | 5.63 | 5.39 | 5.30 | 5.10 |
| **Private Equity** | 13.35 | 13.35 | 15.95 | 15.95 | 14.82 | 14.74 | 8.92 | 10.08 |
| **Real Estate** | 8.77 | 11.46 | 8.62 | 11.38 | 14.55 | 12.86 | N/A | |
| **Absolute Return** | 3.58 | 4.46 | 7.54 | 5.45 | N/A | | N/A | |
| **Real Return** | 1.14 | 2.27 | 1.89 | 3.25 | N/A | | N/A | |
| **Cash Equivalents** | 0.20 | 0.03 | 0.31 | 0.05 | 0.29 | 0.07 | 1.81 | 1.41 |
| **Total Fund** | 4.77 | 6.66 | 8.03 | 9.21 | 7.40 | 8.77 | 5.62 | 6.06 |

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RECOMMENDATION: The Board is requested to ratify the actions of the Investment Committee.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the KRS Board of Trustees

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Presentation of the Asset Liability Modeling (ALM) Study

Representatives from RV Kuhns will be present at the Board meeting to make a presentation on the results of the recently completed ALM study.

**RECOMMENDATION**: None. This presentation is for information only.

May 21, 2015

# Asset/Liability Summary

## Kentucky Retirement Systems

# Asset/Liability Studies

## Introduction

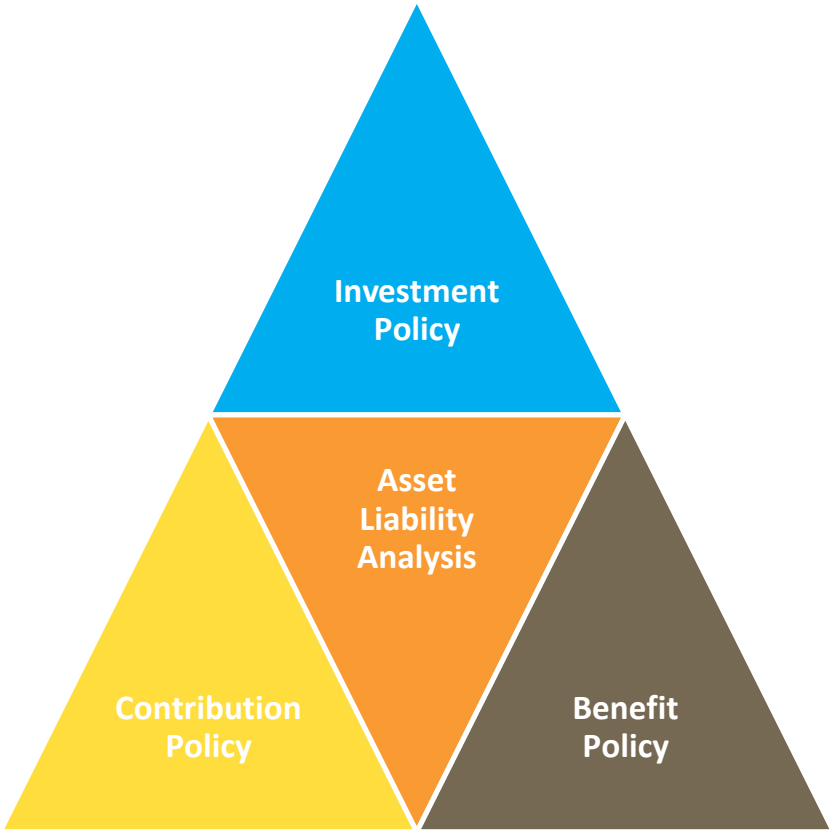
- This presentation summarizes the key findings from the following Asset/Liability studies:
  - KERS Non-Hazardous Pension Plan
  - KERS Hazardous Pension Plan
  - CERS Non-Hazardous Pension Plan
  - CERS Hazardous Pension Plan
  - State Police Pension Plan

- 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

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# 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
  - 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

## What do they consist of?

- 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
  - Stochastic analysis is more complex but also more realistic and offers insights into the range of potential outcomes

# 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** |

# These Asset/Liability Studies…

- Use data from the June 30, 2014 Actuarial Valuations.
- Use the methods 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**

# CERS Non-Hazardous Pension Plan
# CERS Hazardous Pension Plan
# KERS Hazardous Pension Plan

# Deterministic Summary Results

## CERS Non-Hazardous Pension Plan

| | 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 |

# Deterministic Summary Results

## CERS Hazardous Pension Plan

| | 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 |

# Deterministic Summary Results

## KERS Hazardous Pension Plan

| | 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 |

# Deterministic Summary Results

- Payout ratios are healthy and not materially increasing
- Funded ratios will likely gradually improve over time
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher
- Investing out the current situation is not a reasonable expectation

# Stochastic Summary Results

- Peak payout ratios remain unrestrictive
- Funding
  - 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 being in materially worse shape than today
  - Improvement is possible but not guaranteed
- Potential Portfolios 2 and 3 appear superior to the Current Target
- The ultra-conservative portfolio is likely to end the projection period far worse off than today and with the highest contributions and payout ratios

# 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

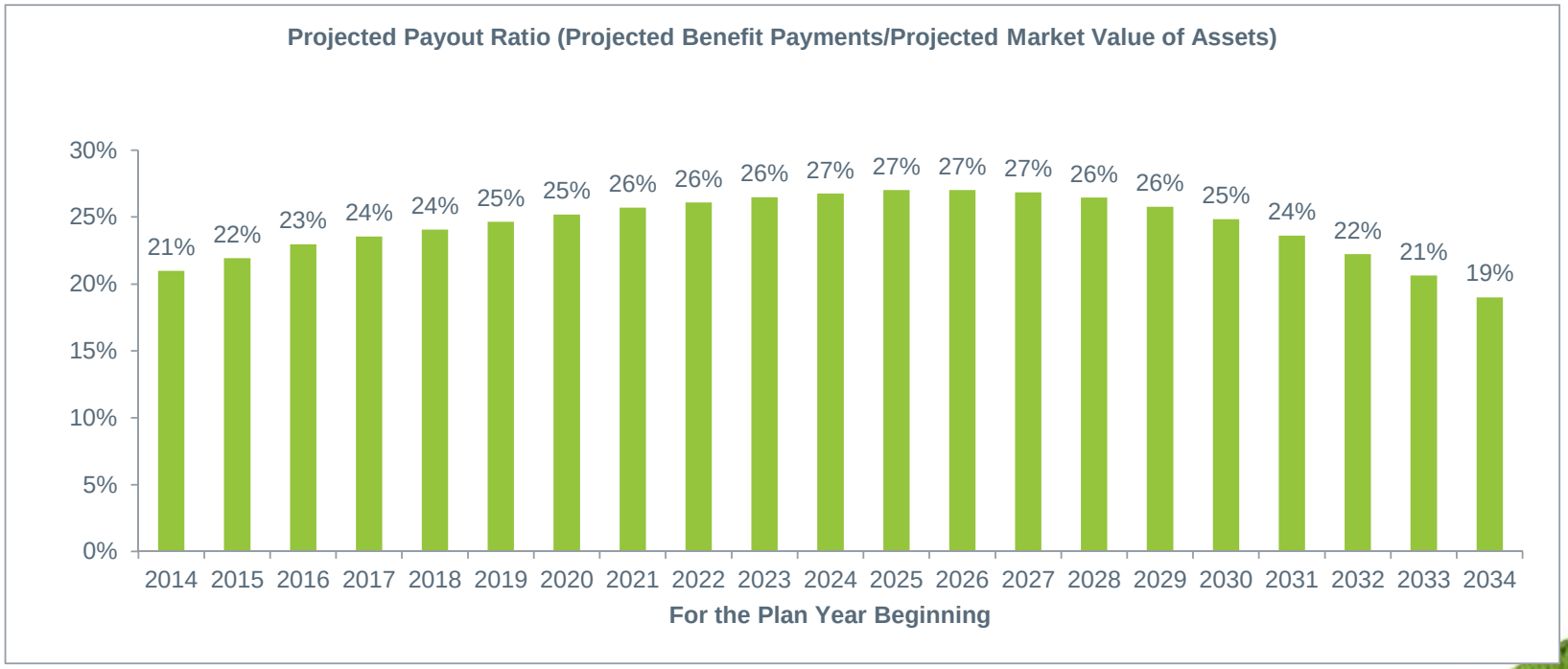
## Deterministic Summary Results

| | 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

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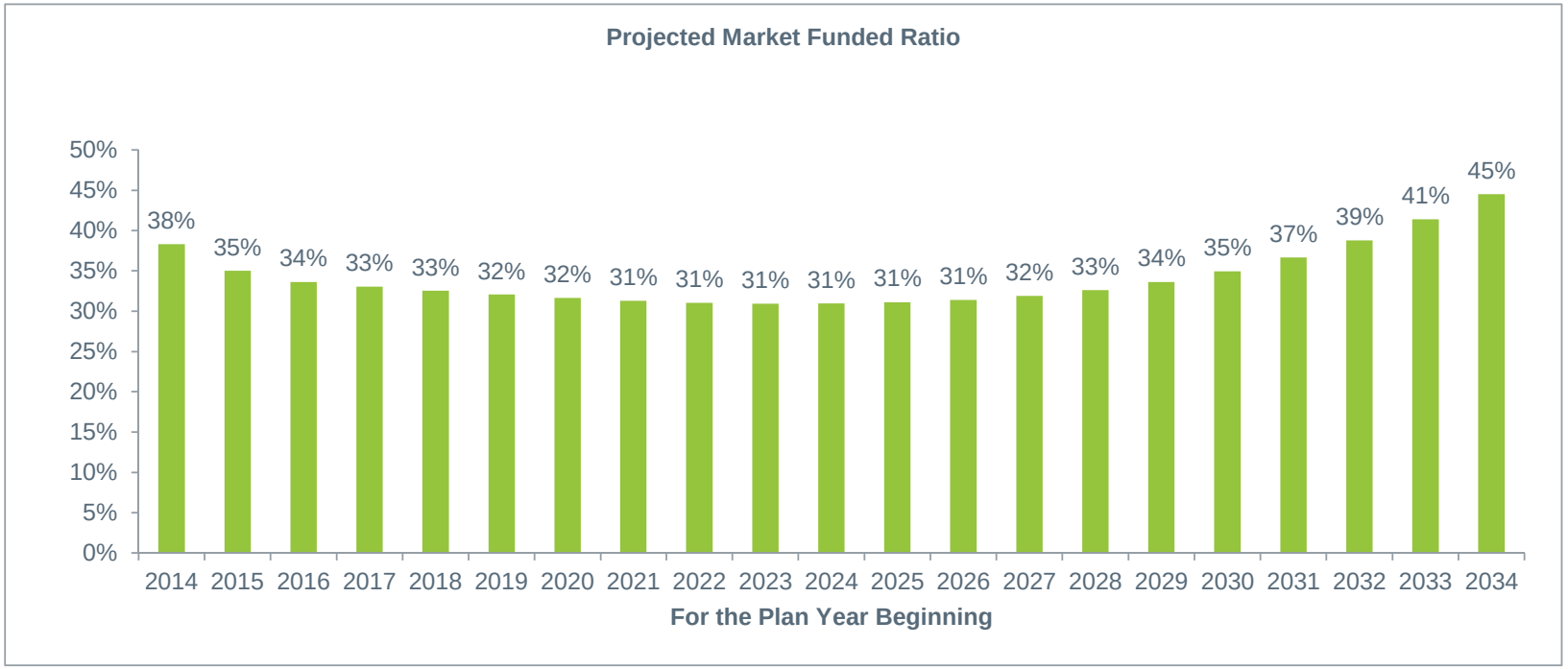
# State Police Pension Plan

## Deterministic Summary Results

- The funded ratio will likely improve over time

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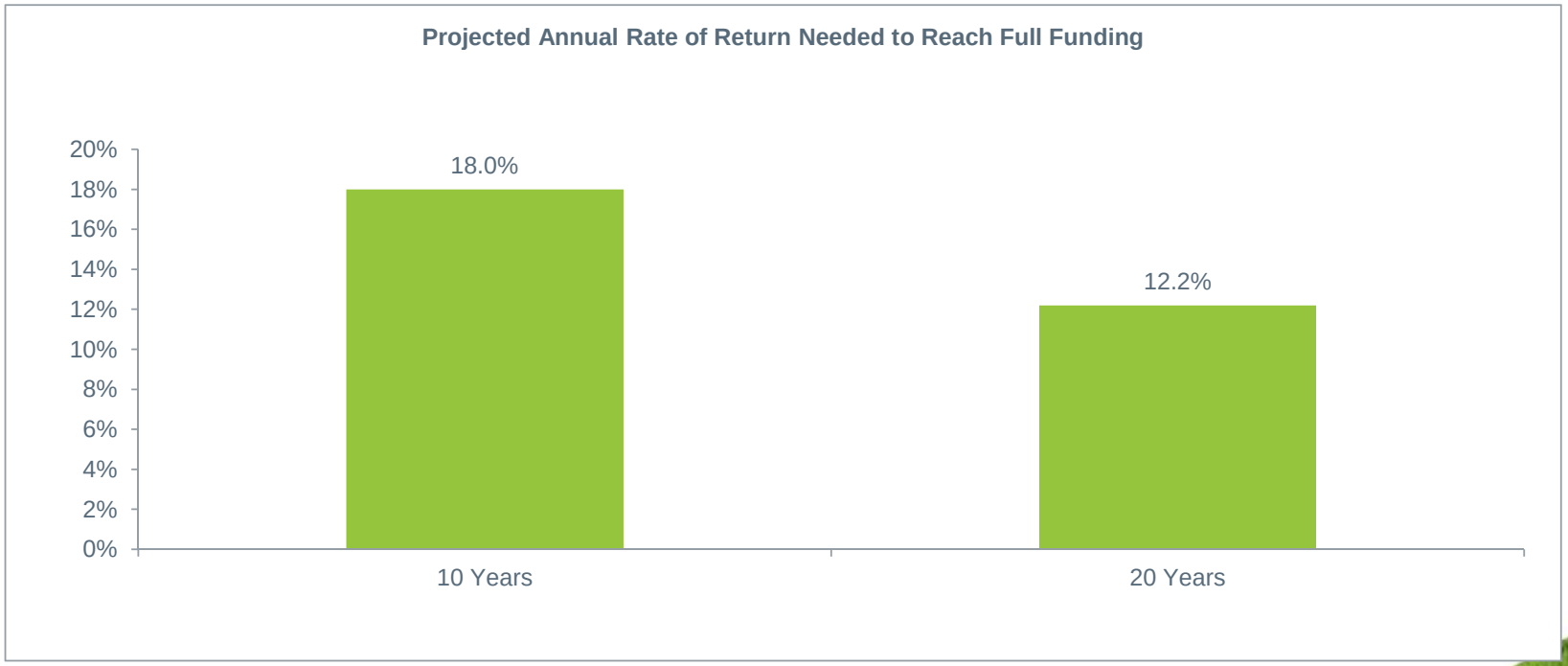
# State Police Pension Plan

## Deterministic Summary Results

- Investing out the current situation is not a reasonable expectation



# State Police Pension Plan

## Deterministic Summary Results

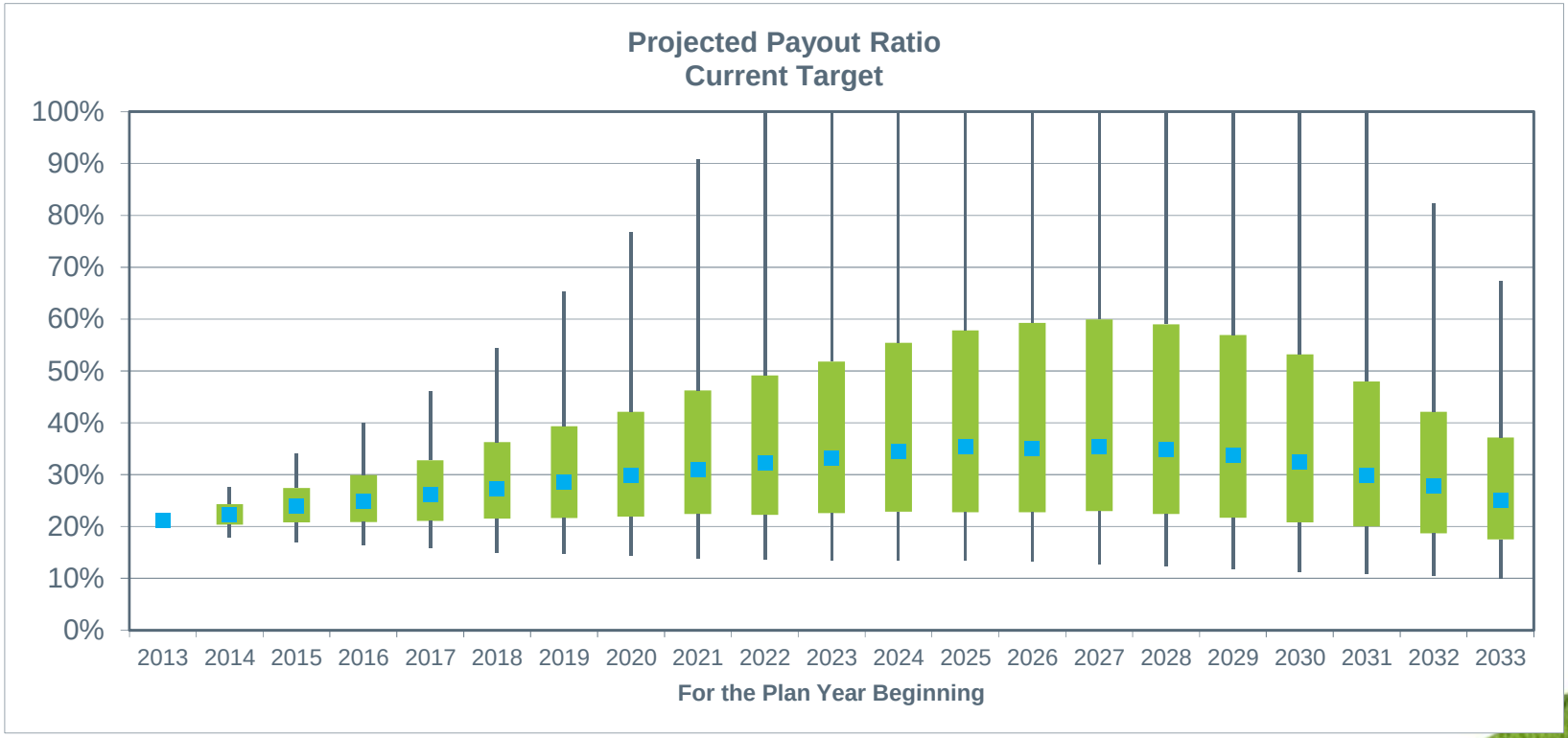
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

| | 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

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# 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 Median | 2014-2034 Peak | 2014-2034 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

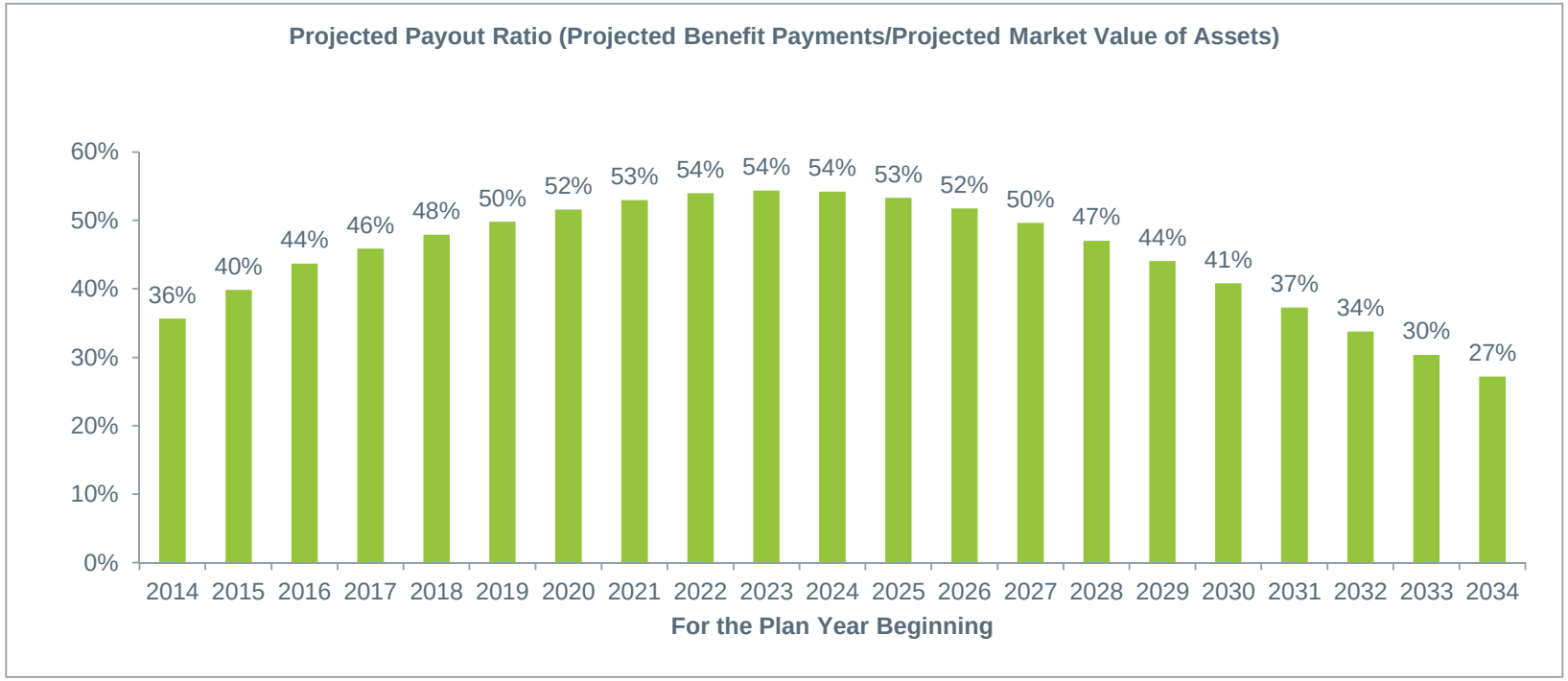
| | Current (June 30, 2014) | Projected Year 20 (Deterministic) |
|---|---|---|
| Actuarial Accrued Liability | $11.6 billion | $13.1 billion |
| Market value of Assets | $2.6 billion | $4.2 billion |
| Deficit | $9.0 billion | $8.9 billion |
| Market Value Funded Ratio | 22% | 32% |
| Payout Ratio |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

2008 House Bill 1 which set future State contributions as a percentage of the Annual Required Contribution has been modified and no long applied to future projected contributions.

# KERS Non-Hazardous Pension Plan

## Deterministic Summary Results

- The payout ratio is quickly approaching restrictive levels

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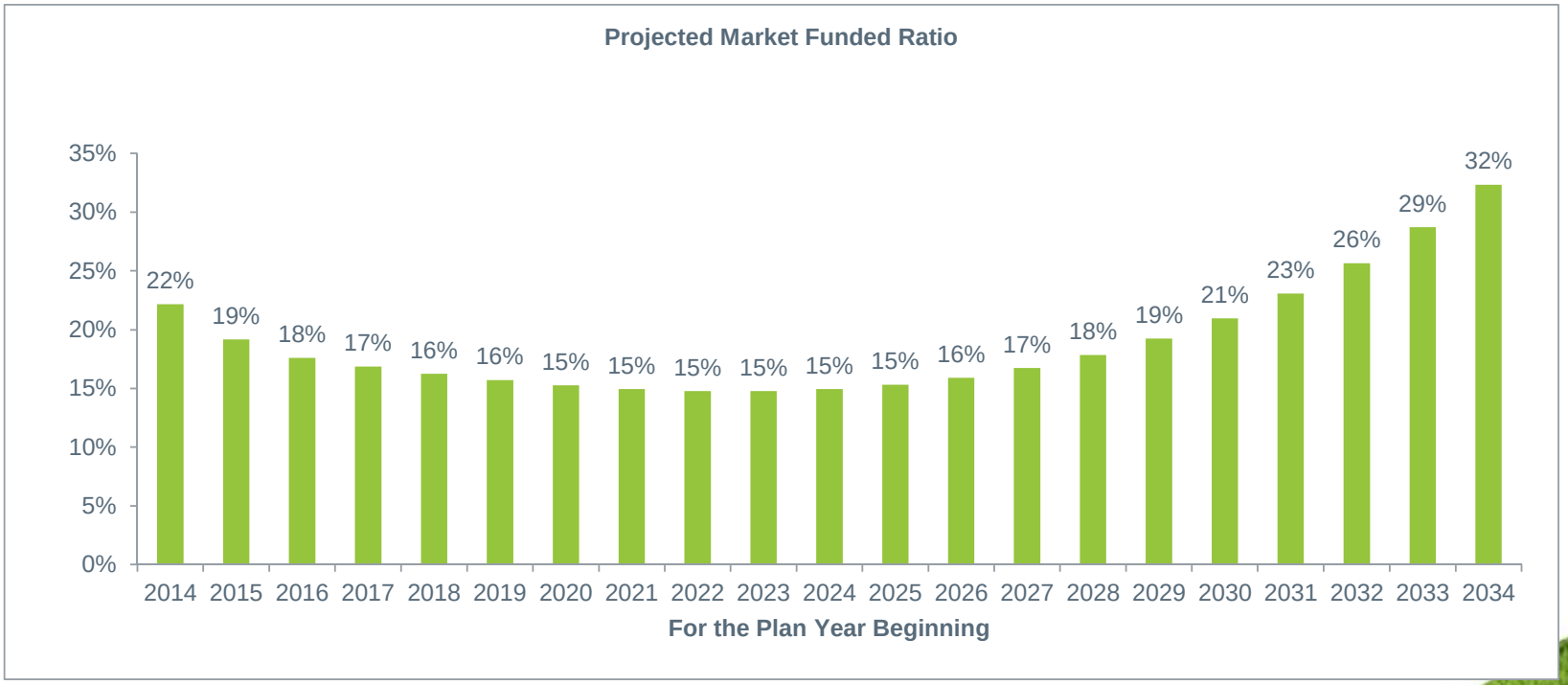
# KERS Non-Hazardous Pension Plan

## Deterministic Summary Results

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

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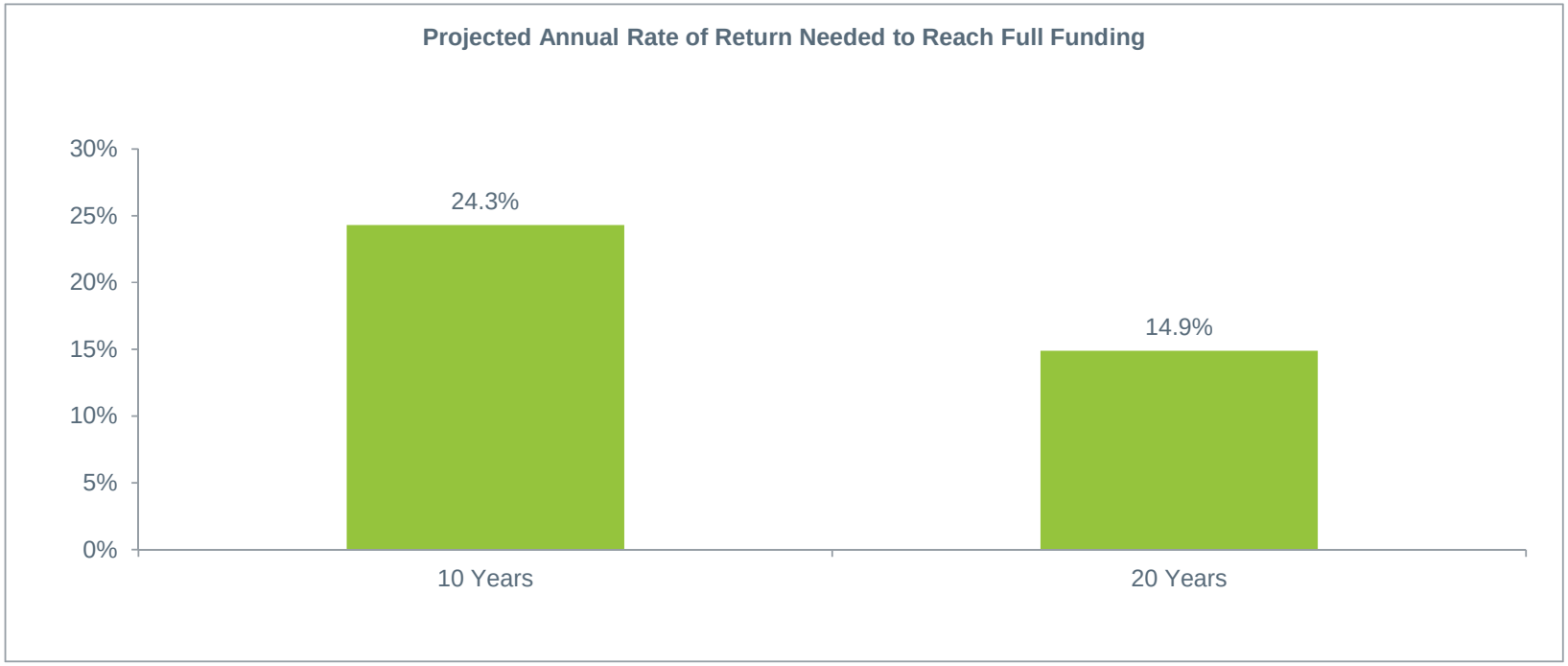
# KERS Non-Hazardous Pension Plan

## Deterministic Summary Results

- Investing out the current situation is not possible



# KERS Non-Hazardous Pension Plan

## Deterministic Summary Results

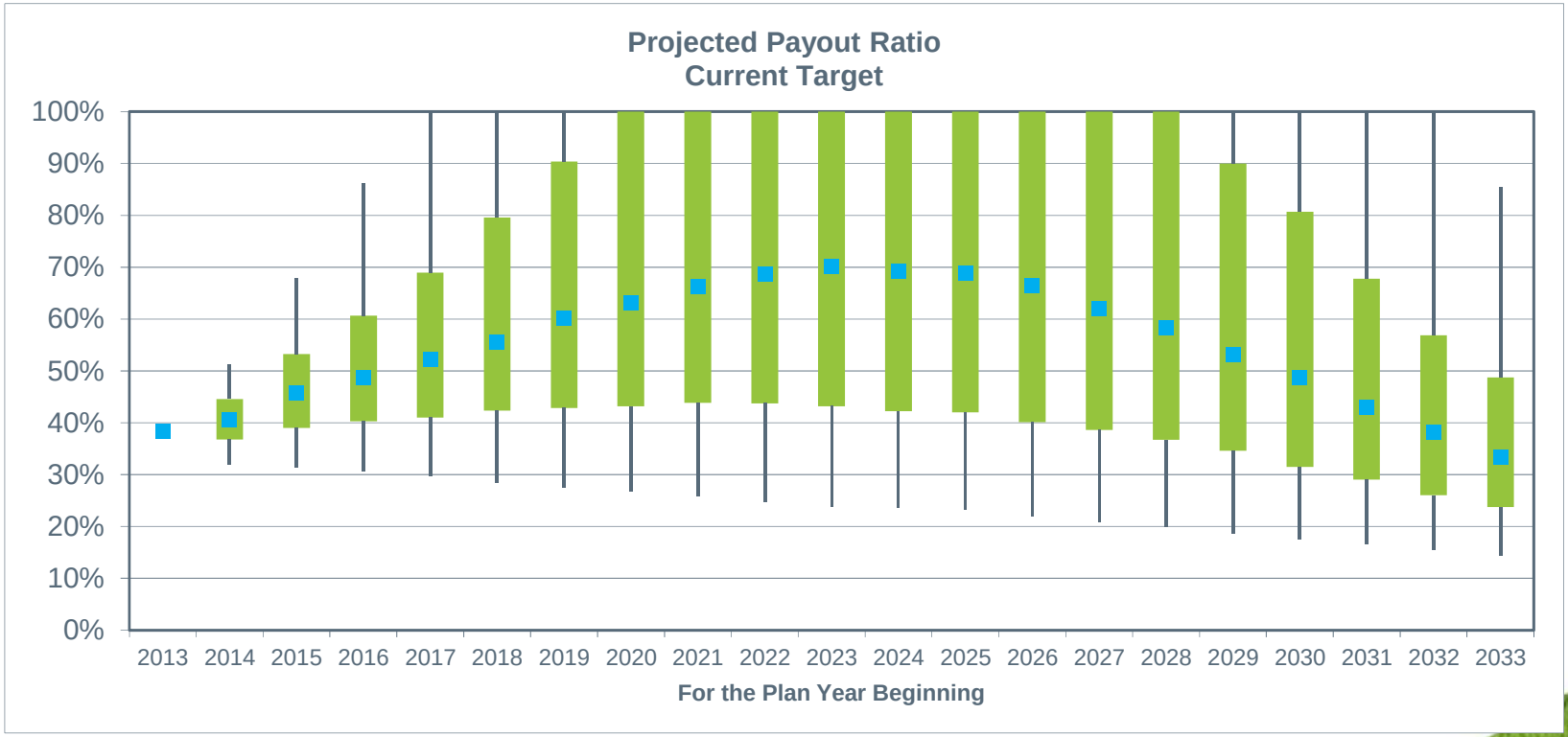
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

| | Value in 2034 | | | |
|---|---|---|---|---|
| | Actuarially Assumed Rate of Return | Reduced Return (100 bps) | Impact of Reduced Return | |
| Projected Payout Ratio | 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 | ▲ |

# KERS Non-Hazardous Pension Plan

## Stochastic Summary Results

- Peak median payout ratios are above 50%




RVK

# KERS Non-Hazardous 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
- 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% |

# KERS Non-Hazardous Pension Plan

## 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 Median | 2014-2034 Peak | 2014-2034 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% |

# KERS Non-Hazardous Pension Plan

## 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


PORTLAND
CHICAGO
NEW YORK

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

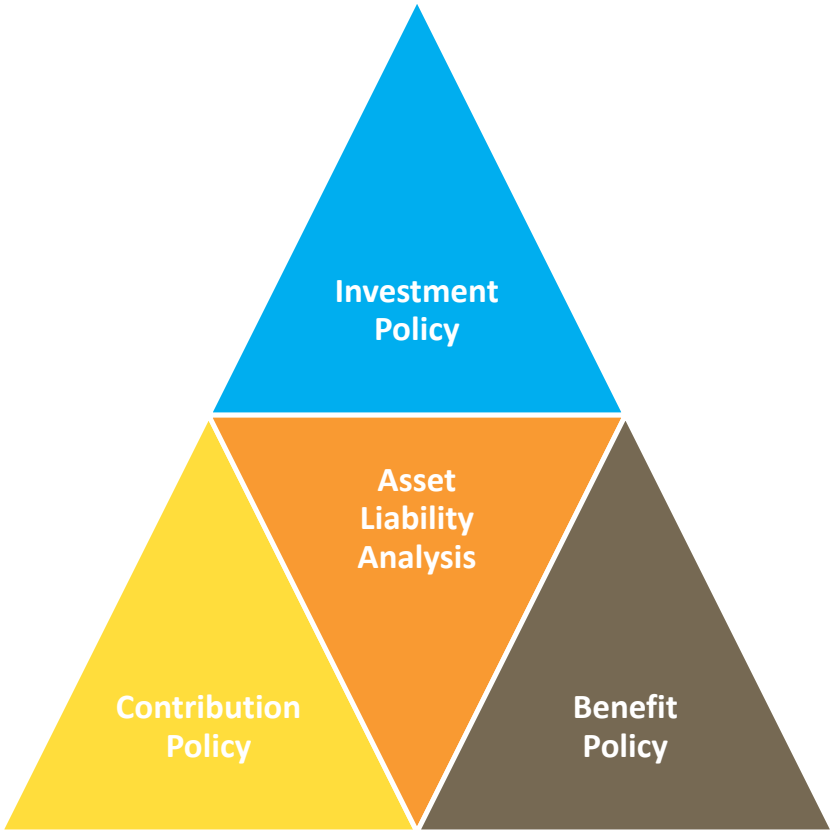
- This presentation is only a partial summary of the full Asset/Liability Studies submitted to KRS.
  - The complete versions of these studies contain important background information and caveats important to a complete understanding of the issues addressed.



# 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

Monte Carlo simulation uses a random sampling of asset class returns, based on the probability distribution implied by the empirical returns, to create several thousand estimates of portfolio performance.



# 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

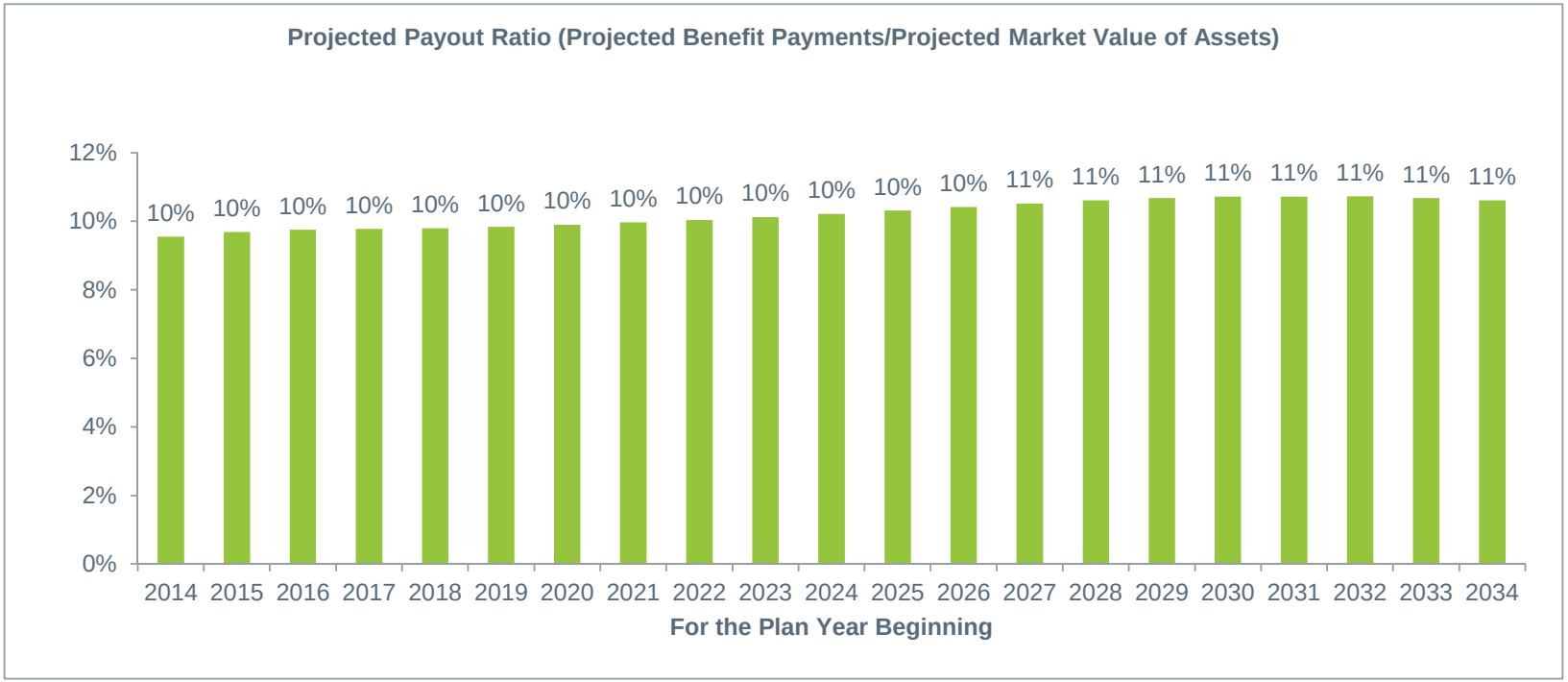
| | Current (June 30, 2014) | Projected Year 20 (Deterministic) |
|---|---|---|
| Actuarial Accrued Liability | $9.8 billion | $15.1 billion |
| Market value of Assets | $6.5 billion | $11.8 billion |
| Deficit | $3.7 billion | $3.3 billion |
| Market Value Funded Ratio | 67% | 78% |
| Payout Ratio |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



# CERS Non-Hazardous Pension Plan

## Deterministic Summary Results

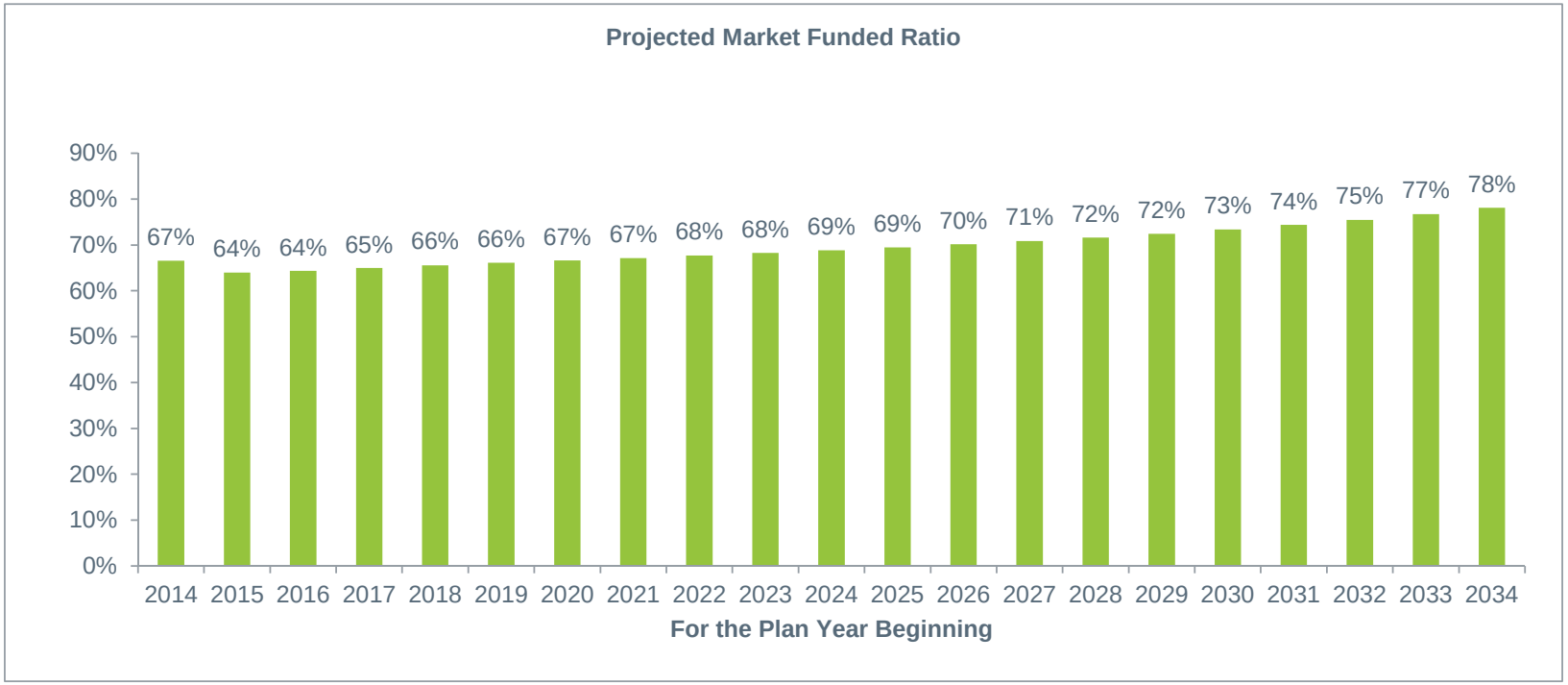
- The payout ratio is healthy and not materially increasing



# CERS Non-Hazardous Pension Plan

## Deterministic Summary Results

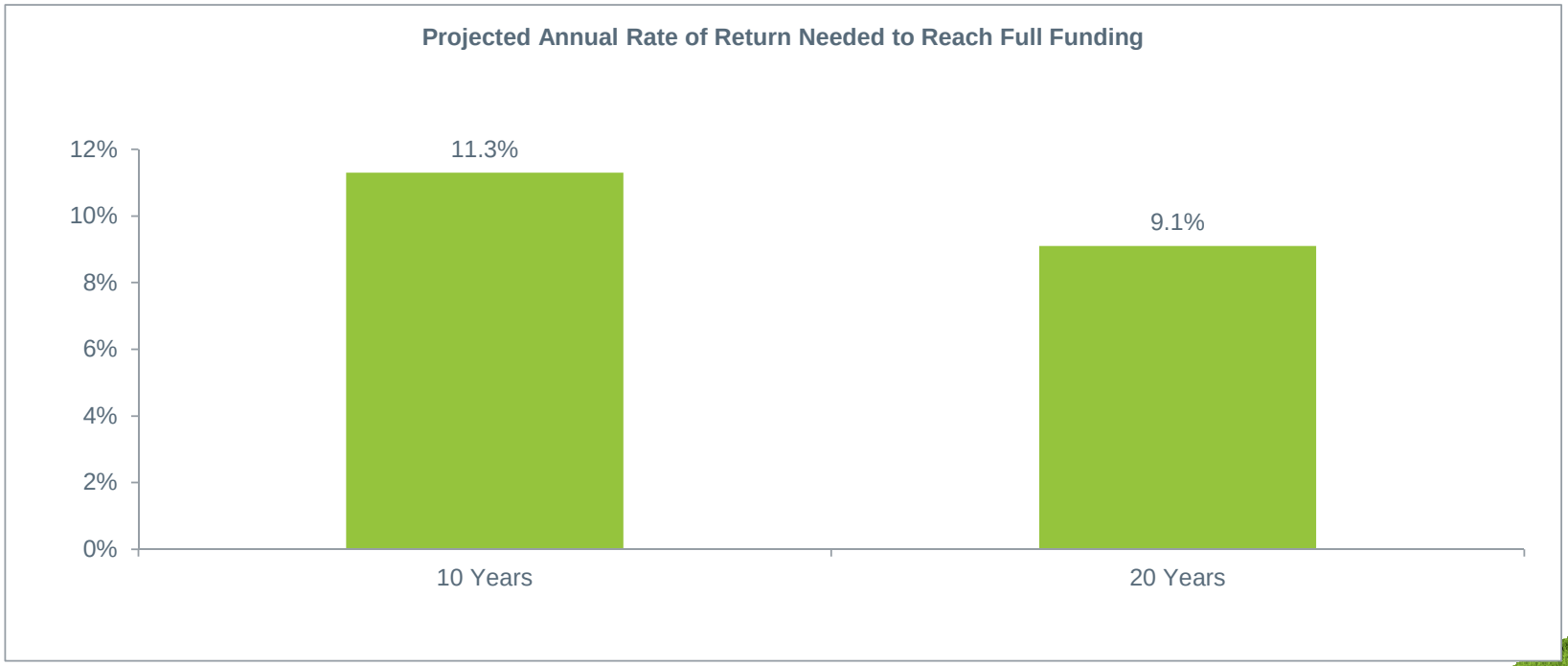
- The funded ratio will likely improve over time



# 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

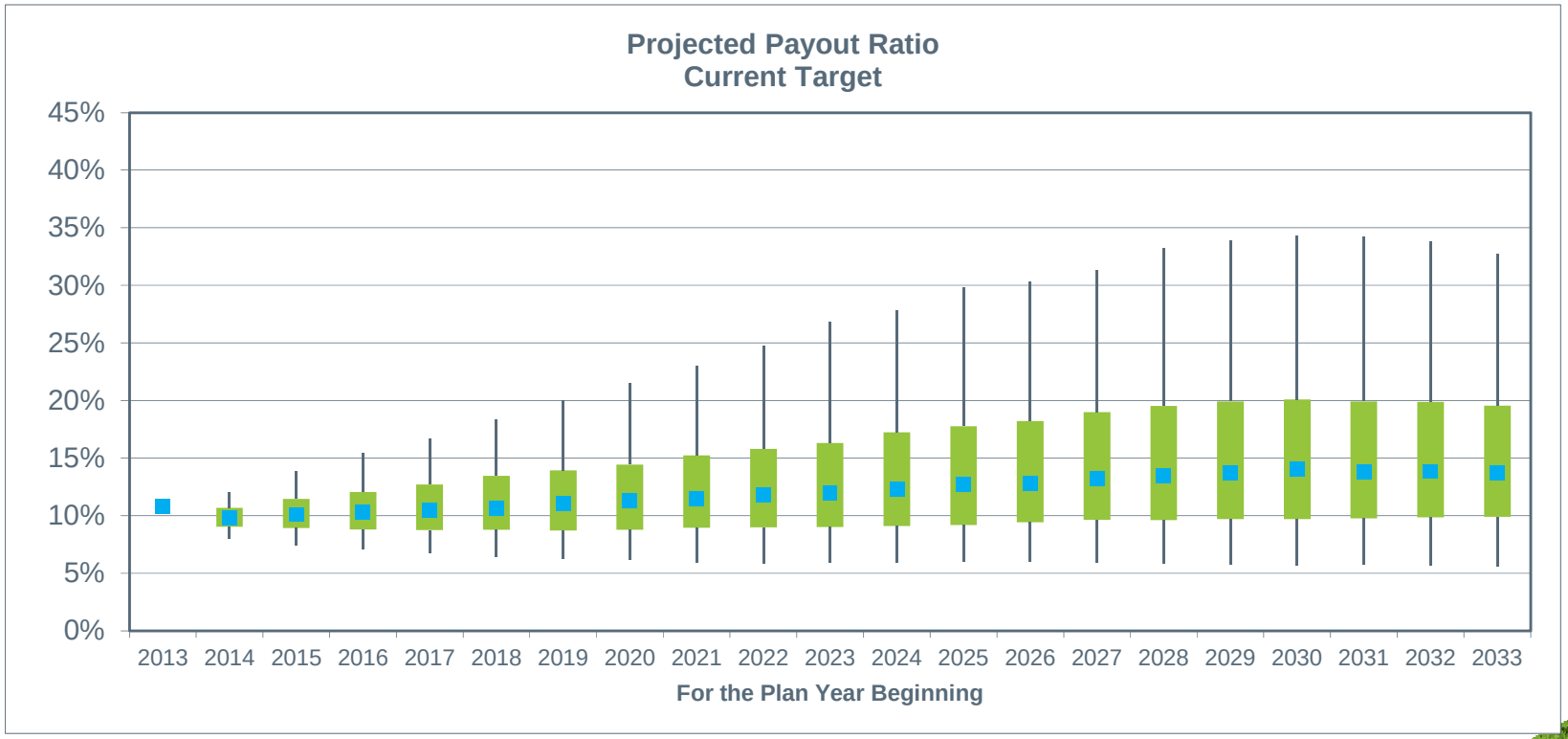
| | Value in 2034 | | | |
|---|---|---|---|---|
| | Actuarially Assumed Rate of Return | Reduced Return (100 bps) | Impact of Reduced Return | |
| Projected Payout Ratio | 11% | 12% | 2% | ▲ |
| Projected Employer Contributions (millions) | $520 | $695 | $175 | ▲ |
| Projected Benefit Payments/Projected 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 Median | 2014-2034 Peak | 2014-2034 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

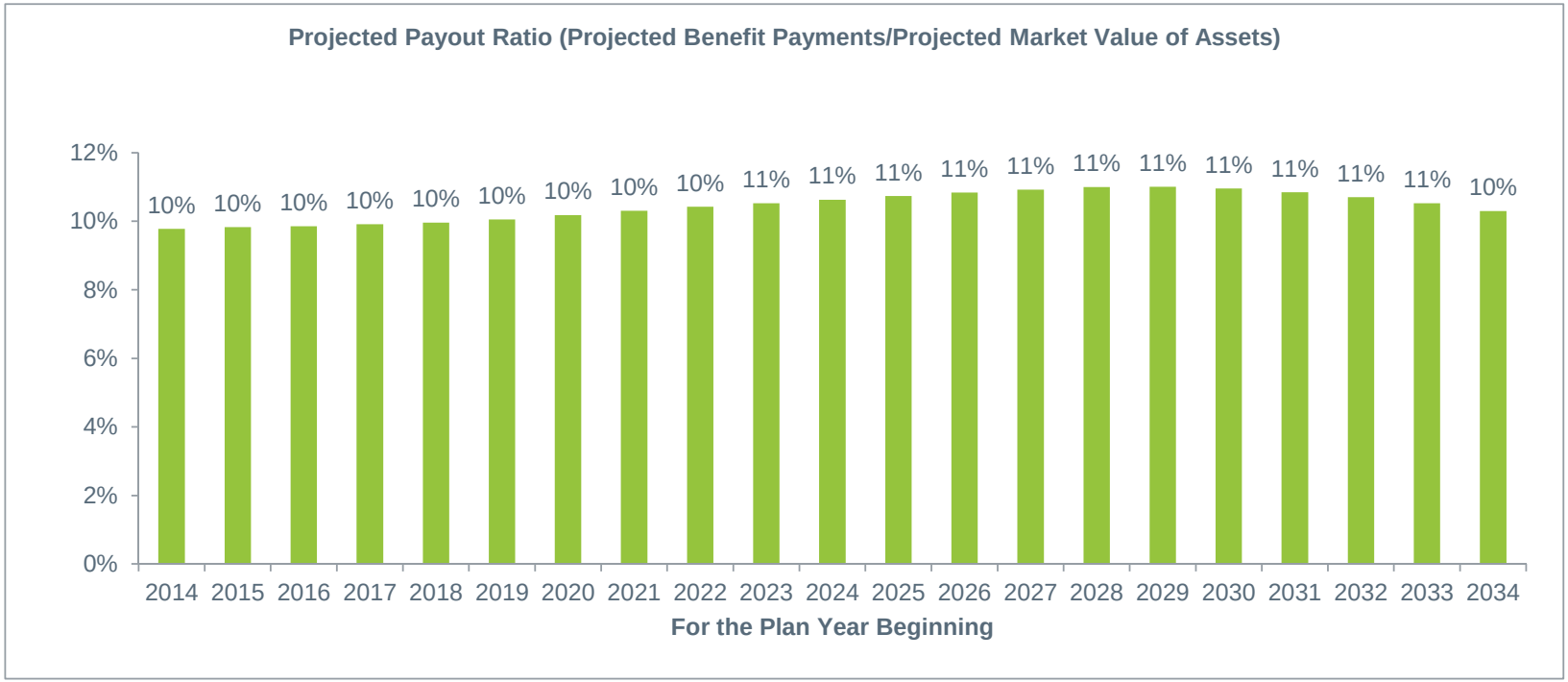
| | Current (June 30, 2014) | Projected Year 20 (Deterministic) |
|---|---|---|
| Actuarial Accrued Liability | $3.3 billion | $5.1 billion |
| Market value of Assets | $2.1 billion | $3.9 billion |
| Deficit | $1.2 billion | $1.2 billion |
| Market Value Funded Ratio | 60% | 77% |
| Payout Ratio | 10%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



# CERS Hazardous Pension Plan

## Deterministic Summary Results

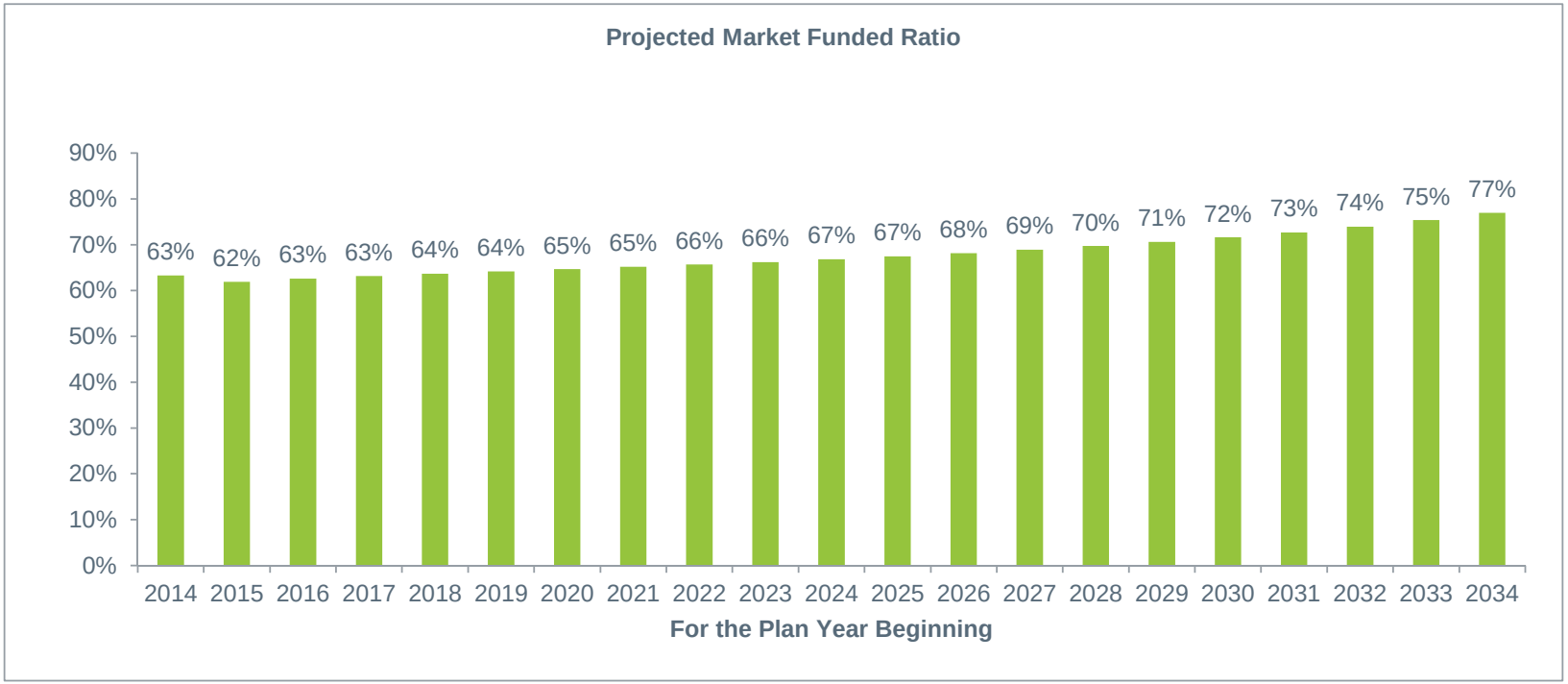
- The payout ratio is healthy and not materially increasing



# CERS Hazardous Pension Plan

## Deterministic Summary Results

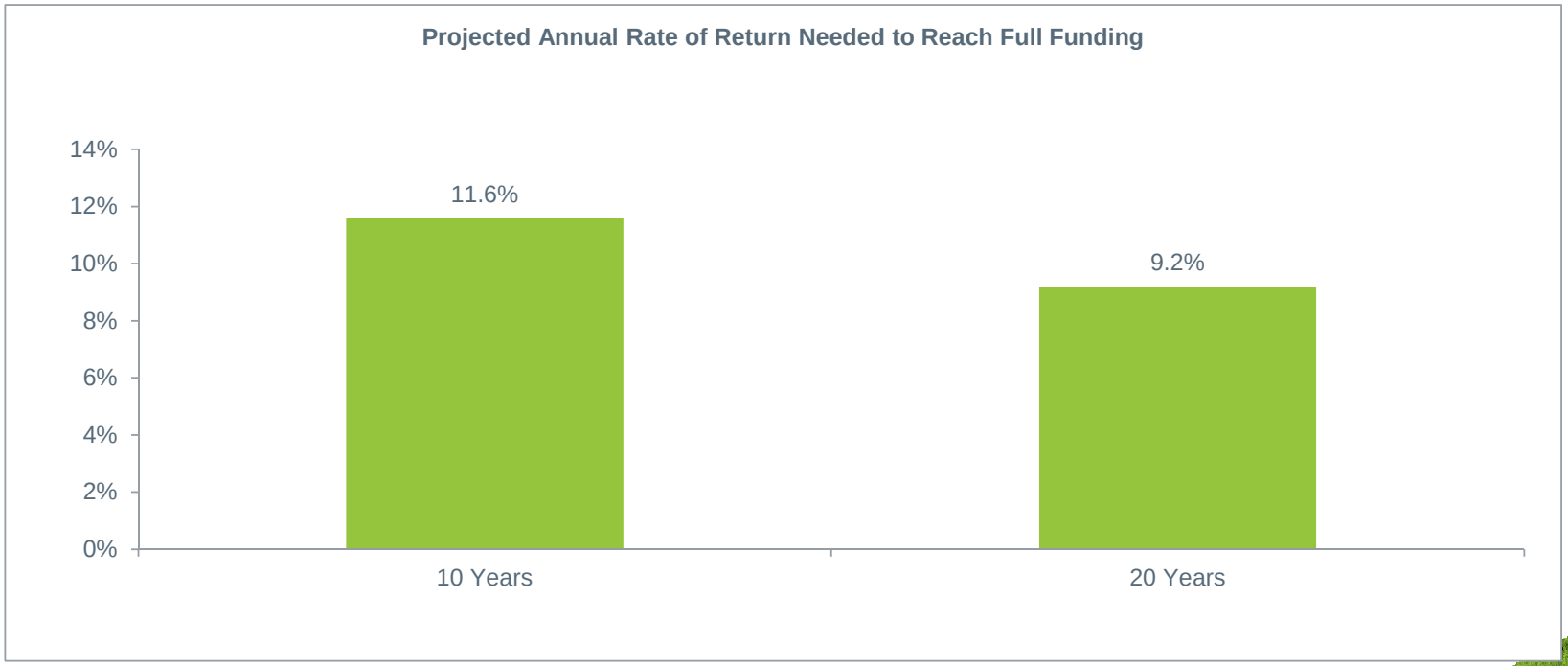
- The funded ratio will likely improve over time



# CERS Hazardous Pension Plan

## Deterministic Summary Results

- Investing out the current situation is not a reasonable expectation



# CERS Hazardous Pension Plan

## Deterministic Summary Results

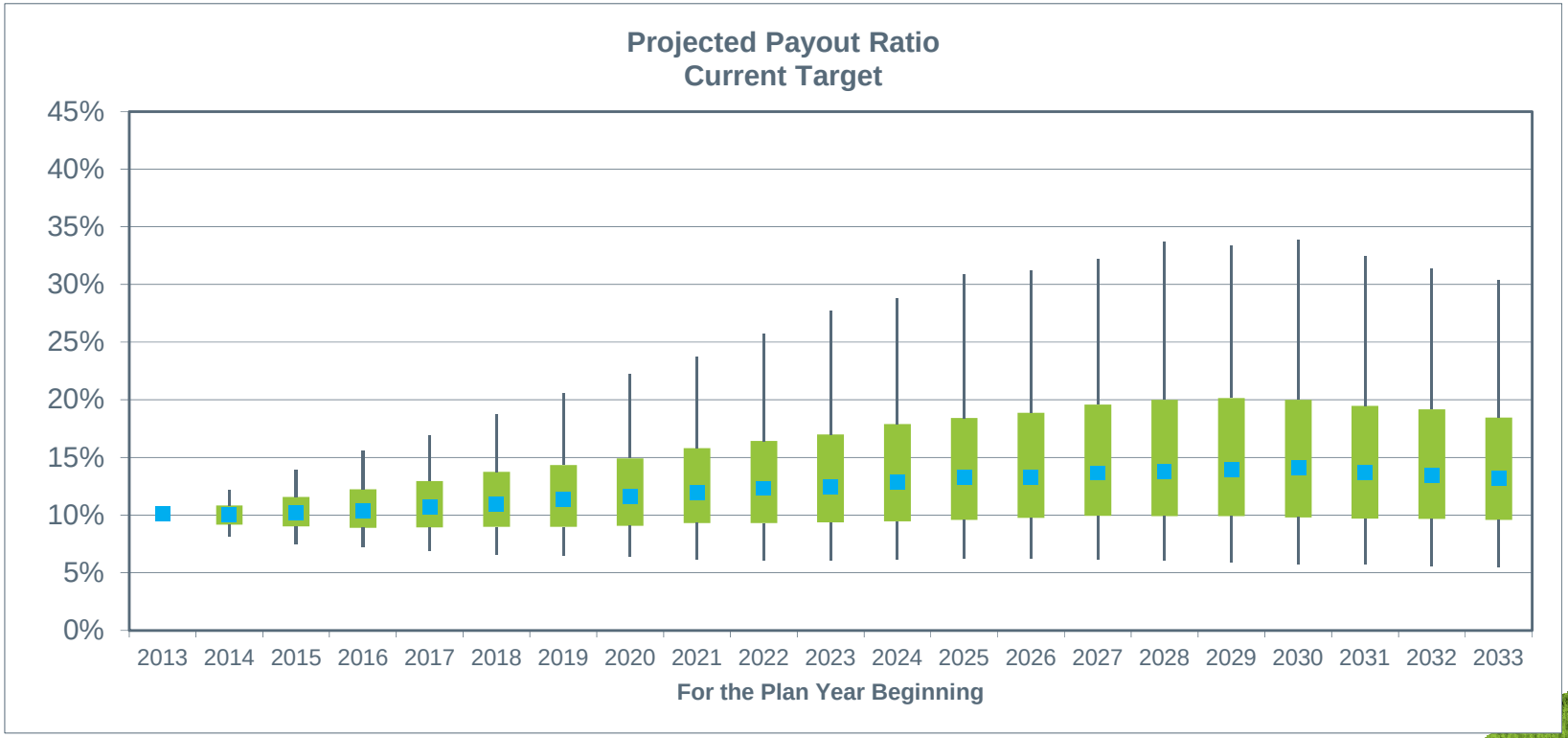
- If returns fall short of the assumed rate of return, improvements will be limited and contributions will be higher

| | 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 | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 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

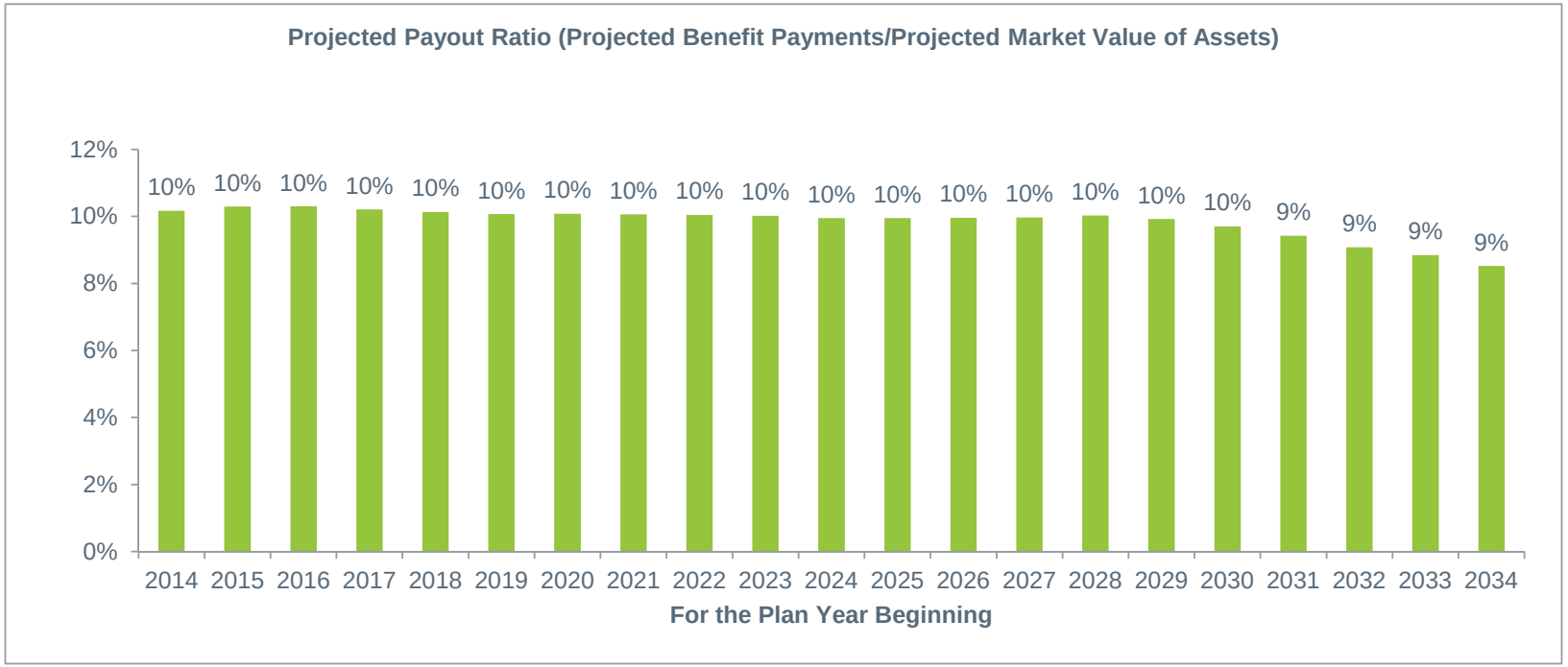
| | Current (June 30, 2014) | Projected Year 20 (Deterministic) |
|---|---|---|
| Actuarial Accrued Liability | $817 million | $1,418 million |
| Market value of Assets | $560 million | $1,152 million |
| Deficit | $257 million | $265 million |
| Market Value Funded Ratio | 68% | 81% |
| Payout Ratio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



# KERS Hazardous Pension Plan

## Deterministic Summary Results

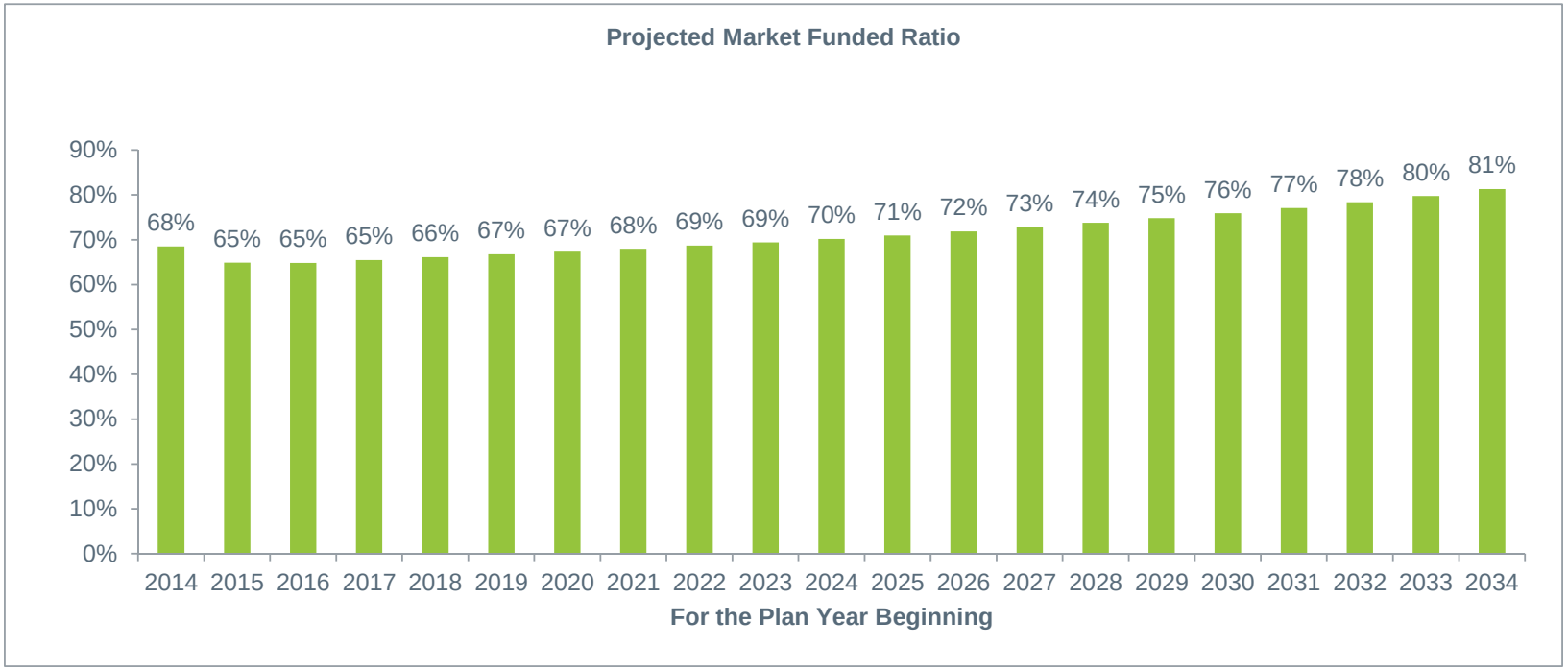
- The payout ratio is healthy and slowly declining



# KERS Hazardous Pension Plan

## Deterministic Summary Results

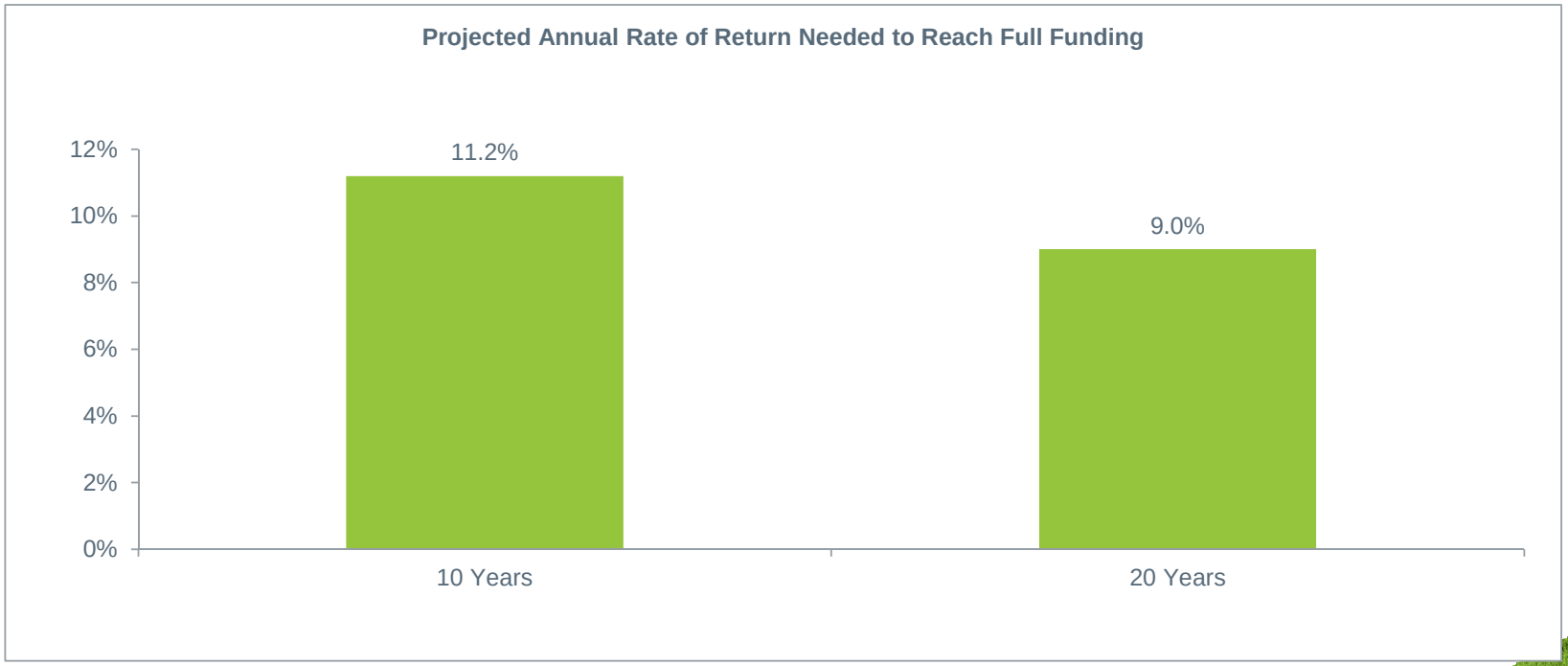
- The funded ratio will likely improve over time



# 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

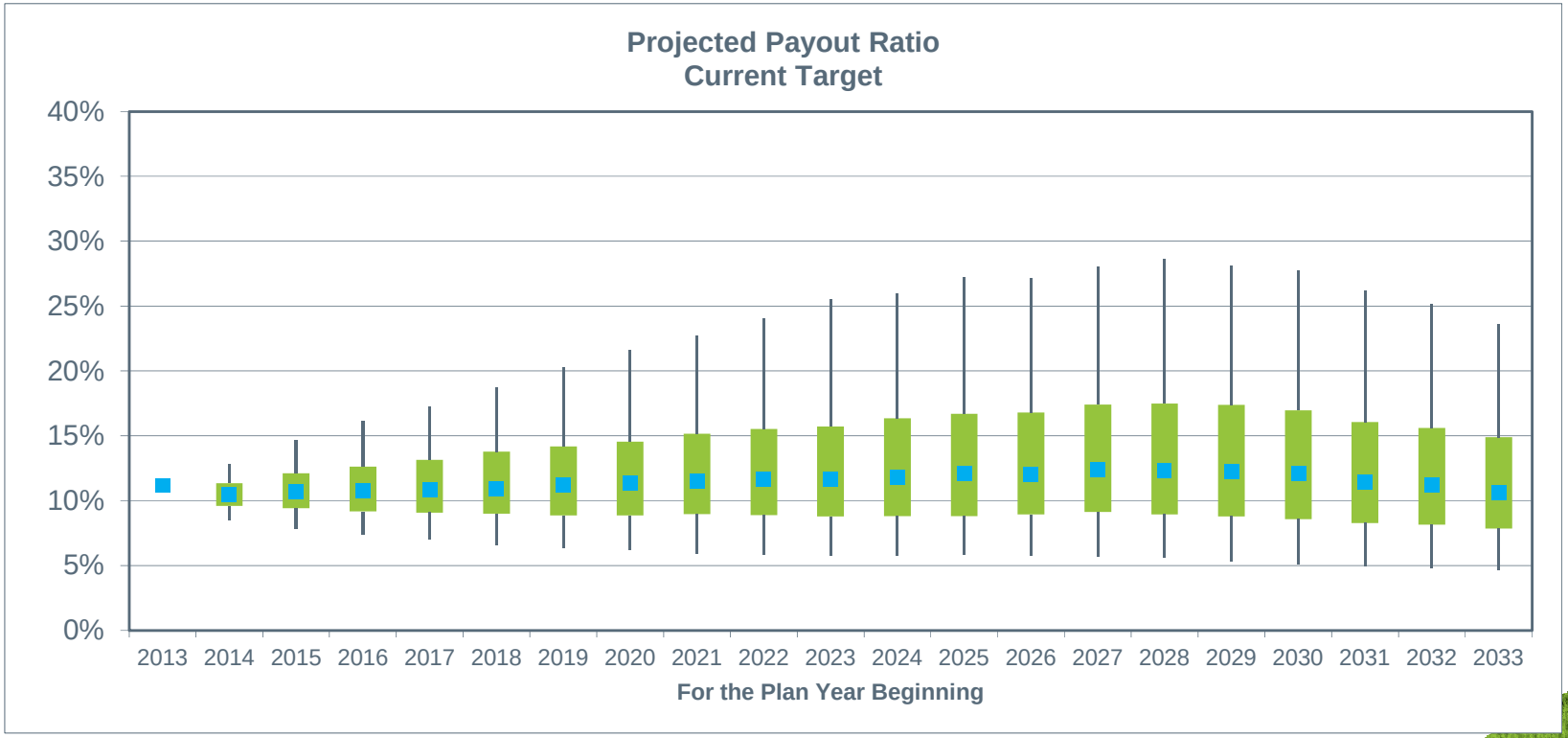
| | Value in 2034 | | | |
|---|---|---|---|---|
| | Actuarially Assumed Rate of Return | Reduced Return (100 bps) | Impact of Reduced Return | |
| Projected Payout Ratio | 9% | 10% | 1% | ▲ |
| Projected Employer Contributions (millions) | $47 | $62 | $15 | ▲ |
| Projected Benefit Payments/Projected 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 | 2014-2034 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

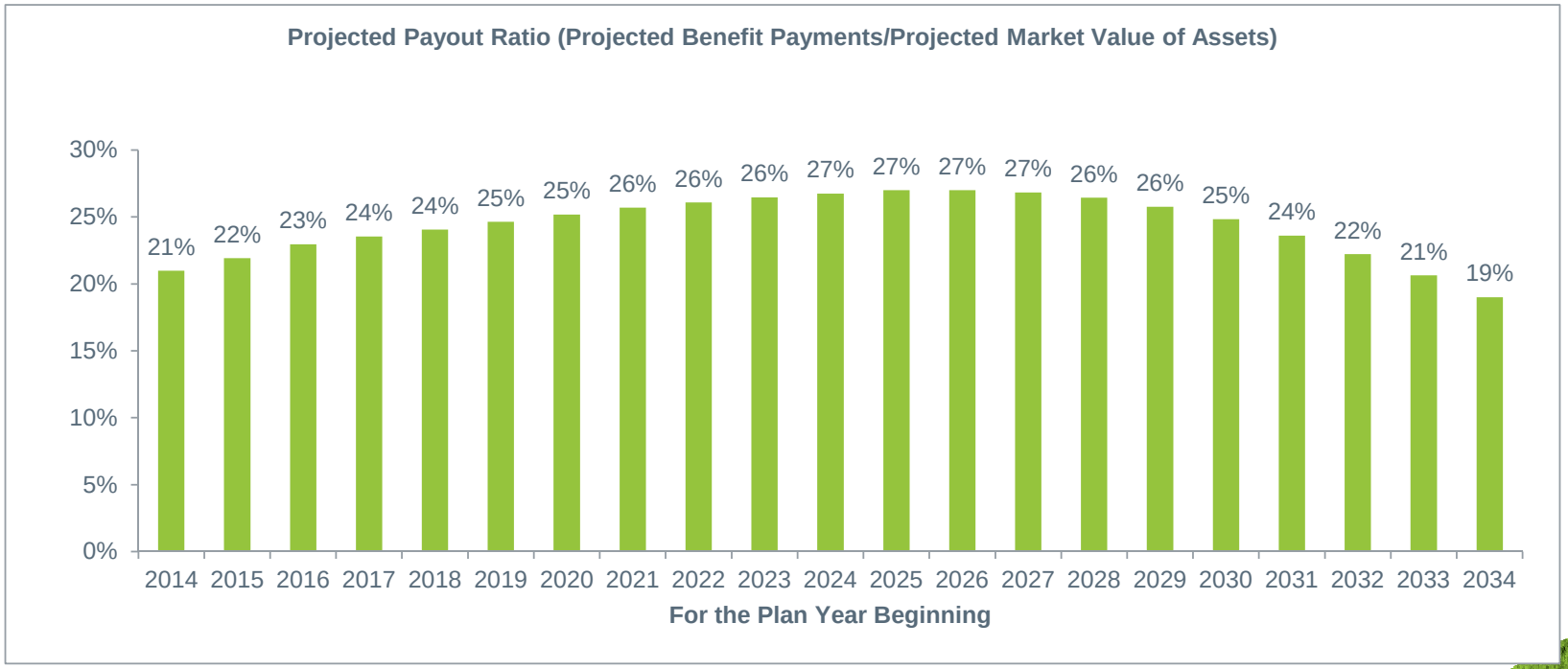
| | Current (June 30, 2014) | Projected Year 20 (Deterministic) |
|---|---|---|
| Actuarial Accrued Liability | $681 million | $754 million |
| Market value of Assets | $261 million | $336 million |
| Deficit | $420 million | $418 million |
| Market Value Funded Ratio | 38% | 45% |
| Payout Ratio | 21%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



# State Police Pension Plan

## Deterministic Summary Results

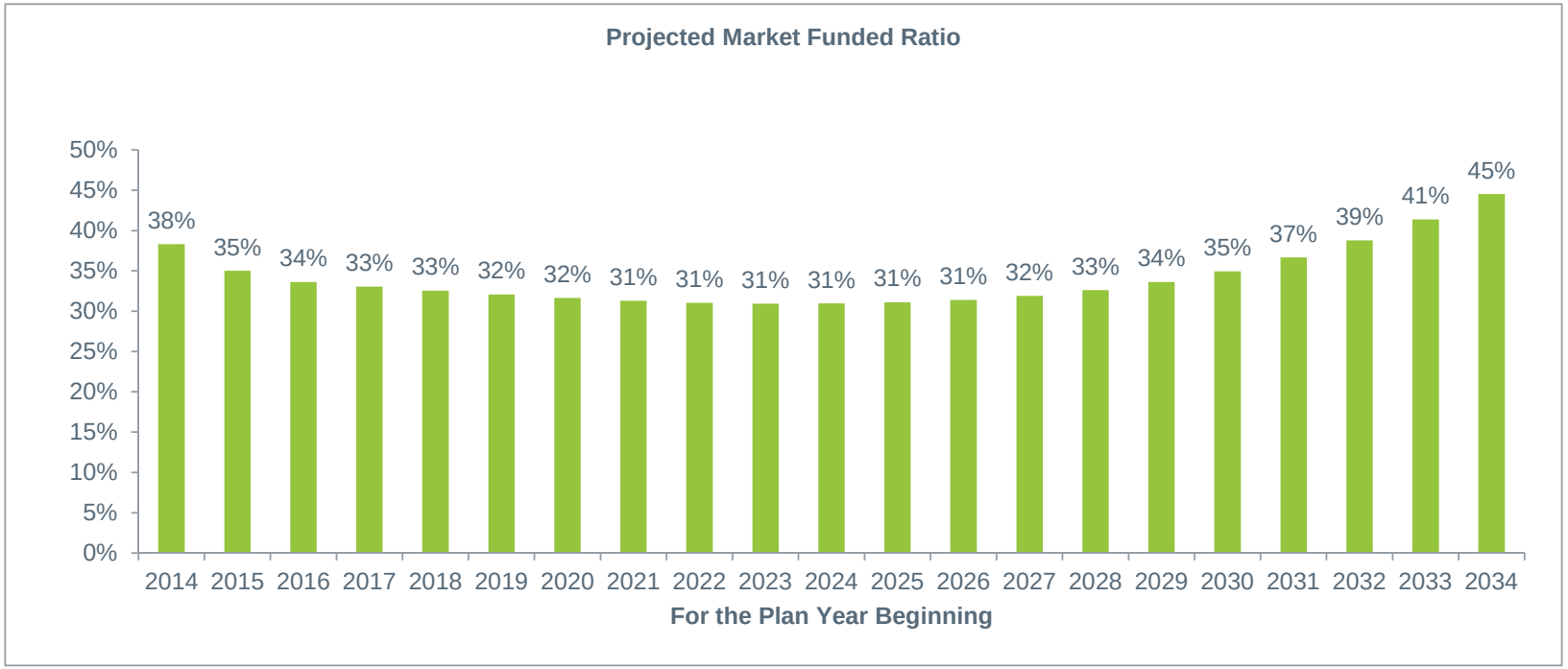
- The payout ratio is approaching levels that may inhibit investment options



# State Police Pension Plan

## Deterministic Summary Results

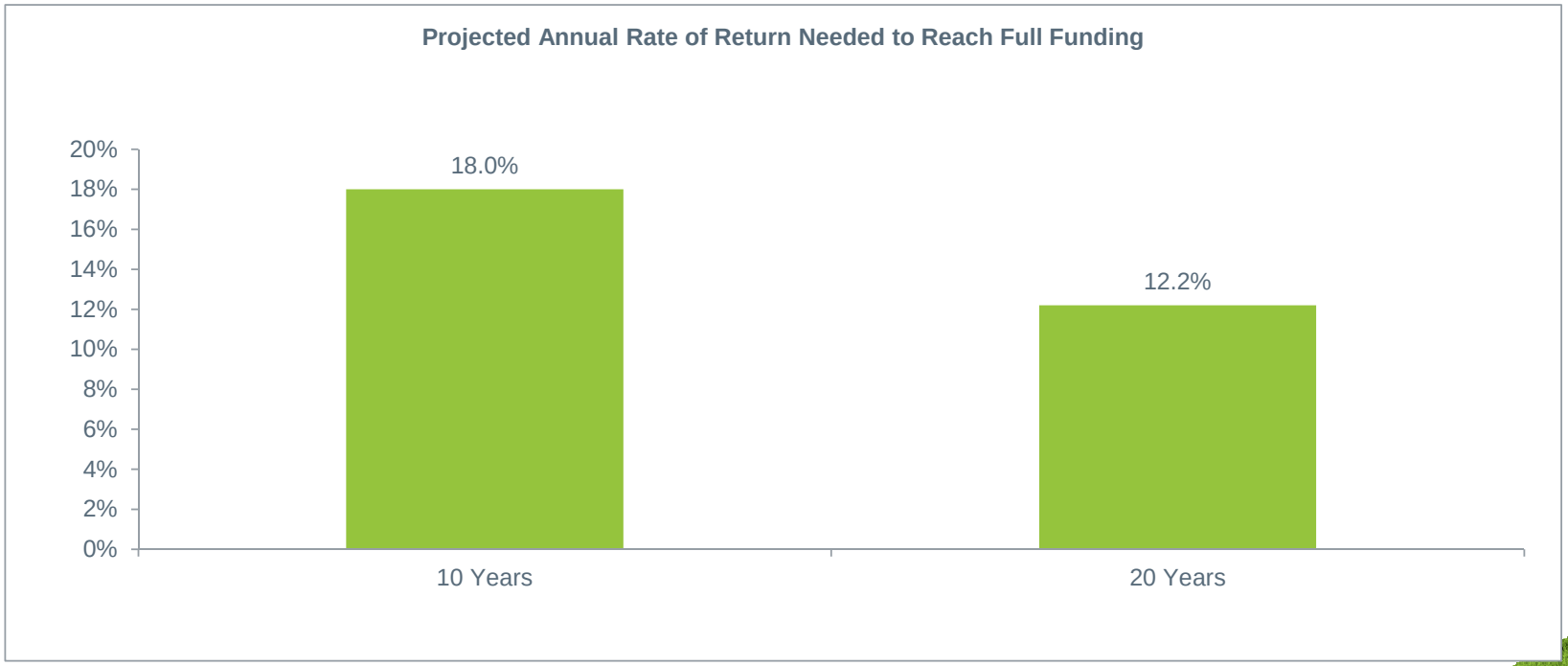
- The funded ratio will likely improve over time



# 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

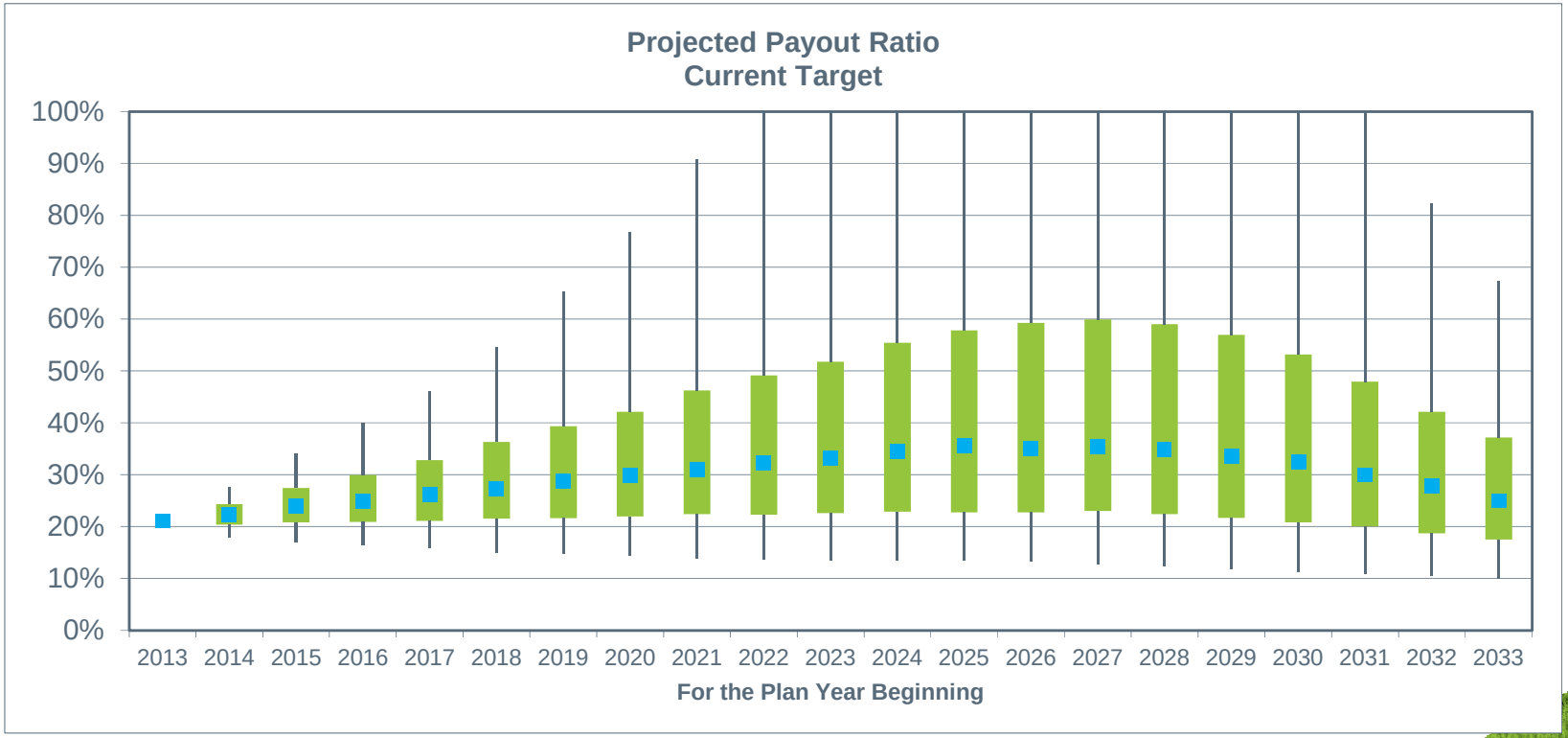
| | Value in 2034 | | | |
|---|---|---|---|---|
| | Actuarially Assumed Rate of Return | Reduced Return (100 bps) | Impact of Reduced Return | |
| Projected Payout Ratio | 19% | 22% | 3% | ▲ |
| Projected Employer Contributions (millions) | $58 | $63 | $5 | ▲ |
| Projected Benefit Payments/Projected 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 Median | 2014-2034 Peak | 2014-2034 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 |

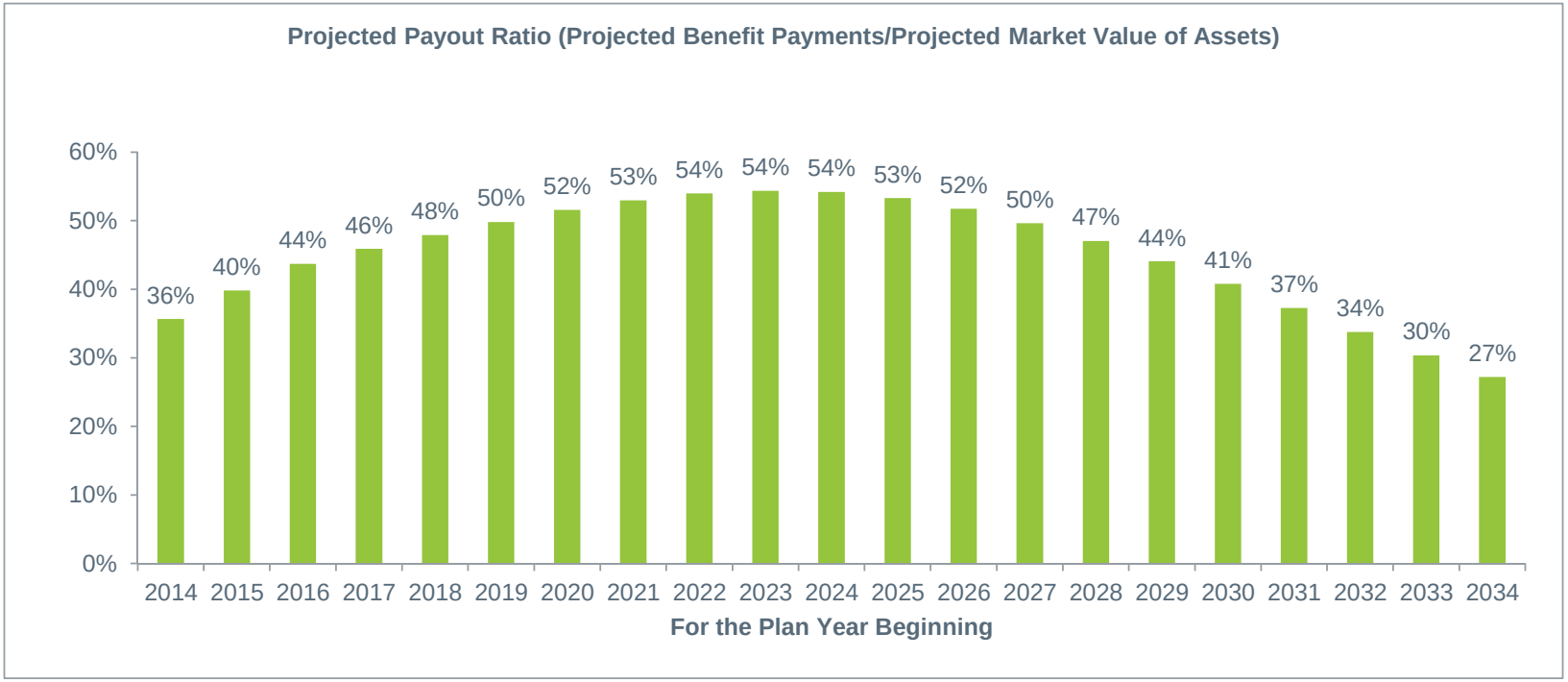
2008 House Bill 1 which set future State contributions as a percentage of the Annual Required Contribution has been modified and no long applied to future projected contributions.



# KERS Non-Hazardous Pension Plan

## Deterministic Summary Results

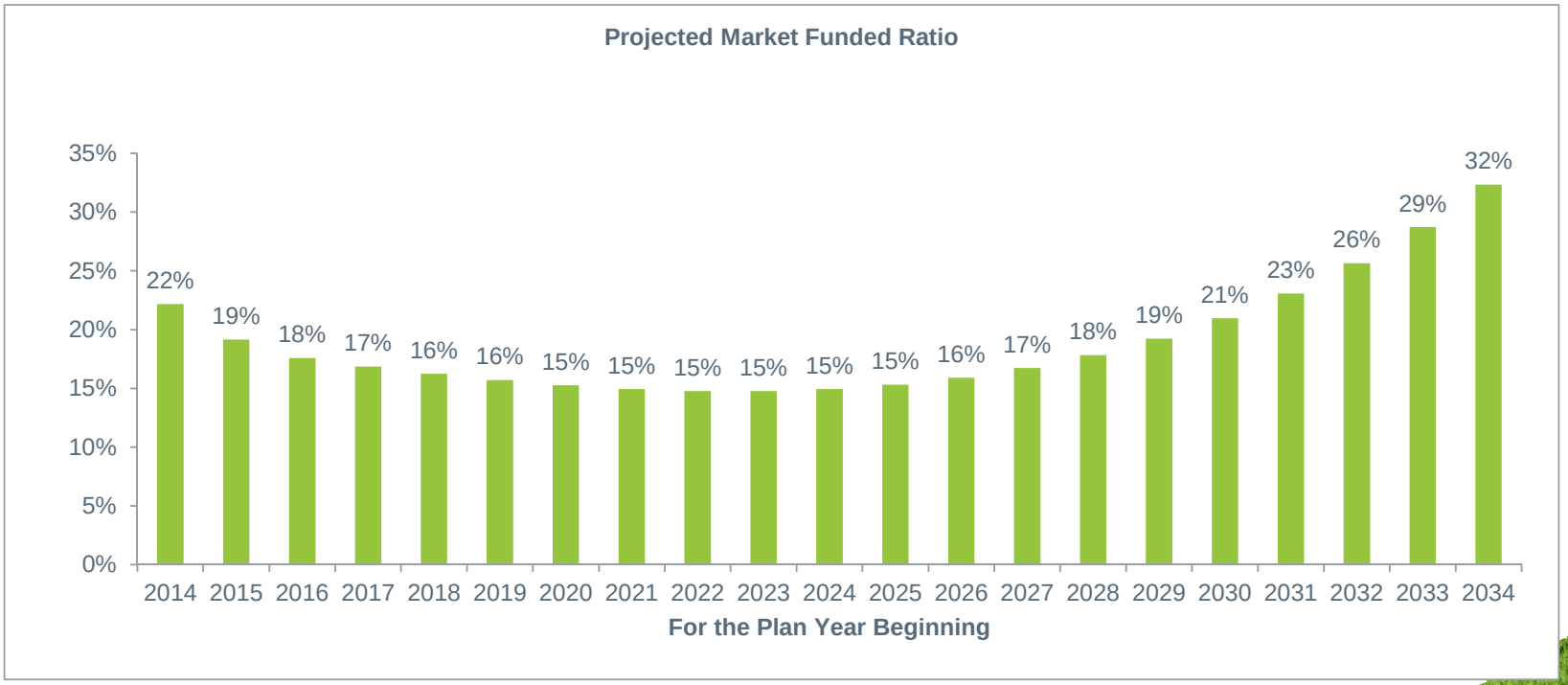
- The payout ratio is quickly approaching restrictive levels



# KERS Non-Hazardous Pension Plan

## Deterministic Summary Results

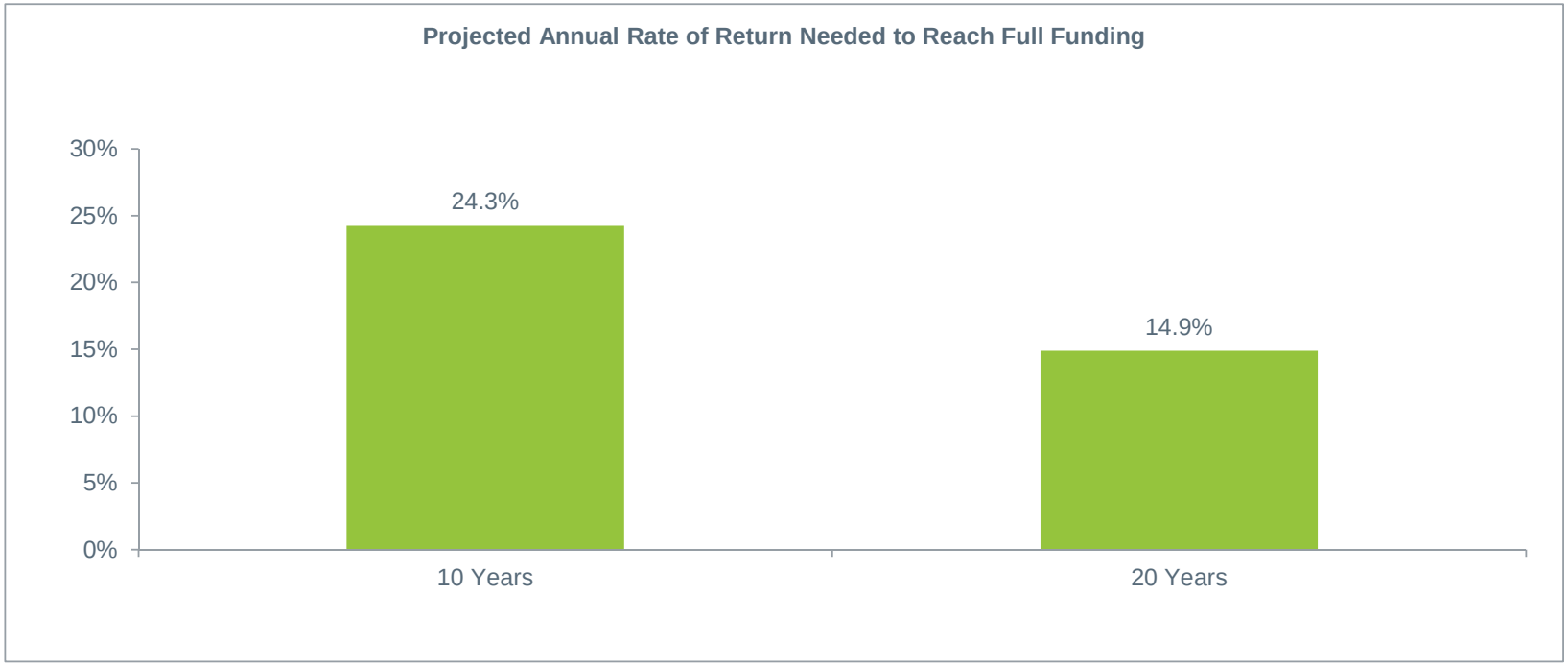
- The funded ratio will likely improve very slowly beginning in about 10 years



# KERS Non-Hazardous Pension Plan

## Deterministic Summary Results

- Investing out the current situation is not possible



# KERS 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

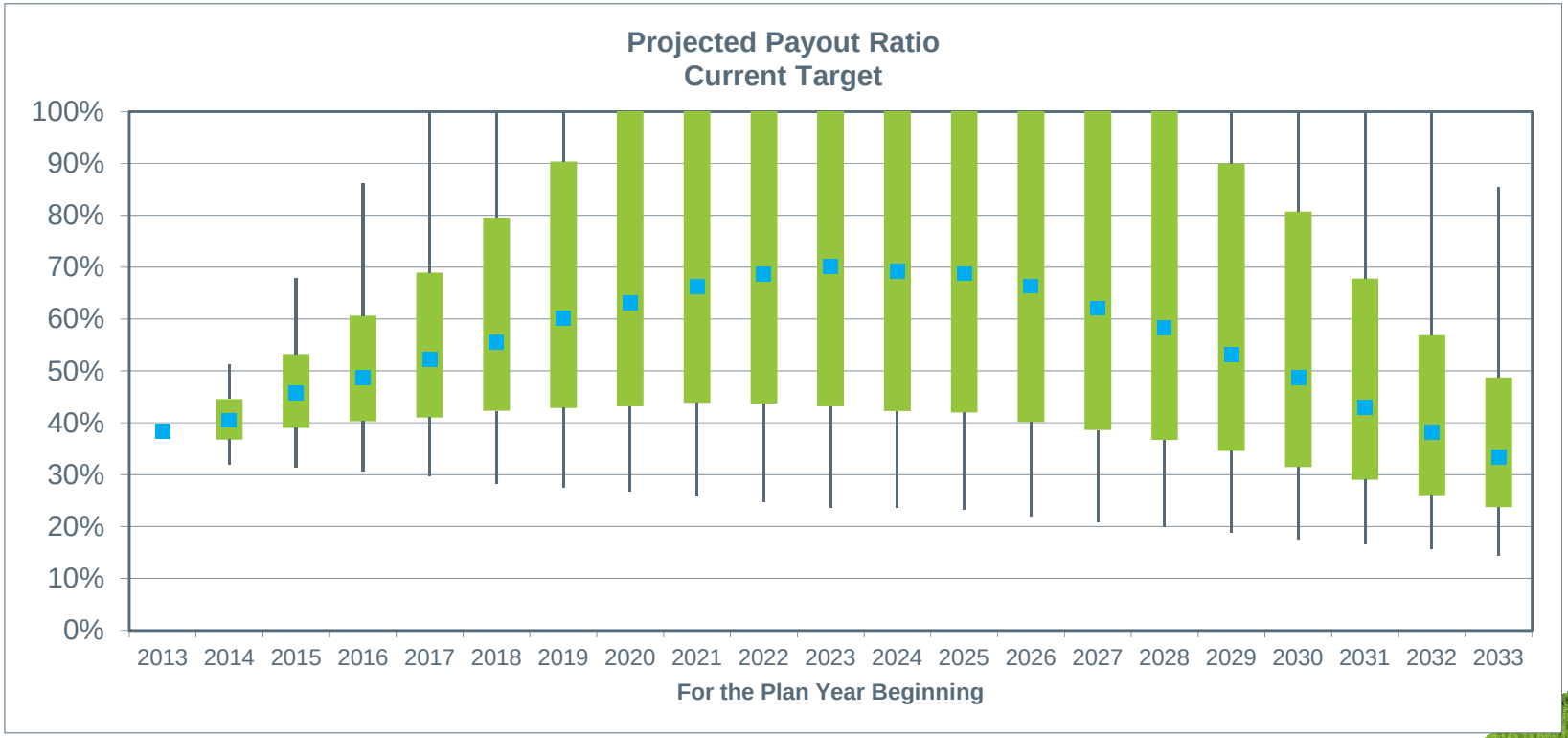
| | Value in 2034 | | | |
|---|---|---|---|---|
| | Actuarially Assumed Rate of Return | Reduced Return (100 bps) | Impact of Reduced Return | |
| Projected Payout Ratio | 27% | 31% | 4% | ▲ |
| Projected Employer Contributions (millions) | $1,192 | $1,241 | $49 | ▲ |
| Projected Benefit Payments/Projected 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 | ▲ |



# KERS Non-Hazardous Pension Plan

## Stochastic Summary Results

- Peak median payout ratios are above 50%



# KERS Non-Hazardous 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
- 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% |



# KERS Non-Hazardous Pension Plan

## 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 Median | 2014-2034 Peak | 2014-2034 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% |



# KERS Non-Hazardous Pension Plan

## 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




PORTLAND
CHICAGO
NEW YORK

May 2015

# Asset/Liability Study

## KERS Non-Hazardous Pension Plan

# Memorandum

| | |
|---|---|
| To | Kentucky Employees Retirement System |
| From | RVK, Inc. |
| Subject | KERS-NHPP Asset/Liability Study – Executive Summary |
| Date | May 5, 2015 |

## Introduction

The purpose of this memorandum is to summarize the key inferences we draw from the Asset/Liability ("A/L") study of the KERS Non-Hazardous Pension Plan ("KERS-NHPP" or the "Plan"). While this memorandum refers directly to points raised within the study, we emphasize that a full understanding of the A/L study and its implications requires a close review of the study in its entirety.

## Background and Key Conclusions

As of the fiscal year beginning June 30, 2014, the date of the most recent actuarial valuation and the start date of the projections in this study, the Plan was 22% funded (on a market value basis) meaning that assets were available to cover 22% of Plan liabilities as currently estimated by the Plan's actuary. This equates to a shortfall of approximately $9 billion. By any measure, this is a significant concern for the future of the Plan's financial health. This study shows that the Plan faces substantial financial challenges over the next 20 years. By this we mean persistent funding shortfalls, elevated contribution levels, unsustainable payout ratios, and, in the worst-case scenario, the potential for complete depletion of the asset base.

As highlighted below, this study suggests that continued diversification in the investment of Plan assets is desirable. However, given the current financial health of the Plan, the results of this study suggest there is no reasonable investment strategy available to KERS-NHPP that would allow the plan to "invest its way to significantly improved financial status." By "reasonable" we mean an investment strategy that offers the probability of substantially higher returns—substantial enough to alone notably improve the KERS-NHPP funding status—without also courting substantial risk to the already diminished asset base of the Plan. The reason, outlined in more detail in the body of this report, is that the returns that might moderately, but notably, improve the funded status of the KERS-NHPP over the next 20 years can almost certainly only be achieved by taking substantial risk – and that risk, once taken, may lead to those improved outcomes, but also may lead to faster depletion of the Plan's assets should the investment markets provide a challenging and unrewarding climate for investors.

Additionally, this study suggests that the Plan will likely face liquidity constraints in the near future making investments in illiquid assets classes difficult to maintain. To the extent this reduces the expected return of the portfolio, the outcomes become less favorable.

## The Purpose of an Asset Liability Study

The central purpose of an A/L study is to examine the probable future consequences, over extended periods of time, of applying alternative asset allocation strategies to the Plan's investment assets in order to fund the liabilities created by the benefit provisions of the Plan. A/L studies are unique in their ability to combine in a single analysis the three critical factors that drive the financial health of the Plan—benefit policy (liabilities), contribution policy, and investment strategy (asset allocation). Certainly this type of forward looking study—nor any others we are aware of—cannot indicate with any reliability what will happen in any given year over this extended period of time and its insights are dependent on the assumptions used. However, we have high conviction that the study's results paint a highly reliable view of the core long-term trends in the Plan's financial health. Best practice, in our judgment, is to take the general direction suggested as most appropriate by this study with its unique consideration of liabilities, contribution policy and trending liquidity needs and refine it in an asset allocation study where implementing the Plan's structure can reflect the pragmatic considerations of investing in the capital markets present at any given point in time.

## Deterministic versus Stochastic

In this study, we examined a series of related questions associated with this central purpose, projecting future outcomes under two distinctly different methodologies:

1. a **deterministic** basis (all underlying assumptions, liabilities, contributions and most critically investment returns, are achieved precisely and without variance in each and every year); and

2. a **stochastic** basis (outcomes for investment returns vary each year according to estimated volatility with contribution *requirements* following suit while *actual* contribution policy and liabilities remains in their current form).

## Key Results

Below you will find a series of important findings, forecasts, and conclusions drawn from the body of the study. While the remarks are presented here to allow a quick assessment of some of the key findings, they represent only a sampling of the fundamental elements of the study. We emphasize that a solid understanding of each element requires that they be reviewed as they are presented in the study itself within their surrounding context (please note the frequent page references to the full study). This is especially important to understanding the findings which represent *probable, but not certain,* outcomes as analyzed in the stochastic section of the study.

*At the Outset:*

- As of June 30, 2014 (the date of the actuarial valuation used to model liabilities), the Plan's market value funded ratio (available assets to fund benefit obligations) was 22% (page 6).

- The number of active members is currently approximately equal to the number of inactive members. Over time, the inactive population is projected to grow and begin to quickly outnumber the active member population (page 8). The maturing demographics of the Plan is an important factor when considering the findings on Plan risk/return options and the projected status of Plan liquidity below.

*Deterministic Analysis: A deterministic analysis assumes full certainty about the future, in particular, certainty of investment returns. Its 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.*

- Benefit payments to Plan participants are expected to increase by about 26% over the next 20 years (page 9). Annual increases are projected to range between 1% and 2%.

- Total annual dollar contributions (employer and employee) based on actuarially required rates are expected to increase substantially over the next 20 years; from $600 million in 2014 to $1.4 billion in 2034 (page 10). *Please note however*, that precise actuarially required rates as they unfold are the purview of the Plan's actuary and are affected by factors other than investment returns and resulting asset values of the Plan.

- Beginning in 2016, contributions expressed as a weighted average percentage of salary are projected to remain constant (page 11).

- Aggregate benefit payments are expected to increase by about 26% over the next 20 years and increase as a percentage of Plan assets over this same time period from 36% in 2014 to 54% in 2023 (pages 9 and 12). After 2023, the payout ratio is projected to begin declining and end the projection period at 27%. While the payout ratio at the end of projection period is lower than current levels, absolute levels are extremely high through the entire projection period. This is a critical observation as elevated payout ratios impose liquidity constraints on the management of the portfolio (inhibiting the ability of the Plan to invest with a long-term horizon). This limits the Plan's opportunity to invest in less liquid asset classes regardless of the potential return or risk reducing diversification benefits they offer. In our opinion, the levels projected in this study will begin to materially inhibit investment opportunities for the Plan, potentially causing investment constraints. In fact, these constraints may become so severe that they inhibit the Plan from reaching its long-term return assumption of 7.50%.

- As assets grow each and every year without exception at the assumed rate of return (7.50%), the funding ratio on a market value basis is expected to gradually increase to

approximately 32% by 2034 from the current value of 22% (page 17). However, please note that before the funding ratio begins to increase, it is likely to decline to roughly 15% between 2020 and 2025.

- Assuming the current contribution policy remains unchanged, the Plan would need to experience annual returns in excess of 24% over the next 10 years or 14% over the next 20 years *without exception in each and every year* in order to reach full funding (page 18). Achieving such lofty returns on such a sustained basis is extremely unlikely in our judgment and underscores our conclusion that investment returns alone cannot move the Plan to full funding.

- Experiencing a return of 100 basis points below the Plan's current assumed rate of return of 7.50% (i.e., 6.50%) each year for the 20 year projection period would result in a moderate decline in the projected funding ratio to 28% in year 20 versus 32% at the current assumed rate of return (page 19). Additionally, under this scenario cumulative employer contributions would be $400 million higher over the 20 year period. Given the widely shared concerns about the prospects for a low return environment in the capital markets over the foreseeable future, this is a conclusion that should be thoroughly understood and appreciated. In the event that capital markets do not support returns commensurate with the assumed rate of return, reliance on contributions to complete the payout of the Plan's liabilities effectively increases, especially in later years.

*Stochastic Analysis: Unlike a deterministic analysis, a stochastic analysis does not assume an unvarying stream of expected investment returns year after year. Instead, it reflects the realistic view that pension plan investment returns are—like the investment markets themselves—volatile and always uncertain. This means that there are a range of possible outcomes for KERS-NHPP; some are more likely, others less likely, but still possible.*

*The deterministic approach is useful for gauging the general direction of change and associated consequences, but adding the element of uncertainty—more specifically year to year variability in the performance of the capital markets and the value of the Plan's assets over time—can offer additional insights, albeit along with considerable complexity.*

Uncertainty in future investment returns is taken into account via a stochastic analysis of six different investment approaches (in the table below and on page 25) ranging from highly conservative (low risk, asset protective) to highly aggressive (high return seeking with substantial associated risk), including the Current Target allocation KERS-NHPP. The reason for testing such a broad range of approaches is that at the heart of the KERS-NHPP situation is a simple question that is difficult to answer: whether the Plan is 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).

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | **30** | **70** | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | **0** | **30** | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | **0** | **30** | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | **5** | **10** | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | **10** | **15** | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | **5** | **15** | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | **2** | **15** | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | **2** | **5** | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

Essential to answering this question is to ask precisely how KERS-NHPP and the Plan's broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plan is "better off" under one approach versus another are as follows:

(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 Plan's ability to pay annual benefits without major disruption of its strategic asset allocation, the driver of its investment strategy).

(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 Plan's assets over the course of time and the associated effects on contributions and potentially investment decisions.

The results of this analysis are displayed on pages 26 through 46 of the accompanying A/L study. For purposes of this summary, the consequences of choosing A versus B, as described above, is summarized most clearly in the tables on pages 32 and 46 of the study (copied below followed by explanatory comments).

| 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% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 27% | 12% | 56% | 26% | 11% | 57% | $18 | $19 | $16 | 33% | 100% | 14% |
| Conservative Portfolio | 21% | 11% | 34% | 20% | 10% | 33% | $19 | $20 | $18 | 44% | 100% | 25% |
| Potential Portfolio 1 | 26% | 12% | 50% | 25% | 11% | 51% | $18 | $19 | $16 | 35% | 100% | 16% |
| Potential Portfolio 2 | 28% | 12% | 60% | 27% | 11% | 62% | $18 | $20 | $15 | 33% | 100% | 14% |
| Potential Portfolio 3 | 29% | 13% | 70% | 28% | 11% | 72% | $18 | $20 | $14 | 31% | 100% | 12% |
| Aggressive Portfolio | 30% | 13% | 82% | 30% | 10% | 88% | $18 | $20 | $13 | 30% | 100% | 10% |

- With the exception of the Conservative Portfolio, the median expected funding ratio at the end of the 20 year study period is higher than the current funding level for all investment options analyzed (pages 31, 32, and 46). This is supportive of the continued utilization of diversified investment approach.

- All portfolios analyzed show at least some probability (between 5% and 8%) of fully depleting the assets at some point during the projection period (page 32). In other words, if the investment markets are significantly unfavorable over the next several years—certainly not an improbable forecast—neither adopting an exceedingly conservative, nor highly aggressive investment approach would prevent near or actual depletion of the Plan's assets. Assuming the very worst investment environment occurs, it is possible that benefit obligations in one or more years would exceed assets and normal contributions creating a need for additional cash flow into the Plan.

- Each of the portfolios show a significant probability of extreme payout ratios over the next 20 years with median values exceeding 50% during the projection period (pages 33-38 and 46). Payout ratios this high severely limit the Plan's ability to invest in illiquid strategies. For example, the Current Target contains a 25% allocation to illiquid investments (10% each to private equity and hedge funds and 5% to real estate). This leaves only 75% of the Plan's assets invested in liquid strategies limiting the options available when selecting sources for benefit payments and rebalancing the portfolio to the strategic asset allocation target. Combining this with the highest median peak projected payout ratio of over 50% makes the Current Allocation an undesirable long-term solution for investing Plan assets. In the event of a payout ratio over 50%, over two-thirds of the liquid portfolio would need to be liquidated to fund benefit payments (assuming they came due at a time when contribution were not coming in). In our view this is unsustainable for long periods of time and may inhibit the Plan's ability to invest with a long-term focus reducing the potential return opportunities. **In short, a heavy reliance on illiquid investments risks turning even normal asset value declines into disruptive events.**

- As you incrementally increase the expected risk and return of the fund (from Potential Portfolio 1 to Potential Portfolio 3), the outcomes do appear to gradually improve at the cost of slightly reduced worst-case outcomes.

- The cumulative cost of providing the Plan's benefits is met through a combination of contributions and the investment returns on those contributions. The Conservative Portfolio requires the highest level of contributions (i.e., the direct funding of benefits) (pages 40, 45, and 46). Even under the very unlikely best-case scenario the Plan would have a funded ratio of about 33%, far lower than any of the other portfolios (page 46). The only redeeming virtue of such an ultra-conservative approach is that the potential for large declines in the value of the fund is significantly mitigated albeit at much higher ongoing costs (contributions) and chronic poor Plan financial health.

- The Aggressive Portfolio does appear to produce the most desirable outcomes. *However*, it also has a maximum theoretical one-year portfolio decline of 51%—a loss of more than one half of the Plan's assets, significant we believe by any standard. This likelihood of notably larger one year declines within the study period gives pause to the desirability of a far more aggressive approach simply from a quantitative viewpoint. It also suggests it may be a strategy that is extremely difficult for decision makers to sustain over a long period of time. Declines in the total fund market value of this magnitude are a disruptive event from all aspects of Plan management. Yet, the benefit of such an aggressive approach that makes it superficially attractive can only be realized with any probability if the aggressive and highly volatile approach is maintained for several decades through good times, bad times, and unnerving times. Furthermore, this type of strategy could prove difficult to maintain in future years should demographic (early retirement incentives for example) or financial events create higher liquidity demands on the Plan. For all these reasons, it is not an approach that should be seriously considered without full recognition of the significant risks.

- While RVK supports the conclusions of the study using our current capital market assumptions, we also model for extreme market scenarios to stress test the results of the study. The summary of this analysis can be found in Appendices 1 and 2 (beginning on pages 47 and 50 respectively). The first test models the case of extreme market volatility by doubling the assumed standard deviations of all asset classes. The second test models converging market returns by assuming all assets are perfectly correlated (i.e. correlations equal +1.00). The results of these additional analyses show that the *relative* portfolio outcomes do not change, but that the range of potential results widens, indicating higher risk for all asset mixes given the increased systemic volatility and the reduced dampening effects of total fund diversification we assume under these stress scenarios.

**Final Comments**

This A/L study shows that KERS-NHPP is currently underfunded and may face liquidity concerns in the future. The Plan can best meet its objectives through the continued use of a

well-diversified investment portfolio that focuses on increasing liquidity. However, positive outcomes are extremely dependent on the contribution policy. The study is not supportive of a long-term, ultra-conservative approach. The increasing potential for large one-year declines suggests that there is likely a limit to the net benefits of adding increased risk in pursuit of additional return. Progress should be monitored periodically through studies such as these, particularly if the Plan encounters a sustained period of lower returns in the capital markets (and thus for the Plan's assets) as well as material changes in contribution policy or benefit levels.

Additionally, this study assumes no further changes are made to the benefit policy at any point during the 20 year projection period. Such changes would fall outside the reach of an Asset/Liability study. However, we do note that even small changes to the benefit policy can have a meaningful long-term impact on the likely future outcomes of the Plan.

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RVK

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# Introduction

RVK, Inc. (RVK) has prepared this report for the Kentucky Employees Retirement System Non-Hazardous Pension Plan (KERS) to:

- Present projected valuation results with respect to the funded status of the Plan.
- Present projected benefit payments of the Plan.
- Investigate asset mixes to determine those which best serve to protect and increase funding levels, while providing adequate liquidity for benefit payments.

The valuation projections are shown using both a deterministic and stochastic process.

The deterministic process provides an open group analysis of projected valuation results based on a fixed set of future assumptions (see summary in the Assumptions and Methods section of this report).

The stochastic process provides an open group analysis of projected valuation results under many capital market environments based on expected asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation. Expected values, variances of the returns and inflation, and correlations are used to generate 2,000 trials to produce a distribution of potential outcomes. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes.

# Introduction (continued)

## What is an Asset/Liability Study?

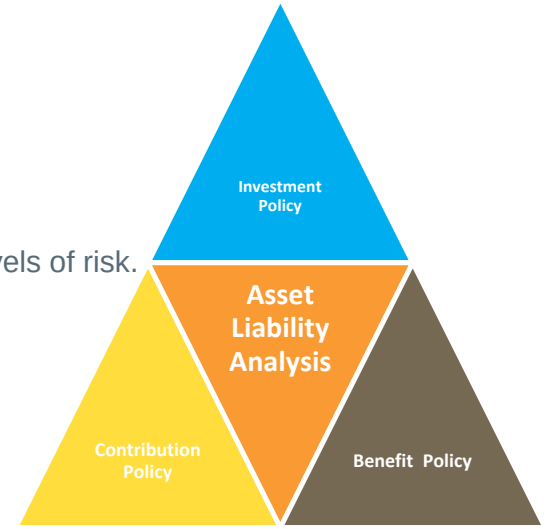
- Investment programs and the strategy they seek to implement (Investment Policy) do not exist in a vacuum. They seek to satisfy one or more investment objectives and operate within a plan framework that includes the investment objectives (Benefit Policy) and plan funding (Contribution Policy).

- The purpose of an Asset/Liability Study is to examine how well alternative investment strategies (i.e., differing asset allocations) address the objectives served by the Plan—the Plan's "liabilities" in the context of the Plan's funding streams—the Plan's Contribution Policy. It is the only standard analysis that fully links all three aspects of the Plan's key financial drivers.

- In doing so, it creates an important "guidepost" for the actual asset allocation for the Plan; the asset allocation chosen by the Plan's fiduciaries will likely reflect the nature of the liabilities but also numerous other factors including risk preferences, liquidity, implementation constraints, etc.

- For the KERS Asset/Liability Study, we assume the objectives are:

    1. Fund all participants' benefits over time.
    2. Assure sufficient liquidity to pay benefits at all times.
    3. Foster a stable contribution stream consistent with objectives 1 and 2.
    4. Achieve adequate returns without accepting unnecessary or imprudent levels of risk.




## An Asset/Liability Study is NOT . . .

- An actuarial study of the KERS liabilities—that is the purview of the Plan's actuary.

- A prescription for Plan benefits—that is the purview of the elected representatives.

- An assessment of the affordability of contribution levels—that is the purview of the elected officials and their constituents.

- The sole determinant of the final asset allocation adopted for the Plan—there are a number of factors, including insights from an Asset/Liability Study, which will bear on the optimal asset allocation.

# Introduction (continued)

## 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 Plan's financial needs.

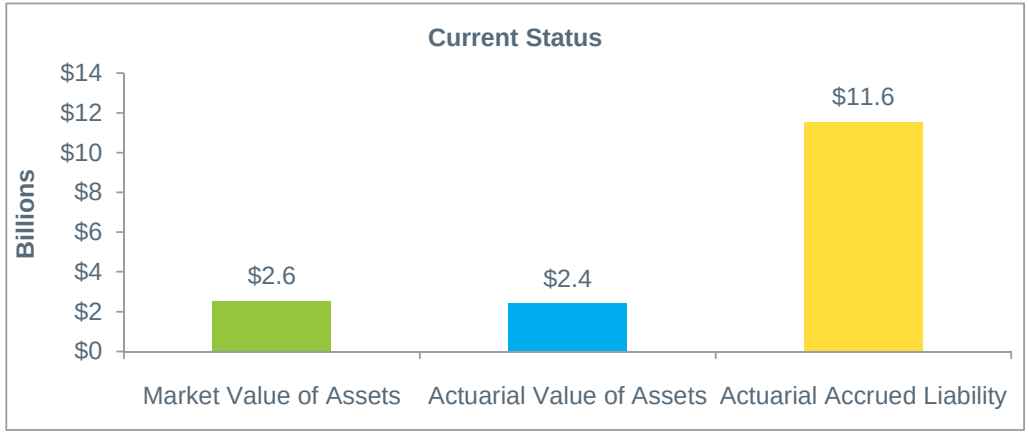
## This Asset/Liability Study . . .

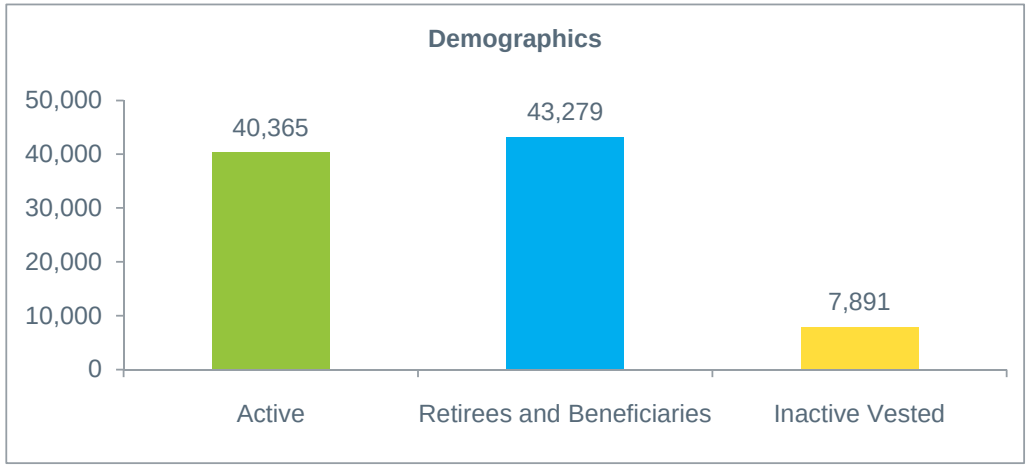
- Uses data from the June 30, 2014 KERS Actuarial Valuation to project pension liabilities.
- Uses the Actuarial Cost Method described in the June 30, 2014 KERS Actuarial Valuation, and the actuarial assumptions from the KRS Experience Study July 1, 2008 to June 30, 2013 ("the 2013 Experience Study") performed by Cavanaugh Macdonald Consulting, LLC (Cavanaugh).
- Compares these specific investment strategies—(A) the Current Target, (B) a conservative illustrative portfolio (Conservative Portfolio), (C) a diversified lower risk portfolio (Potential Portfolio 1), (D) a diversified moderate risk portfolio (Potential Portfolio 2), (E) a diversified higher risk portfolio (Potential Portfolio 3), and (F) an aggressive illustrative portfolio (Aggressive Portfolio).
- Assumes the Plan's current benefit policy throughout the entire projection period—changes to the benefit policy are the purview of the elected representatives.
- Note: Does not assume any actuarial adjustments that may take place in future years.

# Current Status

A summary of the Plan follows:

| | |
|---|---|
| **Valuation Date** | June 30, 2014 |
| **Market Value of Assets (MVA)** | $2.6 billion |
| **Actuarial Value of Assets (AVA)** | $2.4 billion |
| **Actuarial Accrued Liability (AAL)** | $11.6 billion |
| **Market Value Funded Ratio (MVA/AAL)** | 22% |
| **Actuarial Value Funded Ratio (AVA/AAL)** | 21% |
| **Active** | 40,365 |
| **Retirees and Beneficiaries** | 43,279 |
| **Inactive Vested** | 7,891 |




Population counts include approximately 2,200 members who also receive benefits from the hazardous system.

# Deterministic Analysis

This section provides an analysis of the Plan's assets, liabilities, funded status, and benefit payments based on a fixed set of future assumptions. Each analysis that follows in this deterministic section rests on the critical assumptions below and must be read and interpreted with them in mind—particularly assumptions #2, #3 and #4.

The deterministic assumptions are as follows:

1. Current Plan provisions (see Summary of Main Benefit and Contribution Provisions beginning on page 38 of the KERS June 30, 2014 actuarial valuation report prepared by Cavanaugh).

2. The participant data used by Cavanaugh in its June 30, 2014 actuarial valuation.

3. Actuarially assumed rate of return on Plan assets for all projection years: 7.50%.

4. For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013 (30.84% of payroll). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study.

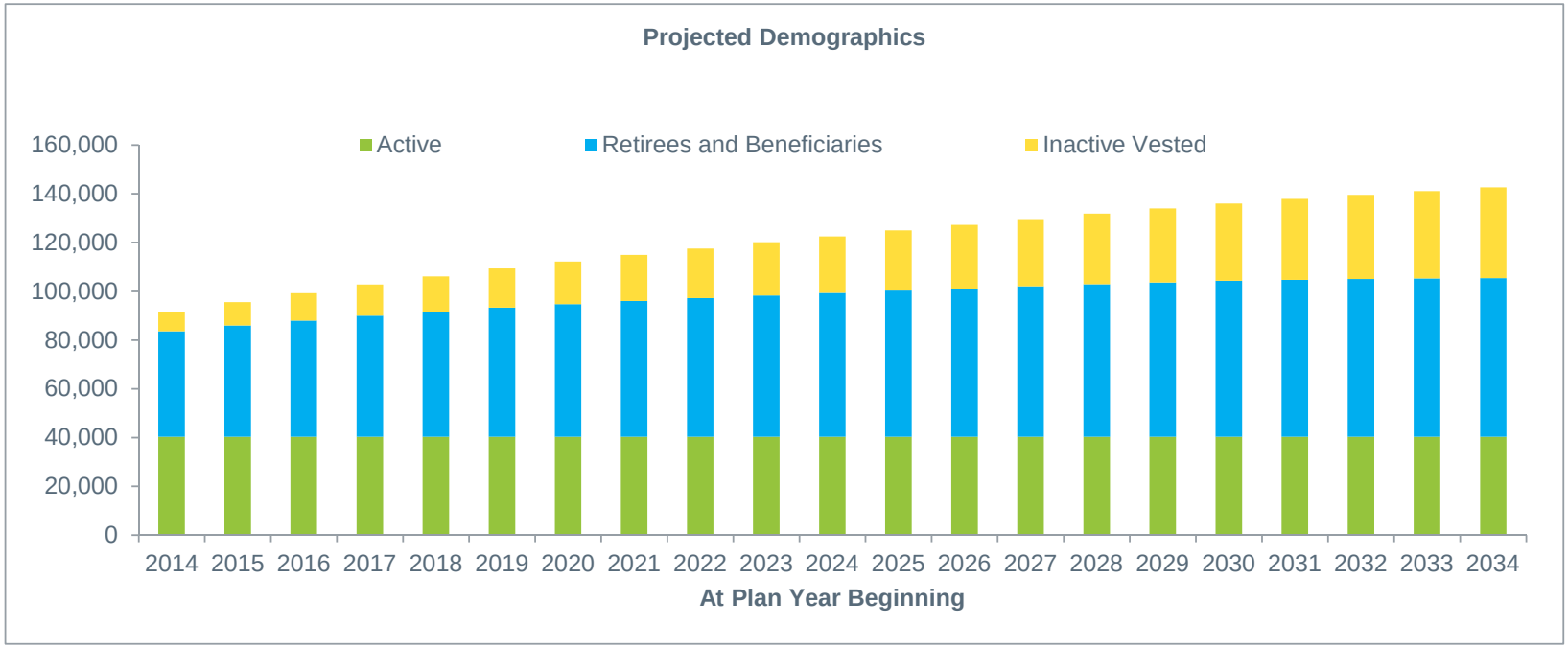
5. Assumes demographic experience projected in accordance with the actuarial assumptions proposed in the 2013 Experience Study.

6. Open group analysis: level active population. New active participants entering the Plan are assumed to have similar characteristics to recently hired participants.

# Deterministic Analysis (continued)

## Demographics

Following are the projected number of active and inactive participants at the beginning of each Plan year from 2014 through 2034 (2014 is actual). These projections are based on an open group analysis. Using the actuary's assumptions for death, termination, retirement, and disability, current participants are assumed to leave the Plan in the future. The number of total inactive participants (Retirees and Beneficiaries and Vested Inactive) increases by approximately 100% during the 20-year projection period shown.



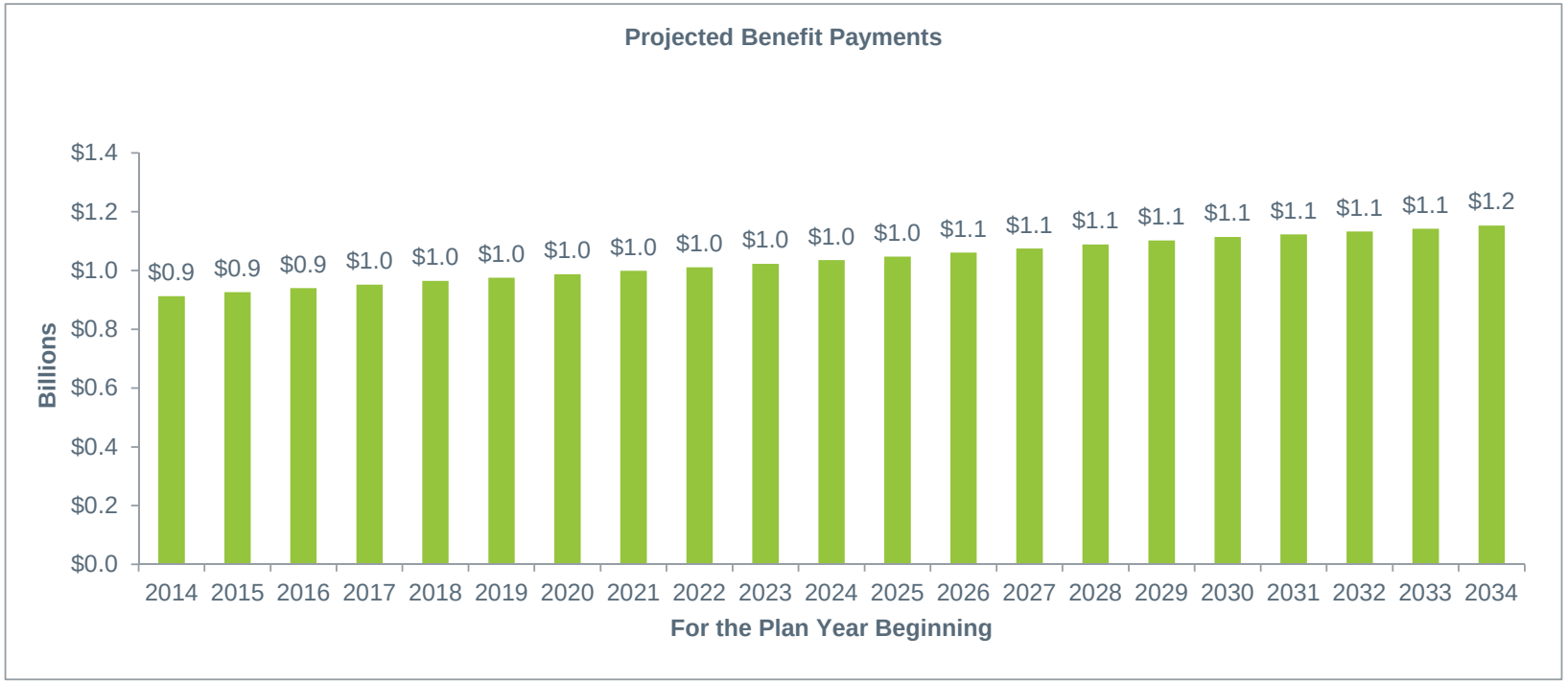

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Population | | | | | | | | | | | | | | | | | | | | | |
| Annual Percent Change | N/A | 4.4% | 3.8% | 3.6% | 3.3% | 3.1% | 2.6% | 2.4% | 2.3% | 2.2% | 2.0% | 2.0% | 1.8% | 1.8% | 1.7% | 1.6% | 1.5% | 1.4% | 1.2% | 1.2% | 1.1% |

Population counts include approximately 2,200 members who also receive benefits from the hazardous system.

# Deterministic Analysis (continued)

## Benefit Payments

The Plan's projected annual benefit payments are shown in the chart below. The projected benefit payments are expected to increase by about 26% over the next 20 years. As a percentage of the market value of Plan assets, benefit payments are expected to increase through approximately 2023 before beginning to decline through the end of the projection period (see page 12).

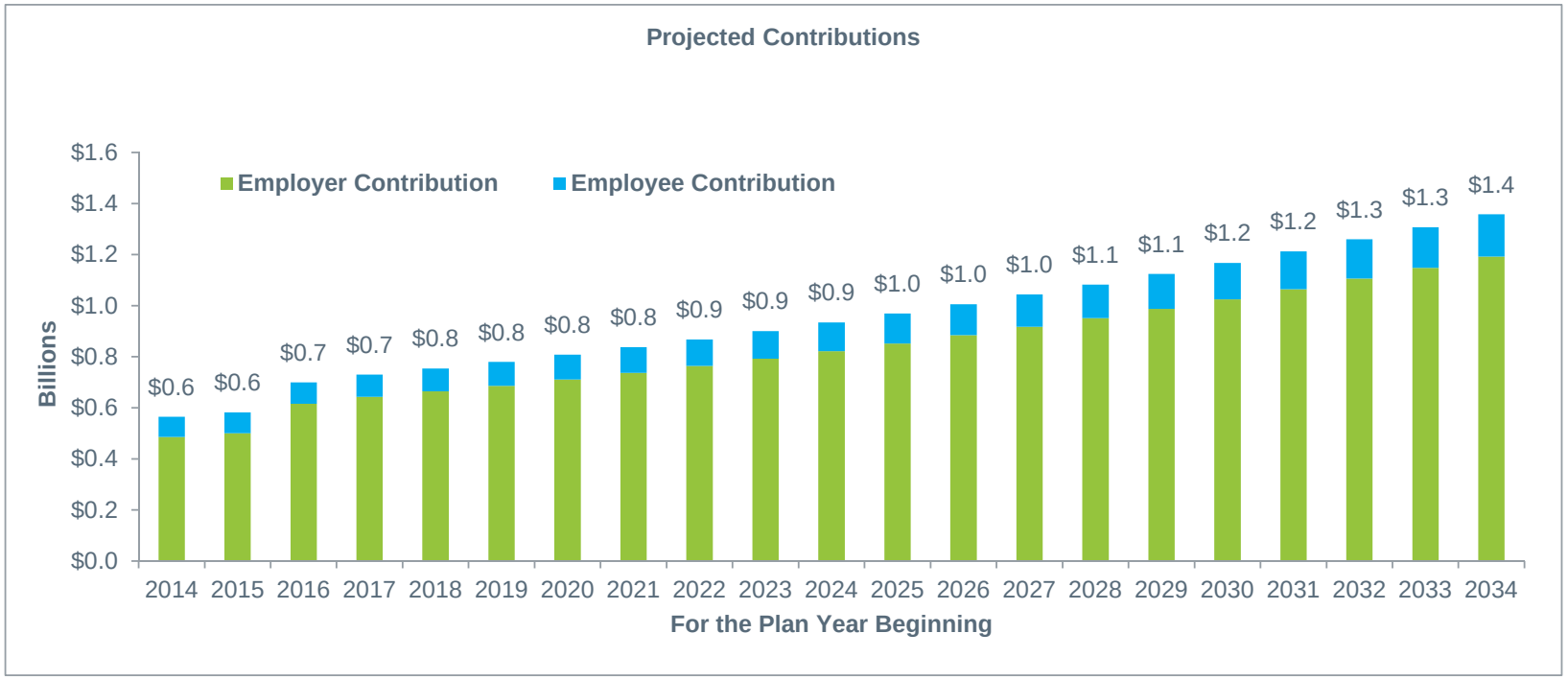



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 1.5% | 1.5% | 1.3% | 1.3% | 1.2% | 1.2% | 1.2% | 1.2% | 1.1% | 1.3% | 1.2% | 1.2% | 1.3% | 1.3% | 1.3% | 1.1% | 0.8% | 0.9% | 0.9% | 1.0% |

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as total dollar contributions, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.

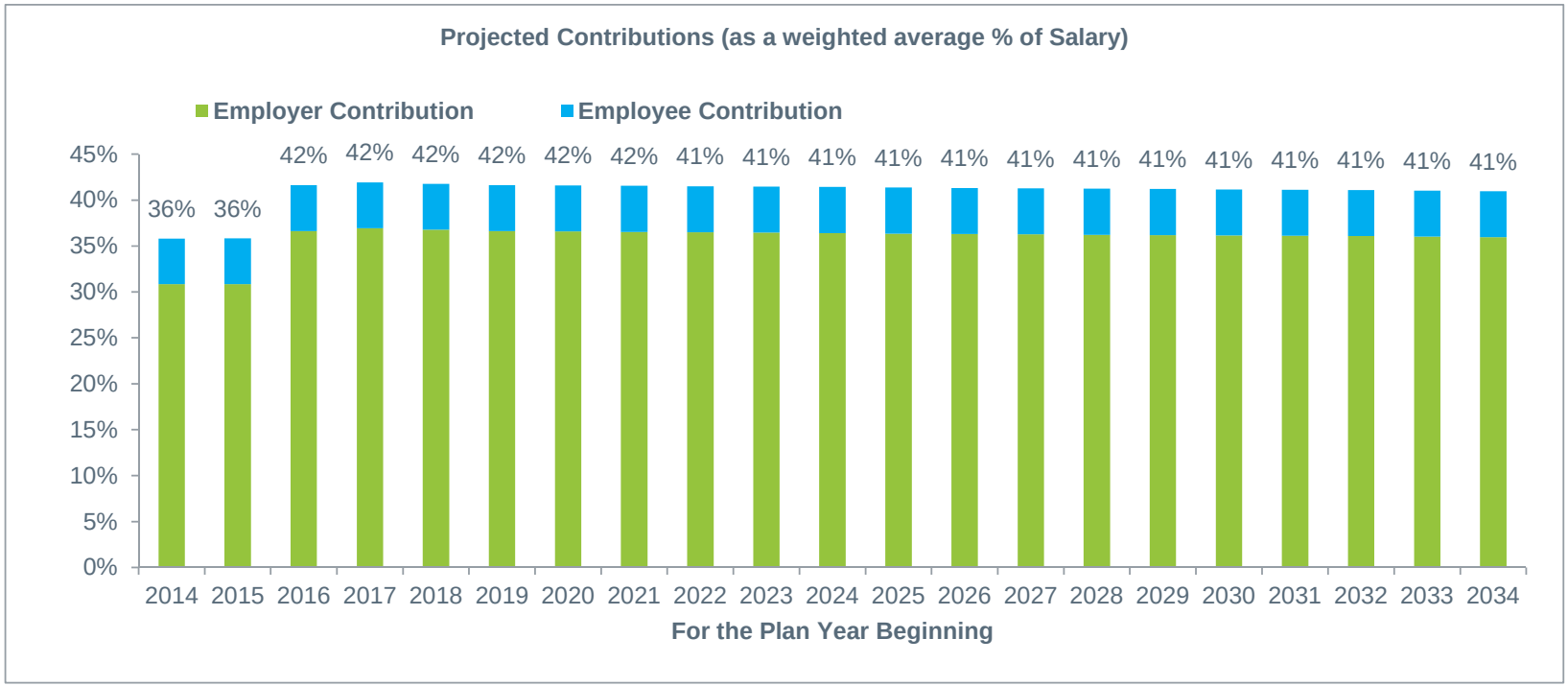



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 3.0% | 20.2% | 4.4% | 3.3% | 3.3% | 3.7% | 3.7% | 3.7% | 3.7% | 3.8% | 3.7% | 3.8% | 3.7% | 3.8% | 3.8% | 3.8% | 3.9% | 3.9% | 3.8% | 3.9% |

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as a weighted average percentage of salary, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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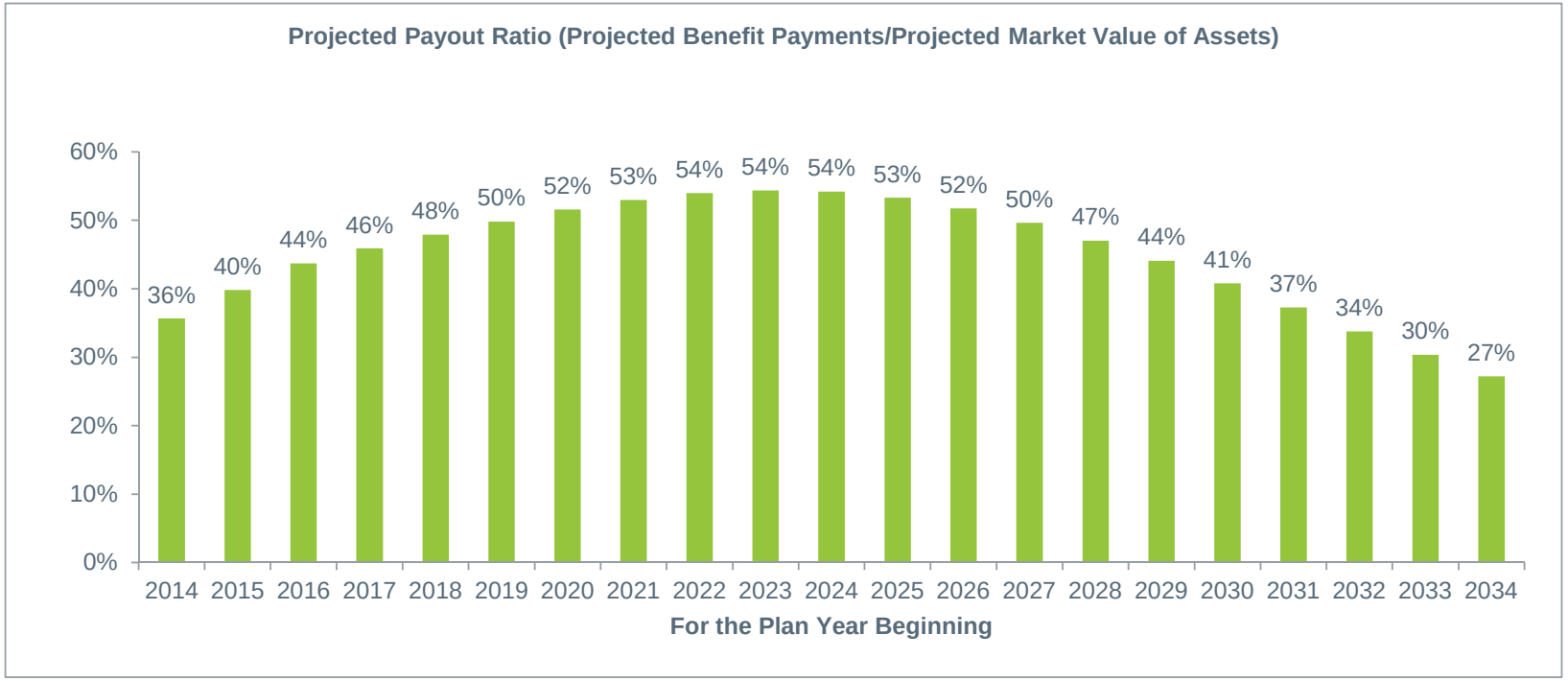
# Deterministic Analysis (continued)

## Payout Ratio (benefit payments/market value of assets)

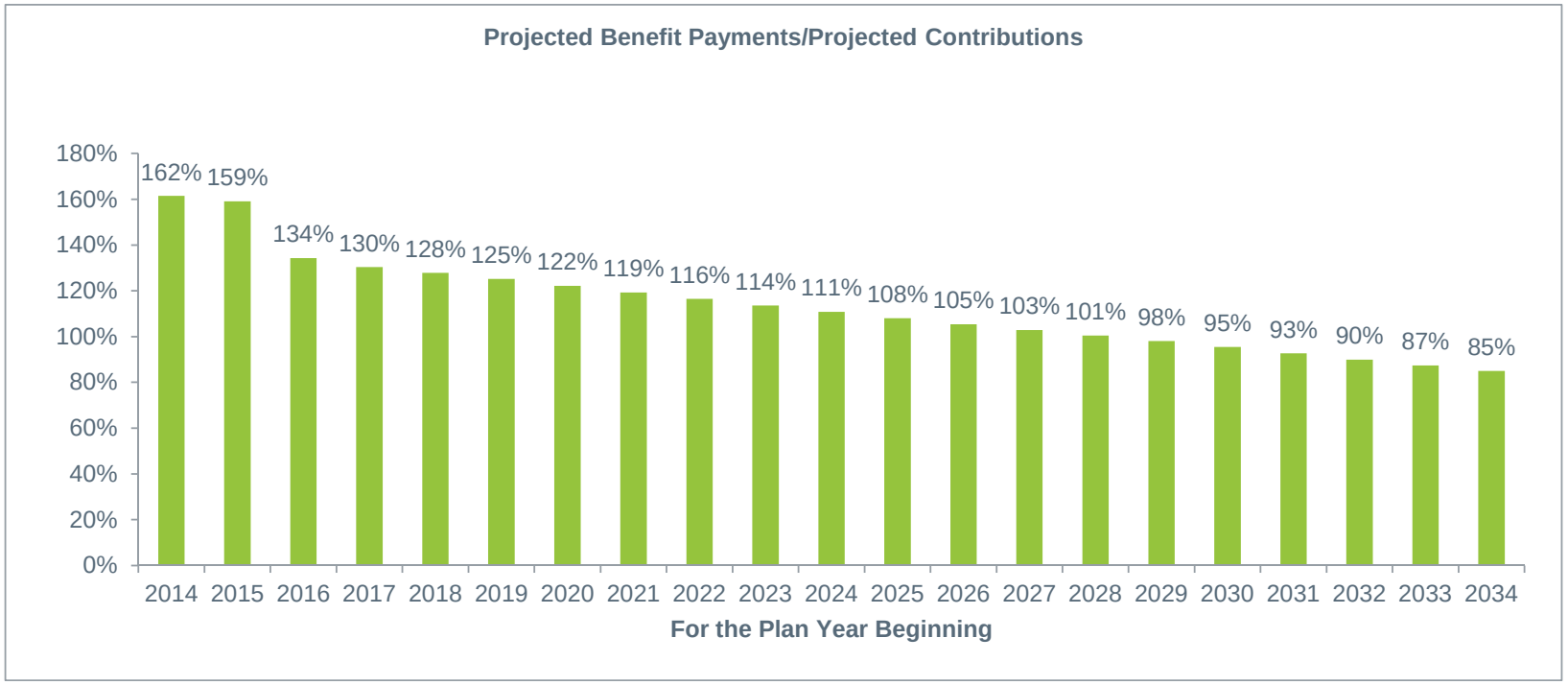
The Plan's projected payout ratios are shown in the chart below. The payout ratios are expected to rapidly increase through 2023 before beginning to decline through the end of the projection period. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Benefit Payments/Contributions

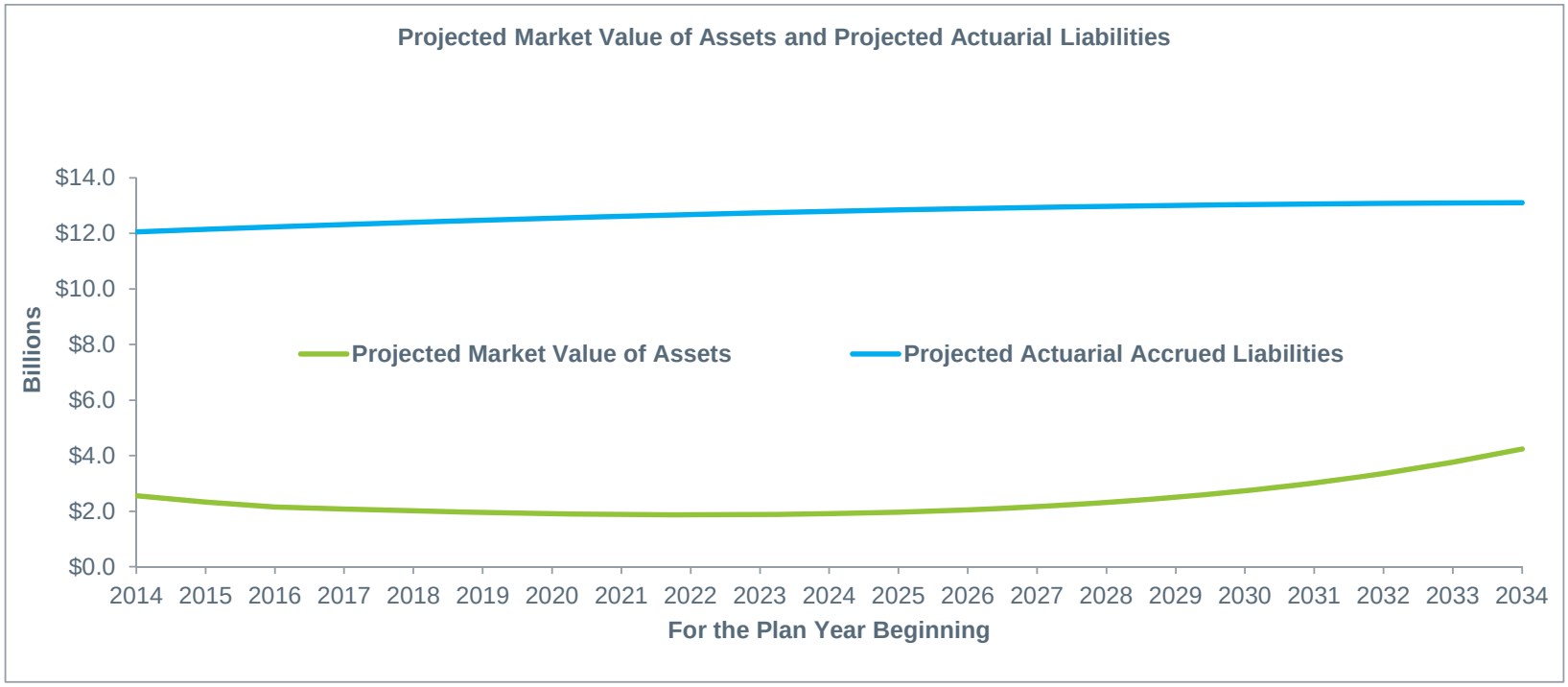
The Plan's projected benefit payments divided by projected contributions are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Actuarial Accrued Liabilities and Market Value of Assets

The Plan's projected actuarial accrued liabilities and market value of assets are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The relative disparity between the market value of assets and Plan liabilities is expected to decrease by 7% through the end of the projection period. The funded ratio (based on market value of assets) is expected to increase to approximately 32% by the end of the projection period. This is shown more clearly on the following pages.



# Deterministic Analysis (continued)

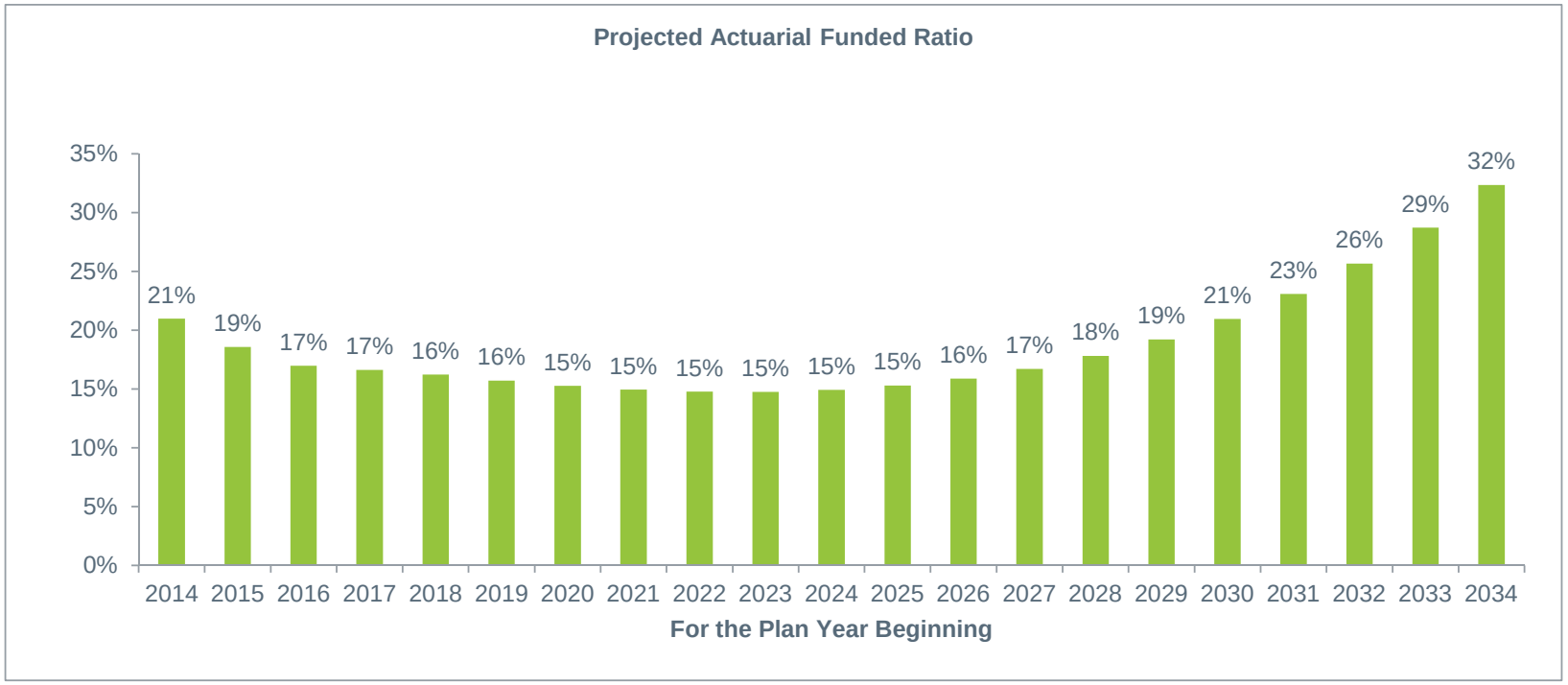
### Deficit (market value of assets – actuarial accrued liabilities)

The Plan's projected deficit of assets is shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The disparity between the market value of assets and Plan liabilities is expected to decrease by the end of the projection period by 7%.

# Deterministic Analysis (continued)

## Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability)

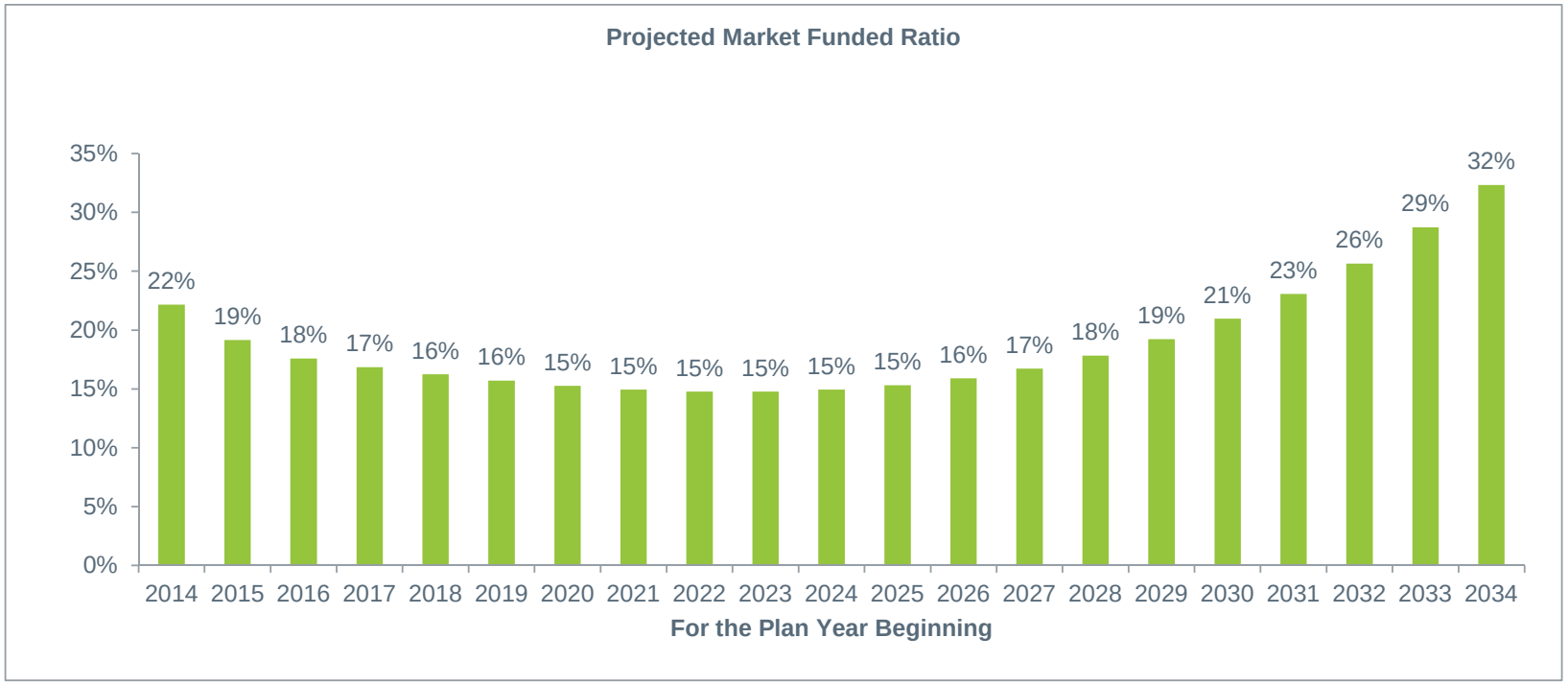
The Plan's projected actuarial funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 32% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Market Funded Ratio (market value of assets/actuarial accrued liability)

The Plan's projected market funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 32% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.

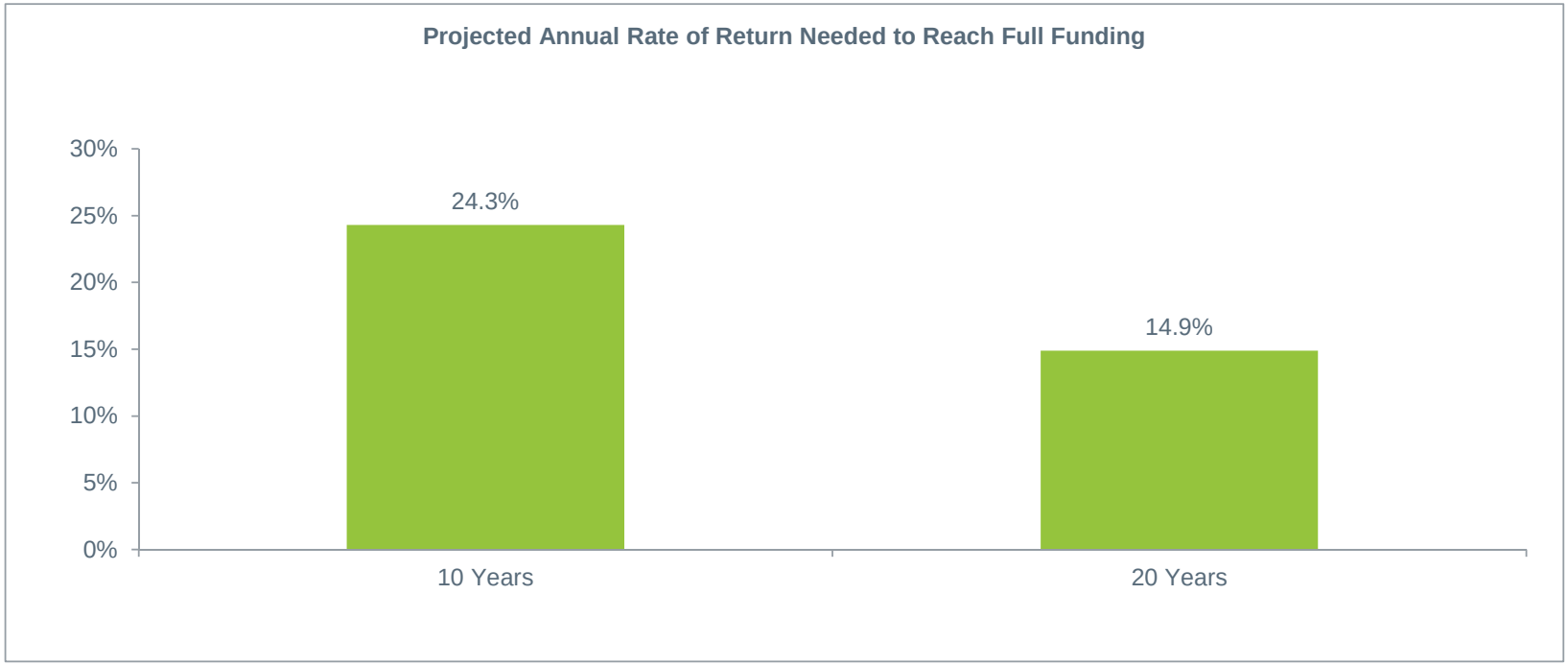


# Deterministic Scenario Analysis

## Full Funding Implied Returns

The figure below shows the projected investment return for the total fund needed to bring the Plan to 100% funding (on a market value basis) in 10 and 20 years, respectively. The results assume all other actuarial assumptions are precisely met over the time periods shown and that these returns are earned for every year, without variance.

Actuarially assumed rate of return – **7.50%**



# Deterministic Scenario Analysis (continued)

## Sensitivity Analysis – Decreased Return

Under the deterministic analysis presented in the preceding pages, the Plan is projected to have a market funded ratio of 32% in 20 years. The table below summarizes the projected funded ratio and other key statistics in 2034 assuming the Plan experiences an annualized investment return of 100 basis points lower (6.50%) than the current actuarially assumed rate of return (7.50%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

| | 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 | ▲ |

Values in impact column may not be additive to due rounding.

# Stochastic Analysis

In the previous section of this report, we assumed the Plan operated going forward with certain knowledge of the future investment returns earned by the Plan's assets. This section introduces the element of uncertainty in those future investment returns. This part of the analysis examines Plan assets and liabilities under many capital market environments based on expected future asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation.

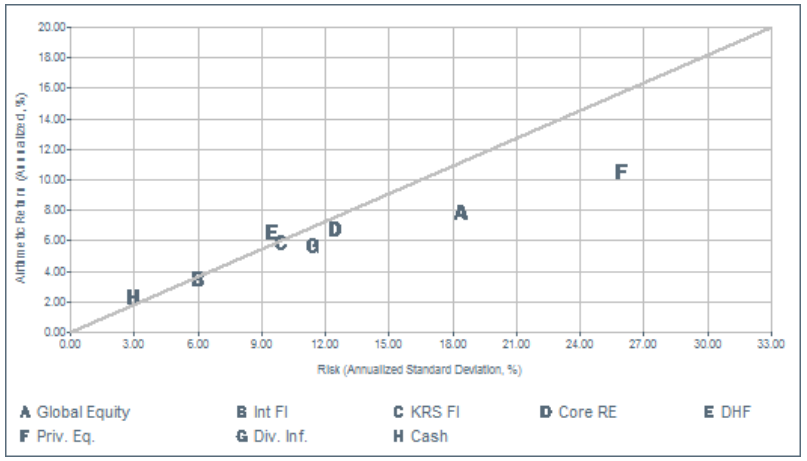
Using the current expected values and variances of the returns and inflation, along with their correlations, 2,000 trials are generated to produce a distribution of results. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes. This is contrasted with the deterministic analysis that provides an expected value if all current Plan assumptions are exactly met.

# Stochastic Analysis (continued)

## Long-Term Return and Risk Assumptions

In order to perform a stochastic analysis and create asset allocation alternatives, it is necessary to estimate, for each asset class, its probable return and risk. The expected returns are our best estimates of the average annual percentage increases in values of each asset class over a prospective long period of time, and assumed to be normally distributed. The risk of an asset class is measured by its standard deviation, or volatility. If asset returns are normally distributed, two-thirds (67%) of all returns are expected to lie within one standard deviation on either side of the mean. For example, we expect Global Equity to return, annually on average, 7.80% with a standard deviation of 18.35%, meaning that two-thirds of the time we expect its return to lie between -10.55% (= 7.80 – 18.35) and 26.15% (= 7.80 + 18.35). Moreover, we expect 95% of all return outcomes to lie within two standard deviations of the mean return, implying only a one-in-twenty chance that the return on Global Equity will either fall below -28.90% or rise above 44.50%. The risk and return assumptions used in this study are outlined in the below table and chart:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption |
|---|---|---|
| Global Equity | 7.80 | 18.35 |
| Int. Duration Fixed Income | 3.50 | 6.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 |
| Core Real Estate | 6.75 | 12.50 |
| Diversified Hedge Funds | 6.50 | 9.50 |
| Private Equity | 10.50 | 26.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 |
| Cash Equivalents | 2.25 | 3.00 |



# Stochastic Analysis (continued)

## Correlation Between Asset Classes

Creating a diversified portfolio of asset classes enables the investor to achieve a high rate of return while minimizing volatility of the portfolio. As defined on the previous page, volatility is "risk" or standard deviation. By minimizing the volatility of a portfolio, we produce asset returns that vary less from year to year. Diversification exists because the returns of different asset classes do not always move in the same direction, at the same time, or with the same magnitude. Correlation values are between 1.00 and –1.00. If returns of two asset classes rise or fall at the same time and in the same magnitude, they have a correlation value of 1.00. Conversely, two asset classes that simultaneously move in opposite directions, and in the same magnitude, have a correlation value of –1.00. A correlation of zero indicates no relationship between returns. The assumed correlations are largely based on historical index data, with some qualitative analysis applied. For instance, where appropriate, we have weighted current history more heavily. The correlation matrix used in this study is shown below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | -0.02 | 0.84 | 0.32 | 0.70 | 0.78 | 0.72 | -0.05 |
| Int. Duration Fixed Income | -0.02 | 1.00 | 0.28 | -0.06 | 0.12 | -0.26 | 0.22 | 0.24 |
| Custom KRS Fixed Income | 0.84 | 0.28 | 1.00 | 0.27 | 0.69 | 0.66 | 0.82 | -0.07 |
| Core Real Estate | 0.32 | -0.06 | 0.27 | 1.00 | 0.24 | 0.60 | 0.37 | 0.14 |
| Diversified Hedge Funds | 0.70 | 0.12 | 0.69 | 0.24 | 1.00 | 0.69 | 0.59 | 0.22 |
| Private Equity | 0.78 | -0.26 | 0.66 | 0.60 | 0.69 | 1.00 | 0.62 | 0.07 |
| Diversified Inflation Strategies | 0.72 | 0.22 | 0.82 | 0.37 | 0.59 | 0.62 | 1.00 | -0.03 |
| Cash Equivalents | -0.05 | 0.24 | -0.07 | 0.14 | 0.22 | 0.07 | -0.03 | 1.00 |

The fact that the correlations shown in the table are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others. This point is demonstrated on the following pages, which illustrate that diversification into less correlated asset classes can decrease the expected overall volatility of a portfolio.

# Stochastic Analysis (continued)

## Efficient Portfolios

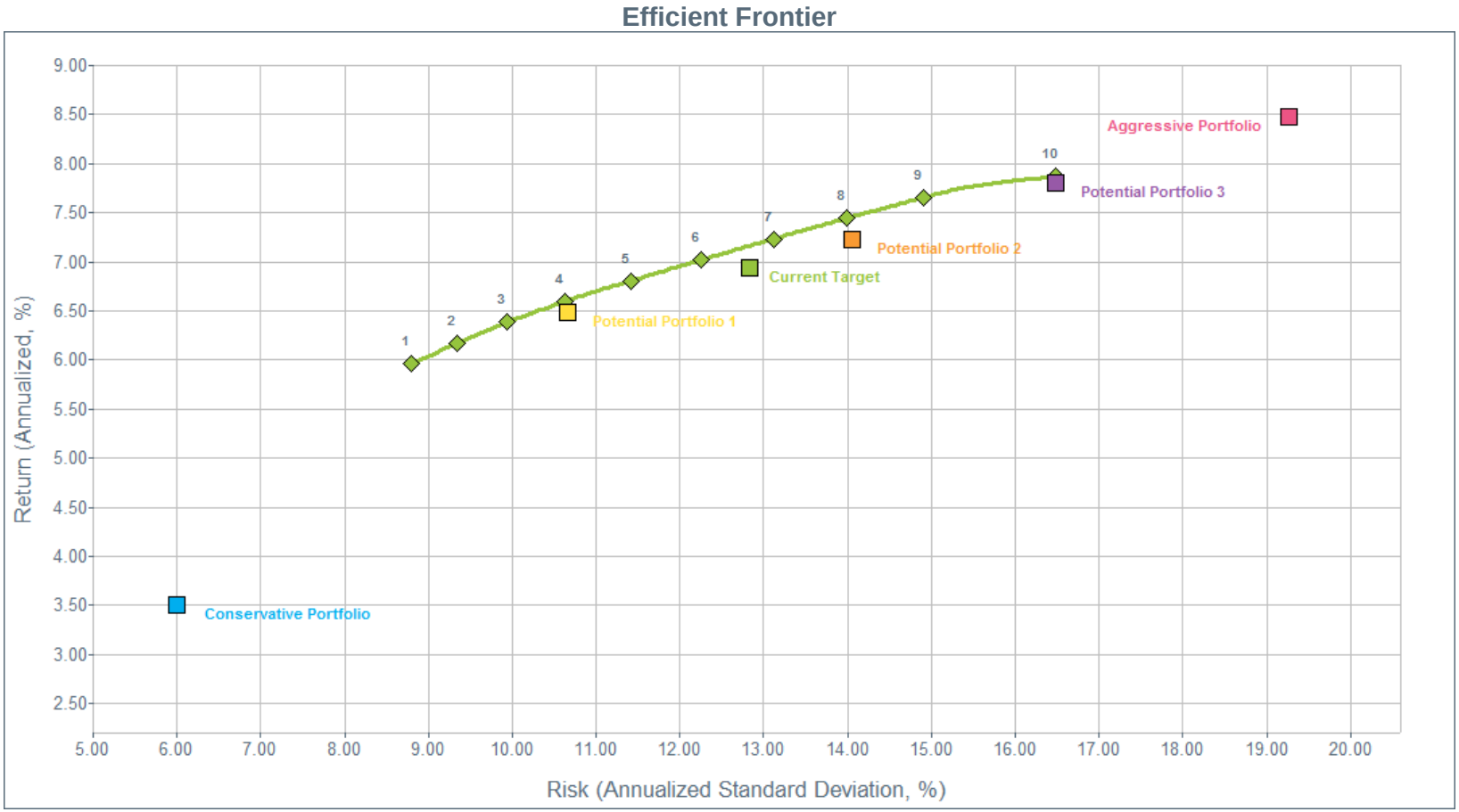
Each frontier portfolio (optimal allocation) is created using target rates of return both above and below the projected rate of return for the current allocation. This range illustrates the trade-off between return and risk; additional return can only be achieved by undertaking additional risk. The table below shows the possible optimal allocations given the selected asset classes and their constraints listed under "Min" and "Max." The table shows the Current Target allocation and highlights three potential targets (Potential Portfolios 1, 2, and 3) for consideration throughout this study. Two illustrative portfolios (Conservative and Aggressive Portfolios) are also shown for demonstrative purposes.

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | **30** | **70** | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | **0** | **30** | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | **0** | **30** | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | **5** | **10** | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | **10** | **15** | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | **5** | **15** | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | **2** | **15** | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | **2** | **5** | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

# Stochastic Analysis (continued)

## Efficient Frontier

The risk of each alternative allocation is plotted against the horizontal axis, while the return is measured on the vertical axis. The line connecting the points represents all the optimal portfolios subject to the given constraints and is known as the "efficient frontier." The upward slope of the efficient frontier indicates the direct relationship between return and risk.



# Stochastic Analysis (continued)

## Asset Mixes

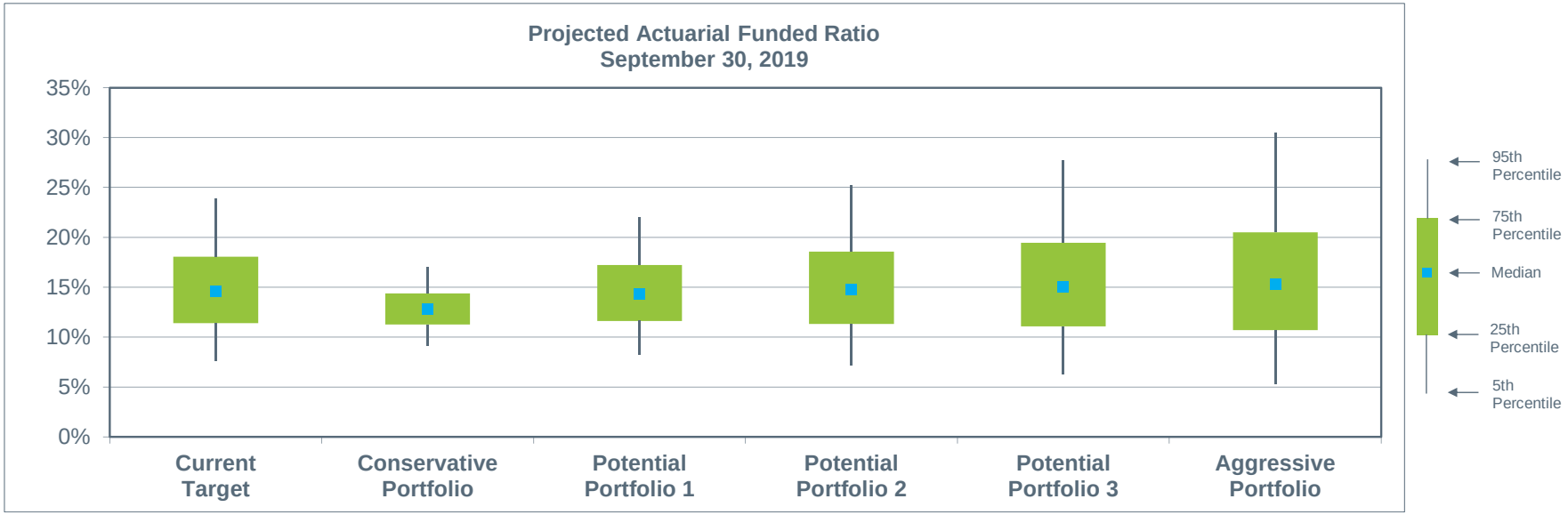
Outlined below are the Current Target allocation and five other mixes to be examined in this stochastic analysis. The expected return, expected risk (as measured by standard deviation), and RVK Liquidity Metric, for each is also shown.

| 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** |

# Stochastic Analysis (continued)

## Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

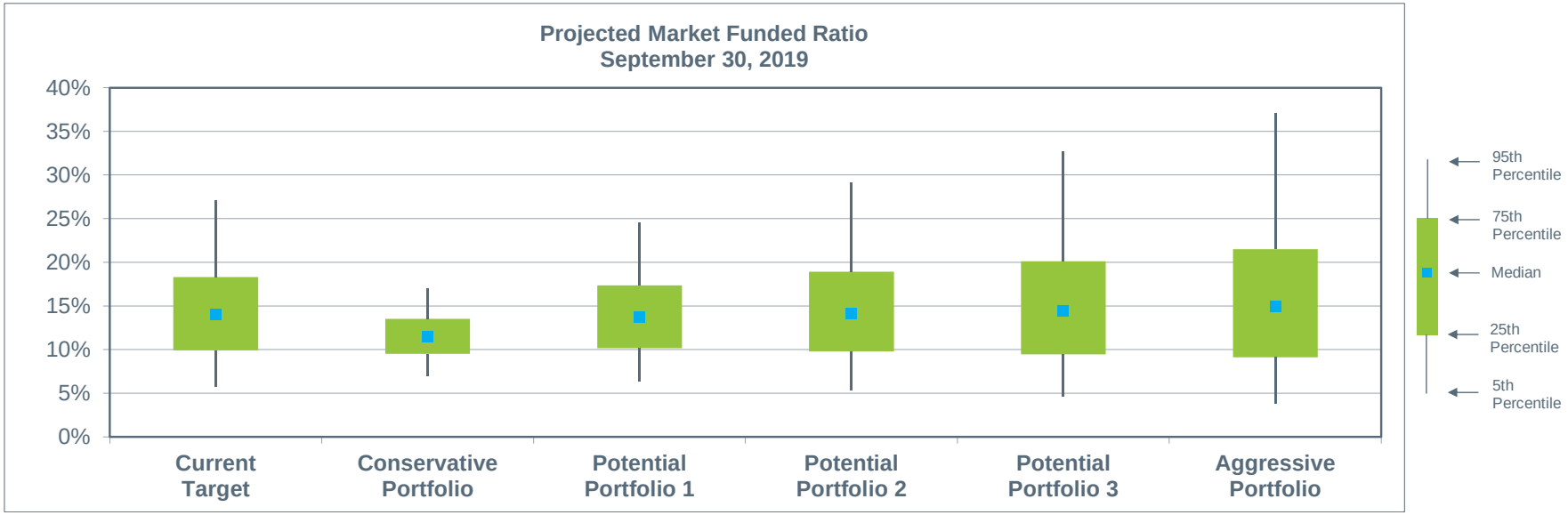



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $11 | 8% | $11 | 9% | $11 | 8% | $11 | 7% | $12 | 6% | $12 | 5% |
| 25th Percentile | $11 | 11% | $11 | 11% | $11 | 12% | $11 | 11% | $11 | 11% | $11 | 11% |
| Median | $11 | 15% | $11 | 13% | $11 | 14% | $11 | 15% | $11 | 15% | $11 | 15% |
| 75th Percentile | $10 | 18% | $11 | 14% | $10 | 17% | $10 | 19% | $10 | 19% | $10 | 21% |
| 95th Percentile | $10 | 24% | $10 | 17% | $10 | 22% | $9 | 25% | $9 | 28% | $9 | 30% |

# Stochastic Analysis (continued)

## Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible market funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

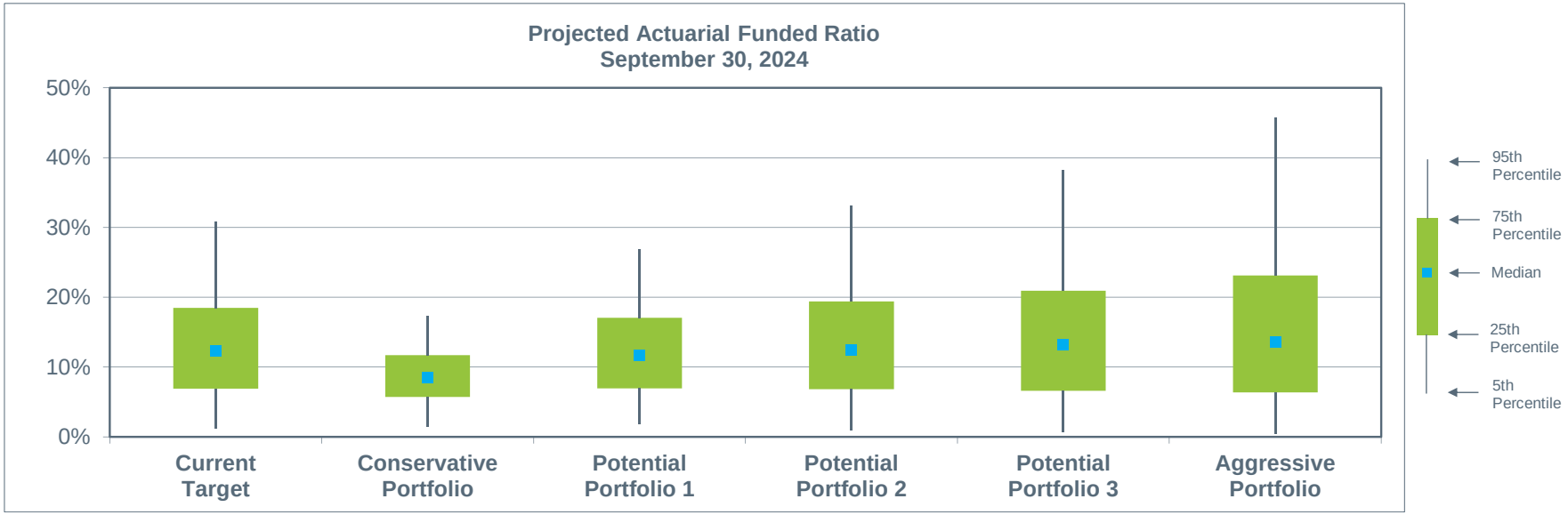



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $12 | 6% | $11 | 7% | $12 | 6% | $12 | 5% | $12 | 5% | $12 | 4% |
| 25th Percentile | $11 | 10% | $11 | 10% | $11 | 10% | $11 | 10% | $11 | 9% | $11 | 9% |
| 50th Percentile | $11 | 14% | $11 | 12% | $11 | 14% | $11 | 14% | $11 | 14% | $11 | 15% |
| 75th Percentile | $10 | 18% | $11 | 14% | $10 | 17% | $10 | 19% | $10 | 20% | $10 | 21% |
| 95th Percentile | $9 | 27% | $11 | 17% | $10 | 25% | $9 | 29% | $9 | 33% | $8 | 37% |

# Stochastic Analysis (continued)

## Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

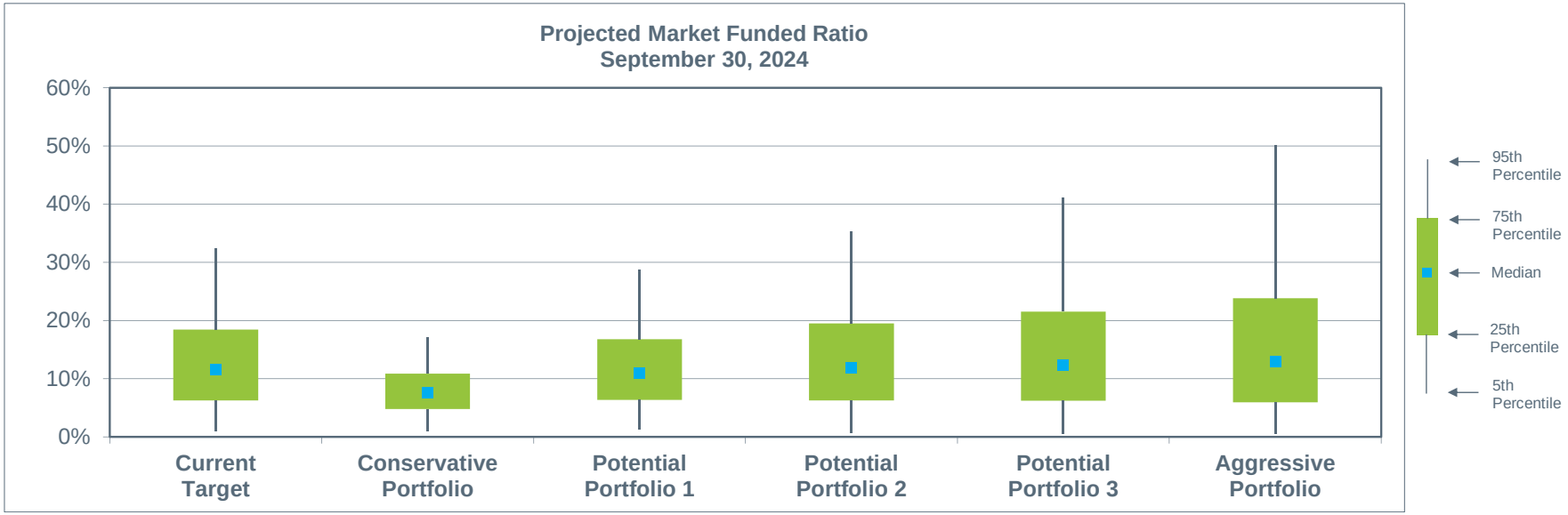



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $12 | 1% | $12 | 1% | $12 | 2% | $12 | 1% | $12 | 1% | $13 | 0% |
| 25th Percentile | $12 | 7% | $12 | 6% | $12 | 7% | $12 | 7% | $12 | 7% | $12 | 6% |
| Median | $11 | 12% | $12 | 9% | $11 | 12% | $11 | 12% | $11 | 13% | $11 | 14% |
| 75th Percentile | $11 | 18% | $11 | 12% | $11 | 17% | $10 | 19% | $10 | 21% | $10 | 23% |
| 95th Percentile | $9 | 31% | $11 | 17% | $10 | 27% | $9 | 33% | $8 | 38% | $7 | 46% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **10 Years**

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

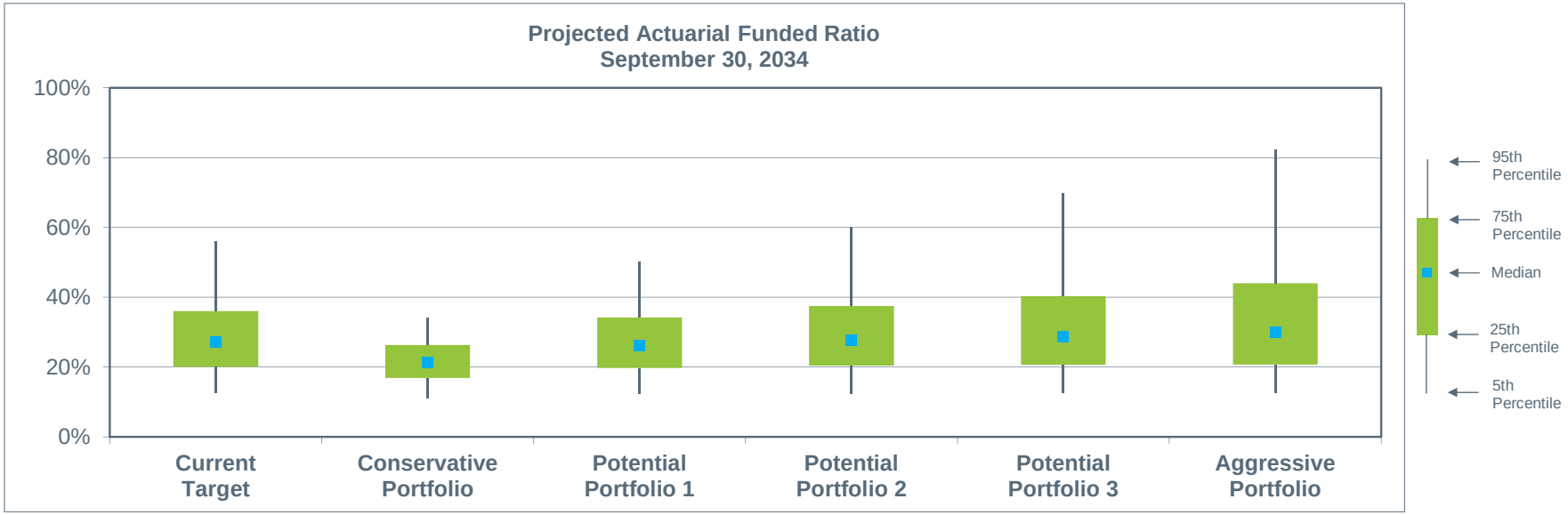



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $12 | 1% | $12 | 1% | $12 | 1% | $12 | 1% | $12 | 1% | $13 | 0% |
| 25th Percentile | $12 | 6% | $12 | 5% | $12 | 6% | $12 | 6% | $12 | 6% | $12 | 6% |
| 50th Percentile | $11 | 12% | $12 | 8% | $11 | 11% | $11 | 12% | $11 | 12% | $11 | 13% |
| 75th Percentile | $11 | 18% | $12 | 11% | $11 | 17% | $10 | 19% | $10 | 22% | $10 | 24% |
| 95th Percentile | $9 | 32% | $11 | 17% | $10 | 29% | $9 | 35% | $8 | 41% | $7 | 50% |

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

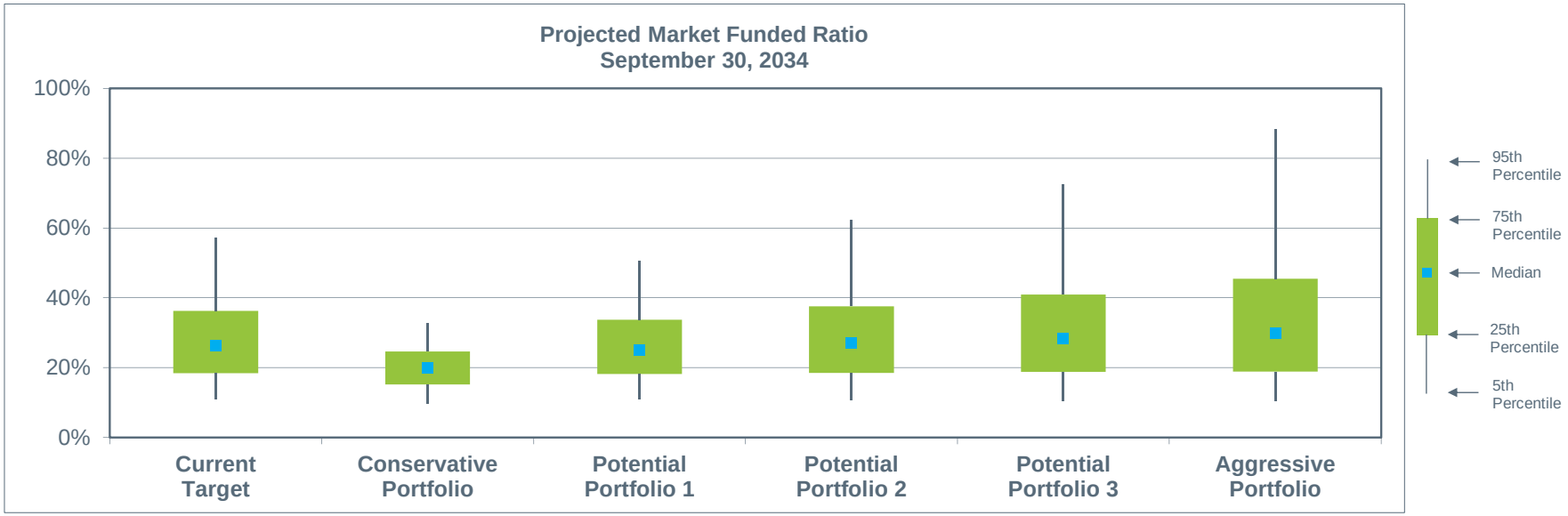



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $11 | 12% | $11 | 11% | $11 | 12% | $11 | 12% | $11 | 13% | $11 | 13% |
| 25th Percentile | $10 | 20% | $10 | 17% | $10 | 20% | $10 | 20% | $10 | 21% | $10 | 21% |
| Median | $9 | 27% | $10 | 21% | $10 | 26% | $9 | 28% | $9 | 29% | $9 | 30% |
| 75th Percentile | $9 | 36% | $10 | 26% | $9 | 34% | $8 | 38% | $8 | 40% | $7 | 44% |
| 95th Percentile | $6 | 56% | $9 | 34% | $7 | 50% | $6 | 60% | $4 | 70% | $2 | 82% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $11 | 11% | $11 | 10% | $11 | 11% | $11 | 11% | $11 | 11% | $11 | 10% |
| 25th Percentile | $10 | 18% | $11 | 15% | $10 | 18% | $10 | 18% | $10 | 19% | $10 | 19% |
| 50th Percentile | $9 | 26% | $10 | 20% | $10 | 25% | $9 | 27% | $9 | 28% | $9 | 30% |
| 75th Percentile | $9 | 36% | $10 | 25% | $9 | 34% | $8 | 38% | $8 | 41% | $7 | 45% |
| 95th Percentile | $6 | 57% | $10 | 33% | $7 | 51% | $5 | 62% | $4 | 72% | $2 | 88% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 22% (Current) Funding in 2019 | Probability of Asset Depletion by 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 86% | 0% | -37% | 43% |
| Conservative Portfolio | 0% | 100% | 0% | -22% | 43% |
| Potential Portfolio 1 | 0% | 90% | 0% | -32% | 43% |
| Potential Portfolio 2 | 0% | 84% | 0% | -39% | 43% |
| Potential Portfolio 3 | 0% | 80% | 0% | -44% | 43% |
| Aggressive Portfolio | 0% | 76% | 0% | -48% | 44% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 22% (Current) Funding in 2024 | Probability of Asset Depletion by 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 83% | 3% | -37% | 49% |
| Conservative Portfolio | 0% | 99% | 3% | -22% | 49% |
| Potential Portfolio 1 | 0% | 88% | 3% | -32% | 48% |
| Potential Portfolio 2 | 0% | 80% | 4% | -39% | 49% |
| Potential Portfolio 3 | 0% | 76% | 5% | -45% | 49% |
| Aggressive Portfolio | 0% | 72% | 6% | -50% | 49% |

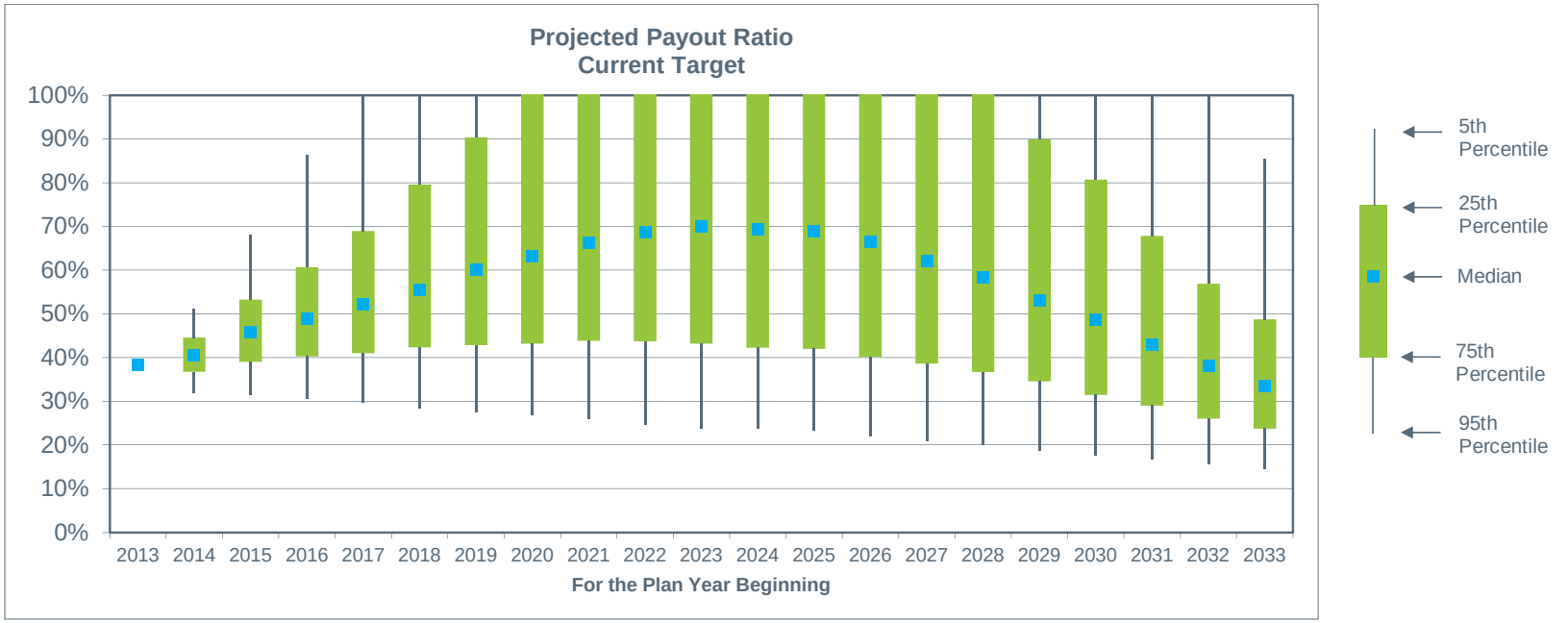
| 20 Years | Probability of Full Funding in 2034 | Probability of < 22% (Current) Funding in 2034 | Probability of Asset Depletion by 2034 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 36% | 5% | -38% | 56% |
| Conservative 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% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Current Target**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 38% and 70%.



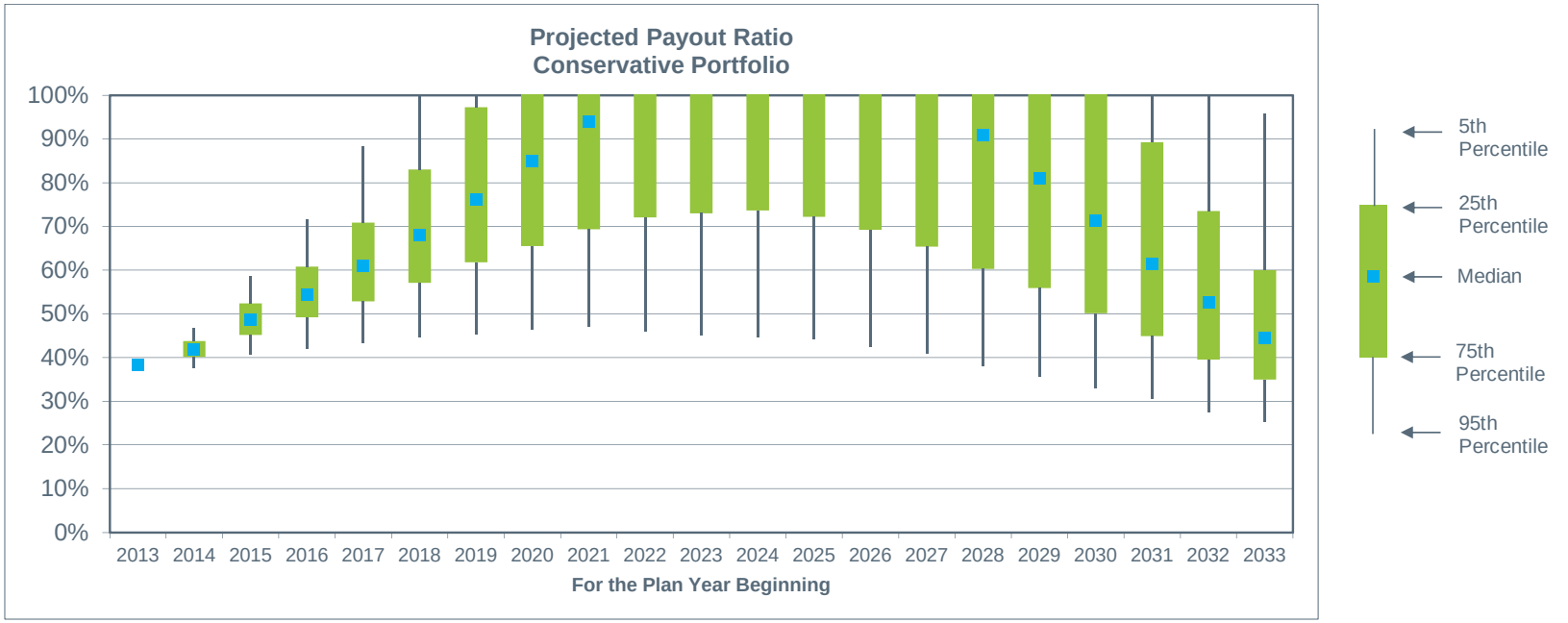

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 38% | 41% | 46% | 49% | 52% | 56% | 60% | 63% | 66% | 69% | 70% | 69% | 69% | 66% | 62% | 58% | 53% | 49% | 43% | 38% | 33% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Conservative Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 38% and 100%.



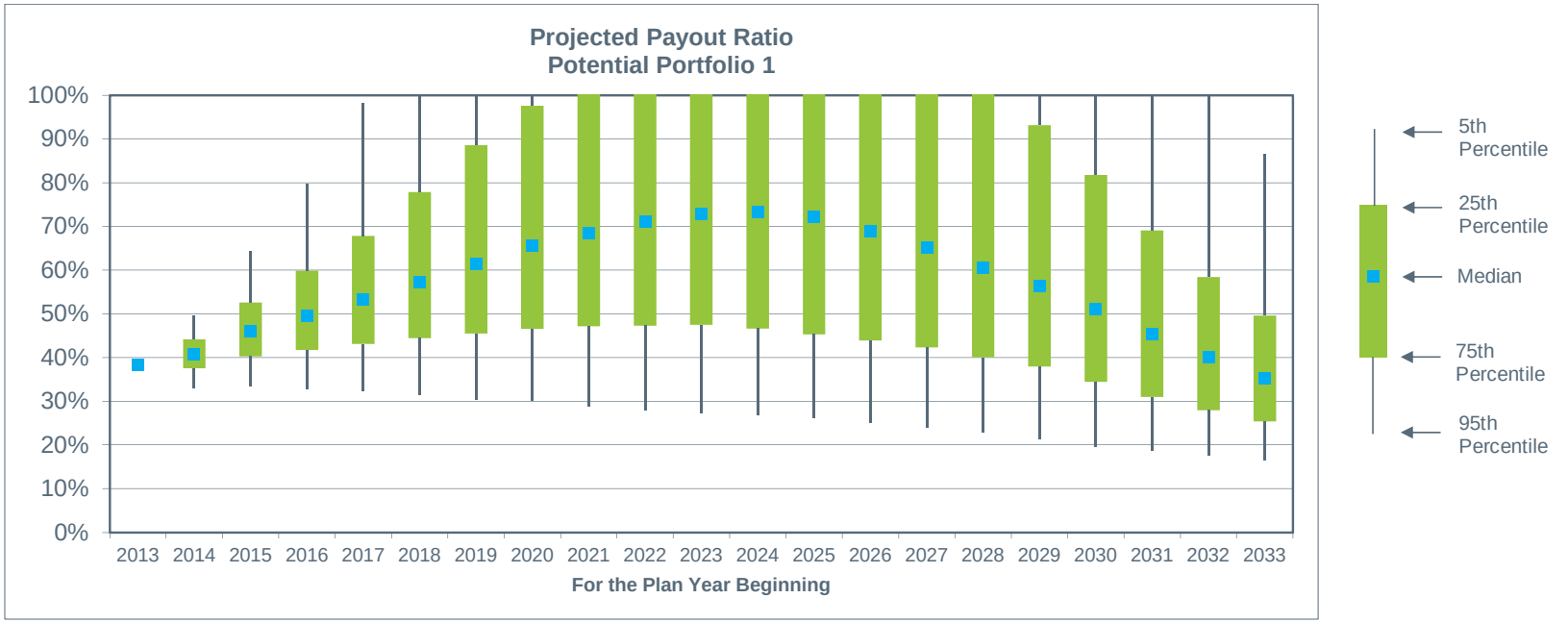

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 38% | 42% | 49% | 54% | 61% | 68% | 76% | 85% | 94% | 101% | 107% | 111% | 112% | 108% | 100% | 91% | 81% | 71% | 61% | 53% | 44% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 1**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 35% and 73%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 38% | 41% | 46% | 49% | 53% | 57% | 62% | 66% | 68% | 71% | 73% | 73% | 72% | 69% | 65% | 61% | 56% | 51% | 45% | 40% | 35% |



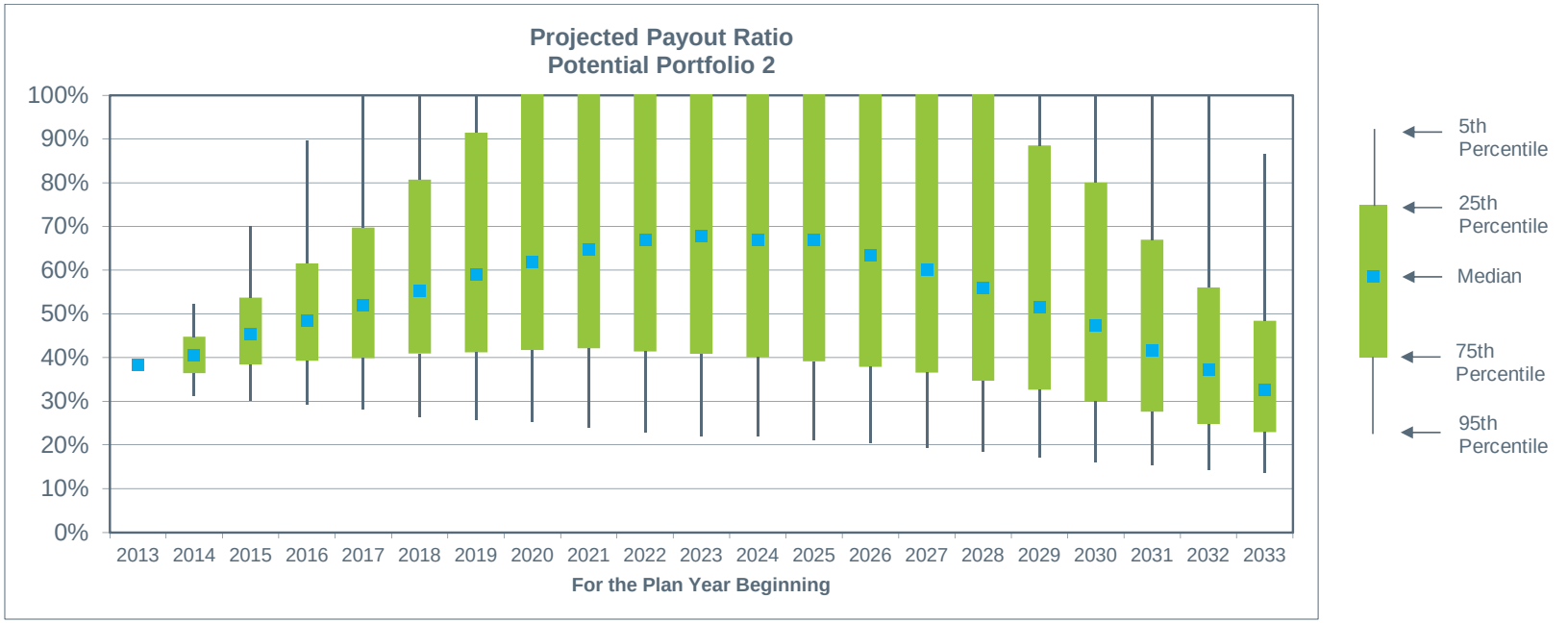
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 2**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 33% and 68%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 38% | 40% | 45% | 49% | 52% | 55% | 59% | 62% | 65% | 67% | 68% | 67% | 67% | 63% | 60% | 56% | 52% | 47% | 42% | 37% | 33% |



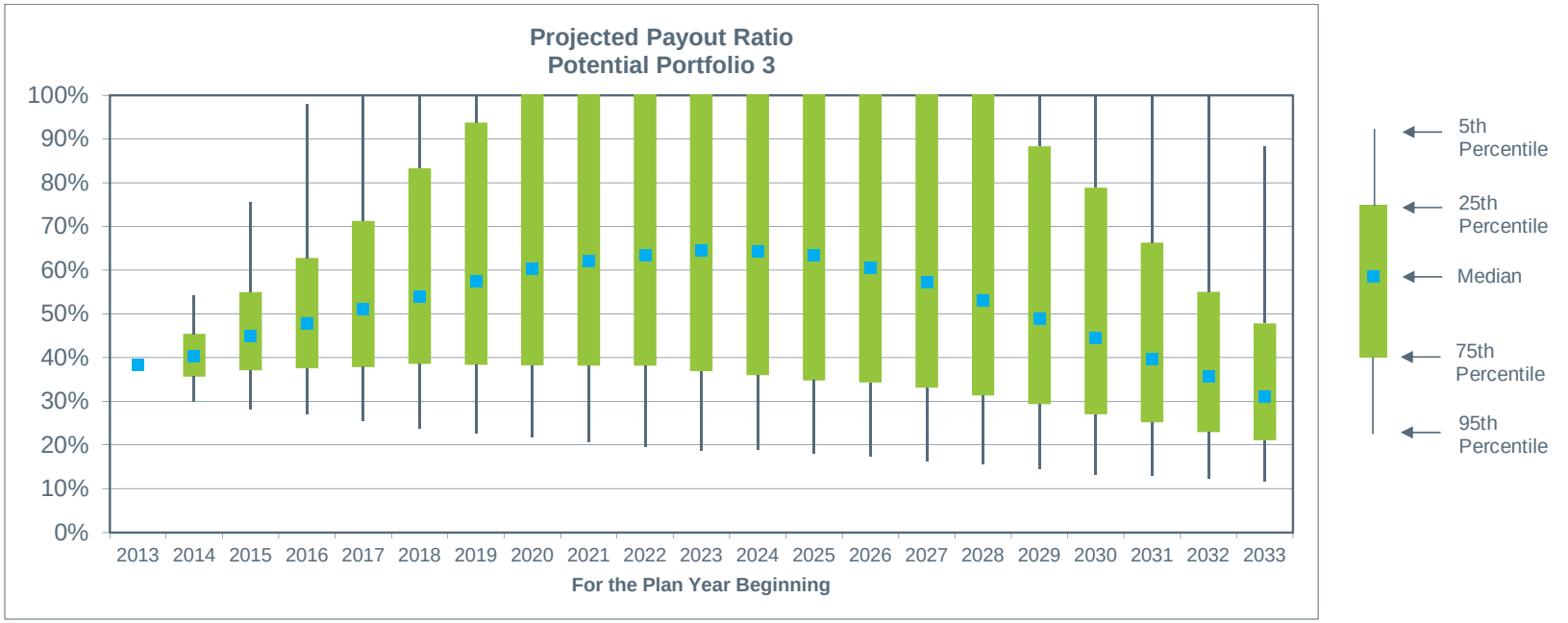
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 3**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 31% and 65%.



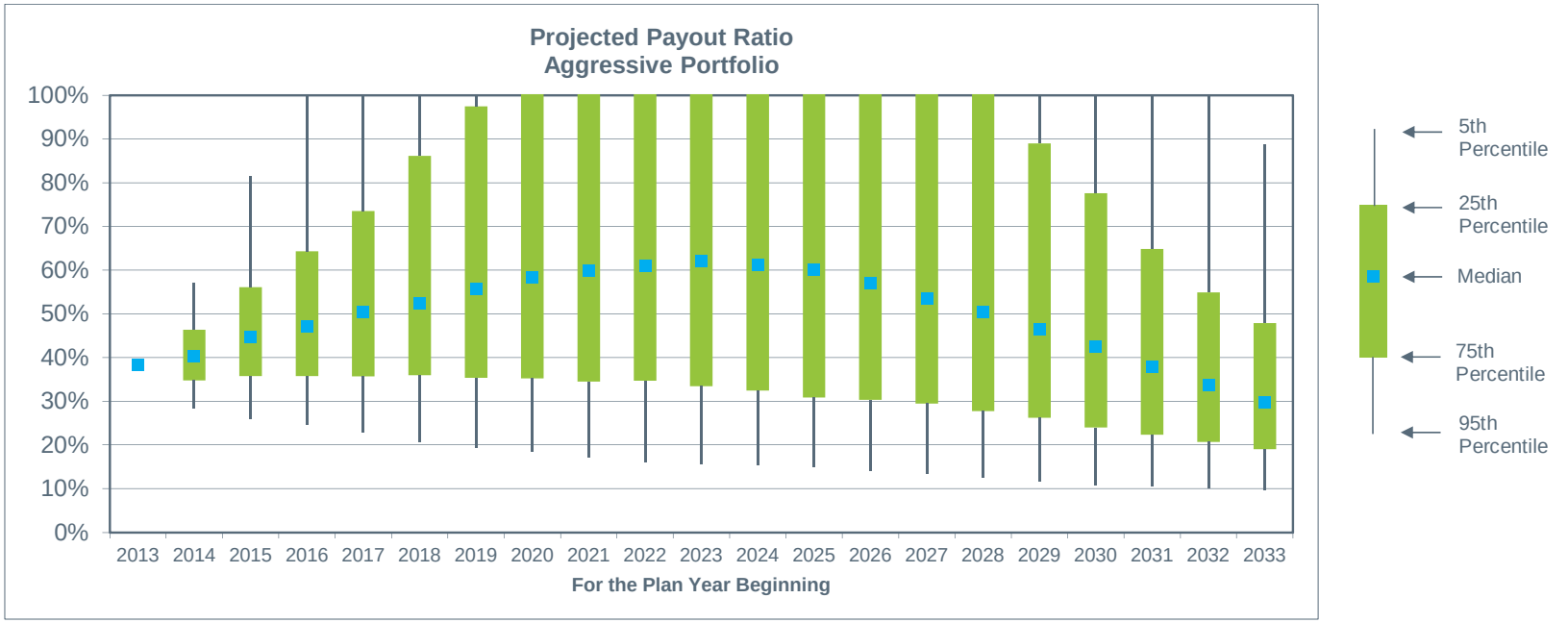

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 38% | 40% | 45% | 48% | 51% | 54% | 57% | 60% | 62% | 63% | 65% | 64% | 63% | 61% | 57% | 53% | 49% | 45% | 40% | 36% | 31% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Aggressive Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 30% and 62%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 38% | 40% | 45% | 47% | 50% | 52% | 56% | 58% | 60% | 61% | 62% | 61% | 60% | 57% | 54% | 51% | 46% | 42% | 38% | 34% | 30% |

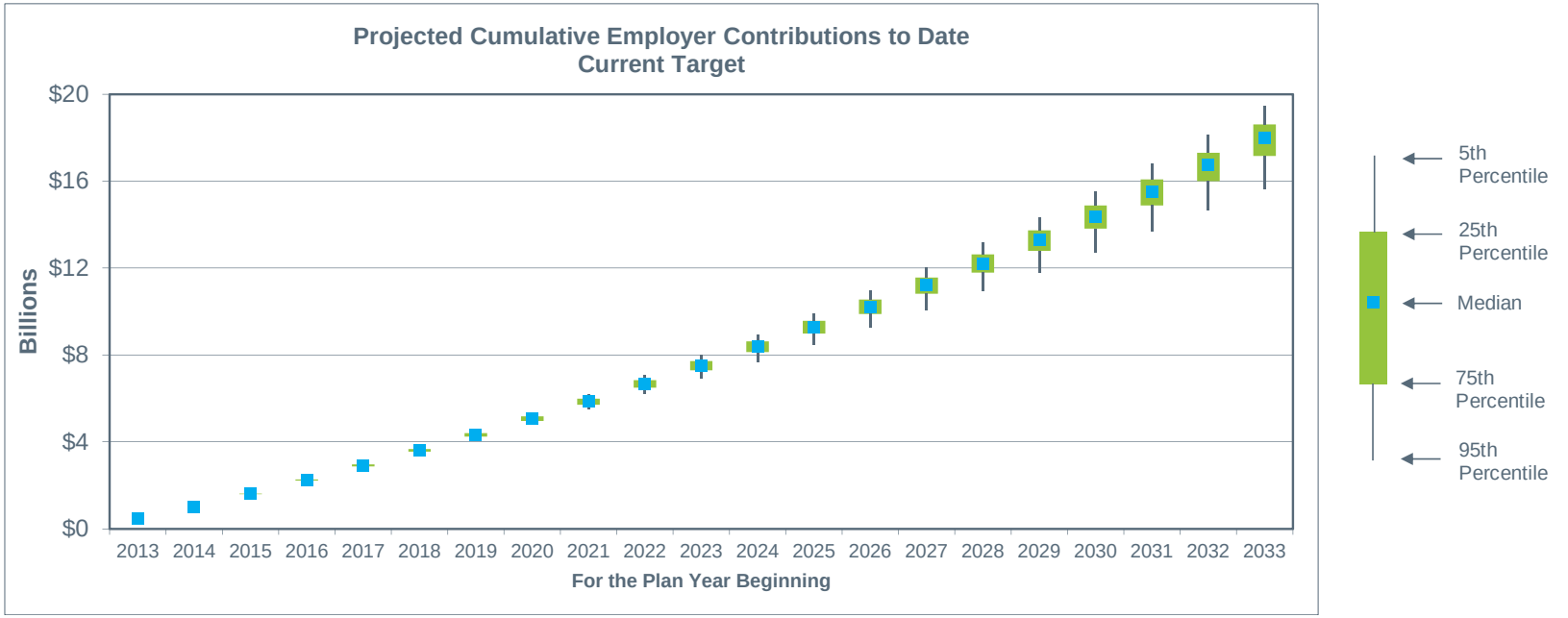


RVK

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Current Target

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

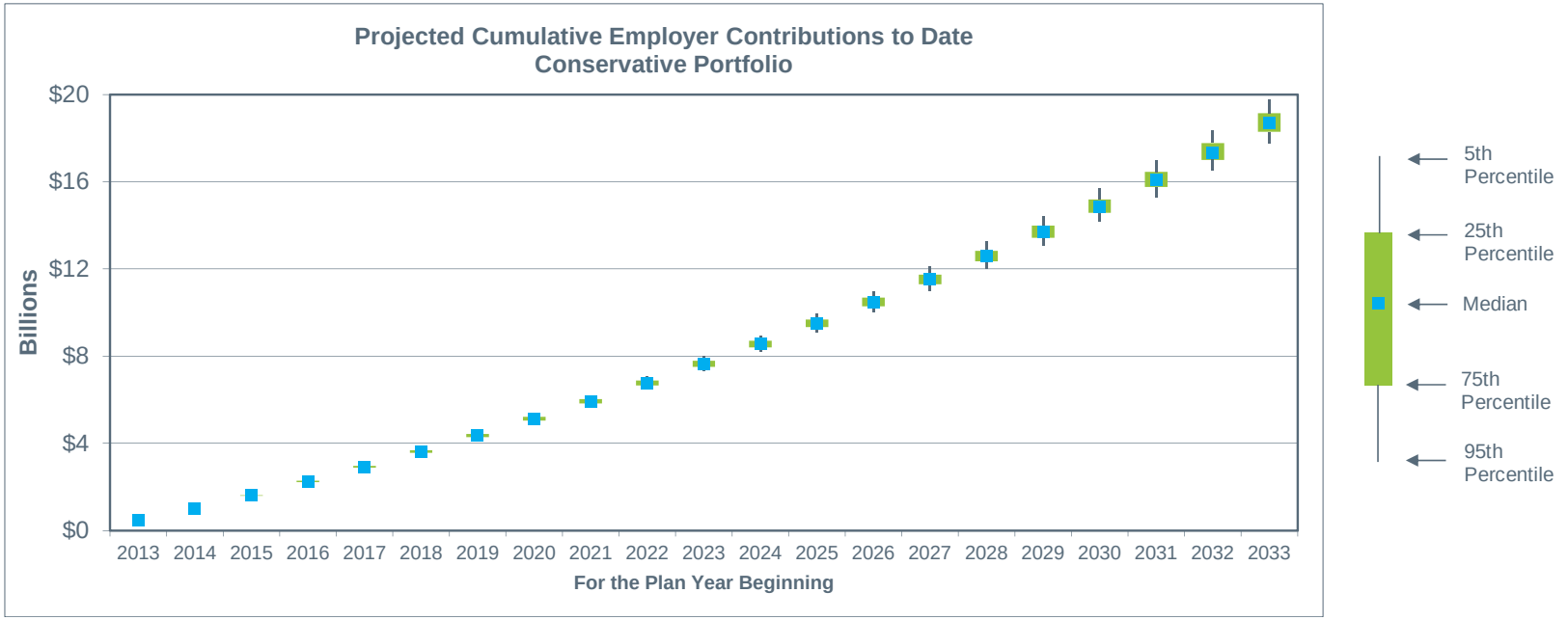



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $16 | $17 | $18 | $19 |
| **25th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 | $19 |
| **Median** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $16 | $17 | $18 |
| **75th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 |
| **95th Percentile** | $0 | $1 | $2 | $2 | $3 | $3 | $4 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Conservative Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

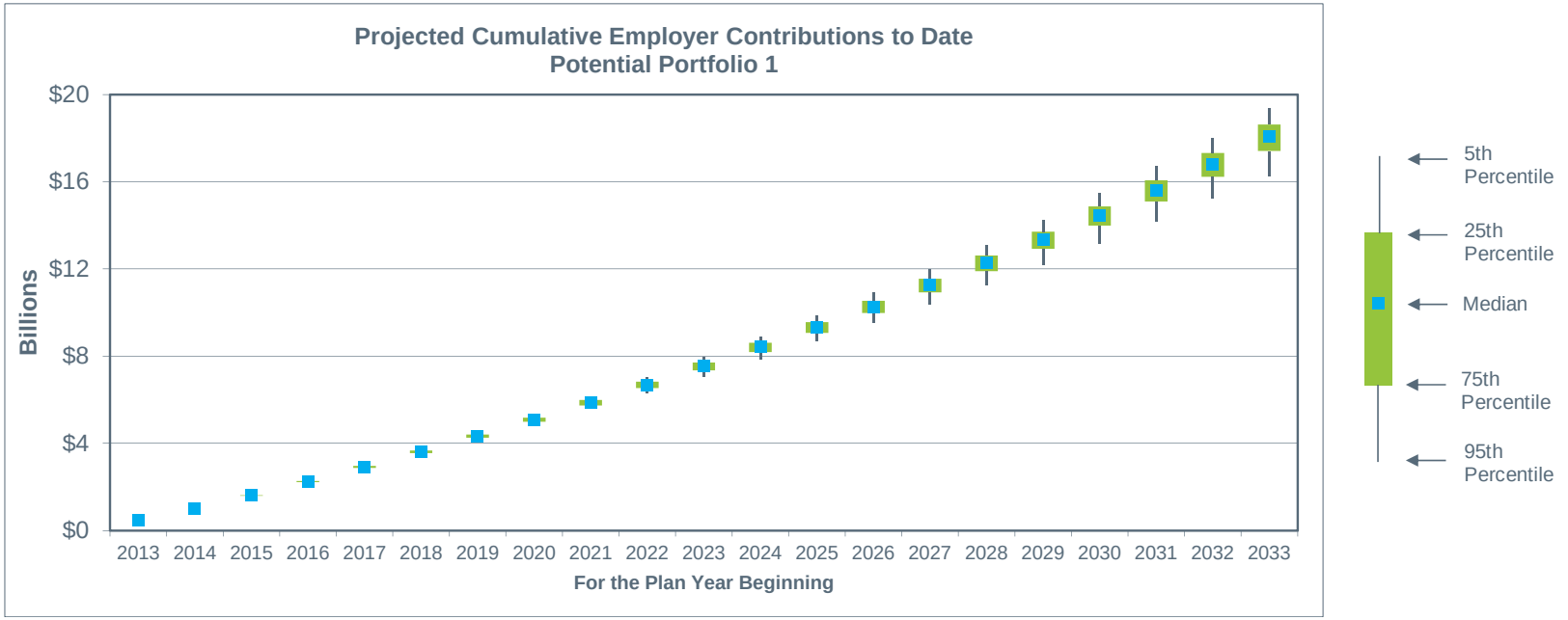



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $16 | $17 | $18 | $20 |
| **25th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $18 | $19 |
| **Median** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $9 | $9 | $10 | $12 | $13 | $14 | $15 | $16 | $17 | $19 |
| **75th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 | $13 | $15 | $16 | $17 | $18 |
| **95th Percentile** | $0 | $1 | $2 | $2 | $3 | $3 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $17 | $18 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 1

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

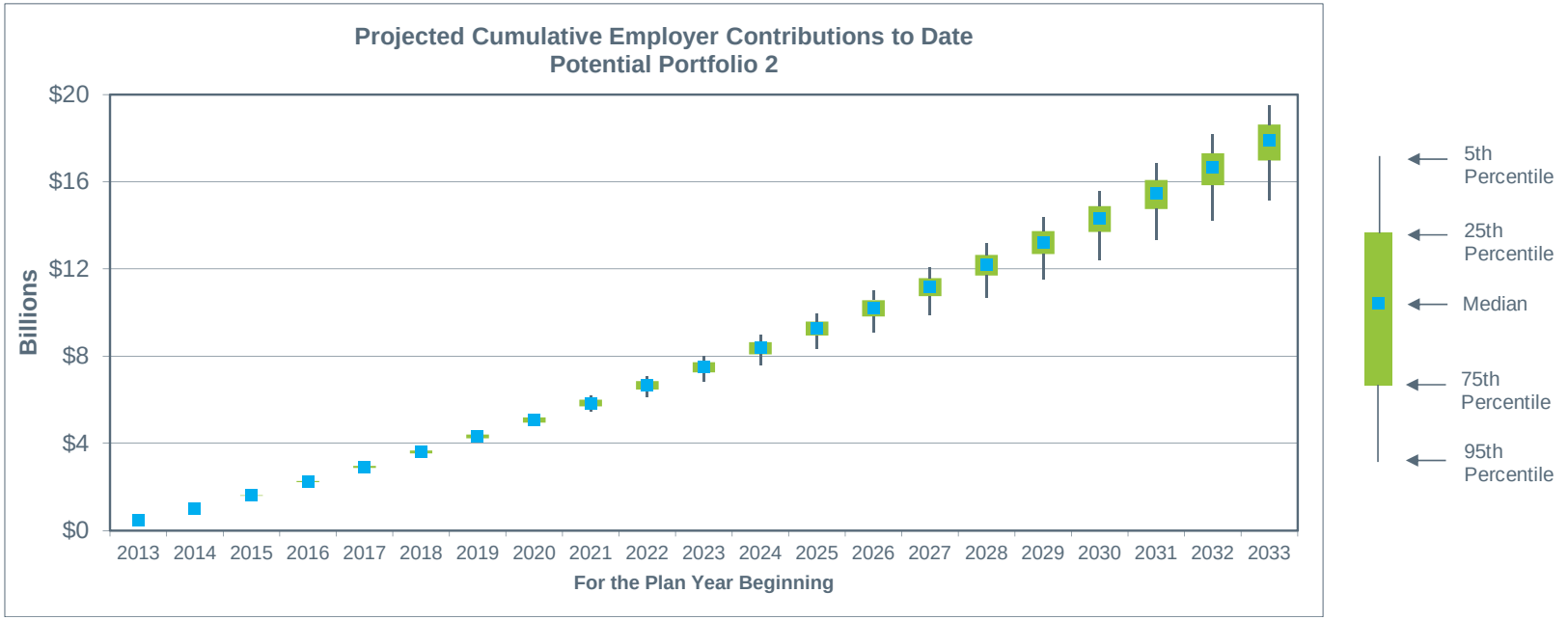



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $17 | $18 | $19 |
| 25th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 | $19 |
| Median | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $16 | $17 | $18 |
| 75th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 |
| 95th Percentile | $0 | $1 | $2 | $2 | $3 | $3 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $10 | $11 | $12 | $13 | $14 | $15 | $16 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 2

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

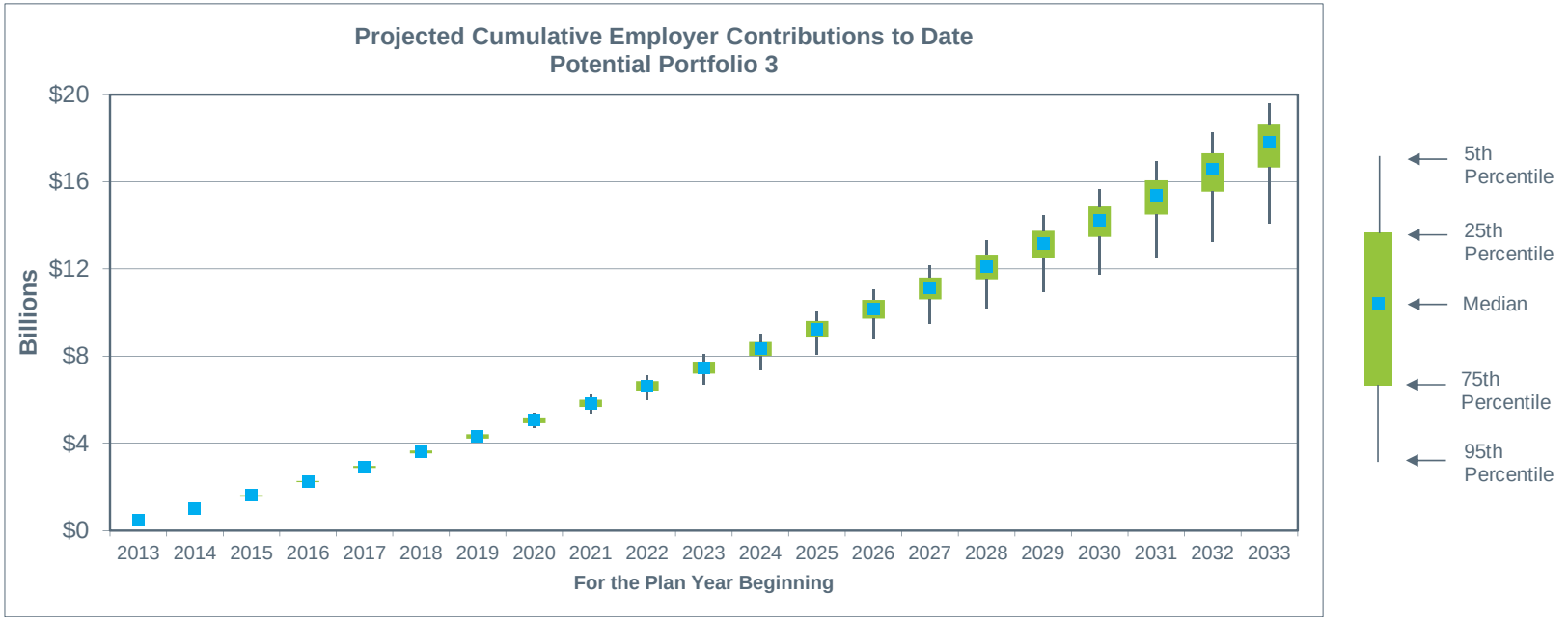



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $16 | $17 | $18 | $20 |
| 25th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 | $19 |
| Median | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $17 | $18 |
| 75th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 |
| 95th Percentile | $0 | $1 | $2 | $2 | $3 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 | $12 | $13 | $14 | $15 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 3

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

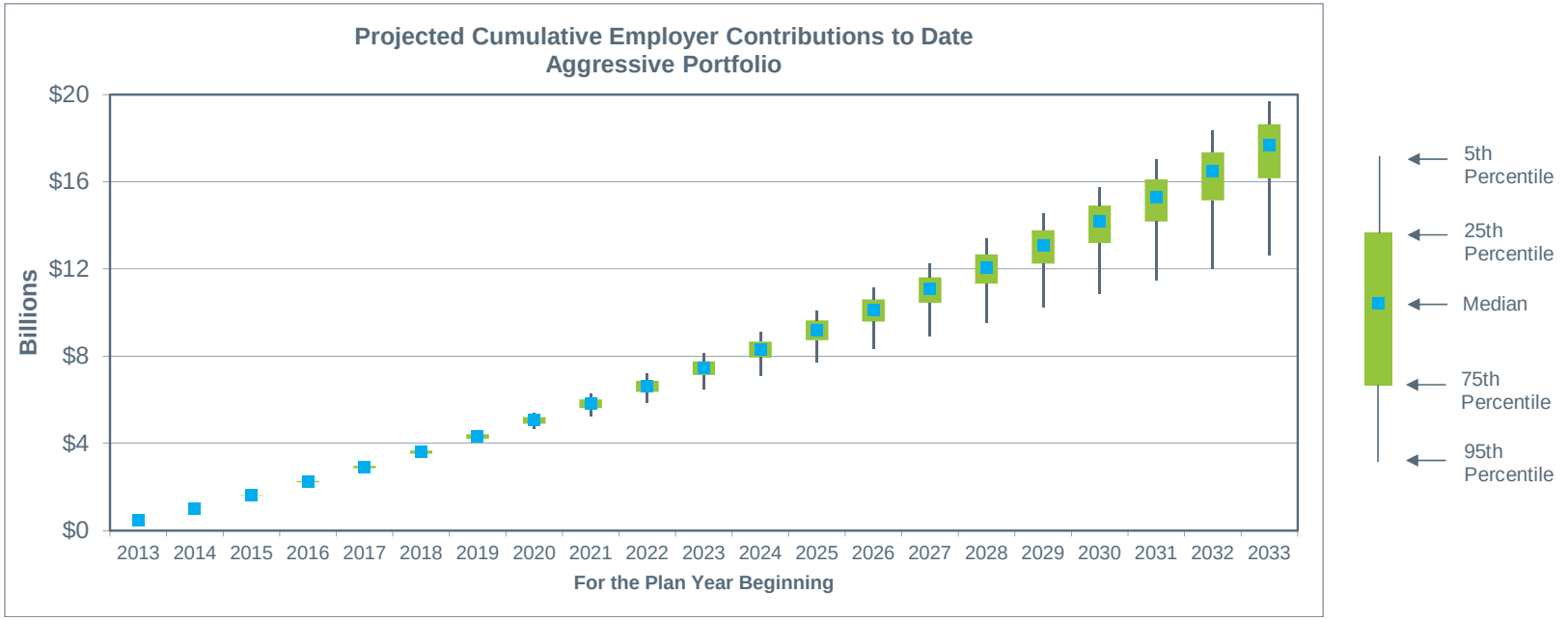



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $16 | $17 | $18 | $20 |
| 25th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 | $19 |
| Median | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $17 | $18 |
| 75th Percentile | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $12 | $13 | $14 | $16 | $17 |
| 95th Percentile | $0 | $1 | $2 | $2 | $3 | $3 | $4 | $5 | $5 | $6 | $7 | $7 | $8 | $9 | $9 | $10 | $11 | $12 | $13 | $13 | $14 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Aggressive Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $15 | $16 | $17 | $18 | $20 |
| **25th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $17 | $19 |
| **Median** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $7 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 | $15 | $16 | $18 |
| **75th Percentile** | $0 | $1 | $2 | $2 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $10 | $11 | $12 | $13 | $14 | $15 | $16 |
| **95th Percentile** | $0 | $1 | $2 | $2 | $3 | $3 | $4 | $5 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 | $10 | $11 | $11 | $12 | $13 |

# Stochastic Analysis (continued)

## Employer Contributions (as a weighted average percentage of salary)

The tables below show the range of required employer contributions (as a weighted average percentage of salary) assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Required Employer Contribution for Plan Year Beginning 2019 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 43% | 39% | 37% | 35% | 32% |
| Conservative Portfolio | 43% | 40% | 38% | 35% | 33% |
| Potential Portfolio 1 | 43% | 39% | 37% | 35% | 32% |
| Potential Portfolio 2 | 43% | 39% | 37% | 35% | 31% |
| Potential Portfolio 3 | 43% | 39% | 37% | 34% | 31% |
| Aggressive Portfolio | 44% | 39% | 37% | 34% | 31% |

| 10 Years | Required Employer Contribution for Plan Year Beginning 2024 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 49% | 41% | 37% | 33% | 27% |
| Conservative Portfolio | 49% | 43% | 39% | 35% | 30% |
| Potential Portfolio 1 | 48% | 42% | 37% | 33% | 28% |
| Potential Portfolio 2 | 49% | 41% | 37% | 32% | 27% |
| Potential Portfolio 3 | 49% | 41% | 37% | 32% | 25% |
| Aggressive Portfolio | 49% | 41% | 36% | 31% | 23% |

| 20 Years | Required Employer Contribution for Plan Year Beginning 2034 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 56% | 45% | 37% | 30% | 21% |
| Conservative Portfolio | 58% | 47% | 40% | 34% | 28% |
| Potential Portfolio 1 | 57% | 45% | 38% | 31% | 22% |
| Potential Portfolio 2 | 56% | 44% | 37% | 30% | 19% |
| Potential Portfolio 3 | 56% | 44% | 36% | 29% | 16% |
| Aggressive Portfolio | 56% | 43% | 36% | 27% | 10% |

# Stochastic Analysis (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 15% | 8% | 24% | 14% | 6% | 27% | $4 | $4 | $3 | 56% | 100% | 28% |
| Conservative Portfolio | 13% | 9% | 17% | 12% | 7% | 17% | $4 | $4 | $3 | 68% | 100% | 38% |
| Potential Portfolio 1 | 14% | 8% | 22% | 14% | 6% | 25% | $4 | $4 | $3 | 57% | 100% | 31% |
| Potential Portfolio 2 | 15% | 7% | 25% | 14% | 5% | 29% | $4 | $4 | $3 | 55% | 100% | 26% |
| Potential Portfolio 3 | 15% | 6% | 28% | 14% | 5% | 33% | $4 | $4 | $3 | 54% | 100% | 24% |
| Aggressive Portfolio | 15% | 5% | 30% | 15% | 4% | 37% | $4 | $4 | $3 | 52% | 100% | 21% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 12% | 1% | 31% | 12% | 1% | 32% | $8 | $8 | $7 | 70% | 100% | 24% |
| Conservative Portfolio | 9% | 1% | 17% | 8% | 1% | 17% | $8 | $8 | $7 | 107% | 100% | 38% |
| Potential Portfolio 1 | 12% | 2% | 27% | 11% | 1% | 29% | $8 | $8 | $7 | 73% | 100% | 27% |
| Potential Portfolio 2 | 12% | 1% | 33% | 12% | 1% | 35% | $7 | $8 | $7 | 68% | 100% | 22% |
| Potential Portfolio 3 | 13% | 1% | 38% | 12% | 1% | 41% | $7 | $8 | $7 | 65% | 100% | 19% |
| Aggressive Portfolio | 14% | 0% | 46% | 13% | 0% | 50% | $7 | $8 | $6 | 62% | 100% | 16% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 27% | 12% | 56% | 26% | 11% | 57% | $18 | $19 | $16 | 33% | 100% | 14% |
| Conservative Portfolio | 21% | 11% | 34% | 20% | 10% | 33% | $19 | $20 | $18 | 44% | 100% | 25% |
| Potential Portfolio 1 | 26% | 12% | 50% | 25% | 11% | 51% | $18 | $19 | $16 | 35% | 100% | 16% |
| Potential Portfolio 2 | 28% | 12% | 60% | 27% | 11% | 62% | $18 | $20 | $15 | 33% | 100% | 14% |
| Potential Portfolio 3 | 29% | 13% | 70% | 28% | 11% | 72% | $18 | $20 | $14 | 31% | 100% | 12% |
| Aggressive Portfolio | 30% | 13% | 82% | 30% | 10% | 88% | $18 | $20 | $13 | 30% | 100% | 10% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility"

This section provides a sensitivity analysis of the original stochastic projections by assuming the risk (as measured by standard deviation) of each asset class is doubled. These modified assumptions are outlined in the table below, compared to the original values:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption | Standard Deviation Assumption Doubled |
|---|---|---|---|
| Global Equity | 7.80 | 18.35 | 36.70 |
| Int. Duration Fixed Income | 3.50 | 6.00 | 12.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 | 21.58 |
| Core Real Estate | 6.75 | 12.50 | 25.00 |
| Diversified Hedge Funds | 6.50 | 9.50 | 19.00 |
| Private Equity | 10.50 | 26.00 | 52.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 | 22.90 |
| Cash Equivalents | 2.25 | 3.00 | 6.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that potential increased capital market volatility does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, exacerbating the potential best and worst-case scenarios.

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 22% (Current) Funding in 2019 | Probability of Asset Depletion by 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 72% | 3% | -62% | 55% |
| Conservative Portfolio | 0% | 92% | 0% | -41% | 49% |
| Potential Portfolio 1 | 0% | 75% | 2% | -56% | 53% |
| Potential Portfolio 2 | 1% | 70% | 3% | -65% | 56% |
| Potential Portfolio 3 | 2% | 67% | 5% | -70% | 58% |
| Aggressive Portfolio | 3% | 64% | 7% | -74% | 60% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 22% (Current) Funding in 2024 | Probability of Asset Depletion by 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 2% | 69% | 16% | -62% | 66% |
| Conservative Portfolio | 0% | 89% | 14% | -41% | 68% |
| Potential Portfolio 1 | 1% | 72% | 15% | -56% | 66% |
| Potential Portfolio 2 | 3% | 67% | 17% | -65% | 66% |
| Potential Portfolio 3 | 5% | 64% | 19% | -71% | 66% |
| Aggressive Portfolio | 9% | 61% | 21% | -76% | 66% |

| 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 | 9% | 39% | 22% | -63% | 77% |
| Conservative Portfolio | 0% | 53% | 22% | -41% | 79% |
| Potential Portfolio 1 | 5% | 41% | 21% | -56% | 78% |
| Potential Portfolio 2 | 11% | 38% | 23% | -67% | 77% |
| Potential Portfolio 3 | 15% | 36% | 26% | -72% | 76% |
| Aggressive Portfolio | 20% | 35% | 28% | -77% | 75% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 15% | 2% | 37% | 14% | 1% | 48% | $4 | $4 | $3 | 54% | 100% | 16% |
| Conservative Portfolio | 13% | 5% | 22% | 12% | 3% | 24% | $4 | $4 | $3 | 68% | 100% | 31% |
| Potential Portfolio 1 | 14% | 3% | 32% | 14% | 2% | 41% | $4 | $4 | $3 | 57% | 100% | 19% |
| Potential Portfolio 2 | 15% | 1% | 41% | 14% | 1% | 54% | $4 | $4 | $3 | 54% | 100% | 14% |
| Potential Portfolio 3 | 15% | 0% | 48% | 15% | 0% | 65% | $4 | $4 | $3 | 53% | 100% | 12% |
| Aggressive Portfolio | 16% | 0% | 57% | 15% | 0% | 79% | $4 | $4 | $3 | 51% | 100% | 10% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 12% | 0% | 62% | 12% | 0% | 71% | $8 | $9 | $6 | 67% | 100% | 10% |
| Conservative Portfolio | 9% | 0% | 28% | 8% | 0% | 30% | $8 | $8 | $7 | 103% | 100% | 24% |
| Potential Portfolio 1 | 12% | 0% | 52% | 11% | 0% | 59% | $8 | $8 | $6 | 70% | 100% | 13% |
| Potential Portfolio 2 | 13% | 0% | 71% | 12% | 0% | 81% | $8 | $9 | $6 | 65% | 100% | 9% |
| Potential Portfolio 3 | 13% | 0% | 91% | 13% | 0% | 106% | $8 | $9 | $5 | 62% | 100% | 7% |
| Aggressive Portfolio | 14% | 0% | 118% | 13% | 0% | 144% | $8 | $9 | $5 | 59% | 100% | 5% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 30% | 7% | 122% | 28% | 5% | 134% | $18 | $21 | $10 | 30% | 100% | 6% |
| Conservative Portfolio | 22% | 6% | 51% | 21% | 5% | 50% | $19 | $21 | $17 | 42% | 100% | 15% |
| Potential Portfolio 1 | 28% | 7% | 94% | 27% | 5% | 102% | $18 | $20 | $12 | 33% | 100% | 8% |
| Potential Portfolio 2 | 30% | 7% | 143% | 30% | 5% | 158% | $18 | $21 | $9 | 29% | 100% | 5% |
| Potential Portfolio 3 | 32% | 7% | 204% | 32% | 5% | 221% | $18 | $21 | $7 | 27% | 100% | 4% |
| Aggressive Portfolio | 34% | 7% | 311% | 35% | 5% | 333% | $17 | $21 | $6 | 25% | 100% | 2% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations"

This section provides a sensitivity analysis of the original stochastic projections by assuming that all asset classes are perfectly positively correlated (i.e. correlation = 1.00). A correlation matrix reflecting these modified assumptions is provided below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Int. Duration Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Custom KRS Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Core Real Estate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Hedge Funds | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Private Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Inflation Strategies | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Cash Equivalents | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that converging correlations across capital markets does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, indicating higher risk for all asset mixes given the dampened effects of total fund diversification.

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 22% (Current) Funding in 2019 | Probability of Asset Depletion by 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 78% | 0% | -41% | 45% |
| Conservative Portfolio | 0% | 97% | 0% | -23% | 44% |
| Potential Portfolio 1 | 0% | 81% | 0% | -38% | 45% |
| Potential Portfolio 2 | 0% | 76% | 1% | -43% | 45% |
| Potential Portfolio 3 | 0% | 74% | 1% | -47% | 46% |
| Aggressive Portfolio | 0% | 71% | 1% | -51% | 46% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 22% (Current) Funding in 2024 | Probability of Asset Depletion by 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 75% | 9% | -41% | 54% |
| Conservative Portfolio | 0% | 96% | 7% | -23% | 54% |
| Potential Portfolio 1 | 0% | 77% | 9% | -38% | 54% |
| Potential Portfolio 2 | 1% | 73% | 9% | -43% | 54% |
| Potential Portfolio 3 | 1% | 71% | 11% | -47% | 55% |
| Aggressive Portfolio | 1% | 68% | 13% | -51% | 55% |

| 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 | 3% | 42% | 13% | -48% | 58% |
| Conservative Portfolio | 0% | 61% | 11% | -29% | 58% |
| Potential Portfolio 1 | 2% | 43% | 12% | -46% | 58% |
| Potential Portfolio 2 | 4% | 41% | 13% | -50% | 58% |
| Potential Portfolio 3 | 6% | 39% | 15% | -54% | 58% |
| Aggressive Portfolio | 9% | 38% | 17% | -58% | 58% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 15% | 5% | 29% | 14% | 3% | 36% | $4 | $4 | $4 | 57% | 100% | 21% |
| Conservative Portfolio | 13% | 7% | 20% | 11% | 5% | 21% | $4 | $4 | $4 | 68% | 100% | 35% |
| Potential Portfolio 1 | 14% | 5% | 28% | 13% | 4% | 33% | $4 | $4 | $4 | 58% | 100% | 23% |
| Potential Portfolio 2 | 15% | 4% | 31% | 14% | 3% | 38% | $4 | $4 | $4 | 56% | 100% | 20% |
| Potential Portfolio 3 | 15% | 4% | 33% | 14% | 3% | 42% | $4 | $4 | $3 | 55% | 100% | 18% |
| Aggressive Portfolio | 15% | 3% | 36% | 15% | 2% | 47% | $4 | $4 | $3 | 54% | 100% | 16% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 12% | 0% | 44% | 11% | 0% | 46% | $7 | $8 | $7 | 71% | 100% | 17% |
| Conservative Portfolio | 8% | 0% | 22% | 8% | 0% | 21% | $8 | $8 | $7 | 107% | 100% | 35% |
| Potential Portfolio 1 | 11% | 0% | 40% | 11% | 0% | 41% | $8 | $8 | $7 | 74% | 100% | 18% |
| Potential Portfolio 2 | 12% | 0% | 47% | 12% | 0% | 50% | $7 | $8 | $7 | 69% | 100% | 15% |
| Potential Portfolio 3 | 13% | 0% | 53% | 12% | 0% | 57% | $7 | $8 | $6 | 66% | 100% | 13% |
| Aggressive Portfolio | 13% | 0% | 62% | 13% | 0% | 68% | $7 | $8 | $6 | 63% | 100% | 11% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 26% | 10% | 77% | 25% | 8% | 83% | $18 | $19 | $14 | 35% | 100% | 10% |
| Conservative Portfolio | 21% | 10% | 40% | 19% | 9% | 39% | $19 | $19 | $18 | 46% | 100% | 21% |
| Potential Portfolio 1 | 25% | 10% | 69% | 24% | 9% | 73% | $18 | $19 | $15 | 37% | 100% | 11% |
| Potential Portfolio 2 | 27% | 10% | 83% | 26% | 8% | 90% | $18 | $19 | $13 | 35% | 100% | 9% |
| Potential Portfolio 3 | 28% | 10% | 97% | 27% | 8% | 108% | $18 | $19 | $12 | 33% | 100% | 8% |
| Aggressive Portfolio | 29% | 10% | 119% | 28% | 8% | 134% | $18 | $19 | $10 | 32% | 100% | 6% |

# Appendix 3: Assumptions and Methods

**Actuarial Valuation Assumptions and Methods**: At the beginning of each projection year, an actuarial valuation is performed to determine employer contributions. The assumptions proposed in the 2013 Experience Study were used with actuarial valuations beginning in 2015 and beyond. These methods and assumptions are summarized below:

| | |
|---|---|
| **Actuarial Cost Method** | Entry-Age Normal (level % of pay). Funding policies and methods are described in the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Liability Discount Rate** | 7.50% per year, compounded annually. |
| **Future Pay Increases** | Future pay increases as recommended in the 2013 Experience Study. Pay increases include a 4.00% base wage inflation rate. |
| **Retirement** | Rates of retirement as recommended in the 2013 Experience Study. |
| **Mortality** | Rates of mortality as recommended in the 2013 Experience Study. |
| **Disability** | Rates of disability as recommended in the 2013 Experience Study. |
| **Withdrawal** | Rates of withdrawal as recommended in the 2013 Experience Study. |
| **Asset Valuation Method** | 5-Year smoothing of actual versus expected returns. The asset valuation method is described on page 36 of the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Contribution Policy** | For fiscal years 2017 and beyond, employer contributions are assumed to equal the full actuarially required contribution consisting of: (1) gross normal cost, less (2) expected employee contributions, plus (3) administrative expenses (0.70% of 2014-15 payroll, growing at inflation each year), plus (4) an amortization of the unfunded actuarial liability over 29 years beginning in 2014, calculated as a level percentage of payroll assuming 4.00% payroll growth. The amortization period was not assumed to reset at any point in the future, and was not allowed to fall below 10 years. |

# Appendix 3: Assumptions and Methods (continued)

**Projection Assumptions (used in the deterministic and stochastic asset/liability projections)**: These projections begin with the Plan's participant population as of June 30, 2014, as provided by Cavanaugh. The Plan's population is projected forward and assumed to change as a result of employment separation, death, disability, and retirement, as predicted by the assumptions recommended in the 2013 Experience Study (and described on the prior pages). New members are assumed to enter the Plan such that the active population remains level throughout the projection. Employee compensation is projected into the future in accordance with the assumptions described on the prior pages. Investment returns are projected into the future in accordance with the assumptions described below.

| | |
|---|---|
| **Employer Contributions** | For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013 (30.84% of payroll). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study. |
| **Member Contributions** | Member contributions are determined based on current contribution rates, and projected pay. |
| **New Entrants** | New employees are assumed to join the Plan such that the active population remains level throughout the projection. New employees entering the Plan are assumed to have characteristics similar to recently hired participants. |
| **Rate of Return on Assets** | Deterministic Analysis: 7.50%, compounded annually.<br><br>Stochastic Analysis: Returns on the portfolio are based on the expected returns of each asset class and the correlations between each class which are detailed in the Stochastic Analysis section of this report. |
| **Cash Balance Interest Credit** | Deterministic Analysis: 7.00%, compounded annually.<br><br>Stochastic Analysis: Interest credits are based on the expected returns of a benchmark portfolio designed to mirror the overall portfolio return. |

# Appendix 3: Assumptions and Methods (continued)

**Inflation**

2.50% per year with a standard deviation of 3.00%.

**Other**

All other projection assumptions are the same as those recommended in the 2013 Experience Study.

Our work was based partly on original work prepared by Cavanaugh using the ProVal valuation software. This included their coding of benefit provisions and the methodology to generate liabilities under the entry age normal actuarial cost method. Cavanaugh provided us with an actuarial valuation as of June 30, 2014, using assumptions from the 2013 Experience Study. We reviewed this work for reasonableness, but we did not perform a complete audit of this work.

We started with Cavanaugh's base year valuation work. Certain changes to the coding of benefit provisions were required in order to facilitate a 20-year projection of liabilities and costs. For example, we added employee contribution definitions in order to offset gross normal cost calculations by expected employee contributions. In some cases, scaling of liabilities was used to approximate liabilities not valued directly in the work provided by Cavanaugh.

The participant data provided by Cavanaugh was the same as that used in the actuarial valuation as of June 30, 2014, for KERS funding purposes. This data was grouped on entry age and valuation age for efficient data processing.

It is our understanding that Kentucky law does not allow employer contribution rates to change in the second year of a biennium for the KERS systems. This means that an actuarial valuation every other year provides the funding rates for the following two fiscal years. We were not able to model this feature. Instead, we modeled contribution rates based on annual valuations with a one-year lag period.

May 2015

# Asset/Liability Study

## KERS Hazardous Pension Plan

# Memorandum

| | |
|---|---|
| To | Kentucky Employees Retirement System |
| From | RVK, Inc. |
| Subject | KERS-HPP Asset/Liability Study – Executive Summary |
| Date | May 5, 2015 |

## Introduction

The purpose of this memorandum is to summarize the key inferences we draw from the Asset/Liability ("A/L") study of the KERS Hazardous Pension Plan ("KERS-HPP" or the "Plan"). While this memorandum refers directly to points raised within the study, we emphasize that a full understanding of the A/L study and its implications requires a close review of the study in its entirety.

## Background and Key Conclusions

As of the fiscal year beginning June 30, 2014, the date of the most recent actuarial valuation and the start date of the projections in this study, the Plan was 68% funded (on a market value basis) meaning that assets were available to cover 68% of Plan liabilities as currently estimated by the Plan's actuary. This equates to a shortfall of approximately $257 million. This is a significant concern for the future of the Plan's financial health, however, this study shows that the Plan remains solvent and while the Plan's funding ratio will fluctuate during this period, the study suggests the potential for reducing the funding gap over the next 20 years.

As highlighted below, this study suggests that continued diversification in the investment of Plan assets is desirable. The study, however, suggests caution in assuming that increased pursuit of higher expected returns, through even more aggressive (and hence even more volatile) asset allocations, is always beneficial. High expected return and high expected risk approaches bring with them increased risk of large declines in the value of the Plan and increased volatility in required contributions.

## The Purpose of an Asset Liability Study

The central purpose of an A/L study is to examine the probable future consequences, over extended periods of time, of applying alternative asset allocation strategies to the Plan's investment assets in order to fund the liabilities created by the benefit provisions of the Plan. A/L studies are unique in their ability to combine in a single analysis the three critical factors that drive the financial health of the Plan—benefit policy (liabilities), contribution policy, and investment strategy (asset allocation). Certainly this type of forward looking study—nor any others we are aware of—cannot indicate with any reliability what will happen in any given year over this extended period of time and its insights are dependent on the assumptions used. However, we have high conviction that the study's results paint a highly reliable view of the core long-term trends in the Plan's financial health. Best practice, in our judgment, is to take the

general direction suggested as most appropriate by this study with its unique consideration of liabilities, contribution policy and trending liquidity needs and refine it in an asset allocation study where implementing the Plan's structure can reflect the pragmatic considerations of investing in the capital markets present at any given point in time.

**Deterministic versus Stochastic**

In this study, we examined a series of related questions associated with this central purpose, projecting future outcomes under two distinctly different methodologies:

1. a **deterministic** basis (all underlying assumptions, liabilities, contributions and most critically investment returns, are achieved precisely and without variance in each and every year); and

2. a **stochastic** basis (outcomes for investment returns vary each year according to estimated volatility with contribution *requirements* following suit while *actual* contribution policy and liabilities remains in their current form).

**Key Results**

Below you will find a series of important findings, forecasts, and conclusions drawn from the body of the study. While the remarks are presented here to allow a quick assessment of some of the key findings, they represent only a sampling of the fundamental elements of the study. We emphasize that a solid understanding of each element requires that they be reviewed as they are presented in the study itself within their surrounding context (please note the frequent page references to the full study). This is especially important to understanding the findings which represent *probable, but not certain,* outcomes as analyzed in the stochastic section of the study.

*At the Outset:*

- As of June 30, 2014 (the date of the actuarial valuation used to model liabilities), the Plan's market value funded ratio (available assets to fund benefit obligations) was 68% (page 6).

- The number of active members is currently approximately equal to the number of inactive members. Over time, the inactive population is projected to grow and begin to quickly outnumber the active member population (page 8). The maturing demographics of the Plan is an important factor when considering the findings on Plan risk/return options and the projected status of Plan liquidity below.

*Deterministic Analysis: A deterministic analysis assumes full certainty about the future, in particular, certainty of investment returns. Its 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.*

- Benefit payments to Plan participants are expected to increase by about 73% over the next 20 years (page 9). Annual increases are projected to range between 1% and 4%.

- Total annual dollar contributions (employer and employee) based on actuarially required rates are expected to more than double over the next 20 years; from $31 million in 2014 to $70 million in 2034 (page 10). *Please note however*, that precise actuarially required rates as they unfold are the purview of the Plan's actuary and are affected by factors other than investment returns and resulting asset values of the Plan.

- Beginning in 2016, contributions expressed as a weighted average percentage of salary are projected to gradually decline (page 11).

- Aggregate benefit payments are expected to increase by about 73% over the next 20 years but actually slightly decrease as a percentage of Plan assets over this same time period (pages 9 and 12). Not only do benefit payments as a percentage of Plan assets decline, they are also healthy and sustainable on an absolute basis during this period. This is an important and positive indication, because increased payout ratios, if they rise sufficiently high, can potentially impose liquidity constraints on the management of the portfolio (inhibiting the ability of the Plan to invest with a long-term horizon) therefore limiting the opportunity to invest in less liquid asset classes regardless of the return or risk reducing diversification benefits they offer. The payout ratio is projected to decline from current levels near 10% to about 9% at the end of the projection period. These levels do not, in our opinion, materially inhibit investment opportunities for the Plan (page 12).

- As assets grow each and every year without exception at the assumed rate of return (7.50%), the funding ratio on a market value basis is expected to gradually increase to approximately 81% by 2034 from the current value of 68% (page 17).

- Assuming the current contribution policy remains unchanged, the Plan would need to experience annual returns in excess of 11% over the next 10 years or 9% over the next 20 years *without exception in each and every year* in order to reach full funding (page 18). Achieving such lofty returns on such a sustained basis is extremely unlikely in our judgment and underscores our conclusion that investment returns alone cannot move the Plan to full funding.

- Experiencing a return of 100 basis points below the Plan's current assumed rate of return of 7.50% (i.e., 6.50%) each year for the 20 year projection period would result in a moderate decline in the projected funding ratio to 71% in year 20 versus 81% at the current assumed rate of return (page 19). Additionally, under this scenario cumulative employer contributions would be $104 million higher over the 20 year period. Given the widely shared concerns about the prospects for a low return environment in the capital markets over the foreseeable future, this is a conclusion that should be thoroughly understood and appreciated. In the event that capital markets do not support returns

commensurate with the assumed rate of return, reliance on contributions to complete the payout of the Plan's liabilities effectively increases, especially in later years.

*Stochastic Analysis: Unlike a deterministic analysis, a stochastic analysis does not assume an unvarying stream of expected investment returns year after year. Instead, it reflects the realistic view that pension plan investment returns are—like the investment markets themselves—volatile and always uncertain. This means that there are a range of possible outcomes for KERS-HPP; some are more likely, others less likely, but still possible.*

*The deterministic approach is useful for gauging the general direction of change and associated consequences, but adding the element of uncertainty—more specifically year to year variability in the performance of the capital markets and the value of the Plan's assets over time—can offer additional insights, albeit along with considerable complexity.*

Uncertainty in future investment returns is taken into account via a stochastic analysis of six different investment approaches (in the table below and on page 25) ranging from highly conservative (low risk, asset protective) to highly aggressive (high return seeking with substantial associated risk), including the Current Target allocation KERS-HPP. The reason for testing such a broad range of approaches is that at the heart of the KERS-HPP situation is a simple question that is difficult to answer: whether the Plan is 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).

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | **30** | **70** | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | **0** | **30** | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | **0** | **30** | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | **5** | **10** | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | **10** | **15** | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | **5** | **15** | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | **2** | **15** | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | **2** | **5** | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

Essential to answering this question is to ask precisely how KERS-HPP and the Plan's broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plan is "better off" under one approach versus another are as follows:

(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 Plan's ability to pay annual benefits without major disruption of its strategic asset allocation, the driver of its investment strategy).

(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 Plan's assets over the course of time and the associated effects on contributions and potentially investment decisions.

The results of this analysis are displayed on pages 26 through 46 of the accompanying A/L study. For purposes of this summary, the consequences of choosing A versus B, as described above, is summarized most clearly in the tables on pages 32 and 46 of the study (copied below followed by explanatory comments).

| 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% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 67% | 36% | 140% | 65% | 32% | 144% | $868 | $1,221 | $290 | 11% | 29% | 5% |
| Conservative Portfolio | 51% | 36% | 70% | 47% | 31% | 67% | $1,072 | $1,219 | $877 | 15% | 28% | 10% |
| Potential Portfolio 1 | 65% | 38% | 117% | 62% | 33% | 118% | $895 | $1,196 | $392 | 11% | 27% | 6% |
| Potential Portfolio 2 | 69% | 36% | 157% | 67% | 31% | 162% | $848 | $1,236 | $247 | 10% | 30% | 4% |
| Potential Portfolio 3 | 71% | 35% | 199% | 70% | 30% | 200% | $817 | $1,258 | $205 | 10% | 32% | 3% |
| Aggressive Portfolio | 75% | 33% | 255% | 74% | 28% | 267% | $772 | $1,286 | $165 | 9% | 35% | 3% |

- The median expected funding ratio at the end of the 20 year study period is lower than the current funding level all but Potential Portfolio 3 and the Aggressive Portfolio (pages 31, 32, and 46). The Current Target and Potential Portfolio 1 result in expected funding ratios that are substantially similar to the current level. This is supportive of the continued utilization of diversified investment approach.

- With the exception of the Conservative Portfolio all portfolios analyzed show a moderate (from 10% to 33%) probability of full funding in 20 years (page 32). The Conservative Portfolio shows a no probability of full funding in 20 years.

- None of the portfolios show significant probability of extreme payout ratios over the next 20 years (pages 33-38 and 46). However, the peak value for all portfolios is above 20%, a level that does begin to moderately inhibit asset allocation decisions as they relate to illiquid asset classes.

- As you incrementally increase the expected risk and return of the fund (from Potential Portfolio 1 to Potential Portfolio 3), the outcomes do appear to gradually improve at the cost of slightly reduced worst-case outcomes.

- The cumulative cost of providing the Plan's benefits is met through a combination of contributions and the investment returns on those contributions. The Conservative Portfolio requires the largest increase in cumulative contributions (i.e., the direct funding of benefits) (pages 40, 45, and 46). Even under the very unlikely best-case scenario the Plan would have a funded ratio of about 47%, far lower than any of the other portfolios (page 46). The only redeeming virtue of such an ultra-conservative approach is that the potential for large declines in the value of the fund is significantly mitigated albeit at much higher ongoing costs (contributions) and chronic poor Plan financial health.

- The Aggressive Portfolio does appear to have the highest *probability* of producing full funding by 2034 at 33% (page 32). *However*, it also has a maximum theoretical one-year portfolio decline of 51%—a loss of almost one half of the Plan's assets, significant we believe by any standard. This likelihood of notably larger one year declines within the study period gives pause to the desirability of a far more aggressive approach simply from a quantitative viewpoint. It also suggests it may be a strategy that is extremely difficult for decision makers to sustain over a long period of time. Declines in the total fund market value of this magnitude are a disruptive event from all aspects of Plan management. Yet, the benefit of such an aggressive approach that makes it superficially attractive can only be realized with any probability if the aggressive and highly volatile approach is maintained for several decades through good times, bad times, and unnerving times. Furthermore, this type of strategy could prove difficult to maintain in future years should demographic (early retirement incentives for example) or financial events create higher liquidity demands on the Plan. For all these reasons, it is not an approach that should be seriously considered without full recognition of the significant risks.

- While RVK supports the conclusions of the study using our current capital market assumptions, we also model for extreme market scenarios to stress test the results of the study. The summary of this analysis can be found in Appendices 1 and 2 (beginning on pages 47 and 50 respectively). The first test models the case of extreme market volatility by doubling the assumed standard deviations of all asset classes. The second test models converging market returns by assuming all assets are perfectly correlated (i.e. correlations equal +1.00). The results of these additional analyses show that the *relative* portfolio outcomes do not change, but that the range of potential results widens, indicating higher risk for all asset mixes given the increased systemic volatility and the

reduced dampening effects of total fund diversification we assume under these stress scenarios.

**Final Comments**

This A/L study shows that KERS-HPP is currently underfunded but significant improvements in financial health are possible. The Plan can best meet its objectives through the continued use of a well-diversified investment portfolio. However, positive outcomes are extremely dependent on the contribution policy. The study is not supportive of a long-term, ultra-conservative approach. The increasing potential for large one-year declines suggests that there is likely a limit to the net benefits of adding increased risk in pursuit of additional return. Progress should be monitored periodically through studies such as these, particularly if the Plan encounters a sustained period of lower returns in the capital markets (and thus for the Plan's assets) as well as material changes in contribution policy or benefit levels.

Additionally, this study assumes no further changes are made to the benefit policy at any point during the 20 year projection period. Such changes would fall outside the reach of an Asset/Liability study. However, we do note that even small changes to the benefit policy can have a meaningful long-term impact on the likely future outcomes of the Plan.

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## Acknowledgements

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# Introduction

RVK, Inc. (RVK) has prepared this report for the Kentucky Employees Retirement System Hazardous Pension Plan (KERS) to:

- Present projected valuation results with respect to the funded status of the Plan.
- Present projected benefit payments of the Plan.
- Investigate asset mixes to determine those which best serve to protect and increase funding levels, while providing adequate liquidity for benefit payments.

The valuation projections are shown using both a deterministic and stochastic process.

The deterministic process provides an open group analysis of projected valuation results based on a fixed set of future assumptions (see summary in the Assumptions and Methods section of this report).

The stochastic process provides an open group analysis of projected valuation results under many capital market environments based on expected asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation. Expected values, variances of the returns and inflation, and correlations are used to generate 2,000 trials to produce a distribution of potential outcomes. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes.

# Introduction (continued)

## What is an Asset/Liability Study?

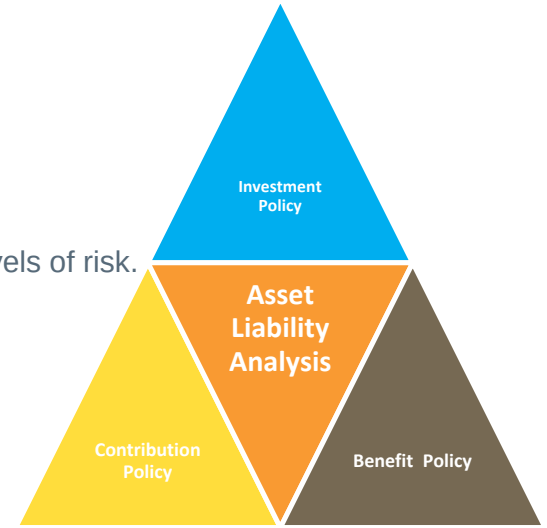
- Investment programs and the strategy they seek to implement (Investment Policy) do not exist in a vacuum. They seek to satisfy one or more investment objectives and operate within a plan framework that includes the investment objectives (Benefit Policy) and plan funding (Contribution Policy).

- The purpose of an Asset/Liability Study is to examine how well alternative investment strategies (i.e., differing asset allocations) address the objectives served by the Plan—the Plan's "liabilities" in the context of the Plan's funding streams—the Plan's Contribution Policy. It is the only standard analysis that fully links all three aspects of the Plan's key financial drivers.

- In doing so, it creates an important "guidepost" for the actual asset allocation for the Plan; the asset allocation chosen by the Plan's fiduciaries will likely reflect the nature of the liabilities but also numerous other factors including risk preferences, liquidity, implementation constraints, etc.

- For the KERS Asset/Liability Study, we assume the objectives are:

    1. Fund all participants' benefits over time.
    2. Assure sufficient liquidity to pay benefits at all times.
    3. Foster a stable contribution stream consistent with objectives 1 and 2.
    4. Achieve adequate returns without accepting unnecessary or imprudent levels of risk.




## An Asset/Liability Study is NOT . . .

- An actuarial study of the KERS liabilities—that is the purview of the Plan's actuary.

- A prescription for Plan benefits—that is the purview of the elected representatives.

- An assessment of the affordability of contribution levels—that is the purview of the elected officials and their constituents.

- The sole determinant of the final asset allocation adopted for the Plan—there are a number of factors, including insights from an Asset/Liability Study, which will bear on the optimal asset allocation.

# Introduction (continued)

## 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 Plan's financial needs.

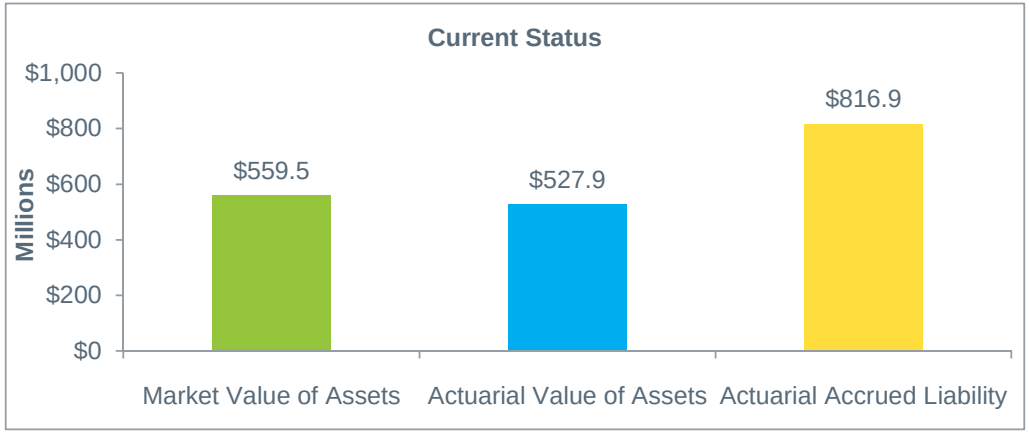
## This Asset/Liability Study . . .

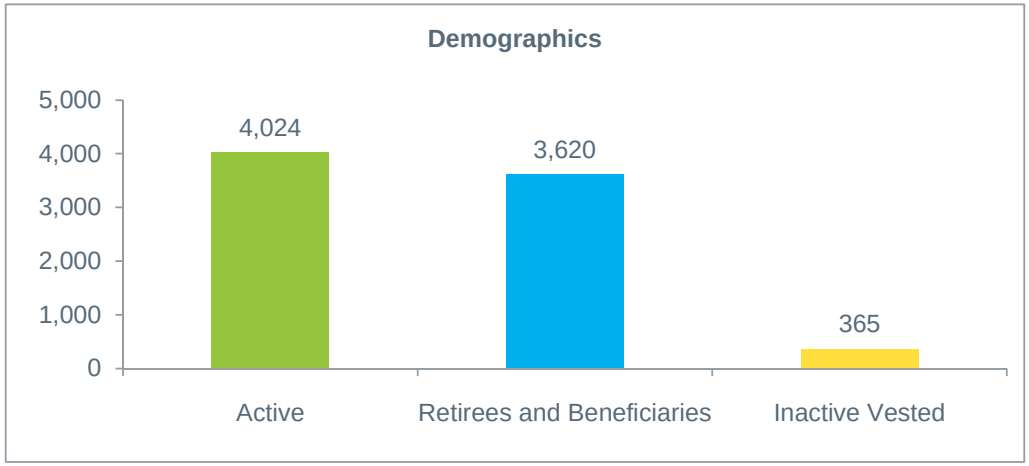
- Uses data from the June 30, 2014 KERS Actuarial Valuation to project pension liabilities.
- Uses the Actuarial Cost Method described in the June 30, 2014 KERS Actuarial Valuation, and the actuarial assumptions from the KRS Experience Study July 1, 2008 to June 30, 2013 ("the 2013 Experience Study") performed by Cavanaugh Macdonald Consulting, LLC (Cavanaugh).
- Compares these specific investment strategies—(A) the Current Target, (B) a conservative illustrative portfolio (Conservative Portfolio), (C) a diversified lower risk portfolio (Potential Portfolio 1), (D) a diversified moderate risk portfolio (Potential Portfolio 2), (E) a diversified higher risk portfolio (Potential Portfolio 3), and (F) an aggressive illustrative portfolio (Aggressive Portfolio).
- Assumes the Plan's current benefit policy throughout the entire projection period—changes to the benefit policy are the purview of the elected representatives.
- Note: Does not assume any actuarial adjustments that may take place in future years.

# Current Status

A summary of the Plan follows:

| | |
|---|---|
| **Valuation Date** | June 30, 2014 |
| **Market Value of Assets (MVA)** | $560 million |
| **Actuarial Value of Assets (AVA)** | $528 million |
| **Actuarial Accrued Liability (AAL)** | $817 million |
| **Market Value Funded Ratio (MVA/AAL)** | 68% |
| **Actuarial Value Funded Ratio (AVA/AAL)** | 65% |
| **Active** | 4,024 |
| **Retirees and Beneficiaries** | 3,620 |
| **Inactive Vested** | 365 |



# Deterministic Analysis

This section provides an analysis of the Plan's assets, liabilities, funded status, and benefit payments based on a fixed set of future assumptions. Each analysis that follows in this deterministic section rests on the critical assumptions below and must be read and interpreted with them in mind—particularly assumptions #2, #3 and #4.

The deterministic assumptions are as follows:

1. Current Plan provisions (see Summary of Main Benefit and Contribution Provisions beginning on page 38 of the KERS June 30, 2014 actuarial valuation report prepared by Cavanaugh).

2. The participant data used by Cavanaugh in its June 30, 2014 actuarial valuation.

3. Actuarially assumed rate of return on Plan assets for all projection years: 7.50%.

4. For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013 (16.37% of payroll). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study.

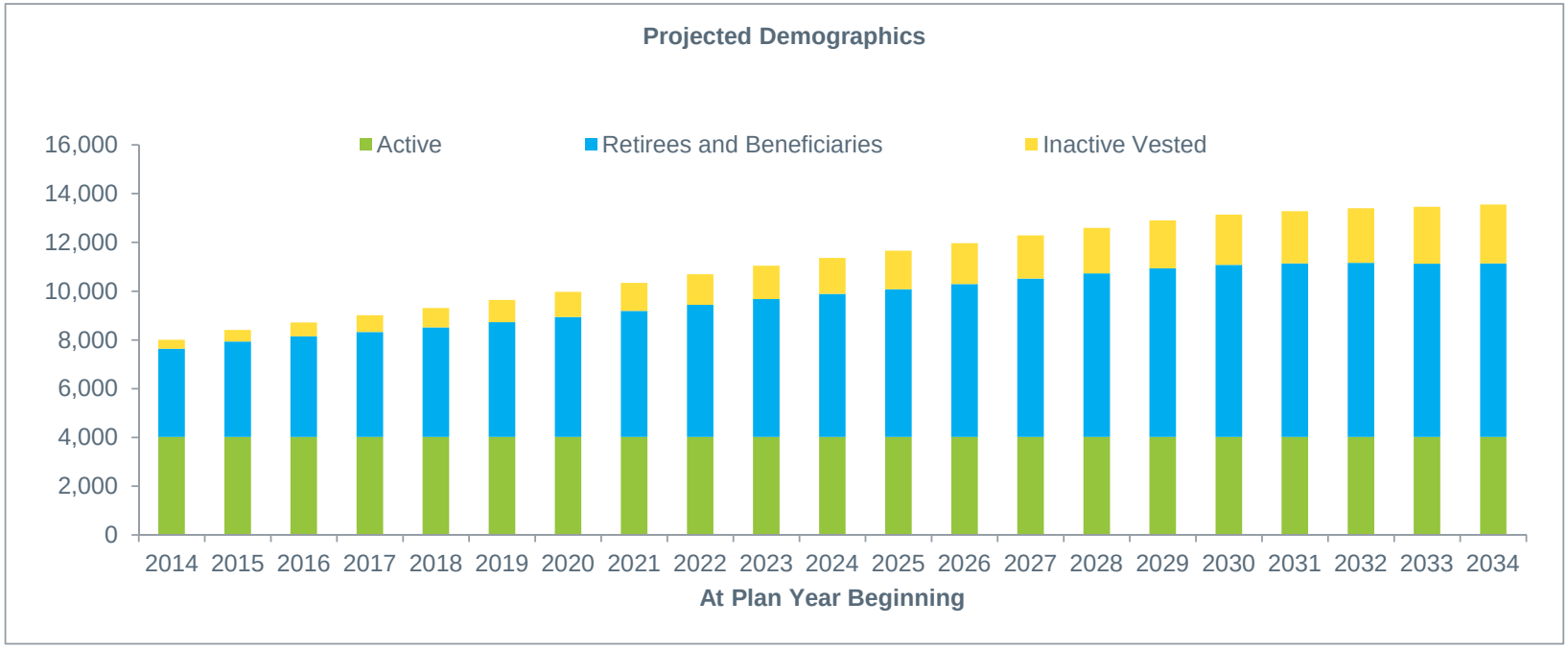
5. Assumes demographic experience projected in accordance with the actuarial assumptions proposed in the 2013 Experience Study.

6. Open group analysis: level active population. New active participants entering the Plan are assumed to have similar characteristics to recently hired participants.

# Deterministic Analysis (continued)

## Demographics

Following are the projected number of active and inactive participants at the beginning of each Plan year from 2014 through 2034 (2014 is actual). These projections are based on an open group analysis. Using the actuary's assumptions for death, termination, retirement, and disability, current participants are assumed to leave the Plan in the future. The number of total inactive participants (Retirees and Beneficiaries and Vested Inactive) increases by approximately 139% during the 20-year projection period shown.

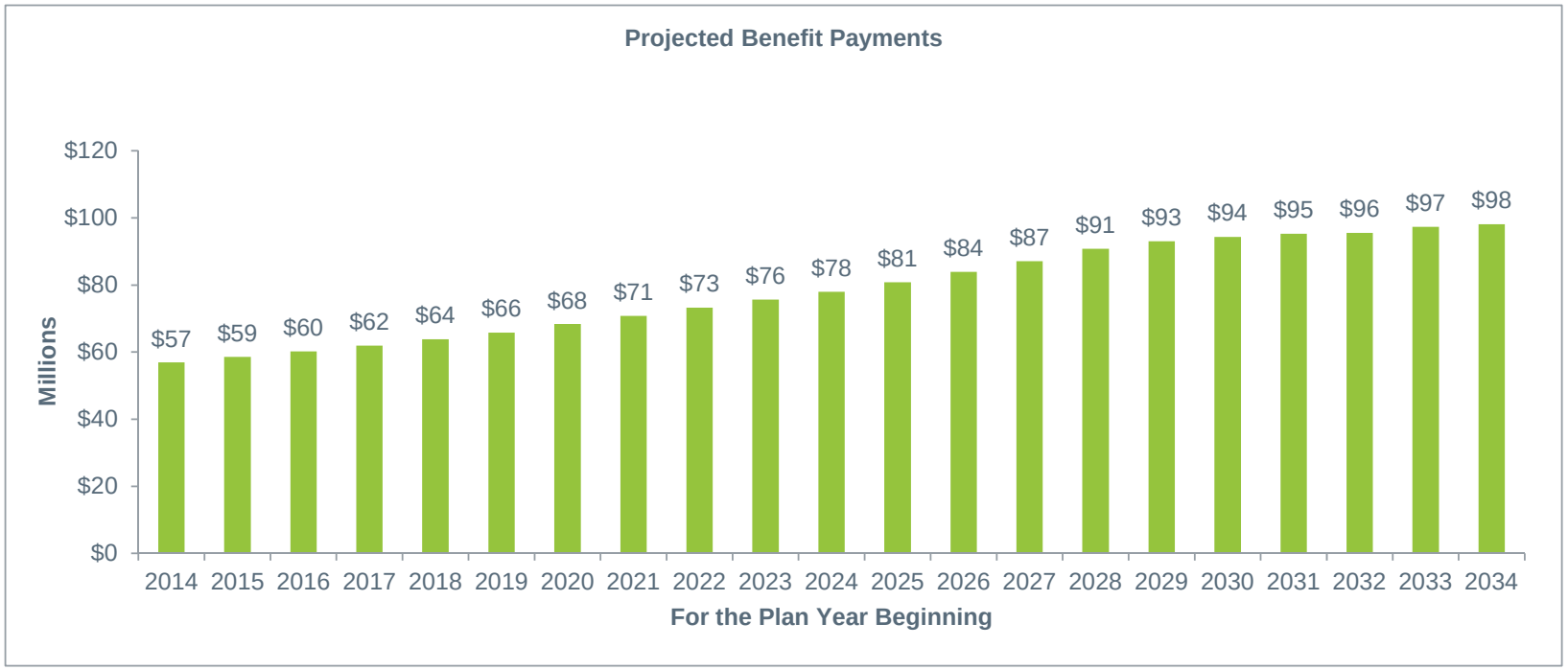



| Total Population | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 5.0% | 3.7% | 3.3% | 3.3% | 3.6% | 3.4% | 3.6% | 3.5% | 3.2% | 2.9% | 2.6% | 2.7% | 2.6% | 2.5% | 2.4% | 1.8% | 1.1% | 0.8% | 0.5% | 0.7% |

# Deterministic Analysis (continued)

## Benefit Payments

The Plan's projected annual benefit payments are shown in the chart below. The projected benefit payments are expected to increase by about 73% over the next 20 years. As a percentage of the market value of Plan assets, benefit payments are expected to gradually decline through approximately through the projection period (see page 12).

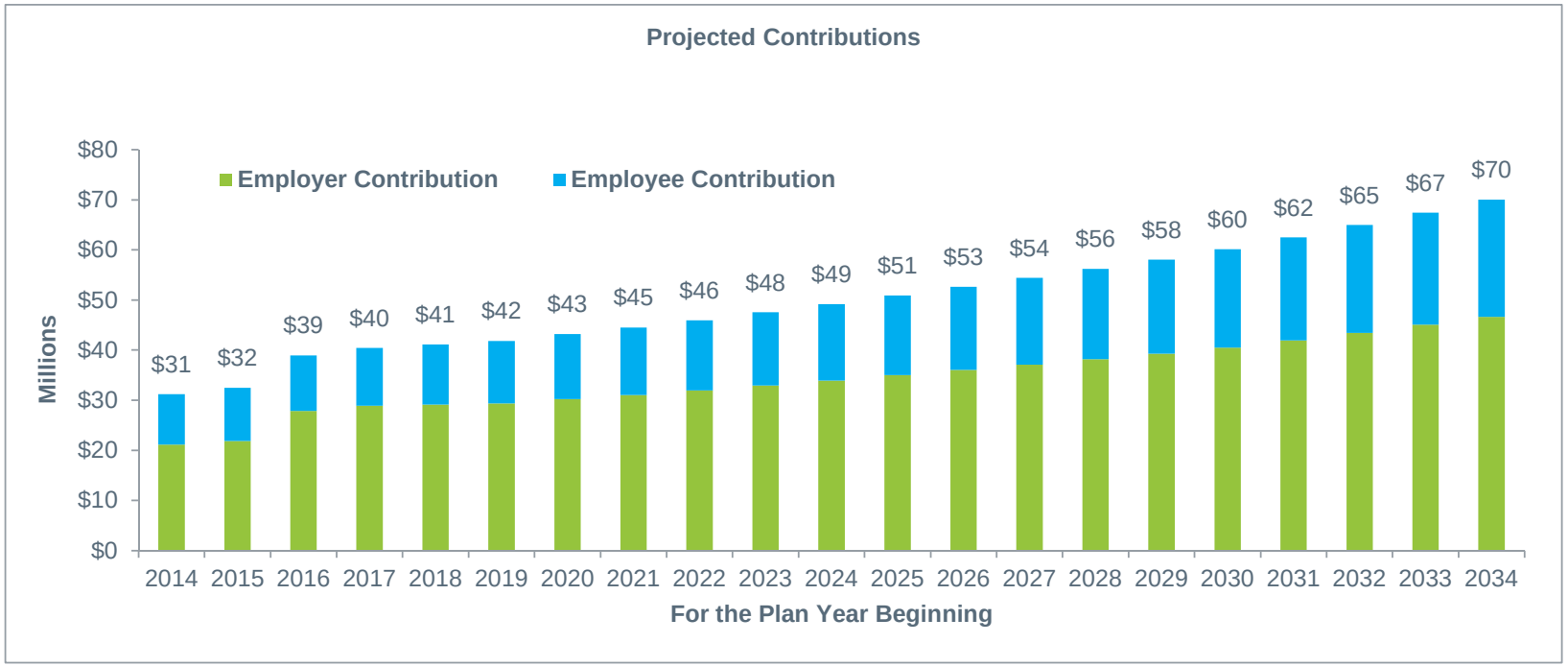



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 2.9% | 2.8% | 2.8% | 3.1% | 3.1% | 3.8% | 3.5% | 3.6% | 3.3% | 3.0% | 3.7% | 3.8% | 3.7% | 4.3% | 2.5% | 1.4% | 0.9% | 0.3% | 1.9% | 0.8% |

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as total dollar contributions, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.

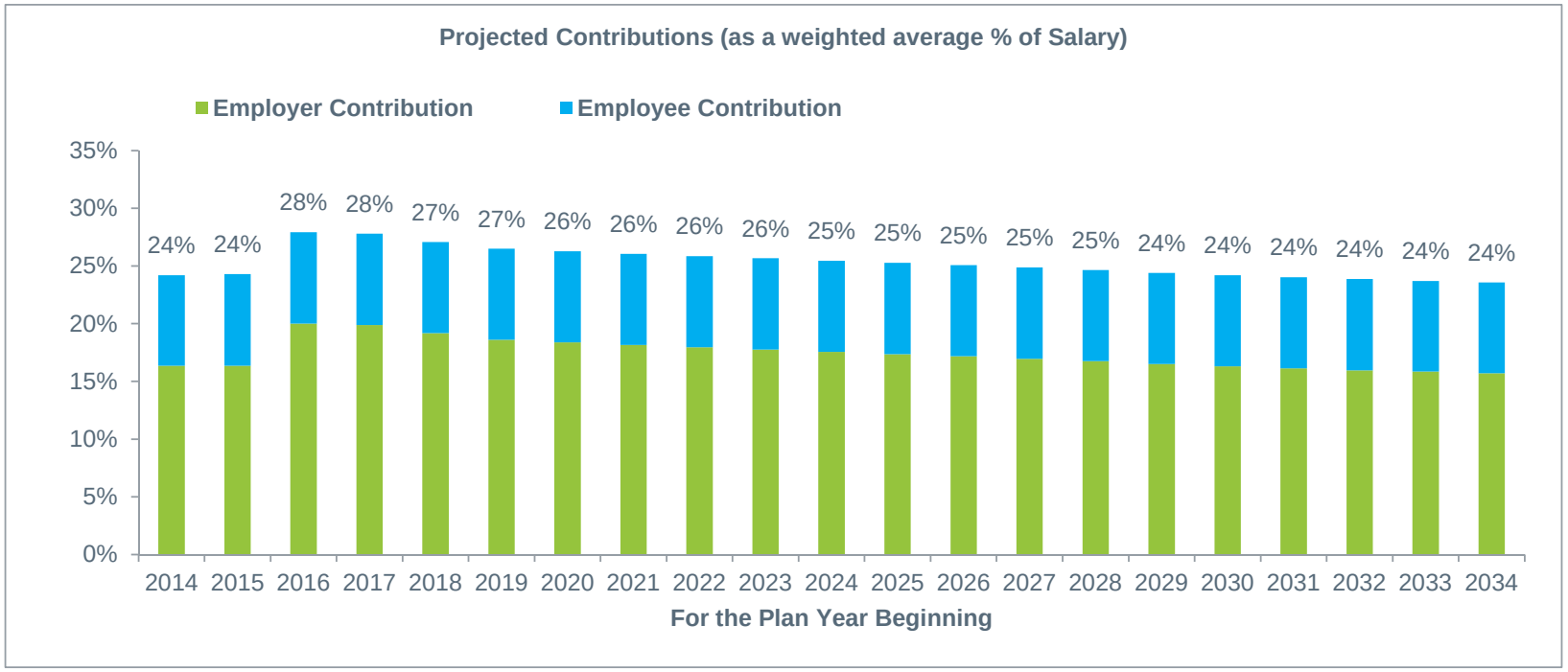



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 4.0% | 19.8% | 3.9% | 1.6% | 1.8% | 3.3% | 3.1% | 3.3% | 3.4% | 3.4% | 3.5% | 3.4% | 3.3% | 3.3% | 3.2% | 3.6% | 3.9% | 4.0% | 3.8% | 3.8% |

# Deterministic Analysis (continued)

## Contributions

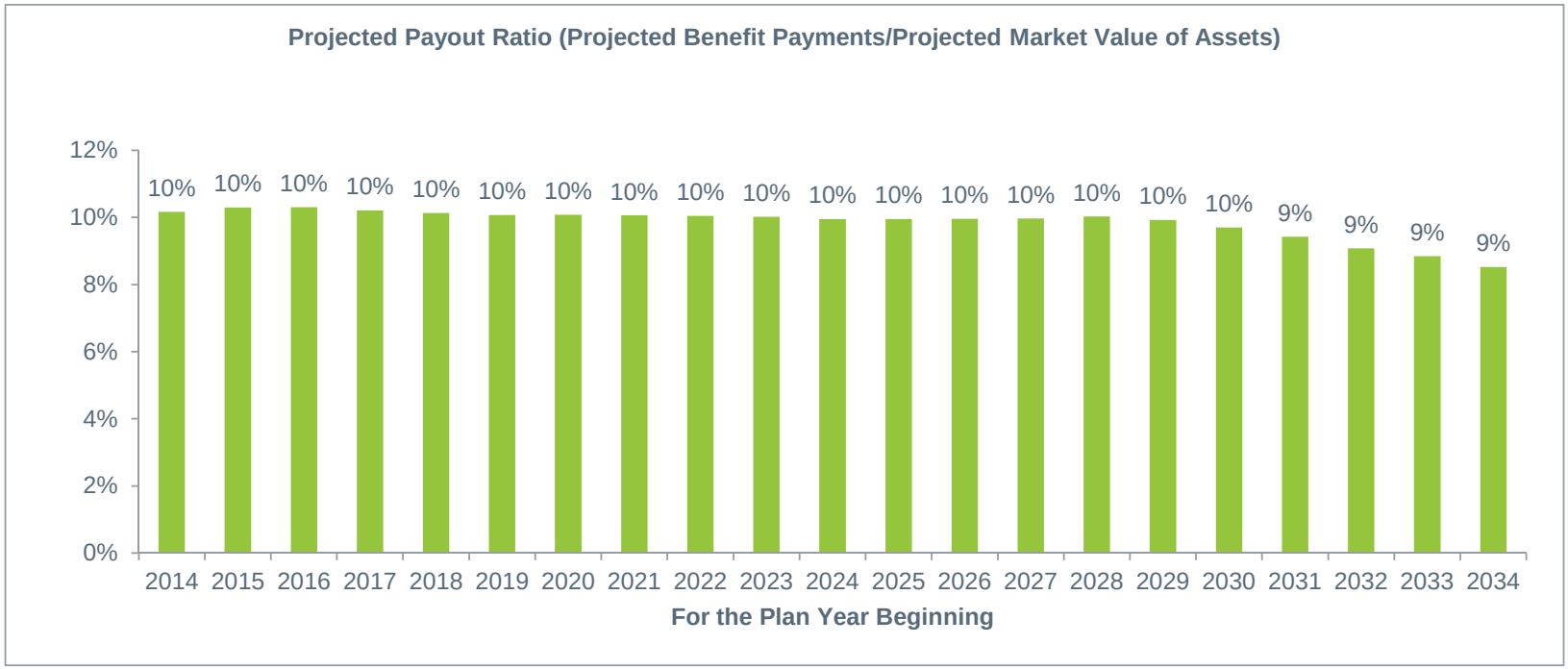
The Plan's projected contributions, expressed as a weighted average percentage of salary, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Payout Ratio (benefit payments/market value of assets)

The Plan's projected payout ratios are shown in the chart below. The payout ratios are expected to gradually decline through the end of the projection period. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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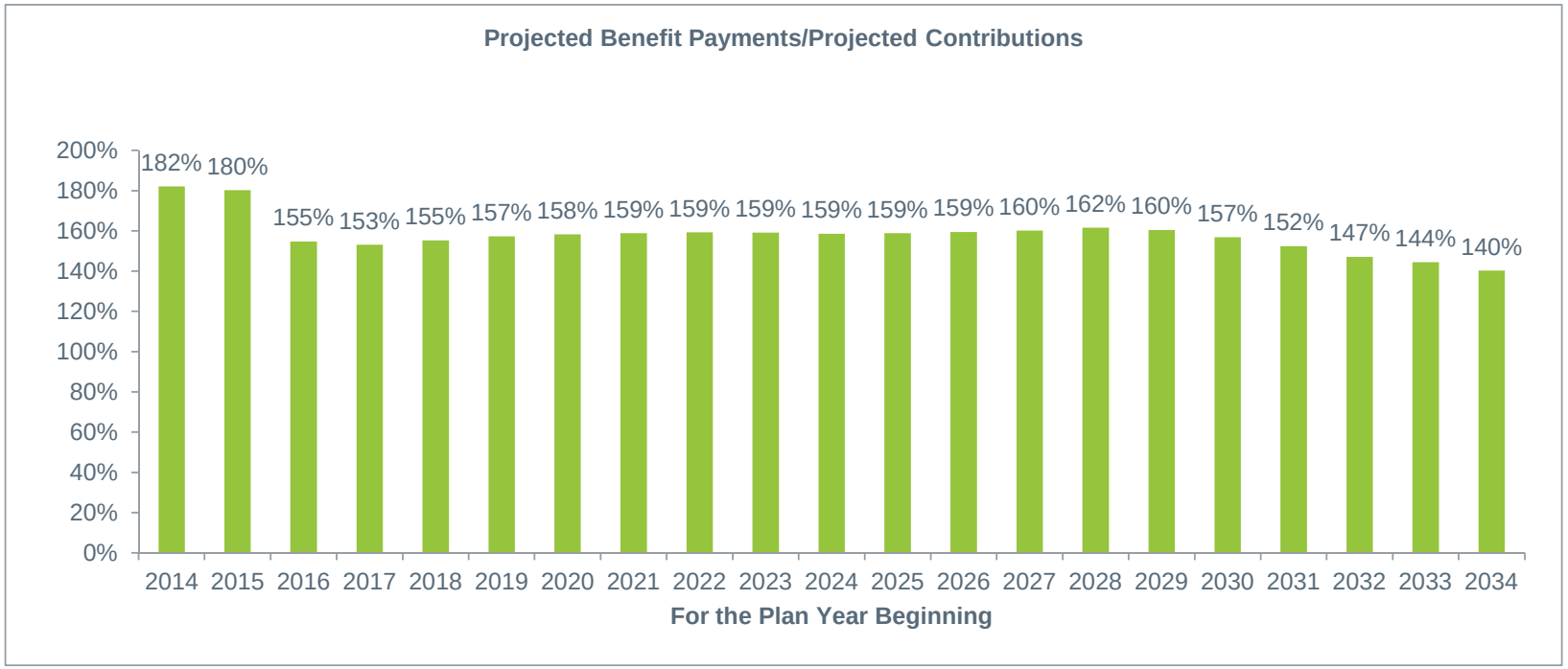
# Deterministic Analysis (continued)

## Benefit Payments/Contributions

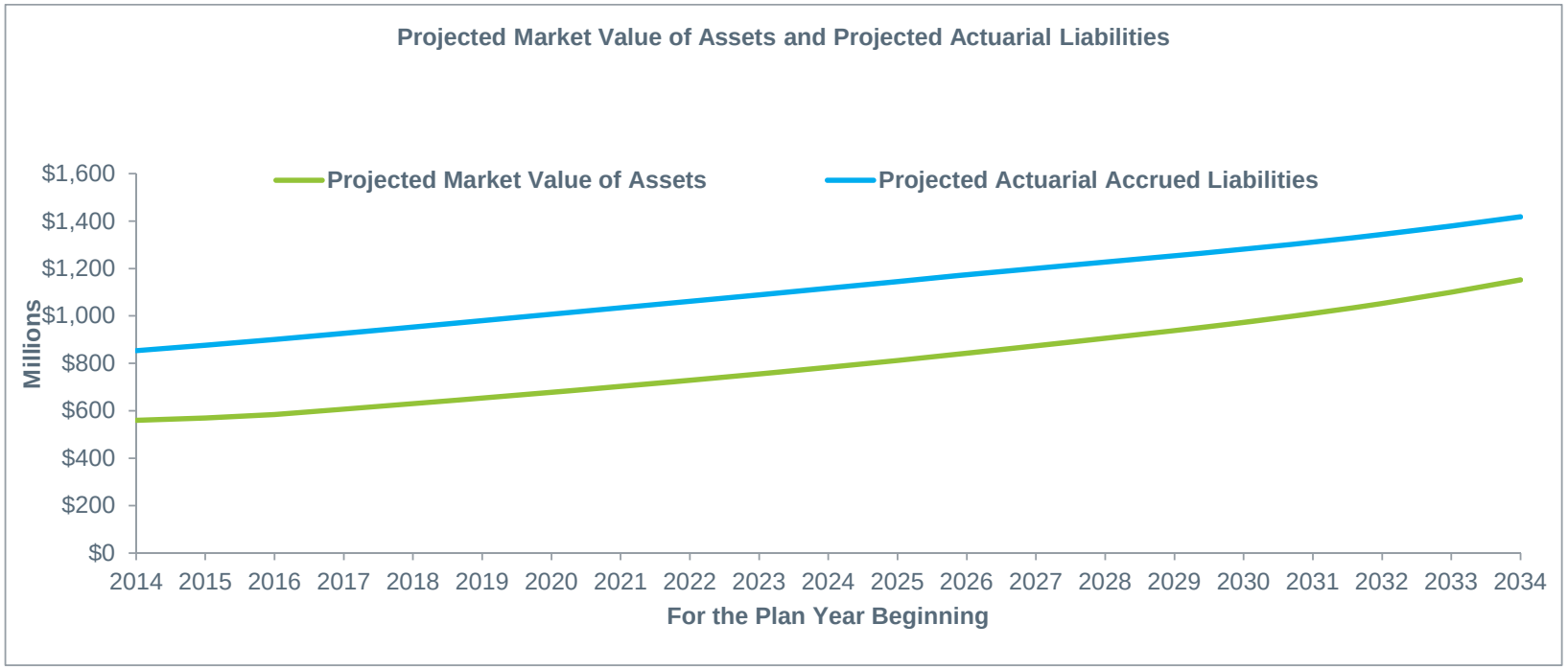
The Plan's projected benefit payments divided by projected contributions are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Actuarial Accrued Liabilities and Market Value of Assets

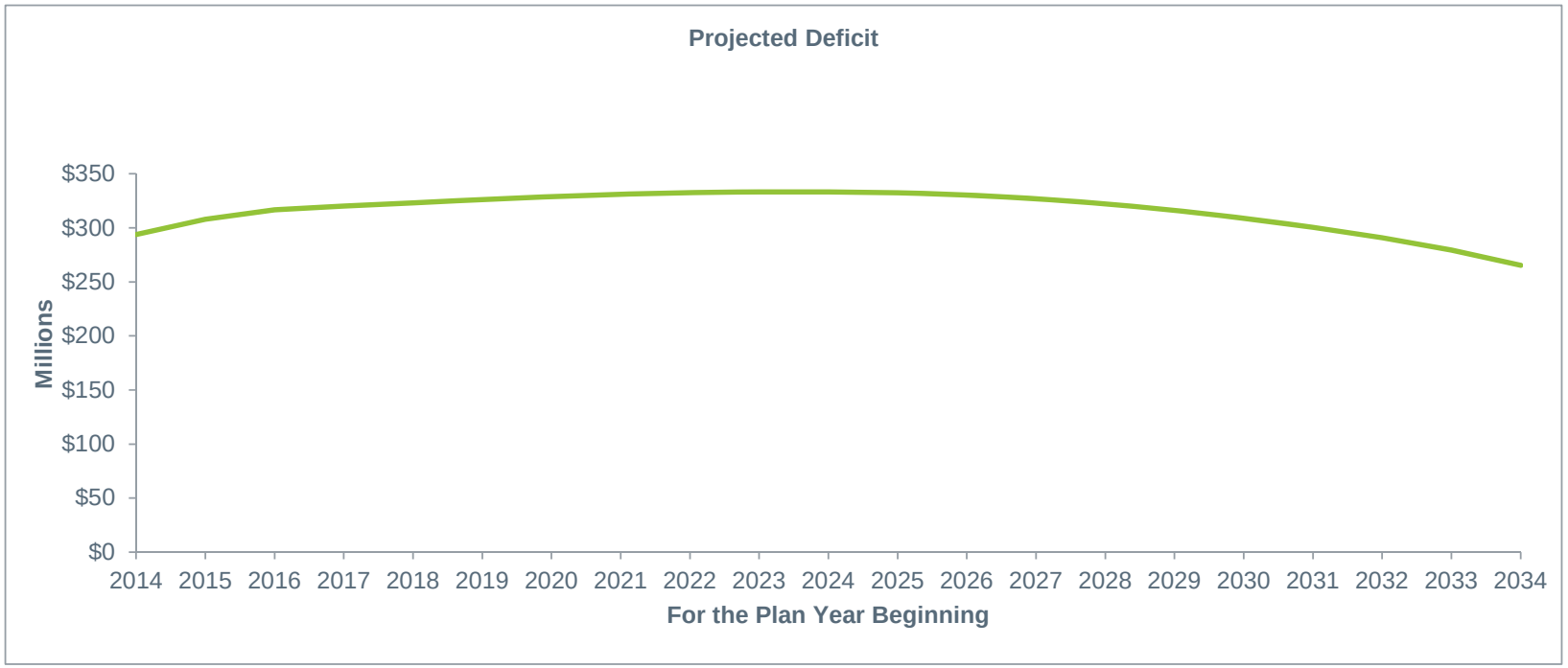
The Plan's projected actuarial accrued liabilities and market value of assets are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The relative disparity between the market value of assets and Plan liabilities is expected to decrease by 10% through the end of the projection period. The funded ratio (based on market value of assets) is expected to increase to approximately 81% by the end of the projection period. This is shown more clearly on the following pages.



# Deterministic Analysis (continued)

### Deficit (market value of assets – actuarial accrued liabilities)

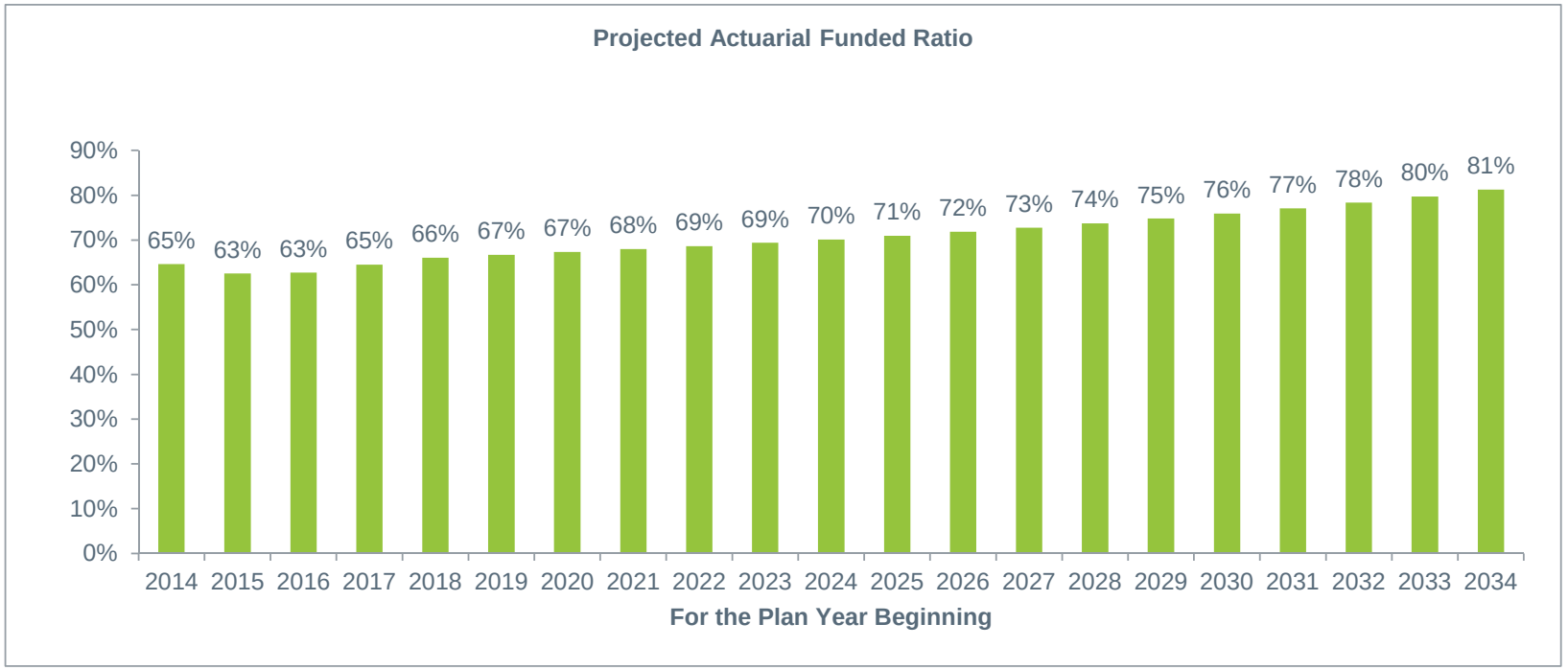
The Plan's projected deficit of assets is shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The disparity between the market value of assets and Plan liabilities is expected to decrease by the end of the projection period by 10%.



# Deterministic Analysis (continued)

## Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability)

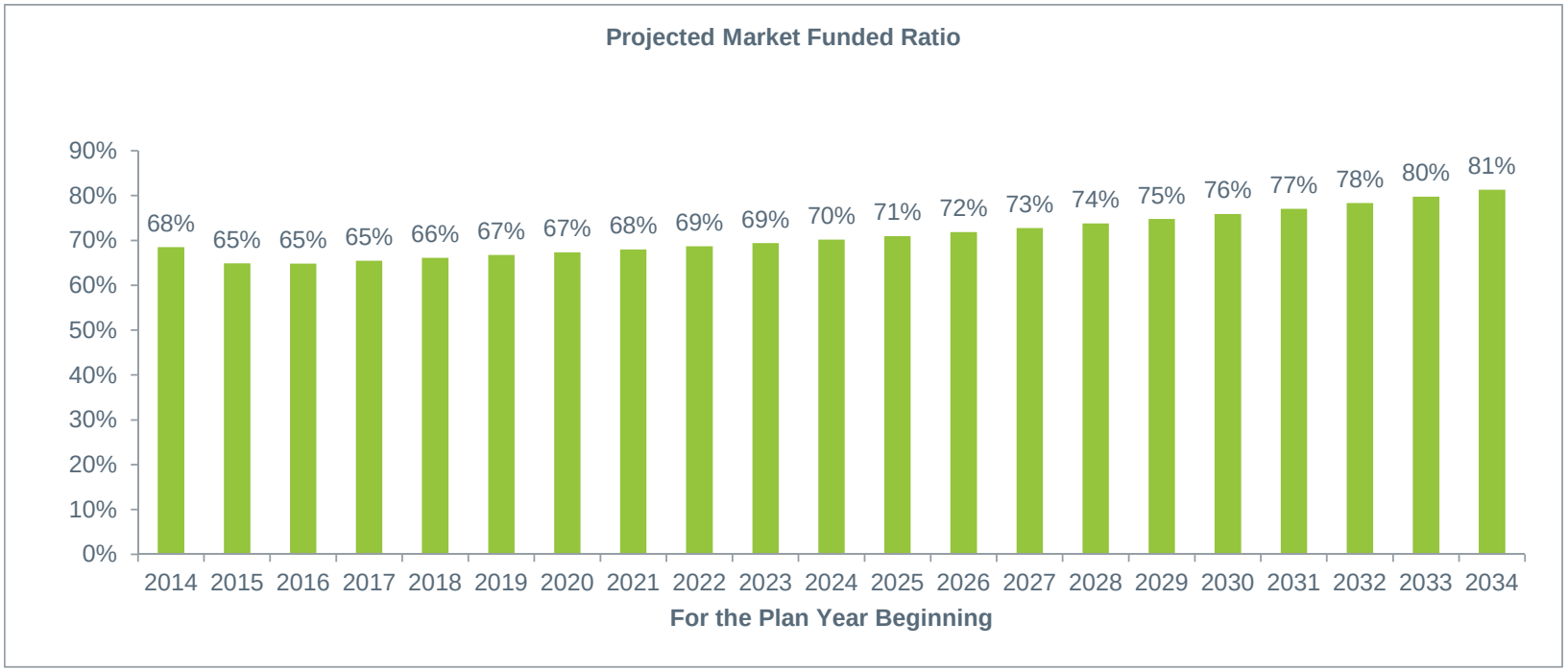
The Plan's projected actuarial funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 81% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Market Funded Ratio (market value of assets/actuarial accrued liability)

The Plan's projected market funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 81% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.

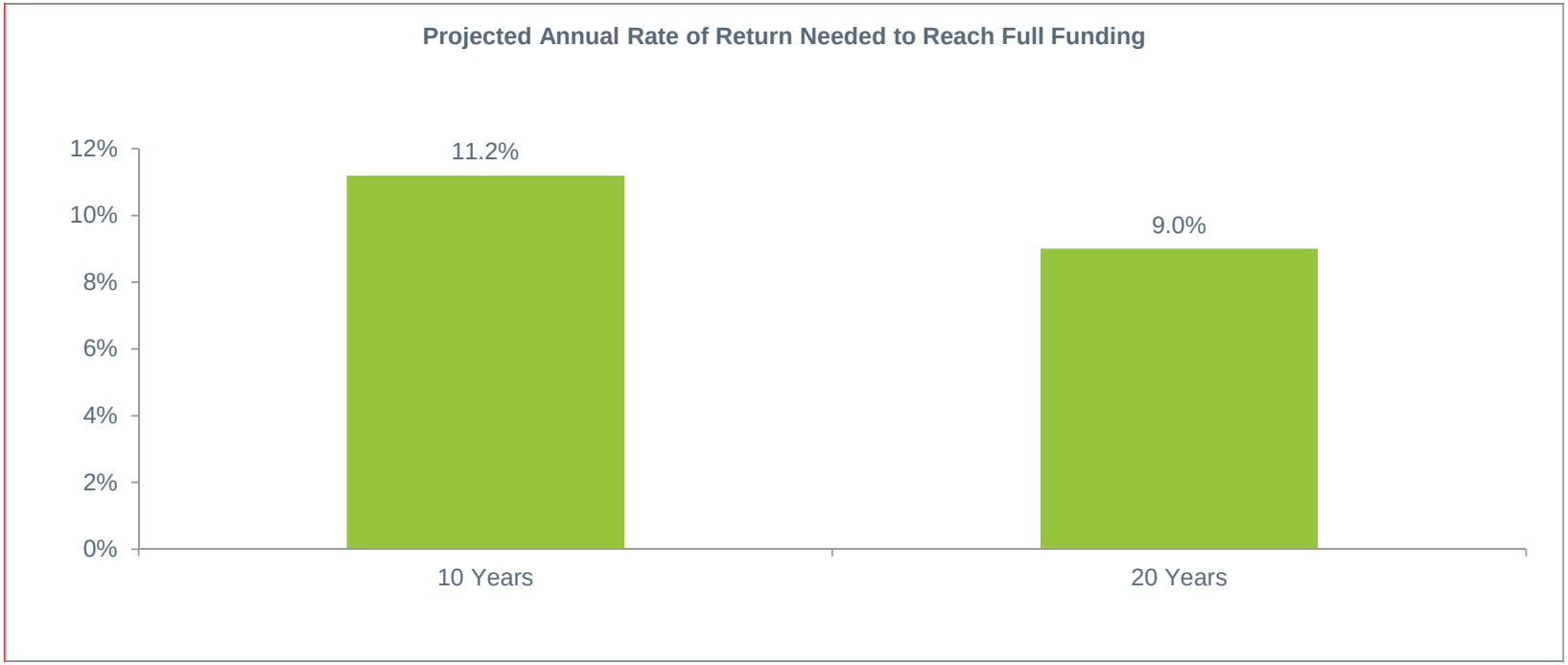


# Deterministic Scenario Analysis

## Full Funding Implied Returns

The figure below shows the projected investment return for the total fund needed to bring the Plan to 100% funding (on a market value basis) in 10 and 20 years, respectively. The results assume all other actuarial assumptions are precisely met over the time periods shown and that these returns are earned for every year, without variance.

Actuarially assumed rate of return – **7.50%**



# Deterministic Scenario Analysis (continued)

## Sensitivity Analysis – Decreased Return

Under the deterministic analysis presented in the preceding pages, the Plan is projected to have a market funded ratio of 81% in 20 years. The table below summarizes the projected funded ratio and other key statistics in 2034 assuming the Plan experiences an annualized investment return of 100 basis points lower (6.50%) than the current actuarially assumed rate of return (7.50%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

| | 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 | ▲ |

Values in impact column may not be additive to due rounding.

# Stochastic Analysis

In the previous section of this report, we assumed the Plan operated going forward with certain knowledge of the future investment returns earned by the Plan's assets. This section introduces the element of uncertainty in those future investment returns. This part of the analysis examines Plan assets and liabilities under many capital market environments based on expected future asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation.

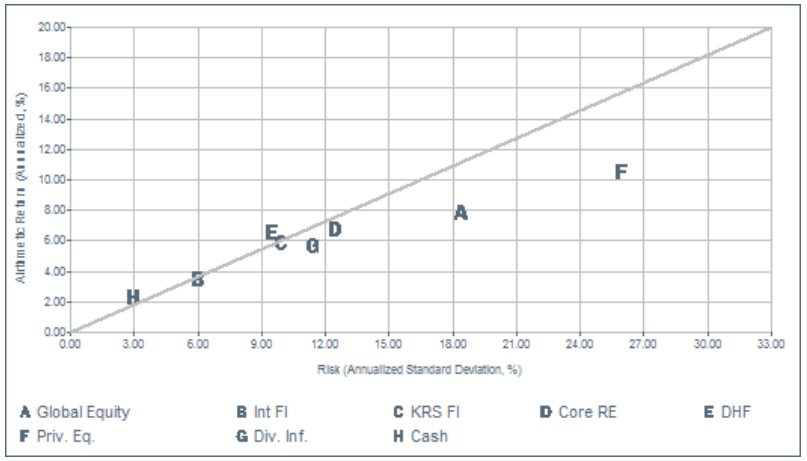
Using the current expected values and variances of the returns and inflation, along with their correlations, 2,000 trials are generated to produce a distribution of results. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes. This is contrasted with the deterministic analysis that provides an expected value if all current Plan assumptions are exactly met.

# Stochastic Analysis (continued)

## Long-Term Return and Risk Assumptions

In order to perform a stochastic analysis and create asset allocation alternatives, it is necessary to estimate, for each asset class, its probable return and risk. The expected returns are our best estimates of the average annual percentage increases in values of each asset class over a prospective long period of time, and assumed to be normally distributed. The risk of an asset class is measured by its standard deviation, or volatility. If asset returns are normally distributed, two-thirds (67%) of all returns are expected to lie within one standard deviation on either side of the mean. For example, we expect Global Equity to return, annually on average, 7.80% with a standard deviation of 18.35%, meaning that two-thirds of the time we expect its return to lie between -10.55% (= 7.80 – 18.35) and 26.15% (= 7.80 + 18.35). Moreover, we expect 95% of all return outcomes to lie within two standard deviations of the mean return, implying only a one-in-twenty chance that the return on Global Equity will either fall below -28.90% or rise above 44.50%. The risk and return assumptions used in this study are outlined in the below table and chart:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption |
|---|---|---|
| Global Equity | 7.80 | 18.35 |
| Int. Duration Fixed Income | 3.50 | 6.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 |
| Core Real Estate | 6.75 | 12.50 |
| Diversified Hedge Funds | 6.50 | 9.50 |
| Private Equity | 10.50 | 26.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 |
| Cash Equivalents | 2.25 | 3.00 |



# Stochastic Analysis (continued)

## Correlation Between Asset Classes

Creating a diversified portfolio of asset classes enables the investor to achieve a high rate of return while minimizing volatility of the portfolio. As defined on the previous page, volatility is "risk" or standard deviation. By minimizing the volatility of a portfolio, we produce asset returns that vary less from year to year. Diversification exists because the returns of different asset classes do not always move in the same direction, at the same time, or with the same magnitude. Correlation values are between 1.00 and –1.00. If returns of two asset classes rise or fall at the same time and in the same magnitude, they have a correlation value of 1.00. Conversely, two asset classes that simultaneously move in opposite directions, and in the same magnitude, have a correlation value of –1.00. A correlation of zero indicates no relationship between returns. The assumed correlations are largely based on historical index data, with some qualitative analysis applied. For instance, where appropriate, we have weighted current history more heavily. The correlation matrix used in this study is shown below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | -0.02 | 0.84 | 0.32 | 0.70 | 0.78 | 0.72 | -0.05 |
| Int. Duration Fixed Income | -0.02 | 1.00 | 0.28 | -0.06 | 0.12 | -0.26 | 0.22 | 0.24 |
| Custom KRS Fixed Income | 0.84 | 0.28 | 1.00 | 0.27 | 0.69 | 0.66 | 0.82 | -0.07 |
| Core Real Estate | 0.32 | -0.06 | 0.27 | 1.00 | 0.24 | 0.60 | 0.37 | 0.14 |
| Diversified Hedge Funds | 0.70 | 0.12 | 0.69 | 0.24 | 1.00 | 0.69 | 0.59 | 0.22 |
| Private Equity | 0.78 | -0.26 | 0.66 | 0.60 | 0.69 | 1.00 | 0.62 | 0.07 |
| Diversified Inflation Strategies | 0.72 | 0.22 | 0.82 | 0.37 | 0.59 | 0.62 | 1.00 | -0.03 |
| Cash Equivalents | -0.05 | 0.24 | -0.07 | 0.14 | 0.22 | 0.07 | -0.03 | 1.00 |

The fact that the correlations shown in the table are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others. This point is demonstrated on the following pages, which illustrate that diversification into less correlated asset classes can decrease the expected overall volatility of a portfolio.

# Stochastic Analysis (continued)

## Efficient Portfolios

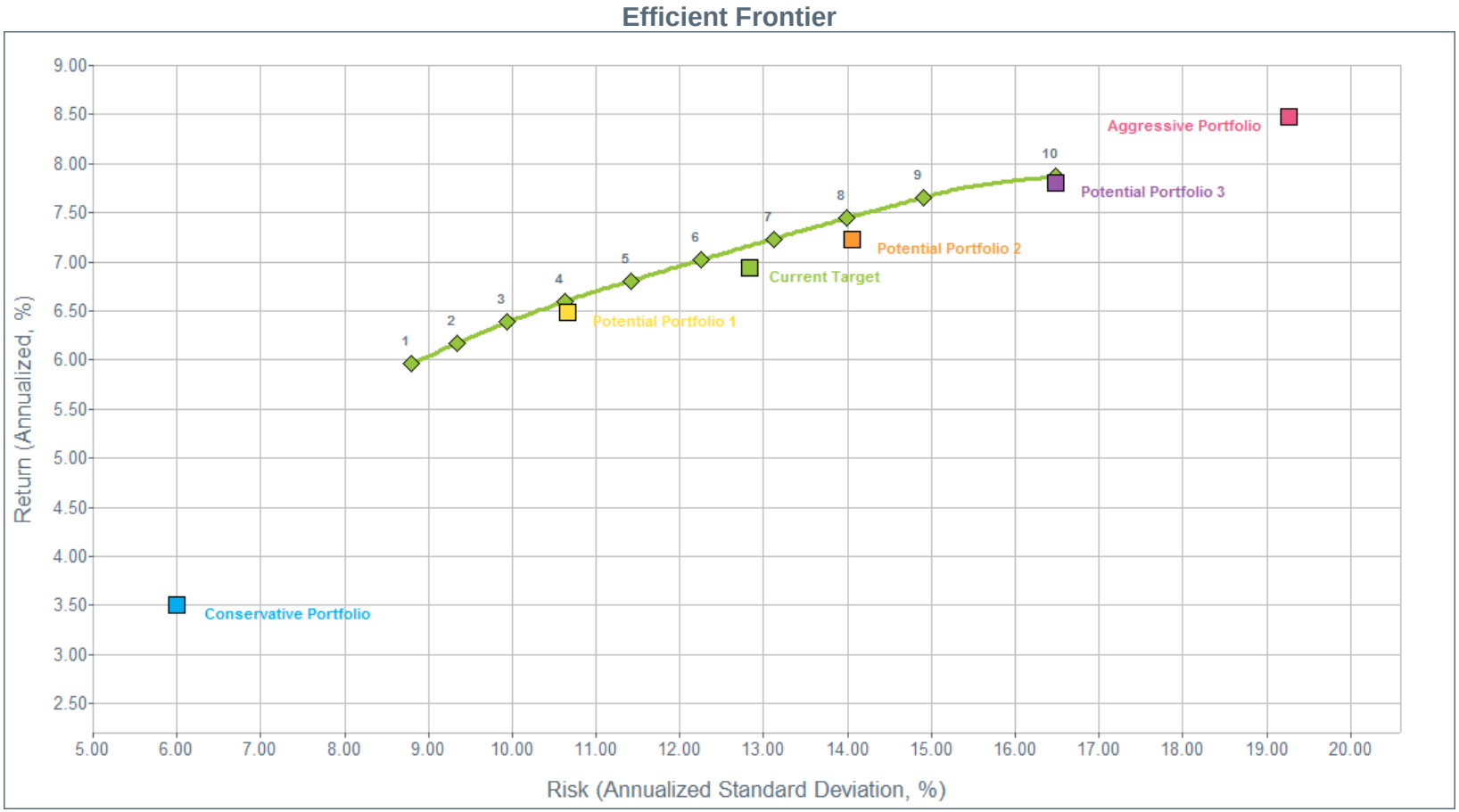
Each frontier portfolio (optimal allocation) is created using target rates of return both above and below the projected rate of return for the current allocation. This range illustrates the trade-off between return and risk; additional return can only be achieved by undertaking additional risk. The table below shows the possible optimal allocations given the selected asset classes and their constraints listed under "Min" and "Max." The table shows the Current Target allocation and highlights three potential targets (Potential Portfolios 1, 2, and 3) for consideration throughout this study. Two illustrative portfolios (Conservative and Aggressive Portfolios) are also shown for demonstrative purposes.

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | 30 | 70 | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | 0 | 30 | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | 0 | 30 | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | 5 | 15 | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | 2 | 15 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | 2 | 5 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

# Stochastic Analysis (continued)

## Efficient Frontier

The risk of each alternative allocation is plotted against the horizontal axis, while the return is measured on the vertical axis. The line connecting the points represents all the optimal portfolios subject to the given constraints and is known as the "efficient frontier." The upward slope of the efficient frontier indicates the direct relationship between return and risk.



# Stochastic Analysis (continued)

## Asset Mixes

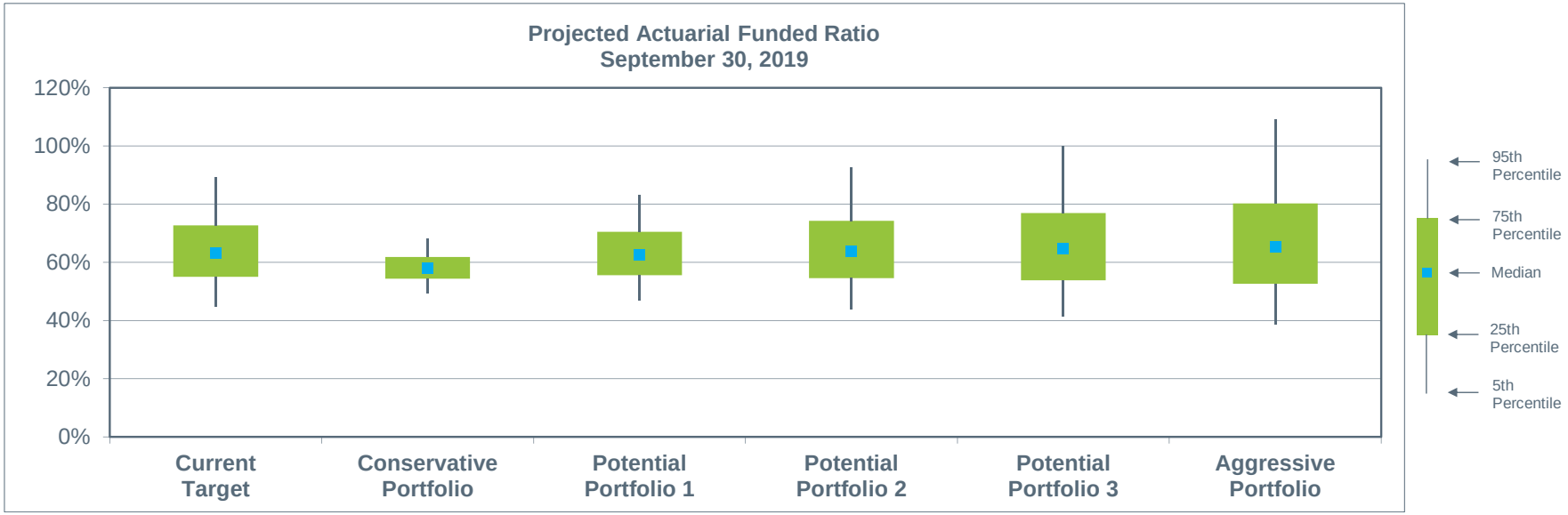
Outlined below are the Current Target allocation and five other mixes to be examined in this stochastic analysis. The expected return, expected risk (as measured by standard deviation), and RVK Liquidity Metric, for each is also shown.

| 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** |

# Stochastic Analysis (continued)

## Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

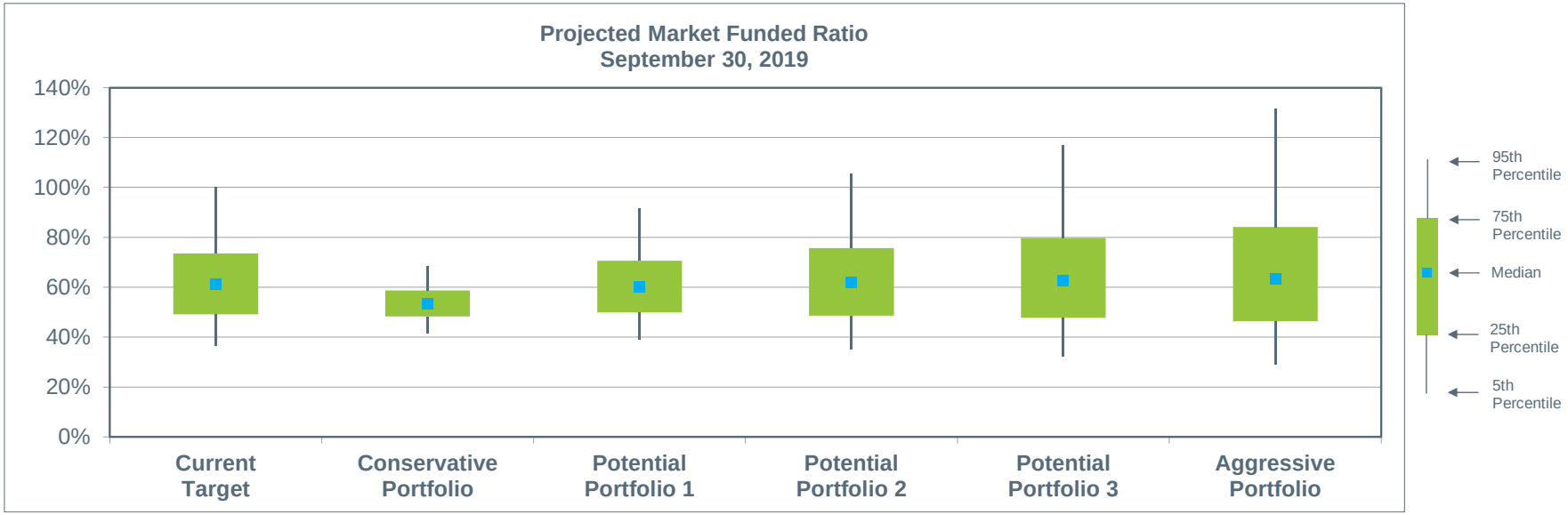



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $535 | 45% | $493 | 49% | $513 | 47% | $546 | 44% | $568 | 41% | $593 | 39% |
| 25th Percentile | $439 | 55% | $444 | 54% | $435 | 56% | $443 | 55% | $453 | 54% | $463 | 53% |
| Median | $361 | 63% | $411 | 58% | $368 | 62% | $356 | 64% | $350 | 65% | $341 | 66% |
| 75th Percentile | $268 | 73% | $375 | 62% | $292 | 70% | $254 | 74% | $228 | 77% | $195 | 80% |
| 95th Percentile | $107 | 89% | $320 | 68% | $165 | 83% | $71 | 93% | $1 | 100% | ($88) | 109% |

# Stochastic Analysis (continued)

## Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible market funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $613 | 36% | $562 | 42% | $587 | 39% | $626 | 35% | $654 | 32% | $682 | 29% |
| 25th Percentile | $494 | 49% | $501 | 48% | $484 | 50% | $499 | 49% | $510 | 48% | $520 | 46% |
| 50th Percentile | $379 | 61% | $454 | 53% | $390 | 60% | $372 | 62% | $366 | 63% | $360 | 64% |
| 75th Percentile | $261 | 74% | $408 | 59% | $291 | 71% | $241 | 76% | $200 | 80% | $155 | 84% |
| 95th Percentile | $1 | 100% | $322 | 68% | $84 | 91% | ($55) | 105% | ($172) | 117% | ($308) | 132% |

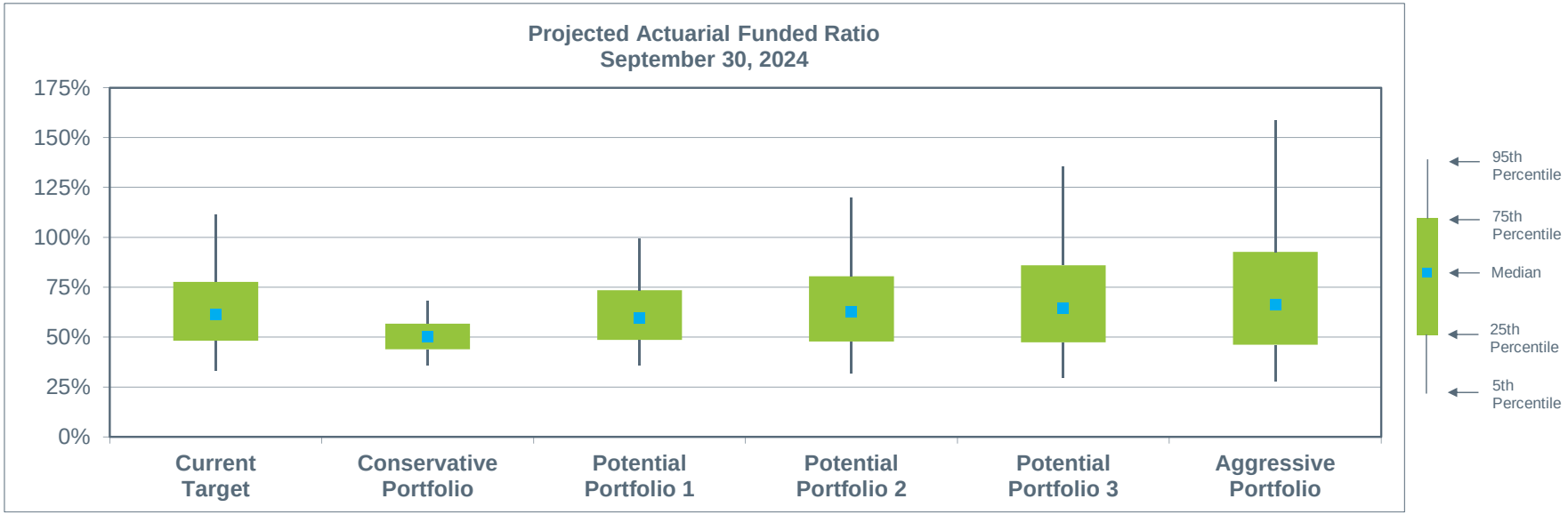


RVK

# Stochastic Analysis (continued)

## Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

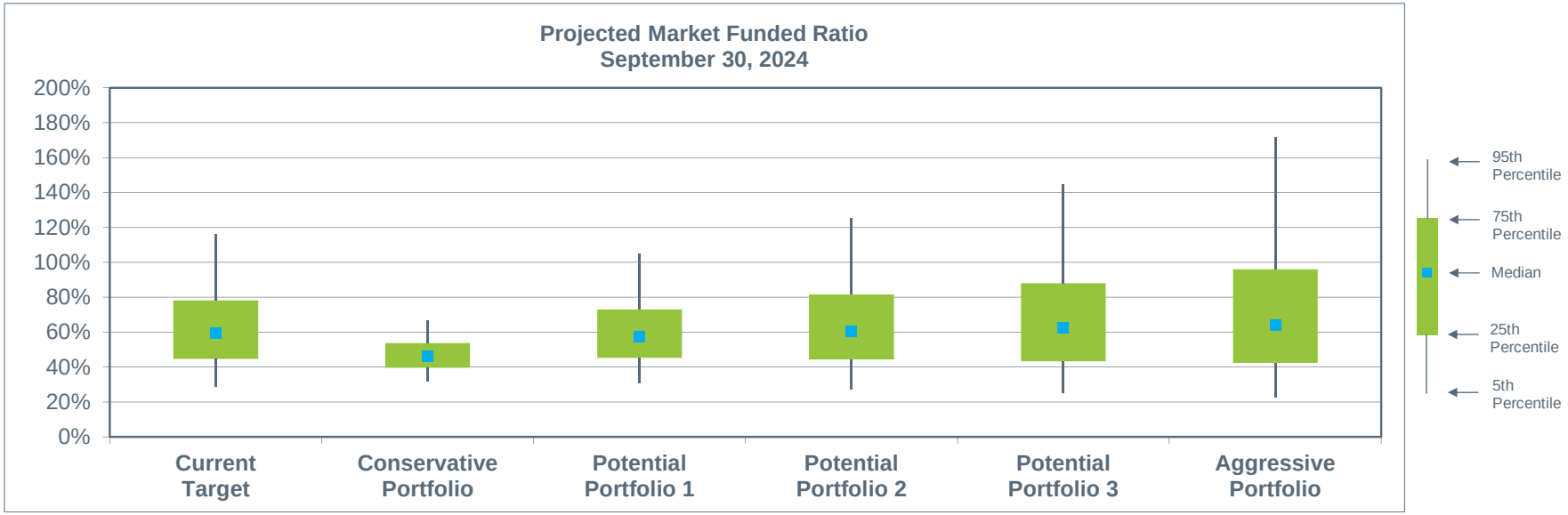



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $722 | 33% | $686 | 36% | $699 | 36% | $737 | 32% | $765 | 30% | $790 | 28% |
| 25th Percentile | $569 | 48% | $615 | 44% | $565 | 49% | $570 | 48% | $578 | 47% | $590 | 46% |
| Median | $431 | 61% | $556 | 50% | $451 | 60% | $421 | 63% | $401 | 64% | $378 | 66% |
| 75th Percentile | $254 | 78% | $495 | 57% | $301 | 74% | $222 | 80% | $164 | 86% | $81 | 93% |
| 95th Percentile | ($134) | 111% | $372 | 68% | $4 | 100% | ($222) | 120% | ($411) | 135% | ($650) | 159% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **10 Years**

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

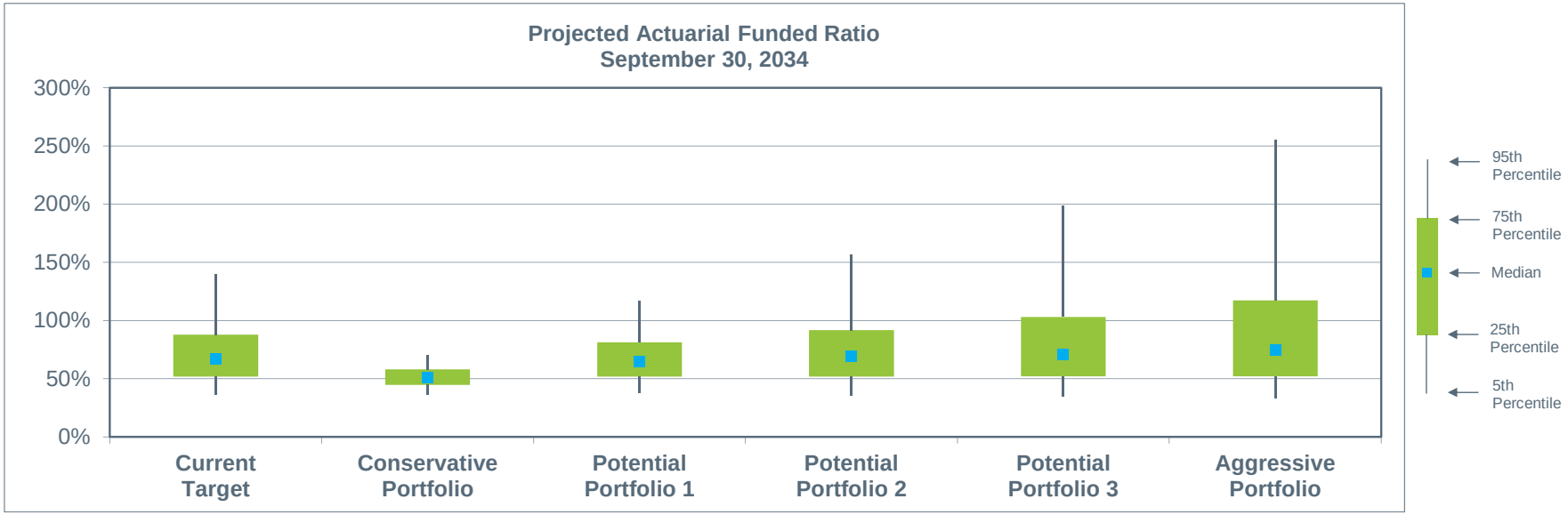



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $767 | 28% | $731 | 31% | $741 | 31% | $785 | 27% | $808 | 25% | $835 | 23% |
| 25th Percentile | $611 | 45% | $663 | 40% | $602 | 45% | $614 | 44% | $627 | 43% | $635 | 42% |
| 50th Percentile | $454 | 59% | $602 | 46% | $473 | 58% | $443 | 61% | $422 | 62% | $400 | 64% |
| 75th Percentile | $250 | 78% | $530 | 54% | $311 | 73% | $211 | 82% | $136 | 88% | $46 | 96% |
| 95th Percentile | ($191) | 116% | $396 | 67% | ($52) | 105% | ($297) | 125% | ($528) | 145% | ($824) | 172% |

# Stochastic Analysis (continued)

## Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 20 Years

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

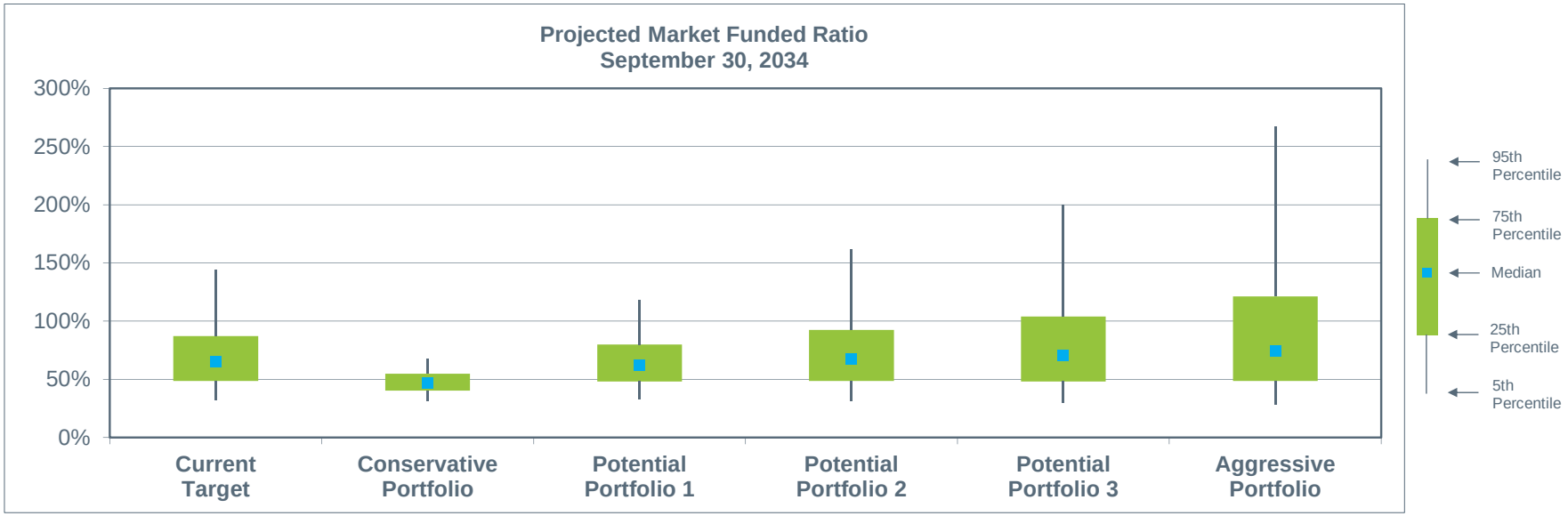



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $808 | 36% | $810 | 36% | $785 | 38% | $816 | 36% | $835 | 35% | $860 | 33% |
| 25th Percentile | $641 | 52% | $735 | 45% | $640 | 52% | $638 | 52% | $642 | 52% | $643 | 52% |
| Median | $454 | 67% | $675 | 51% | $487 | 65% | $434 | 69% | $402 | 71% | $359 | 75% |
| 75th Percentile | $179 | 88% | $604 | 58% | $271 | 81% | $116 | 92% | ($43) | 103% | ($257) | 117% |
| 95th Percentile | ($638) | 140% | $466 | 70% | ($271) | 117% | ($850) | 157% | ($1,483) | 199% | ($2,403) | 255% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $862 | 32% | $866 | 31% | $836 | 33% | $876 | 31% | $904 | 30% | $930 | 28% |
| 25th Percentile | $688 | 49% | $788 | 40% | $686 | 48% | $687 | 48% | $685 | 48% | $686 | 49% |
| 50th Percentile | $476 | 65% | $729 | 47% | $516 | 62% | $451 | 67% | $406 | 70% | $351 | 74% |
| 75th Percentile | $189 | 87% | $655 | 55% | $296 | 80% | $111 | 92% | ($58) | 104% | ($299) | 121% |
| 95th Percentile | ($685) | 144% | $506 | 67% | ($297) | 118% | ($948) | 162% | ($1,574) | 200% | ($2,482) | 267% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 68% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 5% | 65% | 9% | -37% | 26% |
| Conservative Portfolio | 0% | 94% | 4% | -22% | 25% |
| Potential Portfolio 1 | 2% | 69% | 6% | -32% | 25% |
| Potential Portfolio 2 | 7% | 63% | 11% | -39% | 26% |
| Potential Portfolio 3 | 11% | 59% | 14% | -44% | 27% |
| Aggressive Portfolio | 15% | 56% | 16% | -48% | 28% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 68% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 10% | 64% | 18% | -37% | 34% |
| Conservative Portfolio | 0% | 96% | 27% | -22% | 34% |
| Potential Portfolio 1 | 6% | 68% | 16% | -32% | 33% |
| Potential Portfolio 2 | 13% | 61% | 19% | -39% | 35% |
| Potential Portfolio 3 | 18% | 57% | 21% | -45% | 36% |
| Aggressive Portfolio | 23% | 54% | 23% | -50% | 37% |

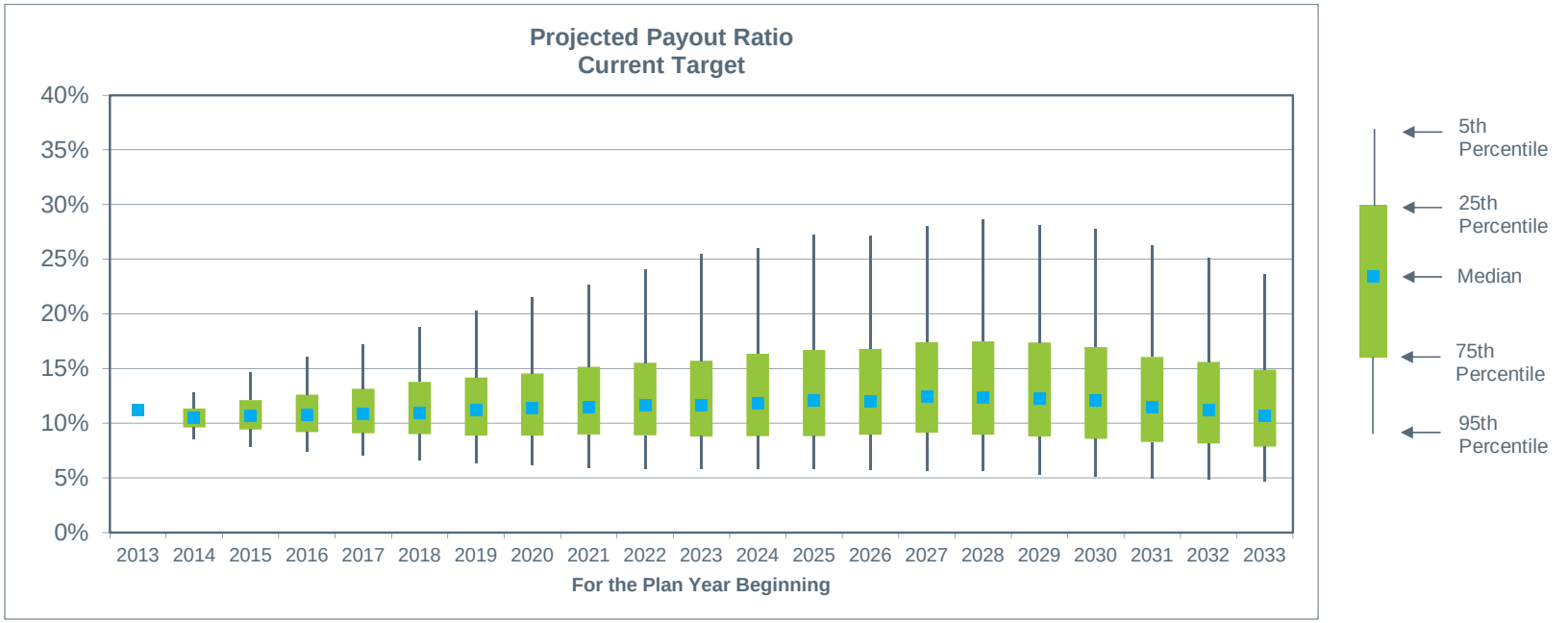
| 20 Years | Probability of Full Funding in 2034 | Probability of < 68% (Current) Funding in 2034 | Probability of < 40% (Current) Funding in 2034 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 17% | 54% | 14% | -38% | 47% |
| Conservative 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% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Current Target**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 12%. The worst-case scenario could reach 29% or higher.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 11% | 11% | 11% |



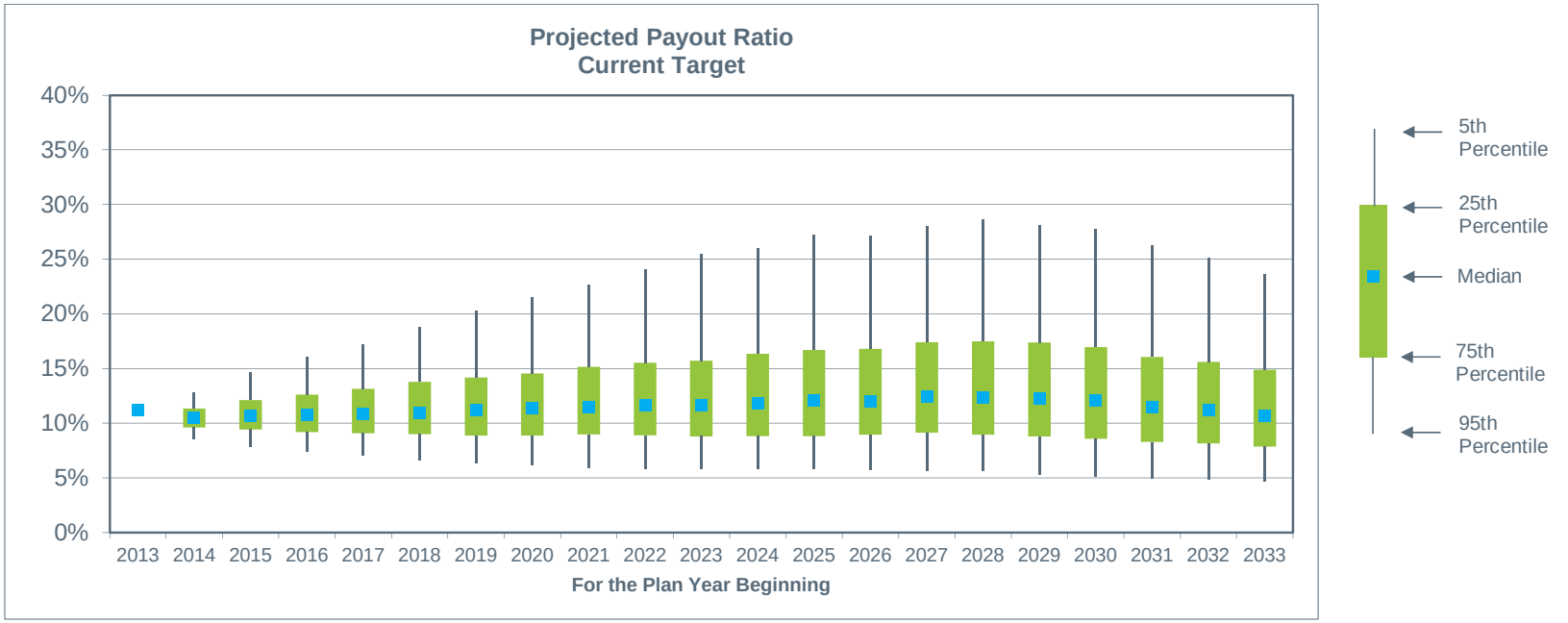
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Conservative Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 11% and 17%. The worst-case scenario could reach 28% or higher.



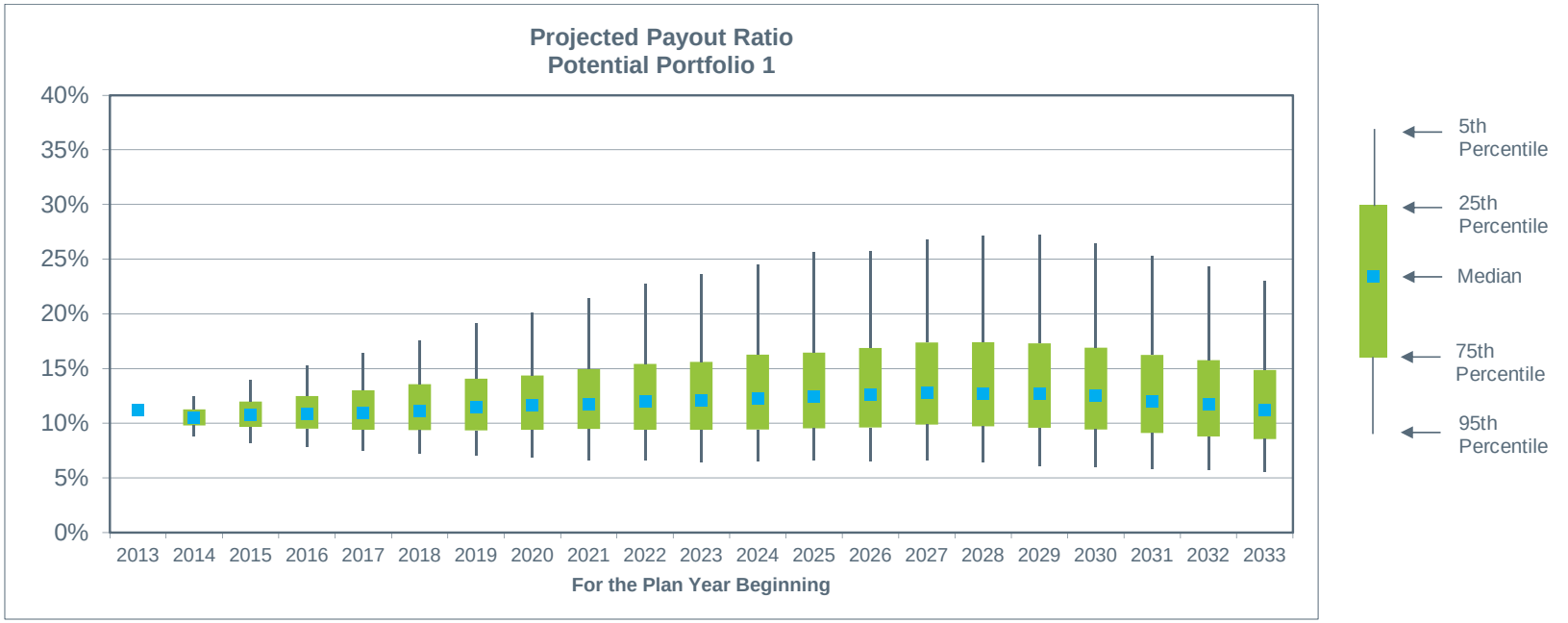

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 11% | 11% | 12% | 12% | 13% | 13% | 14% | 14% | 15% | 15% | 16% | 16% | 17% | 17% | 17% | 17% | 17% | 16% | 16% | 15% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 1**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 11% and 13%. The worst-case scenario could reach 27% or higher.



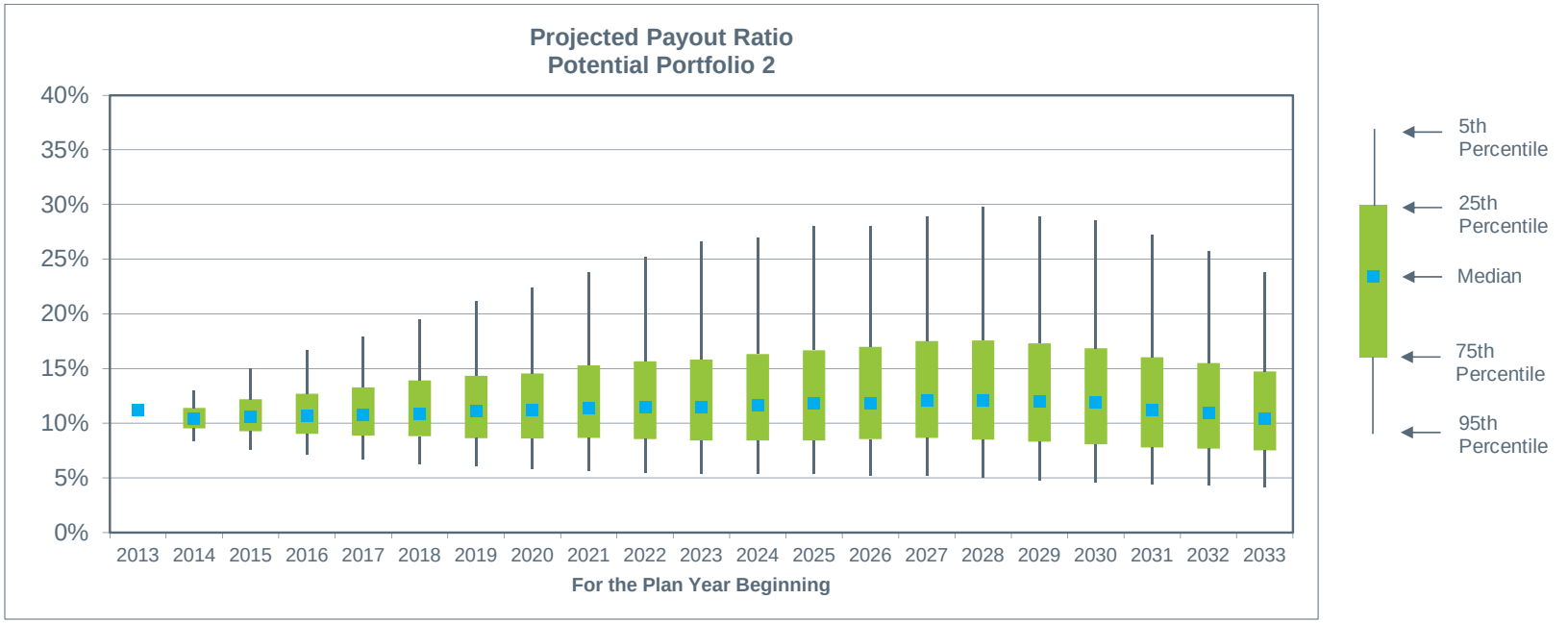

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 13% | 12% | 12% | 11% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 2**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 12%. The worst-case scenario could reach 30% or higher.



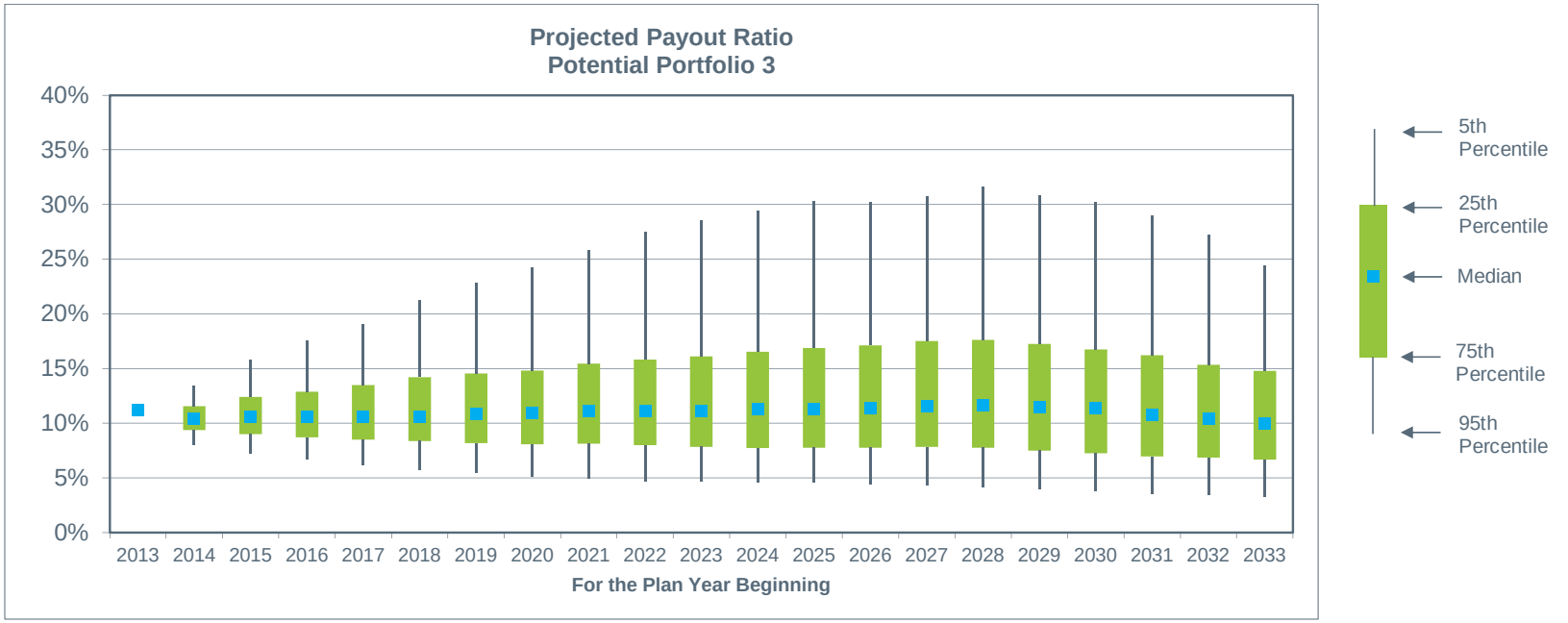

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 11% | 11% | 10% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 3**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 12%. The worst-case scenario could reach 32% or higher.



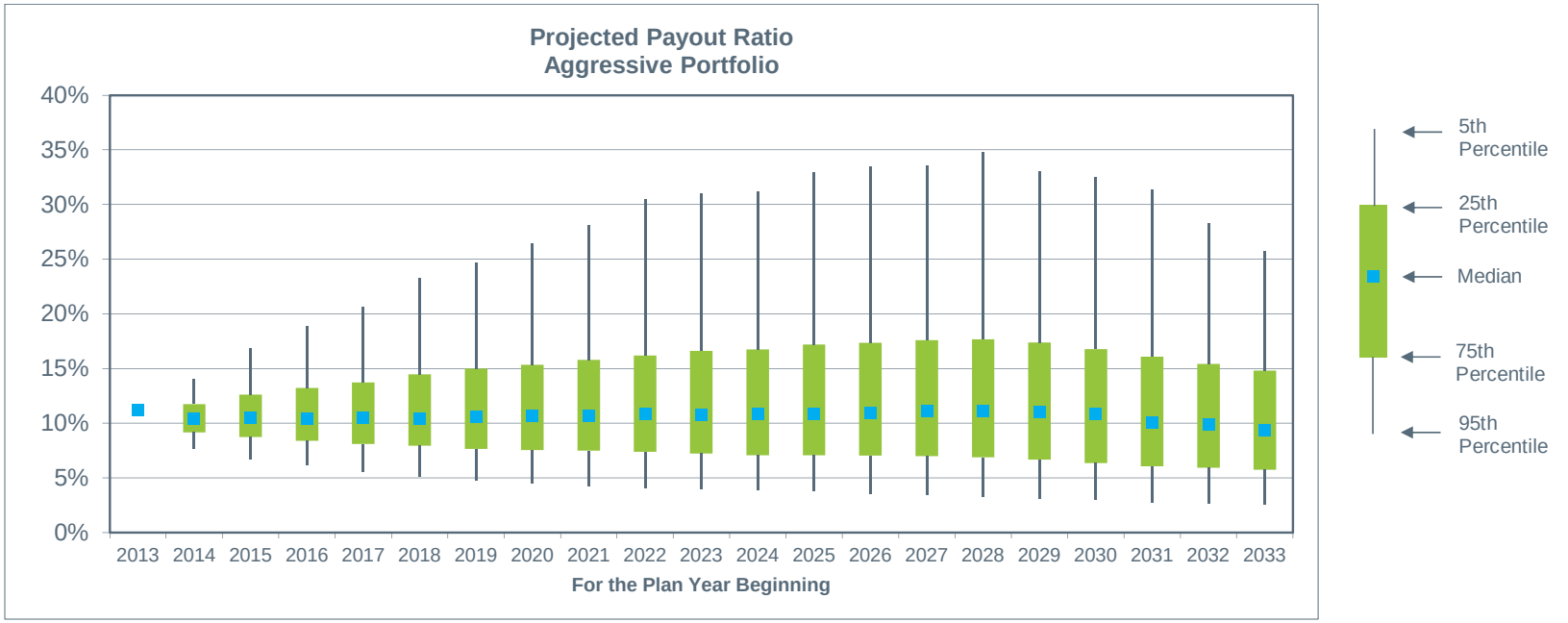

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 12% | 12% | 11% | 11% | 11% | 10% | 10% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Aggressive Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 9% and 11%. The worst-case scenario could reach 35% or higher.

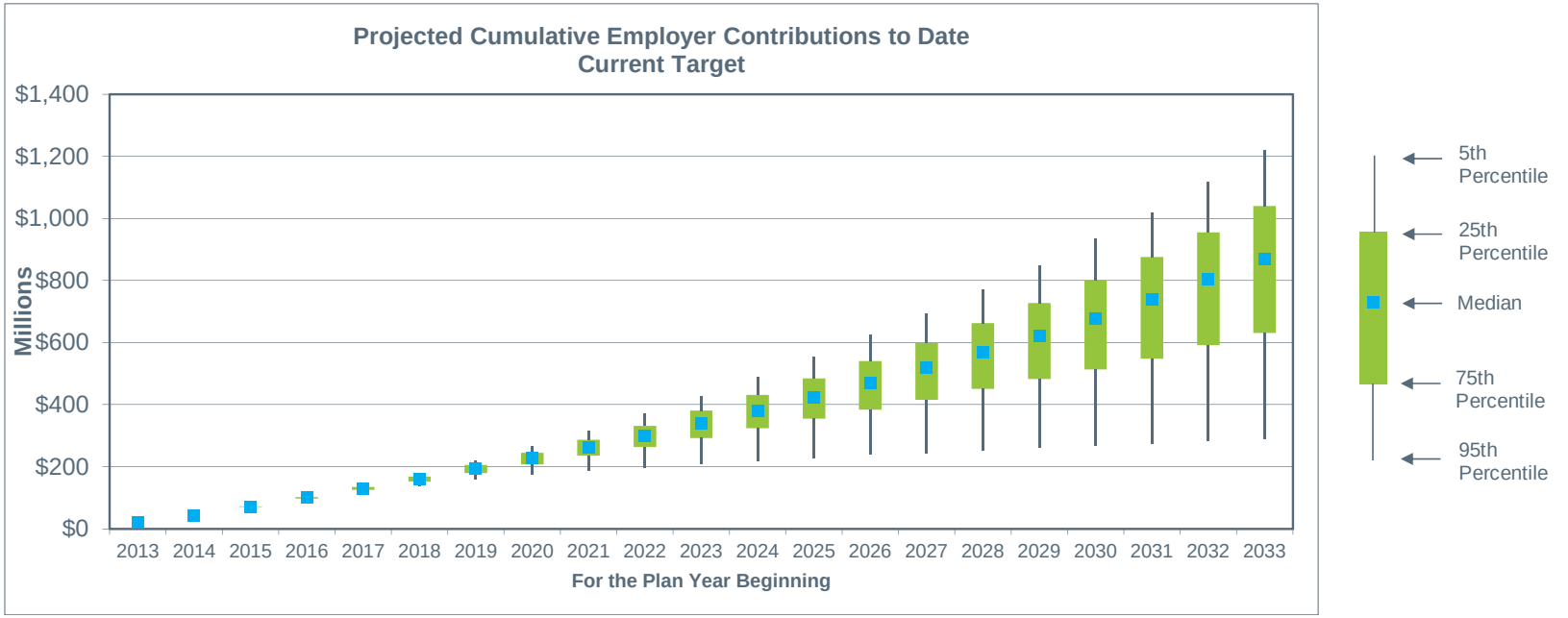



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 11% | 10% | 10% | 9% |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Current Target

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

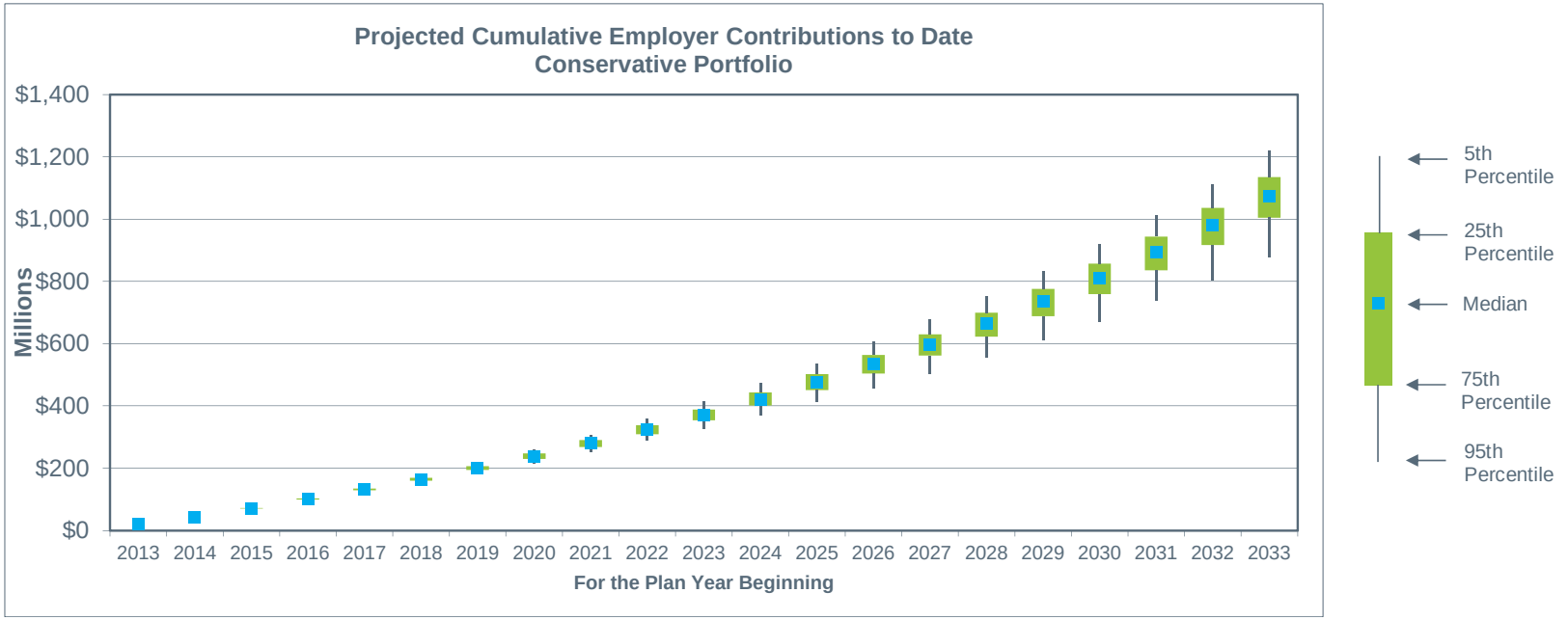



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $21 | $43 | $73 | $106 | $141 | $178 | $220 | $267 | $317 | $371 | $428 | $488 | $554 | $624 | $695 | $772 | $849 | $933 | $1,020 | $1,117 | $1,221 |
| 25th Percentile | $21 | $43 | $72 | $102 | $135 | $168 | $205 | $245 | $287 | $332 | $380 | $431 | $484 | $541 | $599 | $663 | $728 | $800 | $876 | $955 | $1,039 |
| Median | $21 | $43 | $71 | $100 | $130 | $161 | $193 | $227 | $263 | $300 | $339 | $379 | $423 | $469 | $518 | $569 | $621 | $676 | $737 | $803 | $868 |
| 75th Percentile | $21 | $43 | $70 | $98 | $125 | $152 | $180 | $207 | $235 | $264 | $293 | $324 | $355 | $384 | $416 | $450 | $482 | $513 | $548 | $591 | $630 |
| 95th Percentile | $21 | $43 | $69 | $94 | $118 | $139 | $159 | $174 | $186 | $197 | $208 | $219 | $226 | $238 | $244 | $251 | $261 | $267 | $274 | $282 | $290 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Conservative Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

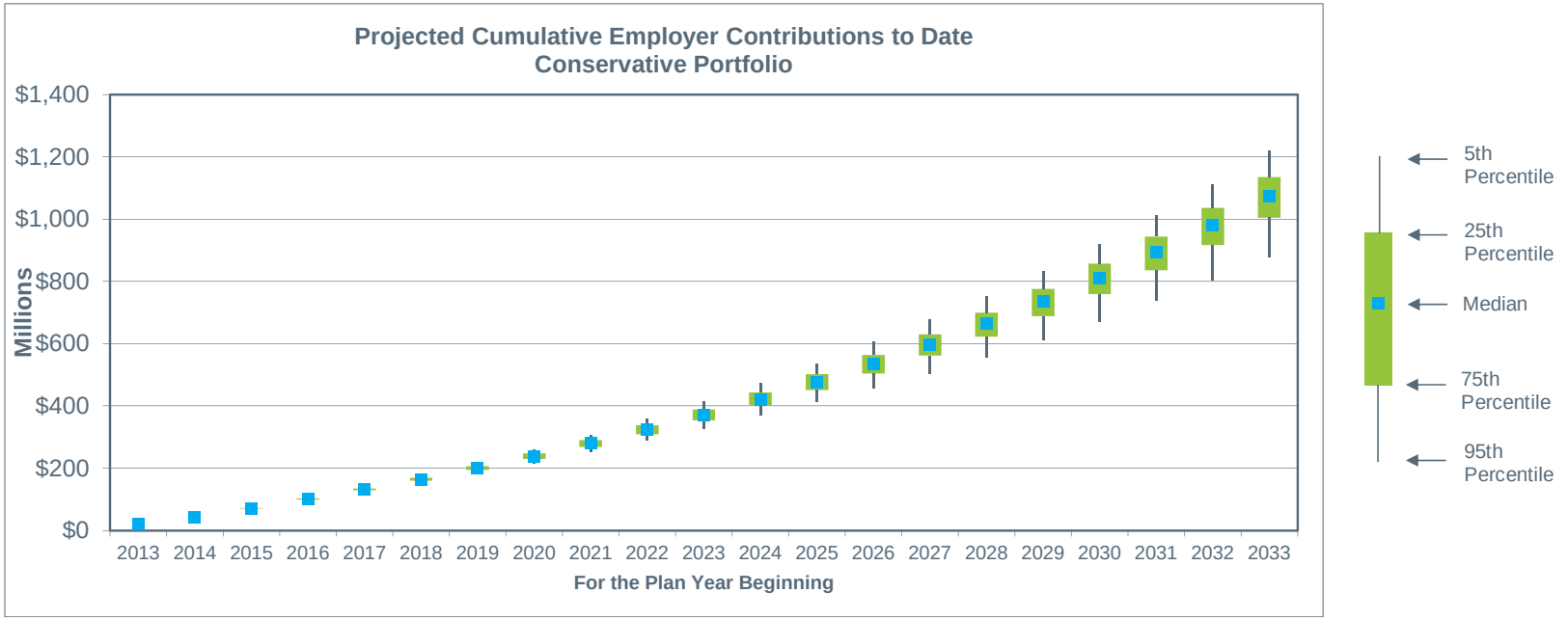



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $21 | $43 | $73 | $106 | $140 | $176 | $216 | $259 | $307 | $359 | $414 | $473 | $536 | $605 | $677 | $753 | $835 | $920 | $1,012 | $1,110 | $1,219 |
| **25th Percentile** | $21 | $43 | $72 | $103 | $135 | $169 | $207 | $247 | $290 | $338 | $389 | $443 | $502 | $563 | $630 | $699 | $776 | $857 | $944 | $1,036 | $1,135 |
| **Median** | $21 | $43 | $71 | $101 | $132 | $165 | $200 | $238 | $279 | $323 | $371 | $421 | $476 | $534 | $596 | $663 | $735 | $811 | $893 | $980 | $1,072 |
| **75th Percentile** | $21 | $43 | $70 | $99 | $129 | $160 | $194 | $230 | $268 | $309 | $354 | $401 | $451 | $504 | $562 | $622 | $688 | $759 | $836 | $917 | $1,004 |
| **95th Percentile** | $21 | $43 | $69 | $97 | $125 | $154 | $184 | $217 | $252 | $289 | $328 | $369 | $411 | $457 | $504 | $556 | $611 | $669 | $736 | $805 | $877 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 1

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

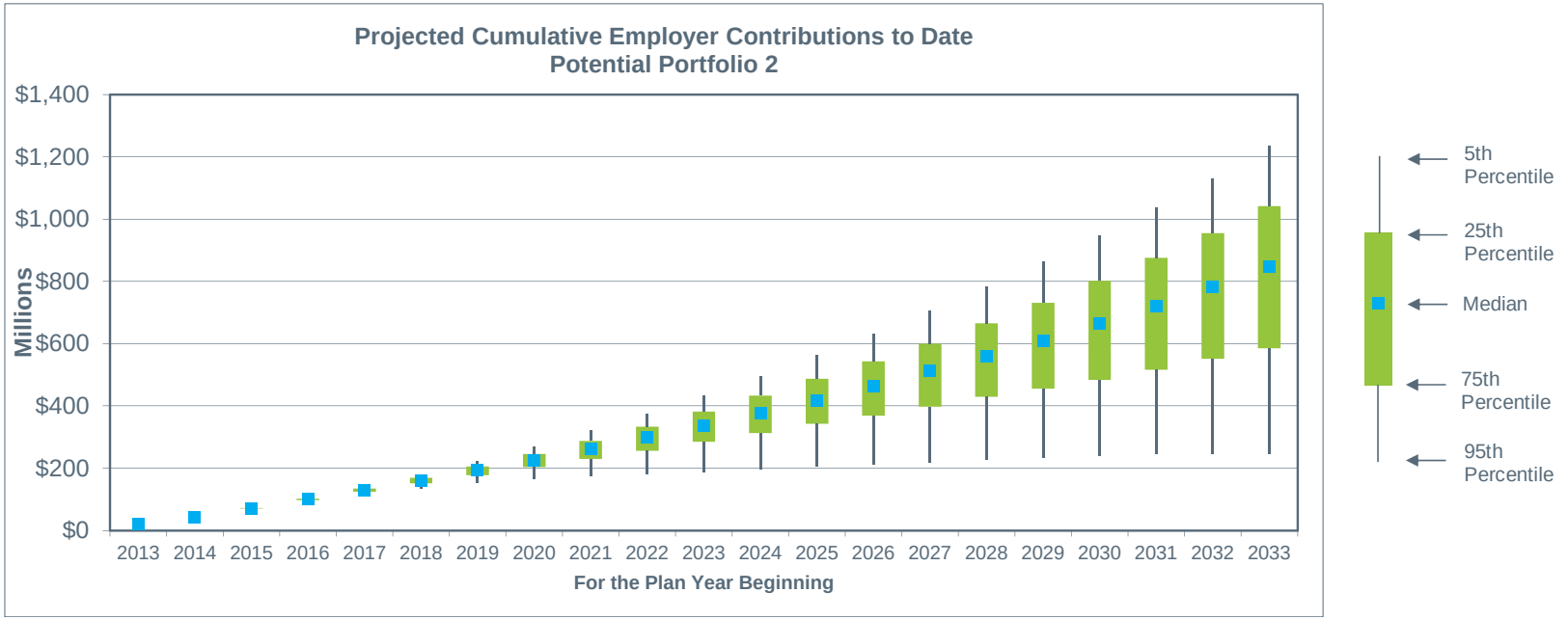



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $21 | $43 | $73 | $105 | $140 | $177 | $217 | $262 | $311 | $363 | $417 | $476 | $540 | $607 | $677 | $751 | $829 | $907 | $996 | $1,094 | $1,196 |
| **25th Percentile** | $21 | $43 | $72 | $102 | $134 | $168 | $204 | $243 | $285 | $329 | $377 | $428 | $481 | $537 | $596 | $658 | $725 | $797 | $874 | $953 | $1,039 |
| **Median** | $21 | $43 | $71 | $100 | $130 | $161 | $194 | $229 | $265 | $303 | $344 | $386 | $431 | $480 | $529 | $581 | $639 | $698 | $759 | $826 | $895 |
| **75th Percentile** | $21 | $43 | $70 | $98 | $126 | $154 | $183 | $212 | $243 | $274 | $306 | $340 | $374 | $407 | $447 | $487 | $527 | $568 | $607 | $660 | $711 |
| **95th Percentile** | $21 | $43 | $69 | $95 | $121 | $144 | $166 | $186 | $204 | $221 | $239 | $256 | $272 | $285 | $301 | $312 | $327 | $342 | $361 | $378 | $392 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 2

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

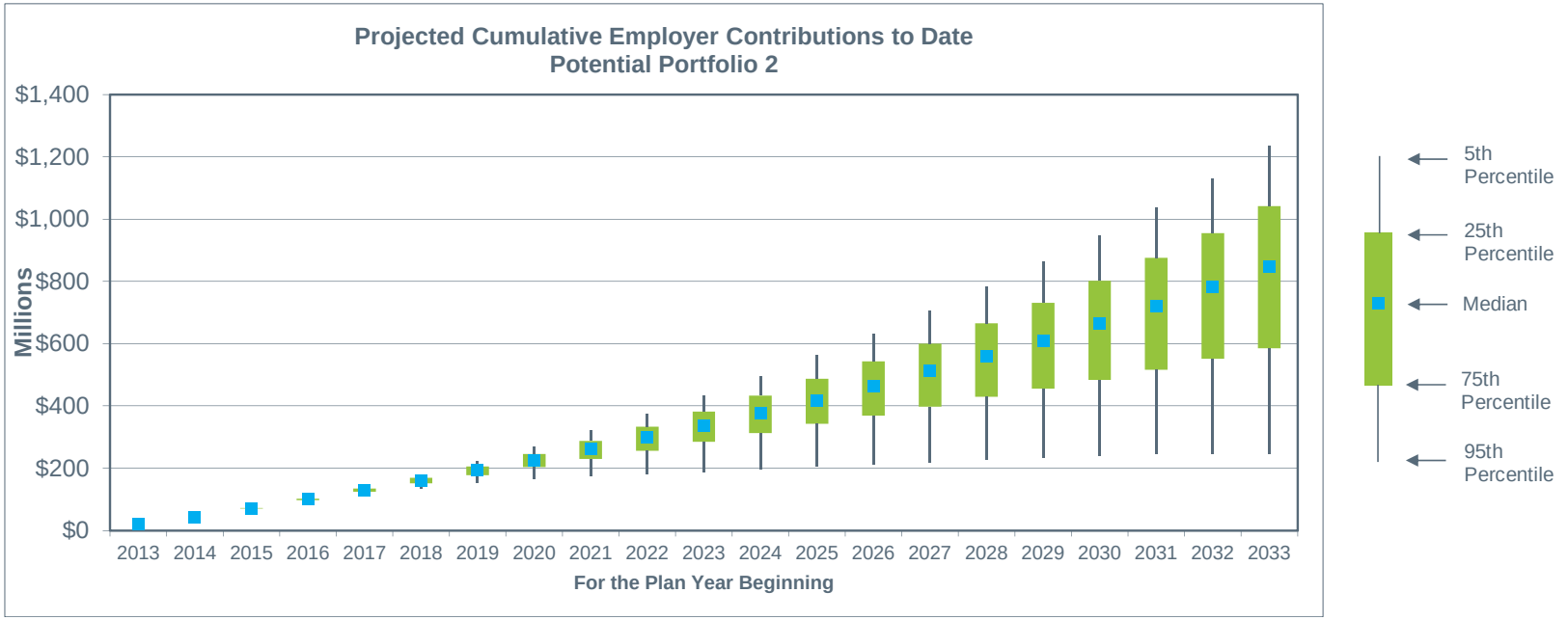



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $21 | $43 | $73 | $106 | $141 | $180 | $222 | $270 | $321 | $375 | $433 | $495 | $562 | $632 | $707 | $784 | $862 | $946 | $1,037 | $1,129 | $1,236 |
| **25th Percentile** | $21 | $43 | $72 | $103 | $135 | $169 | $206 | $246 | $288 | $333 | $381 | $433 | $487 | $543 | $600 | $665 | $732 | $802 | $875 | $955 | $1,041 |
| **Median** | $21 | $43 | $71 | $100 | $130 | $160 | $192 | $226 | $262 | $298 | $336 | $376 | $418 | $464 | $511 | $559 | $609 | $663 | $722 | $784 | $848 |
| **75th Percentile** | $21 | $43 | $70 | $98 | $125 | $151 | $178 | $204 | $230 | $256 | $285 | $313 | $343 | $368 | $398 | $429 | $456 | $483 | $516 | $551 | $585 |
| **95th Percentile** | $21 | $43 | $69 | $94 | $117 | $136 | $153 | $166 | $175 | $181 | $189 | $196 | $206 | $213 | $220 | $226 | $234 | $241 | $245 | $247 | $247 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 3

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

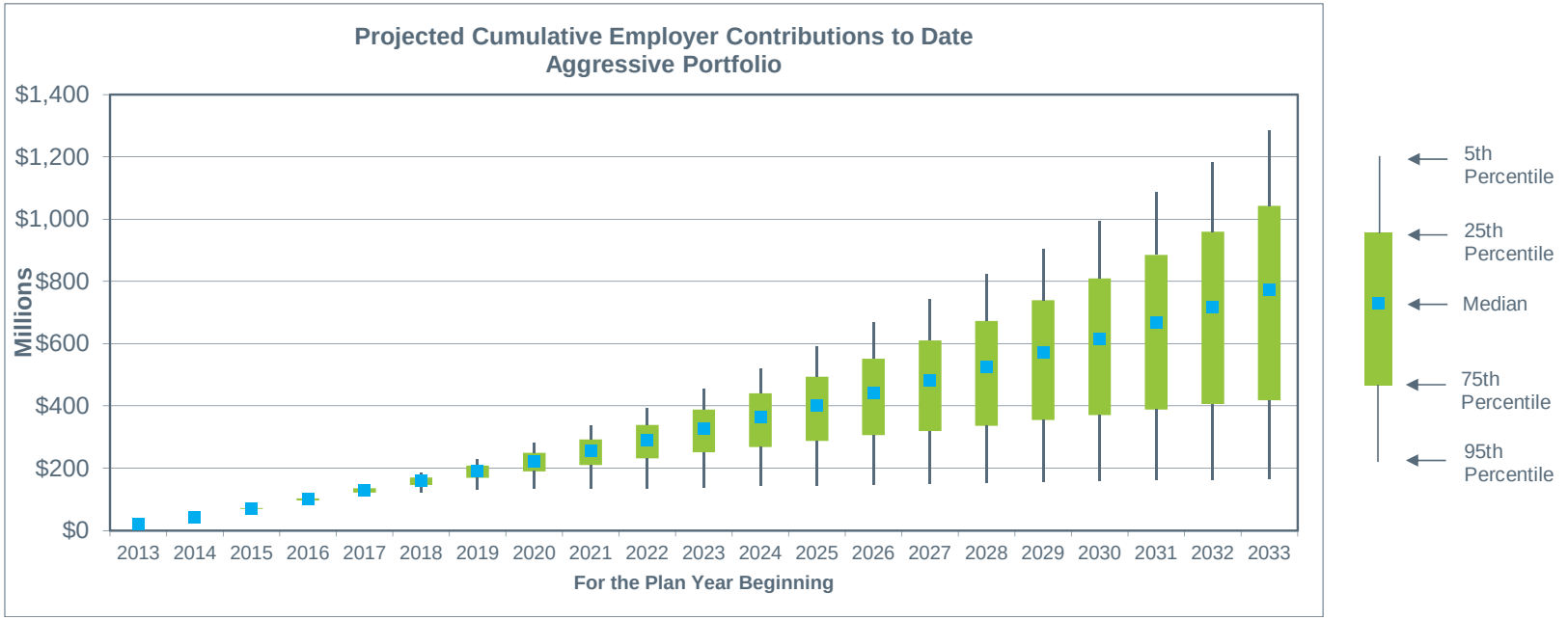



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $21 | $43 | $73 | $106 | $142 | $182 | $226 | $275 | $328 | $384 | $444 | $508 | $576 | $649 | $726 | $806 | $883 | $972 | $1,062 | $1,155 | $1,258 |
| **25th Percentile** | $21 | $43 | $72 | $103 | $135 | $170 | $207 | $247 | $290 | $336 | $384 | $436 | $491 | $546 | $604 | $668 | $735 | $804 | $880 | $957 | $1,043 |
| **Median** | $21 | $43 | $71 | $100 | $129 | $160 | $191 | $224 | $259 | $295 | $331 | $371 | $410 | $453 | $497 | $542 | $593 | $642 | $697 | $751 | $817 |
| **75th Percentile** | $21 | $43 | $70 | $97 | $123 | $149 | $174 | $197 | $221 | $246 | $268 | $293 | $316 | $341 | $359 | $385 | $407 | $427 | $446 | $475 | $498 |
| **95th Percentile** | $21 | $43 | $69 | $93 | $114 | $131 | $143 | $149 | $155 | $158 | $163 | $166 | $170 | $173 | $180 | $187 | $190 | $193 | $198 | $203 | $205 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Aggressive Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $21 | $43 | $73 | $107 | $144 | $184 | $230 | $281 | $336 | $394 | $454 | $520 | $591 | $668 | $742 | $824 | $905 | $993 | $1,085 | $1,183 | $1,286 |
| **25th Percentile** | $21 | $43 | $72 | $103 | $136 | $171 | $209 | $249 | $293 | $339 | $388 | $441 | $494 | $551 | $610 | $672 | $740 | $809 | $885 | $959 | $1,043 |
| **Median** | $21 | $43 | $71 | $100 | $129 | $159 | $190 | $222 | $256 | $291 | $326 | $363 | $401 | $441 | $481 | $526 | $571 | $614 | $667 | $718 | $772 |
| **75th Percentile** | $21 | $43 | $70 | $97 | $122 | $146 | $169 | $190 | $210 | $231 | $251 | $268 | $288 | $306 | $319 | $336 | $355 | $370 | $388 | $406 | $418 |
| **95th Percentile** | $21 | $43 | $68 | $92 | $110 | $123 | $131 | $133 | $134 | $136 | $138 | $143 | $145 | $147 | $150 | $153 | $155 | $157 | $161 | $162 | $165 |

# Stochastic Analysis (continued)

## Employer Contributions (as a weighted average percentage of salary)

The tables below show the range of required employer contributions (as a weighted average percentage of salary) assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Required Employer Contribution for Plan Year Beginning 2019 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 26% | 22% | 20% | 17% | 13% |
| Conservative Portfolio | 25% | 23% | 21% | 20% | 17% |
| Potential Portfolio 1 | 25% | 22% | 20% | 17% | 14% |
| Potential Portfolio 2 | 26% | 22% | 19% | 16% | 12% |
| Potential Portfolio 3 | 27% | 23% | 19% | 16% | 10% |
| Aggressive Portfolio | 28% | 23% | 19% | 15% | 8% |

| 10 Years | Required Employer Contribution for Plan Year Beginning 2024 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 34% | 27% | 21% | 14% | 2% |
| Conservative Portfolio | 34% | 28% | 25% | 22% | 16% |
| Potential Portfolio 1 | 33% | 27% | 21% | 16% | 6% |
| Potential Portfolio 2 | 35% | 27% | 20% | 13% | 0% |
| Potential Portfolio 3 | 36% | 27% | 20% | 11% | 0% |
| Aggressive Portfolio | 37% | 27% | 19% | 9% | 0% |

| 20 Years | Required Employer Contribution for Plan Year Beginning 2034 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 47% | 33% | 23% | 11% | 0% |
| Conservative Portfolio | 50% | 38% | 32% | 26% | 18% |
| Potential Portfolio 1 | 47% | 33% | 24% | 15% | 0% |
| Potential Portfolio 2 | 47% | 33% | 22% | 9% | 0% |
| Potential Portfolio 3 | 47% | 33% | 21% | 4% | 0% |
| Aggressive Portfolio | 48% | 33% | 19% | 0% | 0% |

# Stochastic Analysis (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 63% | 45% | 89% | 61% | 36% | 100% | $161 | $178 | $139 | 11% | 19% | 7% |
| Conservative Portfolio | 58% | 49% | 68% | 53% | 42% | 68% | $165 | $176 | $154 | 13% | 17% | 10% |
| Potential Portfolio 1 | 62% | 47% | 83% | 60% | 39% | 91% | $161 | $177 | $144 | 11% | 18% | 7% |
| Potential Portfolio 2 | 64% | 44% | 93% | 62% | 35% | 105% | $160 | $180 | $136 | 11% | 20% | 6% |
| Potential Portfolio 3 | 65% | 41% | 100% | 63% | 32% | 117% | $160 | $182 | $131 | 11% | 21% | 6% |
| Aggressive Portfolio | 66% | 39% | 109% | 64% | 29% | 132% | $159 | $184 | $123 | 10% | 23% | 5% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 61% | 33% | 111% | 59% | 28% | 116% | $339 | $428 | $208 | 12% | 25% | 6% |
| Conservative Portfolio | 50% | 36% | 68% | 46% | 31% | 67% | $371 | $414 | $328 | 15% | 23% | 10% |
| Potential Portfolio 1 | 60% | 36% | 100% | 58% | 31% | 105% | $344 | $417 | $239 | 12% | 24% | 6% |
| Potential Portfolio 2 | 63% | 32% | 120% | 61% | 27% | 125% | $336 | $433 | $189 | 11% | 27% | 5% |
| Potential Portfolio 3 | 64% | 30% | 135% | 62% | 25% | 145% | $331 | $444 | $163 | 11% | 29% | 5% |
| Aggressive Portfolio | 66% | 28% | 159% | 64% | 23% | 172% | $326 | $454 | $138 | 11% | 31% | 4% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 67% | 36% | 140% | 65% | 32% | 144% | $868 | $1,221 | $290 | 11% | 29% | 5% |
| Conservative Portfolio | 51% | 36% | 70% | 47% | 31% | 67% | $1,072 | $1,219 | $877 | 15% | 28% | 10% |
| Potential Portfolio 1 | 65% | 38% | 117% | 62% | 33% | 118% | $895 | $1,196 | $392 | 11% | 27% | 6% |
| Potential Portfolio 2 | 69% | 36% | 157% | 67% | 31% | 162% | $848 | $1,236 | $247 | 10% | 30% | 4% |
| Potential Portfolio 3 | 71% | 35% | 199% | 70% | 30% | 200% | $817 | $1,258 | $205 | 10% | 32% | 3% |
| Aggressive Portfolio | 75% | 33% | 255% | 74% | 28% | 267% | $772 | $1,286 | $165 | 9% | 35% | 3% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility"

This section provides a sensitivity analysis of the original stochastic projections by assuming the risk (as measured by standard deviation) of each asset class is doubled. These modified assumptions are outlined in the table below, compared to the original values:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption | Standard Deviation Assumption Doubled |
|---|---|---|---|
| Global Equity | 7.80 | 18.35 | 36.70 |
| Int. Duration Fixed Income | 3.50 | 6.00 | 12.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 | 21.58 |
| Core Real Estate | 6.75 | 12.50 | 25.00 |
| Diversified Hedge Funds | 6.50 | 9.50 | 19.00 |
| Private Equity | 10.50 | 26.00 | 52.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 | 22.90 |
| Cash Equivalents | 2.25 | 3.00 | 6.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that potential increased capital market volatility does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, exacerbating the potential best and worst-case scenarios.

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 68% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 19% | 57% | 26% | -62% | 33% |
| Conservative Portfolio | 1% | 80% | 18% | -41% | 29% |
| Potential Portfolio 1 | 15% | 59% | 23% | -56% | 32% |
| Potential Portfolio 2 | 22% | 56% | 26% | -65% | 34% |
| Potential Portfolio 3 | 25% | 54% | 28% | -70% | 35% |
| Aggressive Portfolio | 29% | 53% | 30% | -74% | 37% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 68% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 26% | 57% | 32% | -62% | 46% |
| Conservative Portfolio | 4% | 81% | 38% | -41% | 44% |
| Potential Portfolio 1 | 21% | 60% | 30% | -56% | 45% |
| Potential Portfolio 2 | 29% | 55% | 32% | -65% | 46% |
| Potential Portfolio 3 | 32% | 53% | 33% | -71% | 47% |
| Aggressive Portfolio | 35% | 51% | 33% | -76% | 49% |

| 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 | 34% | 49% | 27% | -63% | 71% |
| Conservative Portfolio | 4% | 79% | 35% | -41% | 72% |
| Potential Portfolio 1 | 28% | 53% | 26% | -56% | 71% |
| Potential Portfolio 2 | 38% | 47% | 26% | -67% | 71% |
| Potential Portfolio 3 | 42% | 45% | 27% | -72% | 70% |
| Aggressive Portfolio | 45% | 43% | 27% | -77% | 70% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 64% | 30% | 126% | 62% | 21% | 160% | $160 | $197 | $112 | 11% | 32% | 4% |
| Conservative Portfolio | 58% | 42% | 79% | 54% | 32% | 86% | $165 | $188 | $144 | 13% | 22% | 7% |
| Potential Portfolio 1 | 63% | 34% | 111% | 60% | 25% | 137% | $161 | $193 | $123 | 11% | 28% | 5% |
| Potential Portfolio 2 | 64% | 27% | 135% | 63% | 20% | 175% | $160 | $201 | $106 | 11% | 35% | 4% |
| Potential Portfolio 3 | 65% | 24% | 154% | 63% | 16% | 212% | $159 | $206 | $96 | 11% | 42% | 3% |
| Aggressive Portfolio | 66% | 20% | 183% | 64% | 13% | 256% | $158 | $213 | $84 | 10% | 51% | 3% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 62% | 18% | 207% | 60% | 13% | 225% | $338 | $494 | $121 | 11% | 55% | 3% |
| Conservative Portfolio | 50% | 25% | 92% | 46% | 21% | 94% | $370 | $456 | $276 | 15% | 36% | 7% |
| Potential Portfolio 1 | 60% | 20% | 166% | 58% | 16% | 183% | $341 | $475 | $140 | 12% | 48% | 3% |
| Potential Portfolio 2 | 63% | 16% | 232% | 62% | 12% | 259% | $333 | $505 | $112 | 11% | 60% | 3% |
| Potential Portfolio 3 | 66% | 14% | 291% | 64% | 11% | 336% | $328 | $522 | $99 | 11% | 71% | 2% |
| Aggressive Portfolio | 67% | 12% | 388% | 66% | 9% | 452% | $321 | $538 | $90 | 10% | 87% | 1% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 71% | 23% | 370% | 70% | 18% | 391% | $848 | $1,402 | $137 | 10% | 65% | 2% |
| Conservative Portfolio | 52% | 24% | 97% | 48% | 20% | 96% | $1,066 | $1,344 | $567 | 15% | 51% | 6% |
| Potential Portfolio 1 | 67% | 23% | 266% | 65% | 19% | 277% | $875 | $1,350 | $180 | 11% | 58% | 2% |
| Potential Portfolio 2 | 73% | 22% | 448% | 72% | 17% | 477% | $829 | $1,423 | $125 | 9% | 69% | 1% |
| Potential Portfolio 3 | 76% | 21% | 649% | 78% | 16% | 714% | $800 | $1,471 | $107 | 9% | 79% | 1% |
| Aggressive Portfolio | 82% | 20% | 961% | 87% | 15% | 1079% | $753 | $1,503 | $94 | 8% | 90% | 1% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations"

This section provides a sensitivity analysis of the original stochastic projections by assuming that all asset classes are perfectly positively correlated (i.e. correlation = 1.00). A correlation matrix reflecting these modified assumptions is provided below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Int. Duration Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Custom KRS Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Core Real Estate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Hedge Funds | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Private Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Inflation Strategies | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Cash Equivalents | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that converging correlations across capital markets does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, indicating higher risk for all asset mixes given the dampened effects of total fund diversification.

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 68% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 13% | 61% | 16% | -41% | 29% |
| Conservative Portfolio | 0% | 85% | 10% | -23% | 27% |
| Potential Portfolio 1 | 10% | 63% | 15% | -38% | 28% |
| Potential Portfolio 2 | 14% | 59% | 16% | -43% | 29% |
| Potential Portfolio 3 | 17% | 57% | 18% | -47% | 30% |
| Aggressive Portfolio | 20% | 55% | 20% | -51% | 31% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 68% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 19% | 59% | 26% | -41% | 40% |
| Conservative Portfolio | 1% | 87% | 33% | -23% | 37% |
| Potential Portfolio 1 | 16% | 61% | 26% | -38% | 39% |
| Potential Portfolio 2 | 21% | 57% | 26% | -43% | 40% |
| Potential Portfolio 3 | 25% | 55% | 26% | -47% | 41% |
| Aggressive Portfolio | 29% | 53% | 26% | -51% | 42% |

| 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 | 25% | 54% | 22% | -48% | 56% |
| Conservative Portfolio | 1% | 86% | 33% | -29% | 55% |
| Potential Portfolio 1 | 21% | 57% | 23% | -46% | 55% |
| Potential Portfolio 2 | 28% | 52% | 22% | -50% | 56% |
| Potential Portfolio 3 | 33% | 49% | 22% | -54% | 57% |
| Aggressive Portfolio | 36% | 46% | 22% | -58% | 57% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 64% | 40% | 102% | 61% | 30% | 121% | $160 | $175 | $136 | 11% | 23% | 5% |
| Conservative Portfolio | 58% | 46% | 74% | 53% | 37% | 78% | $164 | $170 | $158 | 13% | 19% | 8% |
| Potential Portfolio 1 | 63% | 41% | 97% | 60% | 31% | 114% | $161 | $174 | $140 | 11% | 22% | 6% |
| Potential Portfolio 2 | 64% | 39% | 105% | 62% | 30% | 127% | $160 | $176 | $133 | 11% | 24% | 5% |
| Potential Portfolio 3 | 65% | 37% | 113% | 63% | 28% | 139% | $159 | $178 | $127 | 11% | 25% | 5% |
| Aggressive Portfolio | 65% | 34% | 122% | 64% | 26% | 154% | $158 | $180 | $119 | 11% | 27% | 4% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 62% | 26% | 143% | 59% | 22% | 152% | $339 | $426 | $159 | 12% | 34% | 4% |
| Conservative Portfolio | 50% | 31% | 80% | 46% | 26% | 78% | $370 | $407 | $307 | 15% | 29% | 8% |
| Potential Portfolio 1 | 60% | 27% | 130% | 57% | 22% | 137% | $343 | $422 | $172 | 12% | 33% | 5% |
| Potential Portfolio 2 | 63% | 25% | 152% | 60% | 21% | 163% | $336 | $429 | $153 | 12% | 35% | 4% |
| Potential Portfolio 3 | 65% | 24% | 172% | 62% | 19% | 187% | $332 | $436 | $137 | 11% | 38% | 3% |
| Aggressive Portfolio | 66% | 23% | 199% | 64% | 18% | 219% | $327 | $444 | $125 | 11% | 42% | 3% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 67% | 29% | 216% | 64% | 24% | 226% | $863 | $1,225 | $185 | 11% | 43% | 3% |
| Conservative Portfolio | 51% | 31% | 81% | 47% | 26% | 81% | $1,070 | $1,196 | $749 | 15% | 38% | 8% |
| Potential Portfolio 1 | 64% | 30% | 182% | 62% | 25% | 189% | $894 | $1,217 | $211 | 11% | 42% | 3% |
| Potential Portfolio 2 | 68% | 29% | 243% | 66% | 23% | 257% | $842 | $1,232 | $169 | 11% | 45% | 2% |
| Potential Portfolio 3 | 71% | 28% | 303% | 70% | 23% | 323% | $809 | $1,246 | $146 | 10% | 49% | 2% |
| Aggressive Portfolio | 75% | 27% | 392% | 74% | 21% | 419% | $774 | $1,263 | $133 | 10% | 53% | 2% |

# Appendix 3: Assumptions and Methods

**Actuarial Valuation Assumptions and Methods**: At the beginning of each projection year, an actuarial valuation is performed to determine employer contributions. The assumptions proposed in the 2013 Experience Study were used with actuarial valuations beginning in 2015 and beyond. These methods and assumptions are summarized below:

| | |
|---|---|
| **Actuarial Cost Method** | Entry-Age Normal (level % of pay). Funding policies and methods are described in the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Liability Discount Rate** | 7.50% per year, compounded annually. |
| **Future Pay Increases** | Future pay increases as recommended in the 2013 Experience Study. Pay increases include a 4.00% base wage inflation rate. |
| **Retirement** | Rates of retirement as recommended in the 2013 Experience Study. |
| **Mortality** | Rates of mortality as recommended in the 2013 Experience Study. |
| **Disability** | Rates of disability as recommended in the 2013 Experience Study. |
| **Withdrawal** | Rates of withdrawal as recommended in the 2013 Experience Study. |
| **Asset Valuation Method** | 5-Year smoothing of actual versus expected returns. The asset valuation method is described on page 36 of the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Contribution Policy** | For fiscal years 2017 and beyond, employer contributions are assumed to equal the full actuarially required contribution consisting of: (1) gross normal cost, less (2) expected employee contributions, plus (3) administrative expenses (0.69% of 2014-15 payroll, growing at inflation each year), plus (4) an amortization of the unfunded actuarial liability over 29 years beginning in 2014, calculated as a level percentage of payroll assuming 4.00% payroll growth. The amortization period was not assumed to reset at any point in the future, and was not allowed to fall below 10 years. |

# Appendix 3: Assumptions and Methods (continued)

**Projection Assumptions (used in the deterministic and stochastic asset/liability projections)**: These projections begin with the Plan's participant population as of June 30, 2014, as provided by Cavanaugh. The Plan's population is projected forward and assumed to change as a result of employment separation, death, disability, and retirement, as predicted by the assumptions recommended in the 2013 Experience Study (and described on the prior pages). New members are assumed to enter the Plan such that the active population remains level throughout the projection. Employee compensation is projected into the future in accordance with the assumptions described on the prior pages. Investment returns are projected into the future in accordance with the assumptions described below.

| | |
|---|---|
| **Employer Contributions** | For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013 (16.37% of payroll). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study. |
| **Member Contributions** | Member contributions are determined based on current contribution rates, and projected pay. |
| **New Entrants** | New employees are assumed to join the Plan such that the active population remains level throughout the projection. New employees entering the Plan are assumed to have characteristics similar to recently hired participants. |
| **Rate of Return on Assets** | Deterministic Analysis: 7.50%, compounded annually.<br><br>Stochastic Analysis: Returns on the portfolio are based on the expected returns of each asset class and the correlations between each class which are detailed in the Stochastic Analysis section of this report. |
| **Cash Balance Interest Credit** | Deterministic Analysis: 7.00%, compounded annually.<br><br>Stochastic Analysis: Interest credits are based on the expected returns of a benchmark portfolio designed to mirror the overall portfolio return. |

# Appendix 3: Assumptions and Methods (continued)

**Inflation**

2.50% per year with a standard deviation of 3.00%.

**Other**

All other projection assumptions are the same as those recommended in the 2013 Experience Study.

Our work was based partly on original work prepared by Cavanaugh using the ProVal valuation software. This included their coding of benefit provisions and the methodology to generate liabilities under the entry age normal actuarial cost method. Cavanaugh provided us with an actuarial valuation as of June 30, 2014, using assumptions from the 2013 Experience Study. We reviewed this work for reasonableness, but we did not perform a complete audit of this work.

We started with Cavanaugh's base year valuation work. Certain changes to the coding of benefit provisions were required in order to facilitate a 20-year projection of liabilities and costs. For example, we added employee contribution definitions in order to offset gross normal cost calculations by expected employee contributions. In some cases, scaling of liabilities was used to approximate liabilities not valued directly in the work provided by Cavanaugh.

The participant data provided by Cavanaugh was the same as that used in the actuarial valuation as of June 30, 2014, for KERS Hazardous funding purposes. This data was used without grouping or adjustment.

It is our understanding that Kentucky law does not allow employer contribution rates to change in the second year of a biennium for the KERS systems. This means that an actuarial valuation every other year provides the funding rates for the following two fiscal years. We were not able to model this feature. Instead, we modeled contribution rates based on annual valuations with a one-year lag period.

May 2015

# Asset/Liability Study

## CERS Non-Hazardous Pension Plan

# Memorandum

| | |
|---|---|
| To | Kentucky Employees Retirement System |
| From | RVK, Inc. |
| Subject | CERS-NHPP Asset/Liability Study – Executive Summary |
| Date | May 5, 2015 |

## Introduction

The purpose of this memorandum is to summarize the key inferences we draw from the Asset/Liability ("A/L") study of the CERS Non-Hazardous Pension Plan ("CERS-NHPP" or the "Plan"). While this memorandum refers directly to points raised within the study, we emphasize that a full understanding of the A/L study and its implications requires a close review of the study in its entirety.

## Background and Key Conclusions

As of the fiscal year beginning June 30, 2014, the date of the most recent actuarial valuation and the start date of the projections in this study, the Plan was 67% funded (on a market value basis) meaning that assets were available to cover 67% of Plan liabilities as currently estimated by the Plan's actuary. This equates to a shortfall of approximately $3.3 billion. This is a significant concern for the future of the Plan's financial health, however, this study shows that the Plan remains solvent and while the Plan's funding ratio will fluctuate during this period, the study suggests the potential for reducing the funding gap over the next 20 years.

As highlighted below, this study suggests that continued diversification in the investment of Plan assets is desirable. The study, however, suggests caution in assuming that increased pursuit of higher expected returns, through even more aggressive (and hence even more volatile) asset allocations, is always beneficial. High expected return and high expected risk approaches bring with them increased risk of large declines in the value of the Plan and increased volatility in required contributions.

## The Purpose of an Asset Liability Study

The central purpose of an A/L study is to examine the probable future consequences, over extended periods of time, of applying alternative asset allocation strategies to the Plan's investment assets in order to fund the liabilities created by the benefit provisions of the Plan. A/L studies are unique in their ability to combine in a single analysis the three critical factors that drive the financial health of the Plan—benefit policy (liabilities), contribution policy, and investment strategy (asset allocation). Certainly this type of forward looking study—nor any others we are aware of—cannot indicate with any reliability what will happen in any given year over this extended period of time and its insights are dependent on the assumptions used. However, we have high conviction that the study's results paint a highly reliable view of the core long-term trends in the Plan's financial health. Best practice, in our judgment, is to take the

general direction suggested as most appropriate by this study with its unique consideration of liabilities, contribution policy and trending liquidity needs and refine it in an asset allocation study where implementing the Plan's structure can reflect the pragmatic considerations of investing in the capital markets present at any given point in time.

**Deterministic versus Stochastic**

In this study, we examined a series of related questions associated with this central purpose, projecting future outcomes under two distinctly different methodologies:

1. a **deterministic** basis (all underlying assumptions, liabilities, contributions and most critically investment returns, are achieved precisely and without variance in each and every year); and

2. a **stochastic** basis (outcomes for investment returns vary each year according to estimated volatility with contribution *requirements* following suit while *actual* contribution policy and liabilities remains in their current form).

**Key Results**

Below you will find a series of important findings, forecasts, and conclusions drawn from the body of the study. While the remarks are presented here to allow a quick assessment of some of the key findings, they represent only a sampling of the fundamental elements of the study. We emphasize that a solid understanding of each element requires that they be reviewed as they are presented in the study itself within their surrounding context (please note the frequent page references to the full study). This is especially important to understanding the findings which represent *probable, but not certain,* outcomes as analyzed in the stochastic section of the study.

*At the Outset:*

- As of June 30, 2014 (the date of the actuarial valuation used to model liabilities), the Plan's market value funded ratio (available assets to fund benefit obligations) was 67% (page 6).

- The number of active members currently exceeds the number of inactive members by approximately 54%. Over time, the inactive population is projected to grow and begin to quickly outnumber the active member population (page 8). The maturing demographics of the Plan is an important factor when considering the findings on Plan risk/return options and the projected status of Plan liquidity below.

*Deterministic Analysis: A deterministic analysis assumes full certainty about the future, in particular, certainty of investment returns. Its 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.*

- Benefit payments to Plan participants are expected to increase by about 101% over the next 20 years (page 9). Annual increases are projected to range between 2% and 5%.

- Total annual dollar contributions (employer and employee) based on actuarially required rates are expected to almost double over the next 20 years; from $403 million in 2014 to $737 million in 2034 (page 10). *Please note however*, that precise actuarially required rates as they unfold are the purview of the Plan's actuary and are affected by factors other than investment returns and resulting asset values of the Plan.

- Beginning in 2016, contributions expressed as a weighted average percentage of salary are projected to remain constant (page 11).

- Aggregate benefit payments are expected to increase by about 101% over the next 20 years but actually remain roughly constant as a percentage of Plan assets over this same time period (pages 9 and 12). Not only do benefit payments as a percentage of Plan assets not increase, they are also healthy and sustainable on an absolute basis during this period. This is an important and positive indication, because increased payout ratios, if they rise sufficiently high, can potentially impose liquidity constraints on the management of the portfolio (inhibiting the ability of the Plan to invest with a long-term horizon) therefore limiting the opportunity to invest in less liquid asset classes regardless of the return or risk reducing diversification benefits they offer. The payout ratio is projected to fluctuate between 10% and 11%% during the projection period. These levels do not, in our opinion, materially inhibit investment opportunities for the Plan (page 12).

- As assets grow each and every year without exception at the assumed rate of return (7.50%), the funding ratio on a market value basis is expected to gradually increase to approximately 78% by 2034 from the current value of 67% (page 17).

- Assuming the current contribution policy remains unchanged, the Plan would need to experience annual returns in excess of 11% over the next 10 years or 9% over the next 20 years *without exception in each and every year* in order to reach full funding (page 18). Achieving such lofty returns on such a sustained basis is extremely unlikely in our judgment and underscores our conclusion that investment returns alone cannot move the Plan to full funding.

- Experiencing a return of 100 basis points below the Plan's current assumed rate of return of 7.50% (i.e., 6.50%) each year for the 20 year projection period would result in a moderate decline in the projected funding ratio to 67% in year 20 versus 78% at the current assumed rate of return (page 19). Additionally, under this scenario cumulative employer contributions would be $1.2 billion higher over the 20 year period. Given the widely shared concerns about the prospects for a low return environment in the capital markets over the foreseeable future, this is a conclusion that should be thoroughly understood and appreciated. In the event that capital markets do not support returns

commensurate with the assumed rate of return, reliance on contributions to complete the payout of the Plan's liabilities effectively increases, especially in later years.

*Stochastic Analysis: Unlike a deterministic analysis, a stochastic analysis does not assume an unvarying stream of expected investment returns year after year. Instead, it reflects the realistic view that pension plan investment returns are—like the investment markets themselves—volatile and always uncertain. This means that there are a range of possible outcomes for CERS-NHPP; some are more likely, others less likely, but still possible.*

*The deterministic approach is useful for gauging the general direction of change and associated consequences, but adding the element of uncertainty—more specifically year to year variability in the performance of the capital markets and the value of the Plan's assets over time—can offer additional insights, albeit along with considerable complexity.*

Uncertainty in future investment returns is taken into account via a stochastic analysis of six different investment approaches (in the table below and on page 25) ranging from highly conservative (low risk, asset protective) to highly aggressive (high return seeking with substantial associated risk), including the Current Target allocation CERS-NHPP. The reason for testing such a broad range of approaches is that at the heart of the CERS-NHPP situation is a simple question that is difficult to answer: whether the Plan is 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).

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | 30 | 70 | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | 0 | 30 | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | 0 | 30 | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | 5 | 15 | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | 2 | 15 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | 2 | 5 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

Essential to answering this question is to ask precisely how CERS-NHPP and the Plan's broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plan is "better off" under one approach versus another are as follows:

(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 Plan's ability to pay annual benefits without major disruption of its strategic asset allocation, the driver of its investment strategy).

(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 Plan's assets over the course of time and the associated effects on contributions and potentially investment decisions.

The results of this analysis are displayed on pages 26 through 46 of the accompanying A/L study. For purposes of this summary, the consequences of choosing A versus B, as described above, is summarized most clearly in the tables on pages 32 and 46 of the study (copied below followed by explanatory comments).

| 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% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 63% | 31% | 140% | 61% | 27% | 144% | $10 | $14 | $3 | 14% | 34% | 6% |
| Conservative Portfolio | 46% | 30% | 66% | 42% | 26% | 63% | $12 | $14 | $10 | 20% | 35% | 9% |
| Potential Portfolio 1 | 60% | 32% | 115% | 57% | 28% | 118% | $10 | $14 | $4 | 14% | 32% | 7% |
| Potential Portfolio 2 | 64% | 30% | 159% | 62% | 26% | 163% | $10 | $14 | $3 | 13% | 35% | 5% |
| Potential Portfolio 3 | 67% | 29% | 203% | 66% | 25% | 205% | $9 | $14 | $2 | 13% | 38% | 4% |
| Aggressive Portfolio | 70% | 28% | 267% | 70% | 24% | 281% | $9 | $15 | $2 | 12% | 41% | 3% |

- The median expected funding ratio at the end of the 20 year study period is lower than the current funding level all but the Aggressive Portfolio (pages 31, 32, and 46). The Current Target, Potential Portfolio 2, and Potential Portfolio 3 result in expected funding ratios that are substantially similar to the current level. This is supportive of the continued utilization of diversified investment approach.

- With the exception of the Conservative Portfolio all portfolios analyzed show a moderate (from 10% to 32%) probability of full funding in 20 years (page 32). The Conservative Portfolio shows a no probability of full funding in 20 years.

- None of the portfolios show significant probability of extreme payout ratios over the next 20 years (pages 33-38 and 46). However, the peak value for all portfolios is above 30%, a level that does inhibit asset allocation decisions as they relate to illiquid asset classes.

- As you incrementally increase the expected risk and return of the fund (from Potential Portfolio 1 to Potential Portfolio 3), the outcomes do appear to gradually improve at the cost of slightly reduced worst-case outcomes.

- The cumulative cost of providing the Plan's benefits is met through a combination of contributions and the investment returns on those contributions. The Conservative Portfolio requires the largest increase in cumulative contributions (i.e., the direct funding of benefits) (pages 40, 45, and 46). Even under the very unlikely best-case scenario the Plan would have a funded ratio of about 42%, far lower than any of the other portfolios (page 46). The only redeeming virtue of such an ultra-conservative approach is that the potential for large declines in the value of the fund is significantly mitigated albeit at much higher ongoing costs (contributions) and chronic poor Plan financial health.

- The Aggressive Portfolio does appear to have the highest *probability* of producing full funding by 2034 at 32% (page 32). *However*, it also has a maximum theoretical one-year portfolio decline of 51%—a loss of almost one half of the Plan's assets, significant we believe by any standard. This likelihood of notably larger one year declines within the study period gives pause to the desirability of a far more aggressive approach simply from a quantitative viewpoint. It also suggests it may be a strategy that is extremely difficult for decision makers to sustain over a long period of time. Declines in the total fund market value of this magnitude are a disruptive event from all aspects of Plan management. Yet, the benefit of such an aggressive approach that makes it superficially attractive can only be realized with any probability if the aggressive and highly volatile

approach is maintained for several decades through good times, bad times, and unnerving times. Furthermore, this type of strategy could prove difficult to maintain in future years should demographic (early retirement incentives for example) or financial events create higher liquidity demands on the Plan. For all these reasons, it is not an approach that should be seriously considered without full recognition of the significant risks.

- While RVK supports the conclusions of the study using our current capital market assumptions, we also model for extreme market scenarios to stress test the results of the study. The summary of this analysis can be found in Appendices 1 and 2 (beginning on pages 47 and 50 respectively). The first test models the case of extreme market volatility by doubling the assumed standard deviations of all asset classes. The second test models converging market returns by assuming all assets are perfectly correlated (i.e. correlations equal +1.00). The results of these additional analyses show that the *relative* portfolio outcomes do not change, but that the range of potential results widens, indicating higher risk for all asset mixes given the increased systemic volatility and the reduced dampening effects of total fund diversification we assume under these stress scenarios.

**Final Comments**

This A/L study shows that CERS-NHPP is currently underfunded but significant improvements in financial health are possible. The Plan can best meet its objectives through the continued use of a well-diversified investment portfolio. However, positive outcomes are extremely dependent on the contribution policy. The study is not supportive of a long-term, ultra-conservative approach. The increasing potential for large one-year declines suggests that there is likely a limit to the net benefits of adding increased risk in pursuit of additional return. Progress should be monitored periodically through studies such as these, particularly if the Plan encounters a sustained period of lower returns in the capital markets (and thus for the Plan's assets) as well as material changes in contribution policy or benefit levels.

Additionally, this study assumes no further changes are made to the benefit policy at any point during the 20 year projection period. Such changes would fall outside the reach of an Asset/Liability study. However, we do note that even small changes to the benefit policy can have a meaningful long-term impact on the likely future outcomes of the Plan.

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RVK

## Acknowledgements

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# Introduction

RVK, Inc. (RVK) has prepared this report for the County Employees Retirement System Non-Hazardous Pension Plan (CERS) to:

- Present projected valuation results with respect to the funded status of the Plan.
- Present projected benefit payments of the Plan.
- Investigate asset mixes to determine those which best serve to protect and increase funding levels, while providing adequate liquidity for benefit payments.

The valuation projections are shown using both a deterministic and stochastic process.

The deterministic process provides an open group analysis of projected valuation results based on a fixed set of future assumptions (see summary in the Assumptions and Methods section of this report).

The stochastic process provides an open group analysis of projected valuation results under many capital market environments based on expected asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation. Expected values, variances of the returns and inflation, and correlations are used to generate 2,000 trials to produce a distribution of potential outcomes. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes.

# Introduction (continued)

## What is an Asset/Liability Study?

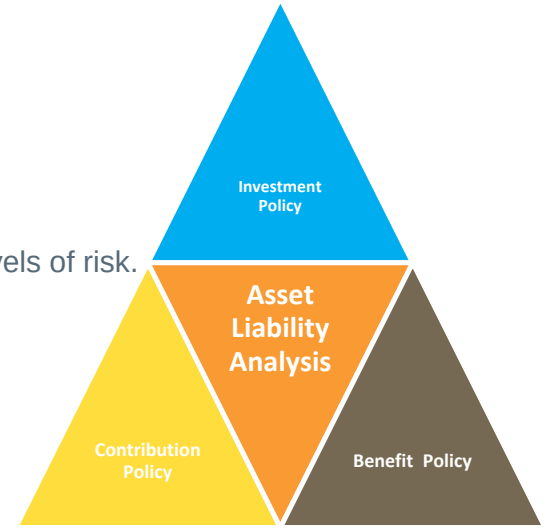
- Investment programs and the strategy they seek to implement (Investment Policy) do not exist in a vacuum. They seek to satisfy one or more investment objectives and operate within a plan framework that includes the investment objectives (Benefit Policy) and plan funding (Contribution Policy).

- The purpose of an Asset/Liability Study is to examine how well alternative investment strategies (i.e., differing asset allocations) address the objectives served by the Plan—the Plan's "liabilities" in the context of the Plan's funding streams—the Plan's Contribution Policy. It is the only standard analysis that fully links all three aspects of the Plan's key financial drivers.

- In doing so, it creates an important "guidepost" for the actual asset allocation for the Plan; the asset allocation chosen by the Plan's fiduciaries will likely reflect the nature of the liabilities but also numerous other factors including risk preferences, liquidity, implementation constraints, etc.

- For the CERS Asset/Liability Study, we assume the objectives are:

    1. Fund all participants' benefits over time.
    2. Assure sufficient liquidity to pay benefits at all times.
    3. Foster a stable contribution stream consistent with objectives 1 and 2.
    4. Achieve adequate returns without accepting unnecessary or imprudent levels of risk.




## An Asset/Liability Study is NOT . . .

- An actuarial study of the CERS liabilities—that is the purview of the Plan's actuary.

- A prescription for Plan benefits—that is the purview of the elected representatives.

- An assessment of the affordability of contribution levels—that is the purview of the elected officials and their constituents.

- The sole determinant of the final asset allocation adopted for the Plan—there are a number of factors, including insights from an Asset/Liability Study, which will bear on the optimal asset allocation.

# Introduction (continued)

## 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 Plan's financial needs.

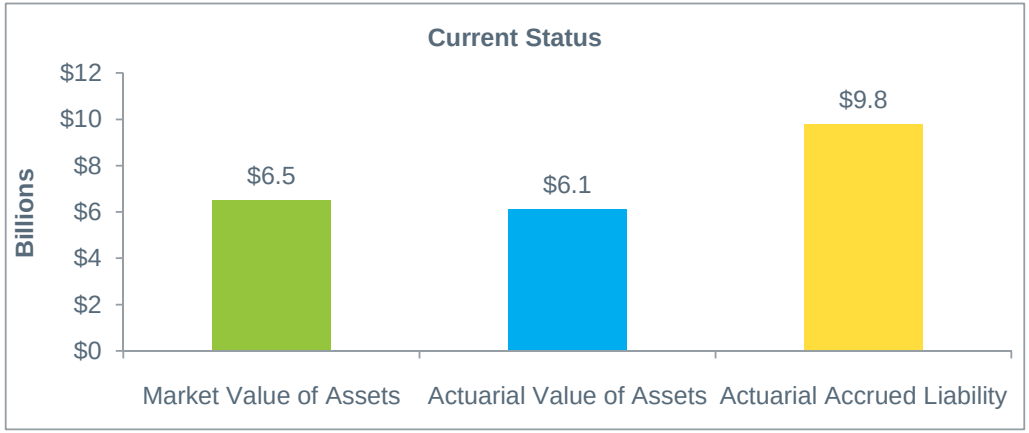
## This Asset/Liability Study . . .

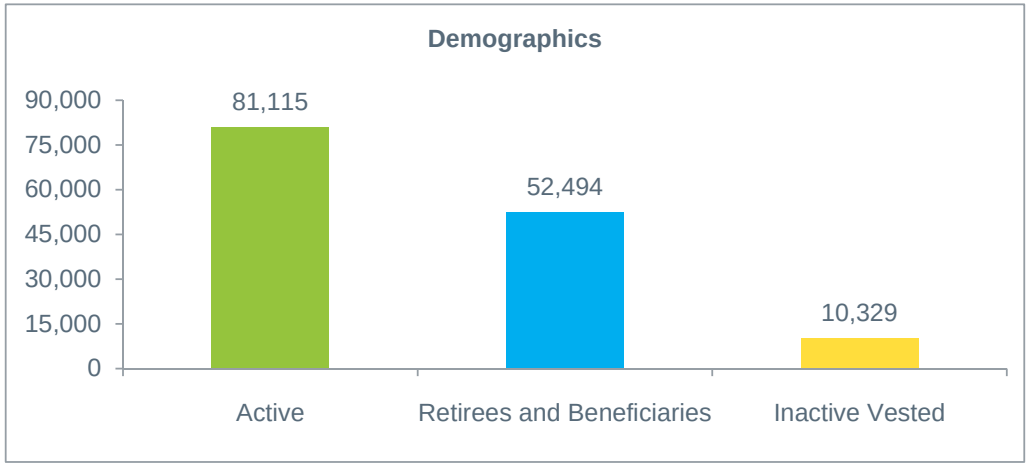
- Uses data from the June 30, 2014 CERS Actuarial Valuation to project pension liabilities.
- Uses the Actuarial Cost Method described in the June 30, 2014 CERS Actuarial Valuation, and the actuarial assumptions from the KRS Experience Study July 1, 2008 to June 30, 2013 ("the 2013 Experience Study") performed by Cavanaugh Macdonald Consulting, LLC (Cavanaugh).
- Compares these specific investment strategies—(A) the Current Target, (B) a conservative illustrative portfolio (Conservative Portfolio), (C) a diversified lower risk portfolio (Potential Portfolio 1), (D) a diversified moderate risk portfolio (Potential Portfolio 2), (E) a diversified higher risk portfolio (Potential Portfolio 3), and (F) an aggressive illustrative portfolio (Aggressive Portfolio).
- Assumes the Plan's current benefit policy throughout the entire projection period—changes to the benefit policy are the purview of the elected representatives.
- Note: Does not assume any actuarial adjustments that may take place in future years.

# Current Status

A summary of the Plan follows:

| | |
|---|---|
| **Valuation Date** | June 30, 2014 |
| **Market Value of Assets (MVA)** | $6.5 billion |
| **Actuarial Value of Assets (AVA)** | $6.1 billion |
| **Actuarial Accrued Liability (AAL)** | $9.8 billion |
| **Market Value Funded Ratio (MVA/AAL)** | 67% |
| **Actuarial Value Funded Ratio (AVA/AAL)** | 63% |
| **Active** | 81,115 |
| **Retirees and Beneficiaries** | 52,494 |
| **Inactive Vested** | 10,329 |




Population counts include approximately 2,700 members who also receive benefits from the hazardous system.

# Deterministic Analysis

This section provides an analysis of the Plan's assets, liabilities, funded status, and benefit payments based on a fixed set of future assumptions. Each analysis that follows in this deterministic section rests on the critical assumptions below and must be read and interpreted with them in mind—particularly assumptions #2, #3 and #4.

The deterministic assumptions are as follows:

1. Current Plan provisions (see Summary of Main Benefit and Contribution Provisions beginning on page 38 of the CERS June 30, 2014 actuarial valuation report prepared by Cavanaugh).

2. The participant data used by Cavanaugh in its June 30, 2014 actuarial valuation.

3. Actuarially assumed rate of return on Plan assets for all projection years: 7.50%.

4. For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013, and June 30, 2014 (12.75% and 12.42% of payroll, respectively). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study.

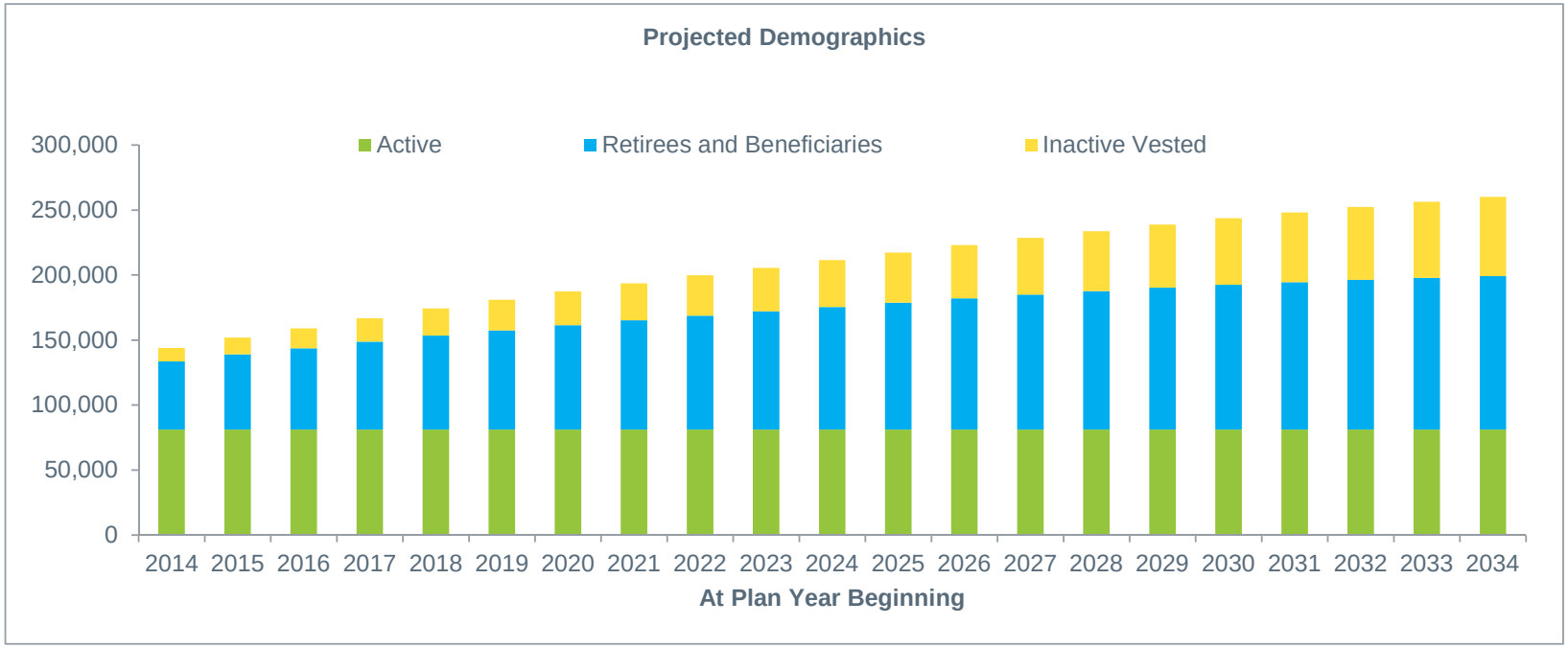
5. Assumes demographic experience projected in accordance with the actuarial assumptions proposed in the 2013 Experience Study.

6. Open group analysis: level active population. New active participants entering the Plan are assumed to have similar characteristics to recently hired participants.

# Deterministic Analysis (continued)

## Demographics

Following are the projected number of active and inactive participants at the beginning of each Plan year from 2014 through 2034 (2014 is actual). These projections are based on an open group analysis. Using the actuary's assumptions for death, termination, retirement, and disability, current participants are assumed to leave the Plan in the future. The number of total inactive participants (Retirees and Beneficiaries and Vested Inactive) increases by approximately 185% during the 20-year projection period shown.



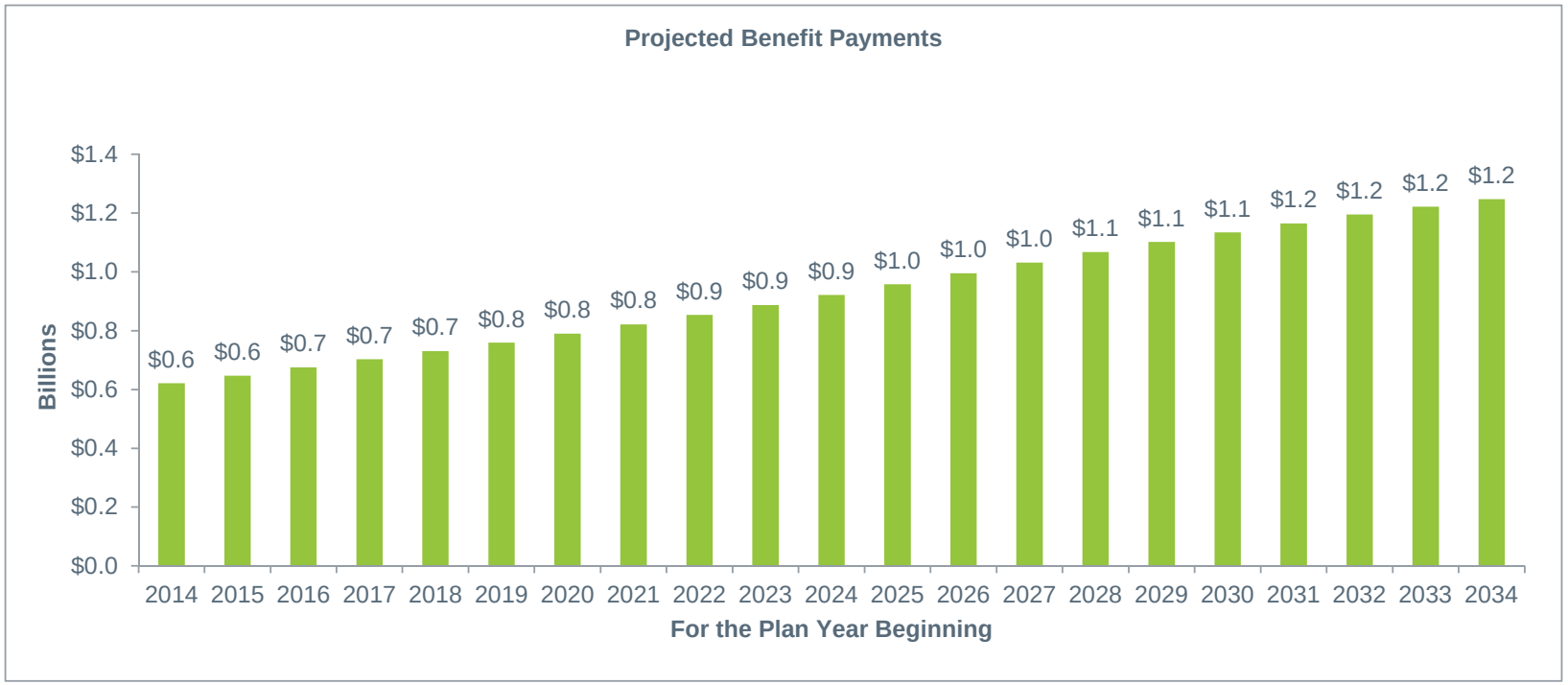

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Population | | | | | | | | | | | | | | | | | | | | | |
| Annual Percent Change | N/A | 5.5% | 4.7% | 4.9% | 4.5% | 3.8% | 3.5% | 3.4% | 3.2% | 2.9% | 2.9% | 2.8% | 2.6% | 2.5% | 2.3% | 2.1% | 2.0% | 1.9% | 1.7% | 1.6% | 1.5% |

Population counts include approximately 2,700 members who also receive benefits from the hazardous system.

# Deterministic Analysis (continued)

## Benefit Payments

The Plan's projected annual benefit payments are shown in the chart below. The projected benefit payments are expected to increase by about 101% over the next 20 years. As a percentage of the market value of Plan assets, benefit payments are expected to gradually increase through the end of the projection period (see page 12).

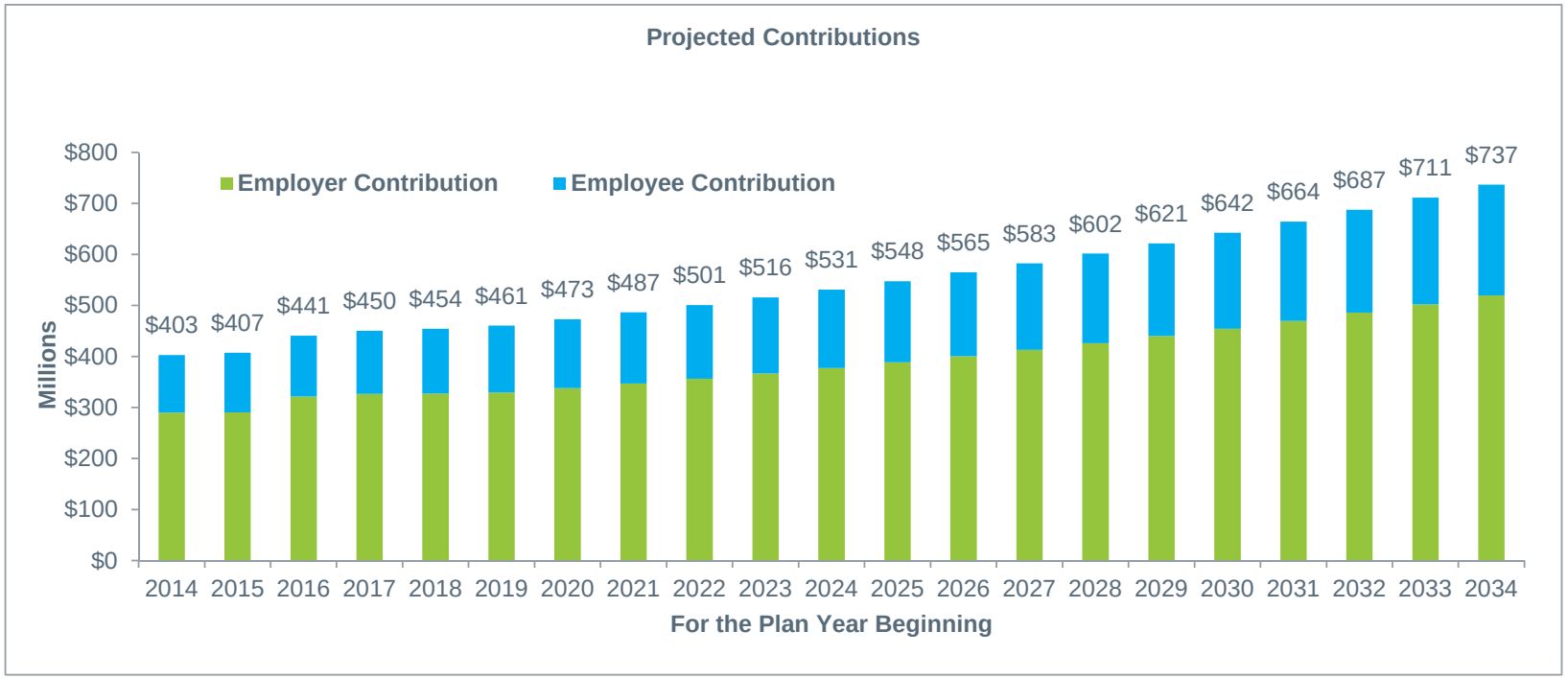



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 4.1% | 4.3% | 4.2% | 3.9% | 3.9% | 4.0% | 4.0% | 3.9% | 3.9% | 3.9% | 3.9% | 3.8% | 3.7% | 3.5% | 3.2% | 3.0% | 2.6% | 2.6% | 2.2% | 2.2% |

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as total dollar contributions, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.

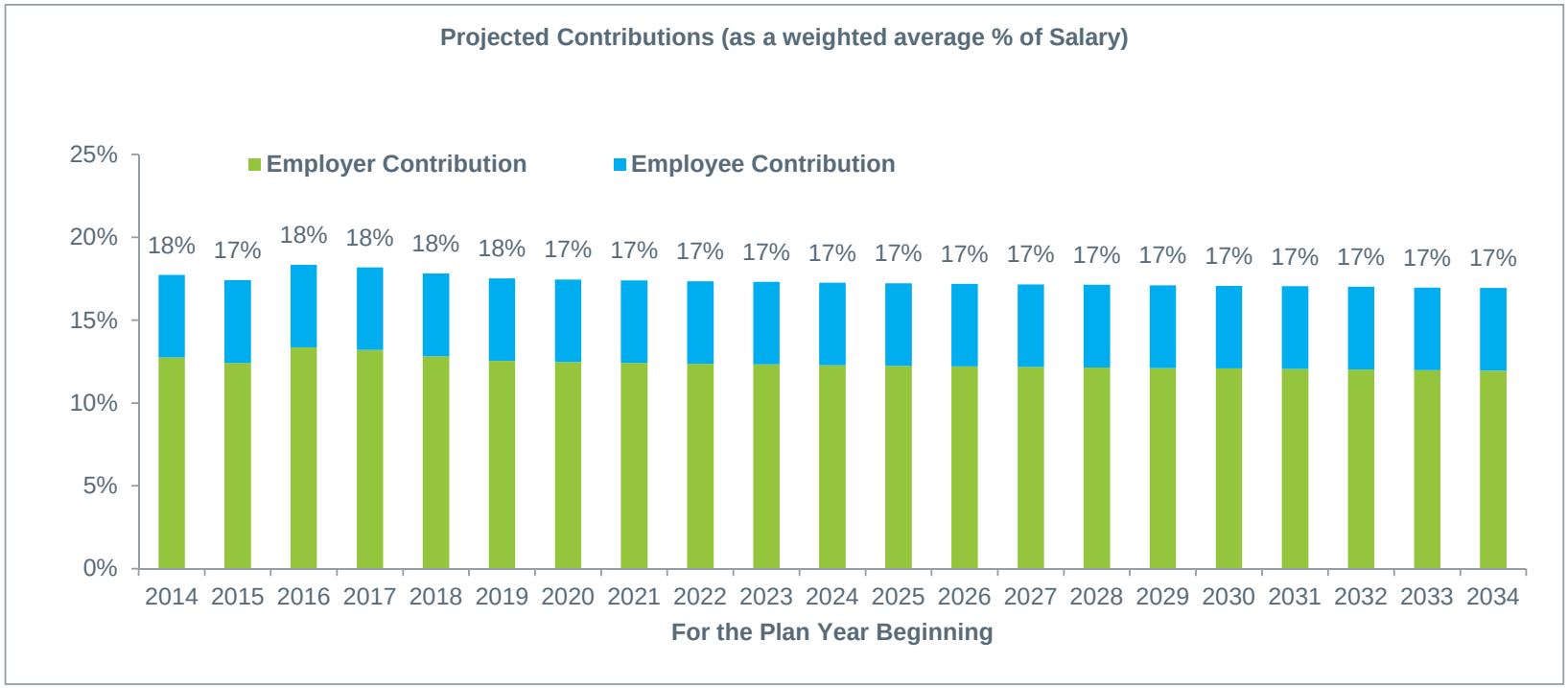



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 1.0% | 8.3% | 2.1% | 1.0% | 1.4% | 2.7% | 2.9% | 2.9% | 3.0% | 3.0% | 3.1% | 3.1% | 3.2% | 3.2% | 3.3% | 3.4% | 3.4% | 3.5% | 3.5% | 3.6% |

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as a weighted average percentage of salary, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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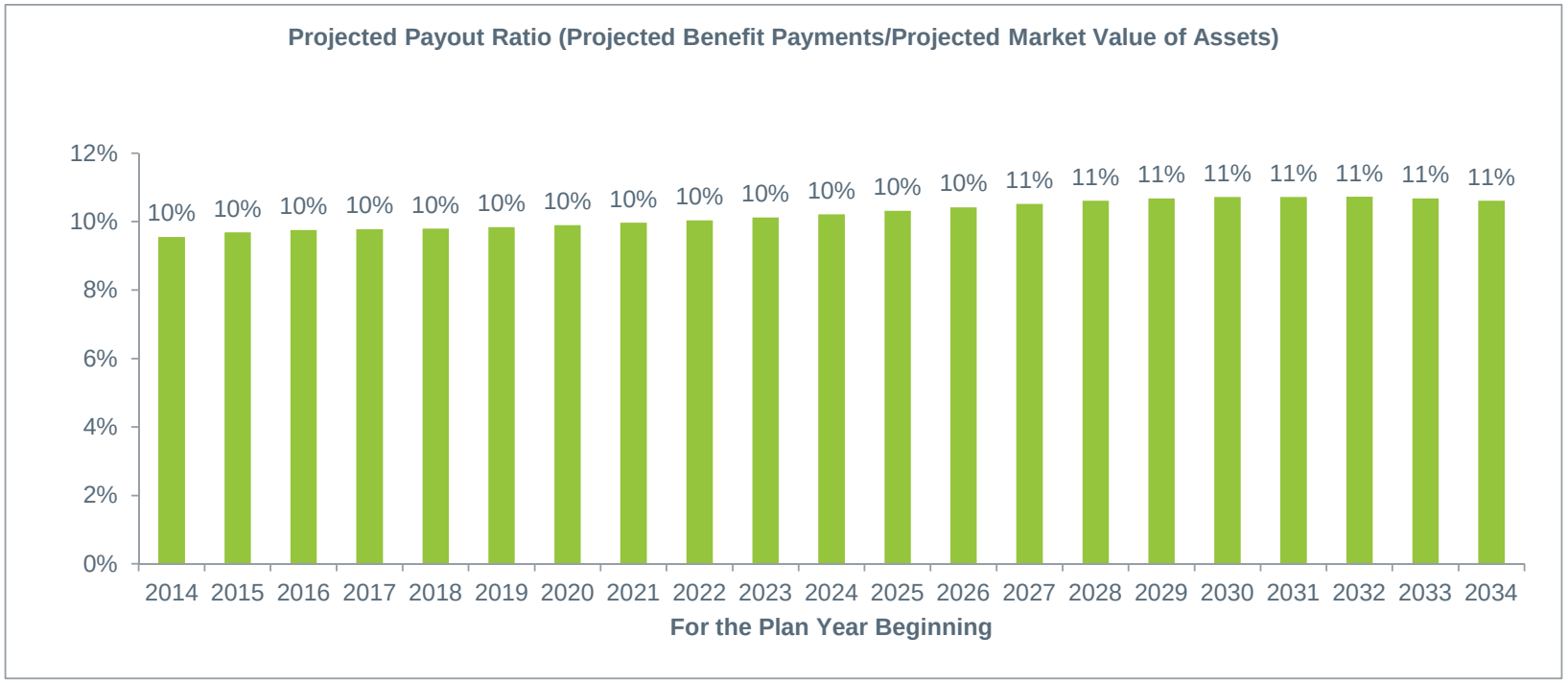
# Deterministic Analysis (continued)

## Payout Ratio (benefit payments/market value of assets)

The Plan's projected payout ratios are shown in the chart below. The payout ratios are expected to gradually increase through the end of the projection period. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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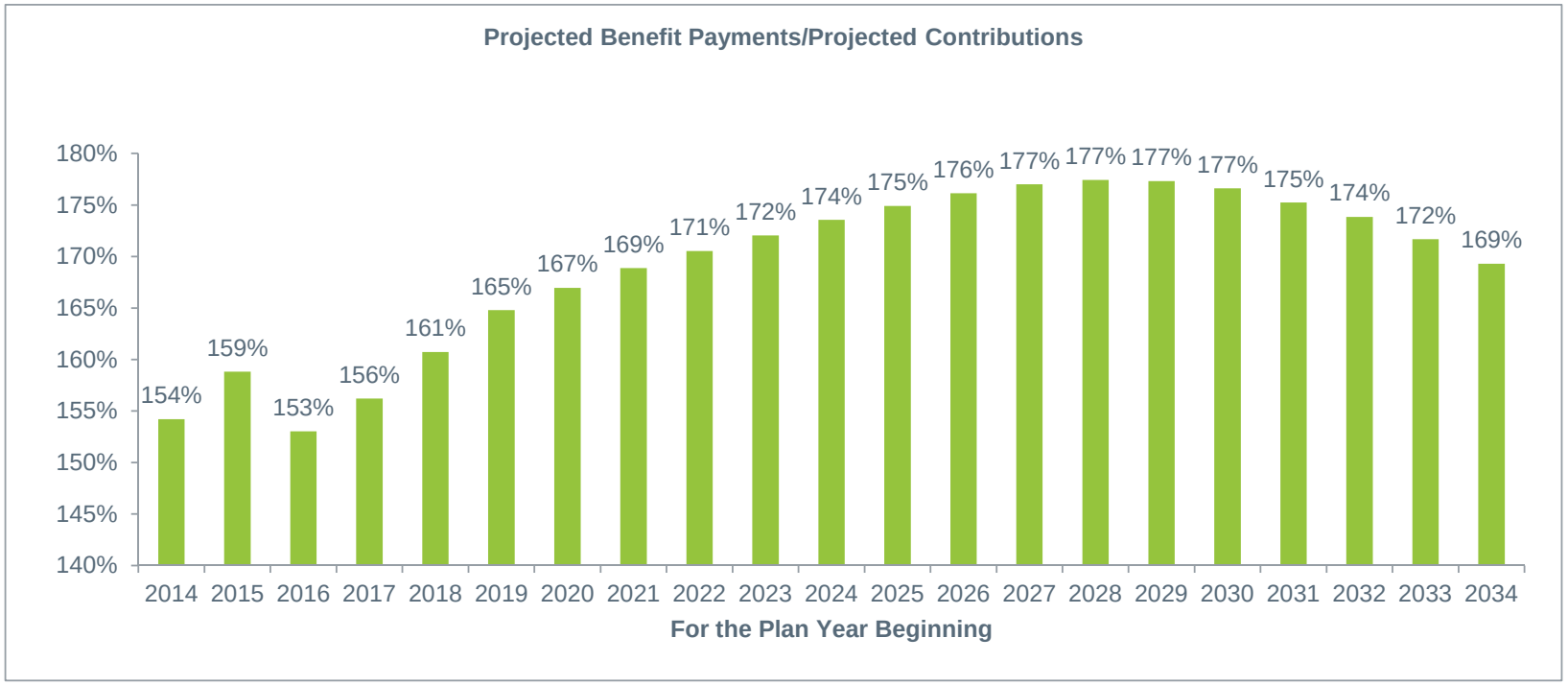
# Deterministic Analysis (continued)

## Benefit Payments/Contributions

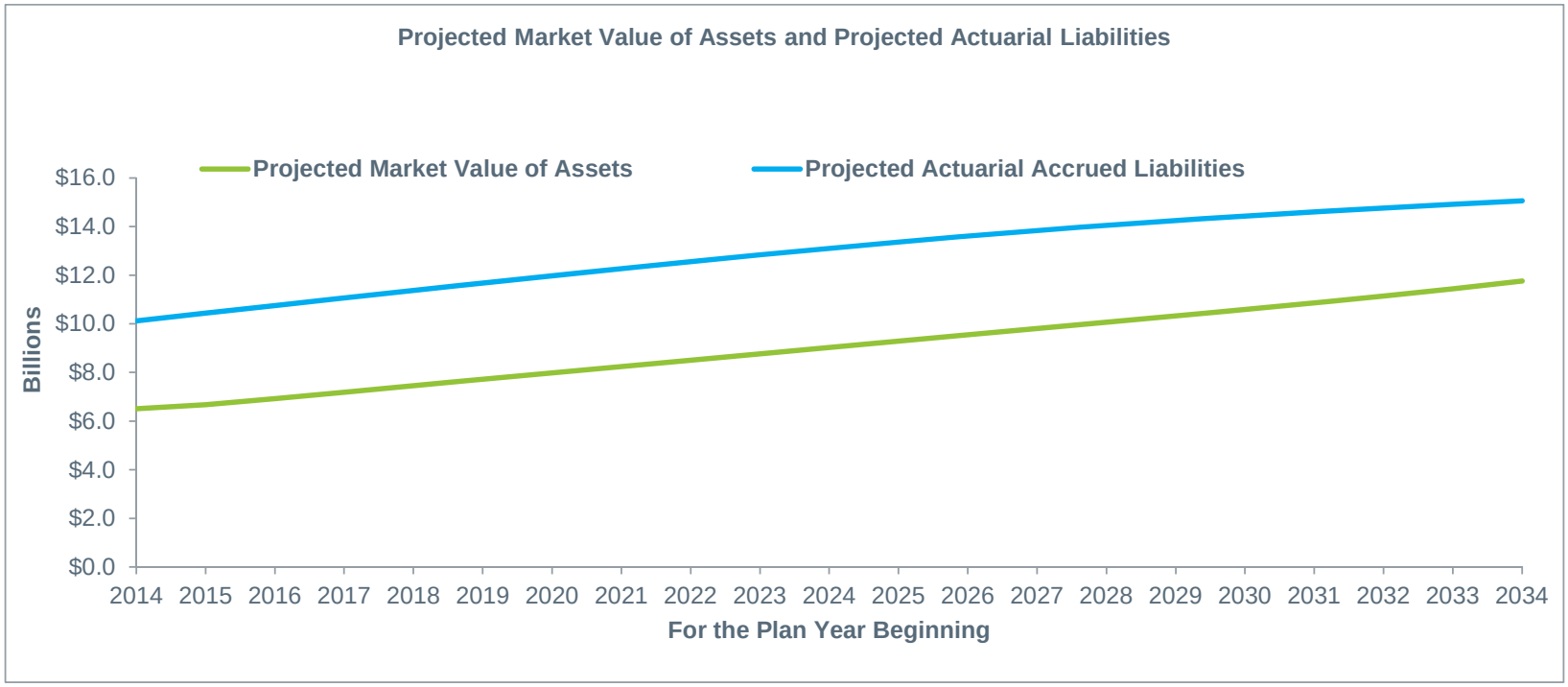
The Plan's projected benefit payments divided by projected contributions are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Actuarial Accrued Liabilities and Market Value of Assets

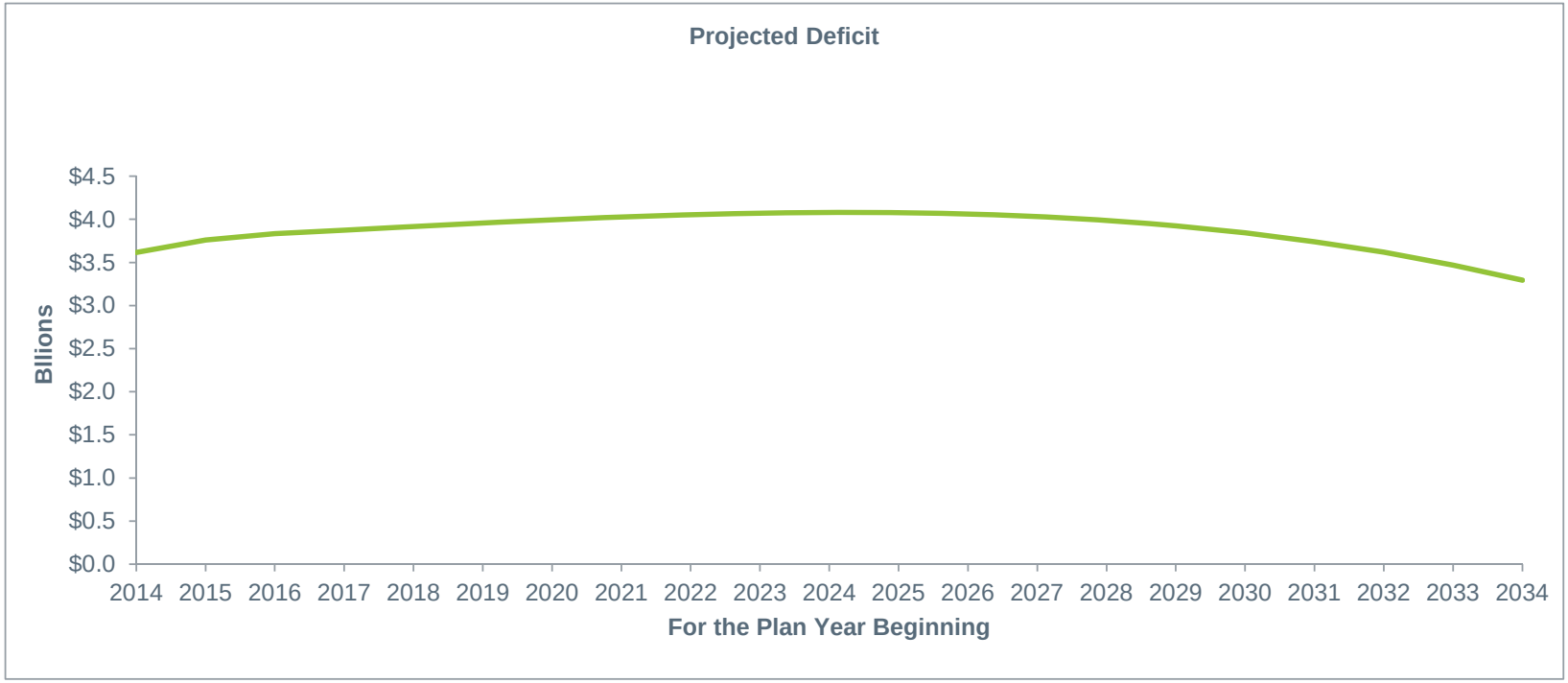
The Plan's projected actuarial accrued liabilities and market value of assets are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The relative disparity between the market value of assets and Plan liabilities is expected to decrease by 9% through the end of the projection period. The funded ratio (based on market value of assets) is expected to increase to approximately 78% by the end of the projection period. This is shown more clearly on the following pages.



# Deterministic Analysis (continued)

### Deficit (market value of assets – actuarial accrued liabilities)

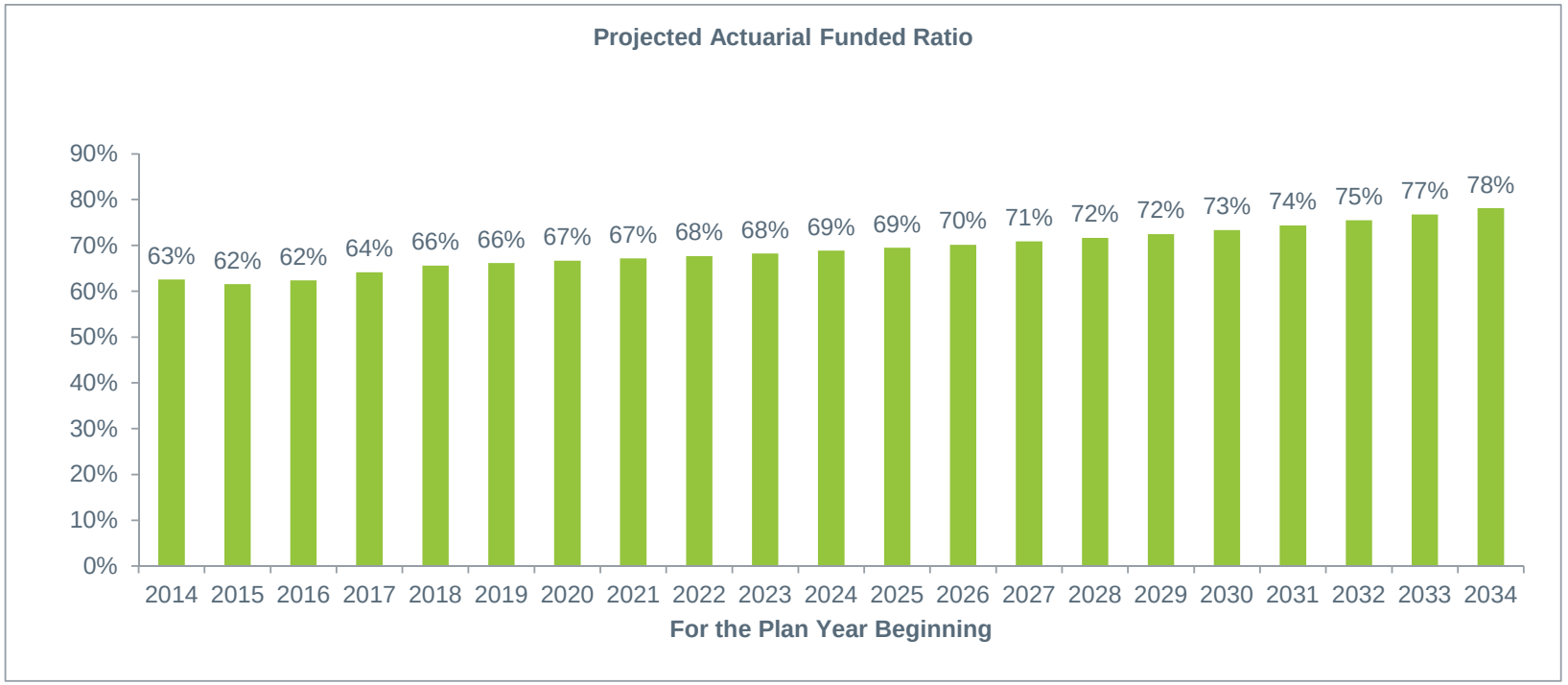
The Plan's projected deficit of assets is shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The disparity between the market value of assets and Plan liabilities is expected to decrease by the end of the projection period by 9%.



# Deterministic Analysis (continued)

## Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability)

The Plan's projected actuarial funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 78% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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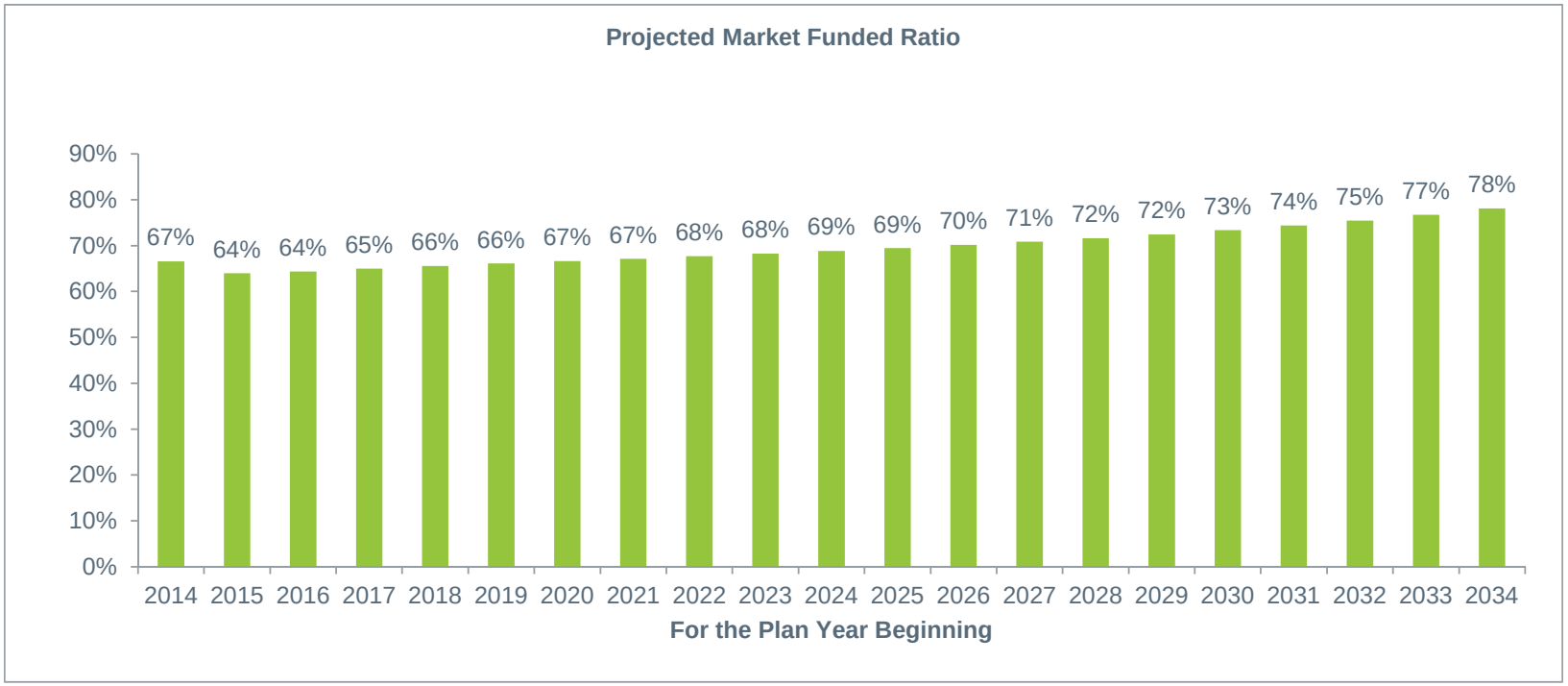
# Deterministic Analysis (continued)

## Market Funded Ratio (market value of assets/actuarial accrued liability)

The Plan's projected market funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 78% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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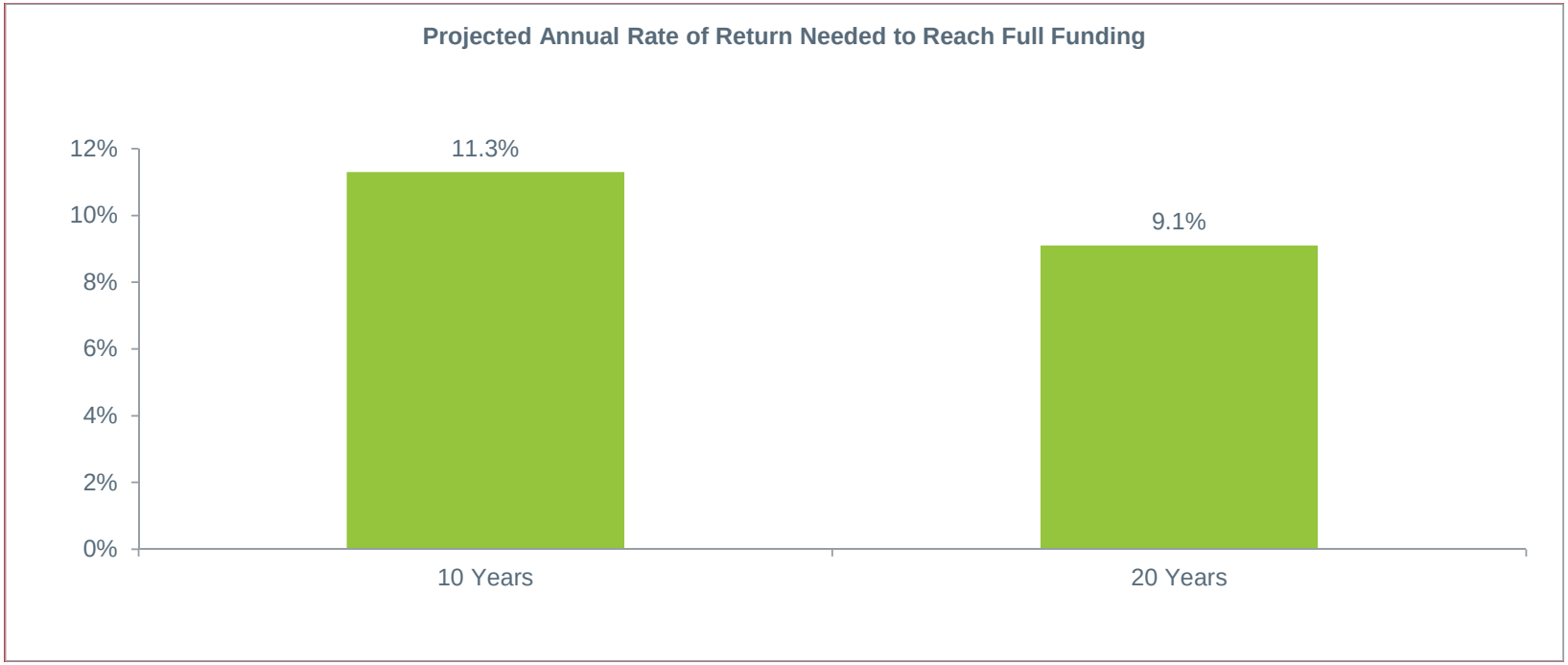
# Deterministic Scenario Analysis

## Full Funding Implied Returns

The figure below shows the projected investment return for the total fund needed to bring the Plan to 100% funding (on a market value basis) in 10 and 20 years, respectively. The results assume all other actuarial assumptions are precisely met over the time periods shown and that these returns are earned for every year, without variance.

Actuarially assumed rate of return – **7.50%**



# Deterministic Scenario Analysis (continued)

## Sensitivity Analysis – Decreased Return

Under the deterministic analysis presented in the preceding pages, the Plan is projected to have a market funded ratio of 78% in 20 years. The table below summarizes the projected funded ratio and other key statistics in 2034 assuming the Plan experiences an annualized investment return of 100 basis points lower (6.50%) than the current actuarially assumed rate of return (7.50%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

| | 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 | ▲ |

Values in impact column may not be additive to due rounding.

# Stochastic Analysis

In the previous section of this report, we assumed the Plan operated going forward with certain knowledge of the future investment returns earned by the Plan's assets. This section introduces the element of uncertainty in those future investment returns. This part of the analysis examines Plan assets and liabilities under many capital market environments based on expected future asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation.

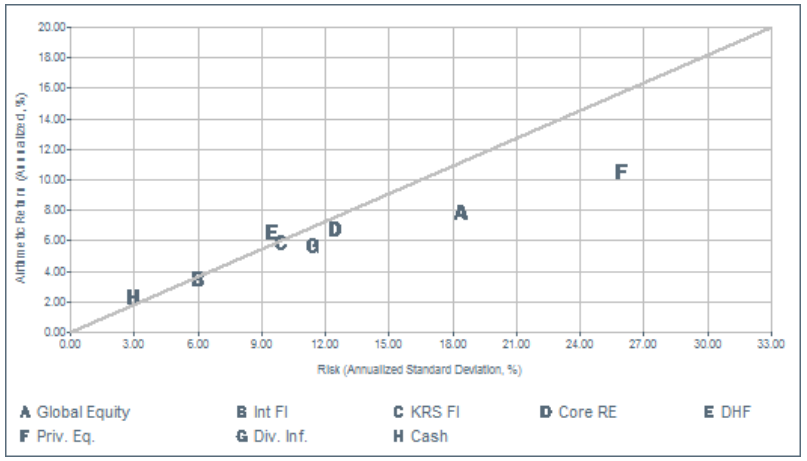
Using the current expected values and variances of the returns and inflation, along with their correlations, 2,000 trials are generated to produce a distribution of results. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes. This is contrasted with the deterministic analysis that provides an expected value if all current Plan assumptions are exactly met.

# Stochastic Analysis (continued)

## Long-Term Return and Risk Assumptions

In order to perform a stochastic analysis and create asset allocation alternatives, it is necessary to estimate, for each asset class, its probable return and risk. The expected returns are our best estimates of the average annual percentage increases in values of each asset class over a prospective long period of time, and assumed to be normally distributed. The risk of an asset class is measured by its standard deviation, or volatility. If asset returns are normally distributed, two-thirds (67%) of all returns are expected to lie within one standard deviation on either side of the mean. For example, we expect Global Equity to return, annually on average, 7.80% with a standard deviation of 18.35%, meaning that two-thirds of the time we expect its return to lie between -10.55% (= 7.80 – 18.35) and 26.15% (= 7.80 + 18.35). Moreover, we expect 95% of all return outcomes to lie within two standard deviations of the mean return, implying only a one-in-twenty chance that the return on Global Equity will either fall below -28.90% or rise above 44.50%. The risk and return assumptions used in this study are outlined in the below table and chart:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption |
|---|---|---|
| Global Equity | 7.80 | 18.35 |
| Int. Duration Fixed Income | 3.50 | 6.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 |
| Core Real Estate | 6.75 | 12.50 |
| Diversified Hedge Funds | 6.50 | 9.50 |
| Private Equity | 10.50 | 26.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 |
| Cash Equivalents | 2.25 | 3.00 |



# Stochastic Analysis (continued)

## Correlation Between Asset Classes

Creating a diversified portfolio of asset classes enables the investor to achieve a high rate of return while minimizing volatility of the portfolio. As defined on the previous page, volatility is "risk" or standard deviation. By minimizing the volatility of a portfolio, we produce asset returns that vary less from year to year. Diversification exists because the returns of different asset classes do not always move in the same direction, at the same time, or with the same magnitude. Correlation values are between 1.00 and –1.00. If returns of two asset classes rise or fall at the same time and in the same magnitude, they have a correlation value of 1.00. Conversely, two asset classes that simultaneously move in opposite directions, and in the same magnitude, have a correlation value of –1.00. A correlation of zero indicates no relationship between returns. The assumed correlations are largely based on historical index data, with some qualitative analysis applied. For instance, where appropriate, we have weighted current history more heavily. The correlation matrix used in this study is shown below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | -0.02 | 0.84 | 0.32 | 0.70 | 0.78 | 0.72 | -0.05 |
| Int. Duration Fixed Income | -0.02 | 1.00 | 0.28 | -0.06 | 0.12 | -0.26 | 0.22 | 0.24 |
| Custom KRS Fixed Income | 0.84 | 0.28 | 1.00 | 0.27 | 0.69 | 0.66 | 0.82 | -0.07 |
| Core Real Estate | 0.32 | -0.06 | 0.27 | 1.00 | 0.24 | 0.60 | 0.37 | 0.14 |
| Diversified Hedge Funds | 0.70 | 0.12 | 0.69 | 0.24 | 1.00 | 0.69 | 0.59 | 0.22 |
| Private Equity | 0.78 | -0.26 | 0.66 | 0.60 | 0.69 | 1.00 | 0.62 | 0.07 |
| Diversified Inflation Strategies | 0.72 | 0.22 | 0.82 | 0.37 | 0.59 | 0.62 | 1.00 | -0.03 |
| Cash Equivalents | -0.05 | 0.24 | -0.07 | 0.14 | 0.22 | 0.07 | -0.03 | 1.00 |

The fact that the correlations shown in the table are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others. This point is demonstrated on the following pages, which illustrate that diversification into less correlated asset classes can decrease the expected overall volatility of a portfolio.

# Stochastic Analysis (continued)

## Efficient Portfolios

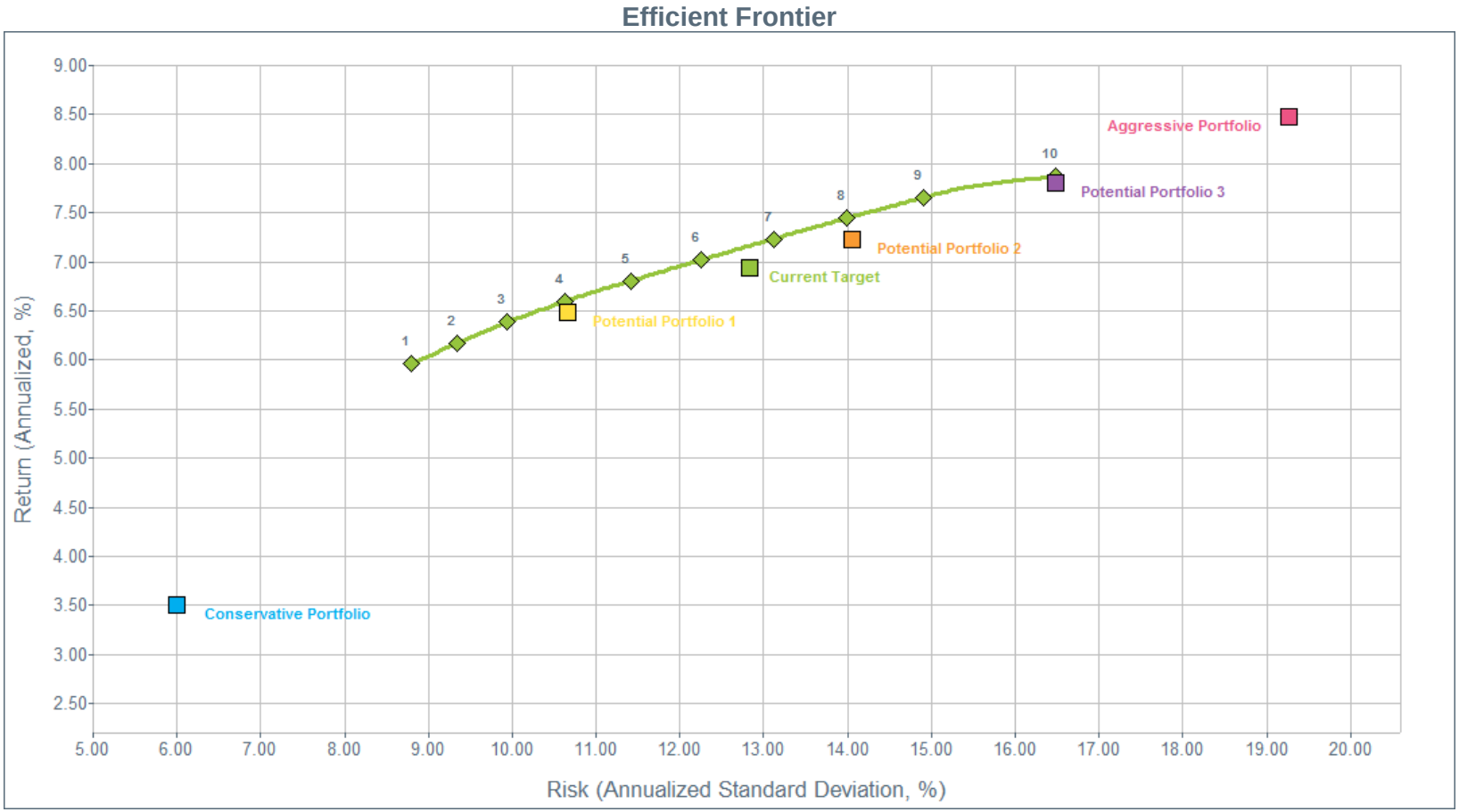
Each frontier portfolio (optimal allocation) is created using target rates of return both above and below the projected rate of return for the current allocation. This range illustrates the trade-off between return and risk; additional return can only be achieved by undertaking additional risk. The table below shows the possible optimal allocations given the selected asset classes and their constraints listed under "Min" and "Max." The table shows the Current Target allocation and highlights three potential targets (Potential Portfolios 1, 2, and 3) for consideration throughout this study. Two illustrative portfolios (Conservative and Aggressive Portfolios) are also shown for demonstrative purposes.

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | 30 | 70 | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | 0 | 30 | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | 0 | 30 | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | 5 | 15 | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | 2 | 15 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | 2 | 5 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

# Stochastic Analysis (continued)

## Efficient Frontier

The risk of each alternative allocation is plotted against the horizontal axis, while the return is measured on the vertical axis. The line connecting the points represents all the optimal portfolios subject to the given constraints and is known as the "efficient frontier." The upward slope of the efficient frontier indicates the direct relationship between return and risk.



# Stochastic Analysis (continued)

## Asset Mixes

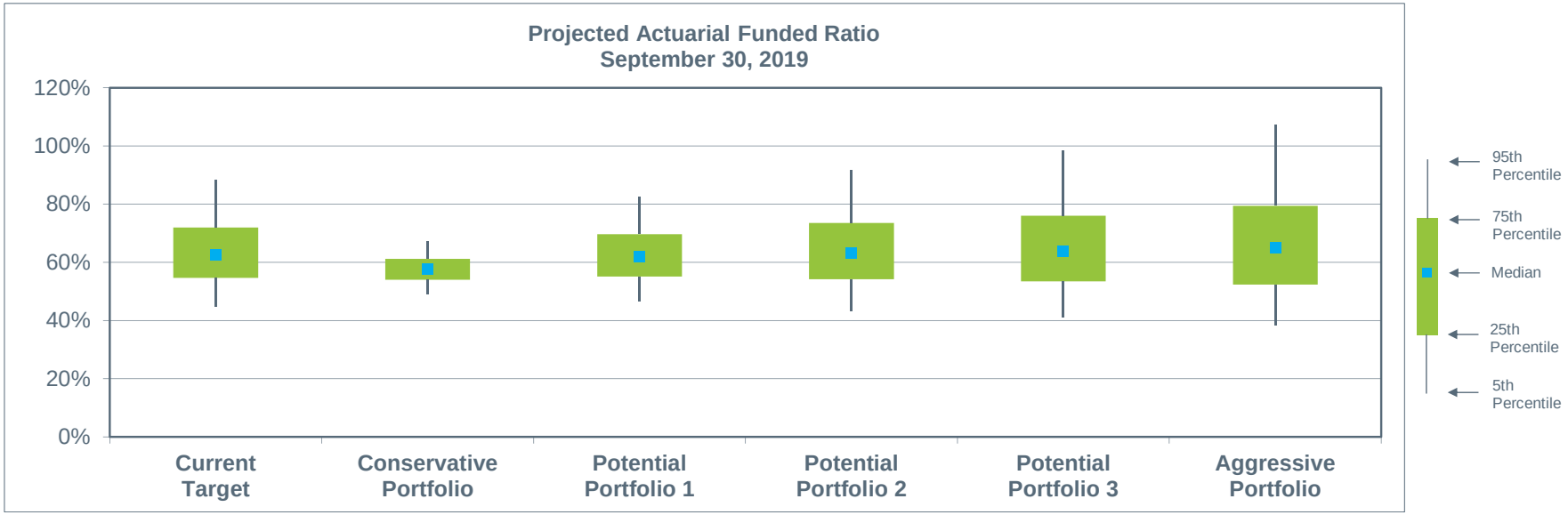
Outlined below are the Current Target allocation and five other mixes to be examined in this stochastic analysis. The expected return, expected risk (as measured by standard deviation), and RVK Liquidity Metric, for each is also shown.

| 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** |

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **5 Years**

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

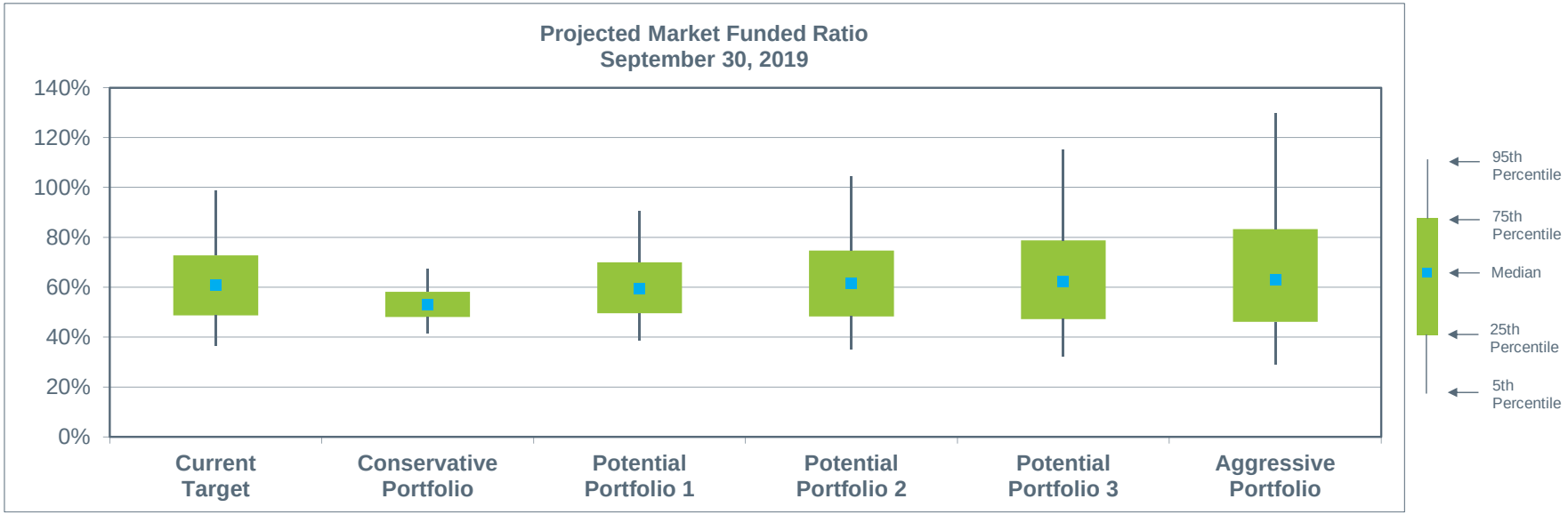



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $6 | 45% | $6 | 49% | $6 | 47% | $7 | 43% | $7 | 41% | $7 | 39% |
| 25th Percentile | $5 | 55% | $5 | 54% | $5 | 55% | $5 | 54% | $5 | 53% | $6 | 52% |
| Median | $4 | 63% | $5 | 58% | $4 | 62% | $4 | 63% | $4 | 64% | $4 | 65% |
| 75th Percentile | $3 | 72% | $5 | 61% | $4 | 70% | $3 | 74% | $3 | 76% | $2 | 79% |
| 95th Percentile | $1 | 88% | $4 | 67% | $2 | 82% | $1 | 92% | $0 | 99% | ($1) | 107% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **5 Years**

The graph below shows the distribution of possible market funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

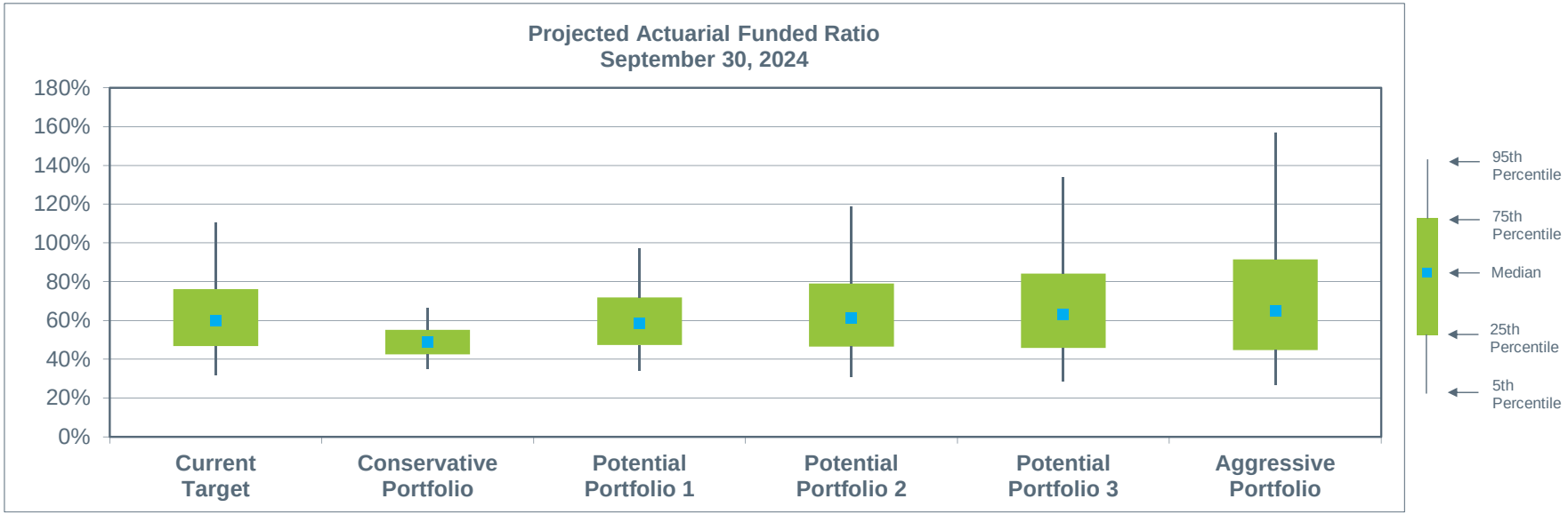



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $7 | 36% | $7 | 42% | $7 | 39% | $7 | 35% | $8 | 32% | $8 | 29% |
| 25th Percentile | $6 | 49% | $6 | 48% | $6 | 50% | $6 | 48% | $6 | 47% | $6 | 46% |
| 50th Percentile | $5 | 61% | $5 | 53% | $5 | 60% | $5 | 61% | $4 | 62% | $4 | 63% |
| 75th Percentile | $3 | 73% | $5 | 58% | $4 | 70% | $3 | 75% | $3 | 79% | $2 | 83% |
| 95th Percentile | $0 | 99% | $4 | 67% | $1 | 90% | ($0) | 104% | ($2) | 115% | ($4) | 130% |

# Stochastic Analysis (continued)

## Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

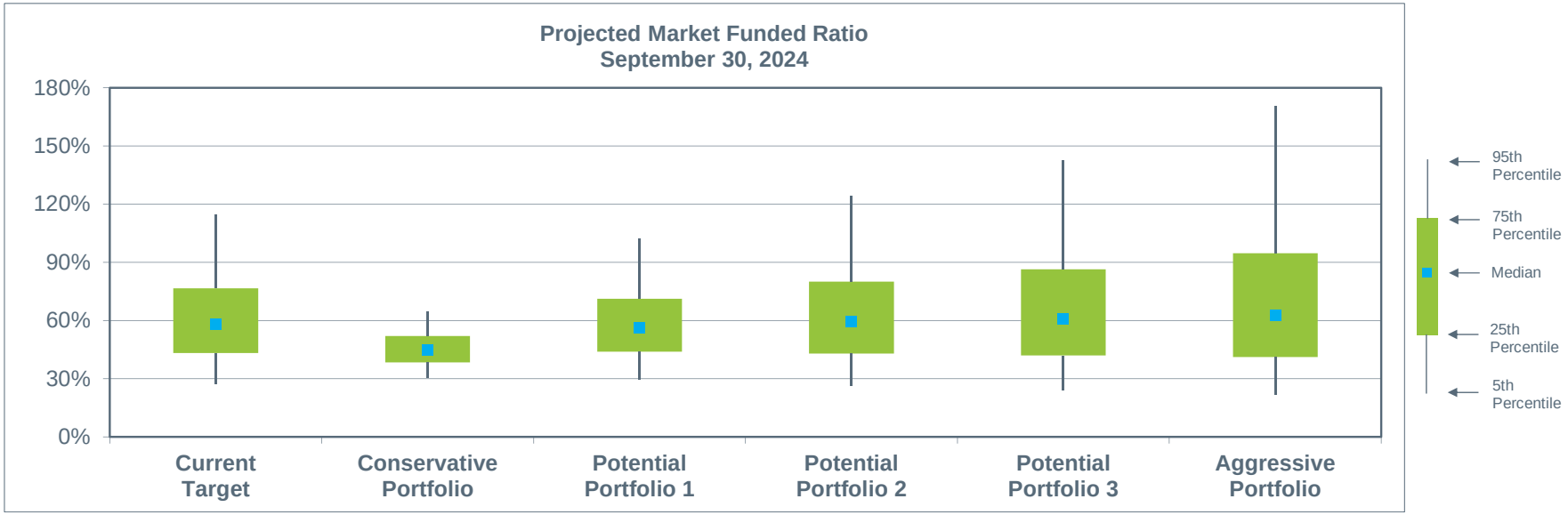



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $9 | 32% | $8 | 35% | $8 | 34% | $9 | 31% | $9 | 28% | $9 | 27% |
| 25th Percentile | $7 | 47% | $7 | 43% | $7 | 47% | $7 | 46% | $7 | 46% | $7 | 45% |
| Median | $5 | 60% | $7 | 49% | $5 | 58% | $5 | 61% | $5 | 63% | $5 | 65% |
| 75th Percentile | $3 | 76% | $6 | 55% | $4 | 72% | $3 | 79% | $2 | 84% | $1 | 92% |
| 95th Percentile | ($1) | 110% | $5 | 67% | $0 | 97% | ($3) | 119% | ($5) | 134% | ($8) | 157% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **10 Years**

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

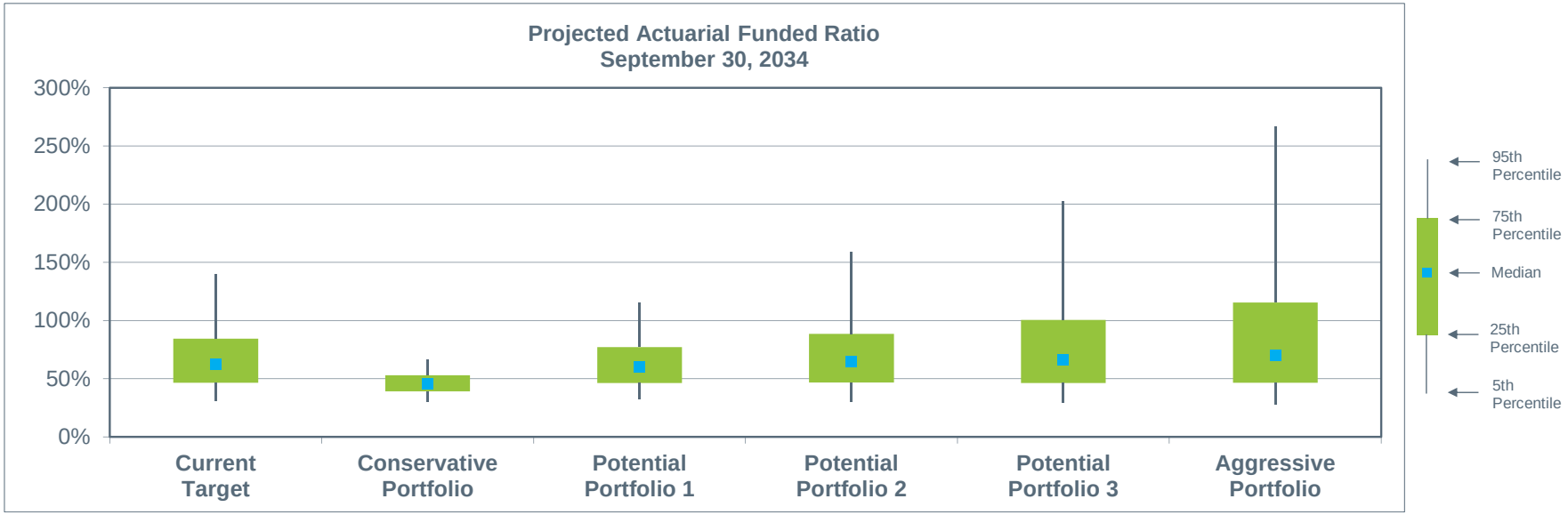



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $9 | 27% | $9 | 30% | $9 | 29% | $9 | 26% | $10 | 24% | $10 | 22% |
| 25th Percentile | $7 | 43% | $8 | 38% | $7 | 44% | $7 | 43% | $7 | 42% | $8 | 41% |
| 50th Percentile | $6 | 58% | $7 | 45% | $6 | 56% | $5 | 59% | $5 | 61% | $5 | 63% |
| 75th Percentile | $3 | 77% | $6 | 52% | $4 | 71% | $3 | 80% | $2 | 86% | $1 | 95% |
| 95th Percentile | ($2) | 114% | $5 | 65% | ($0) | 102% | ($3) | 124% | ($6) | 143% | ($10) | 171% |

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $9 | 31% | $10 | 30% | $9 | 32% | $10 | 30% | $10 | 29% | $10 | 28% |
| 25th Percentile | $8 | 47% | $9 | 39% | $8 | 46% | $8 | 47% | $8 | 46% | $8 | 46% |
| Median | $6 | 63% | $8 | 46% | $6 | 60% | $5 | 64% | $5 | 67% | $4 | 70% |
| 75th Percentile | $2 | 84% | $7 | 53% | $3 | 77% | $2 | 88% | ($0) | 100% | ($2) | 116% |
| 95th Percentile | ($7) | 140% | $6 | 66% | ($2) | 115% | ($9) | 159% | ($17) | 203% | ($28) | 267% |

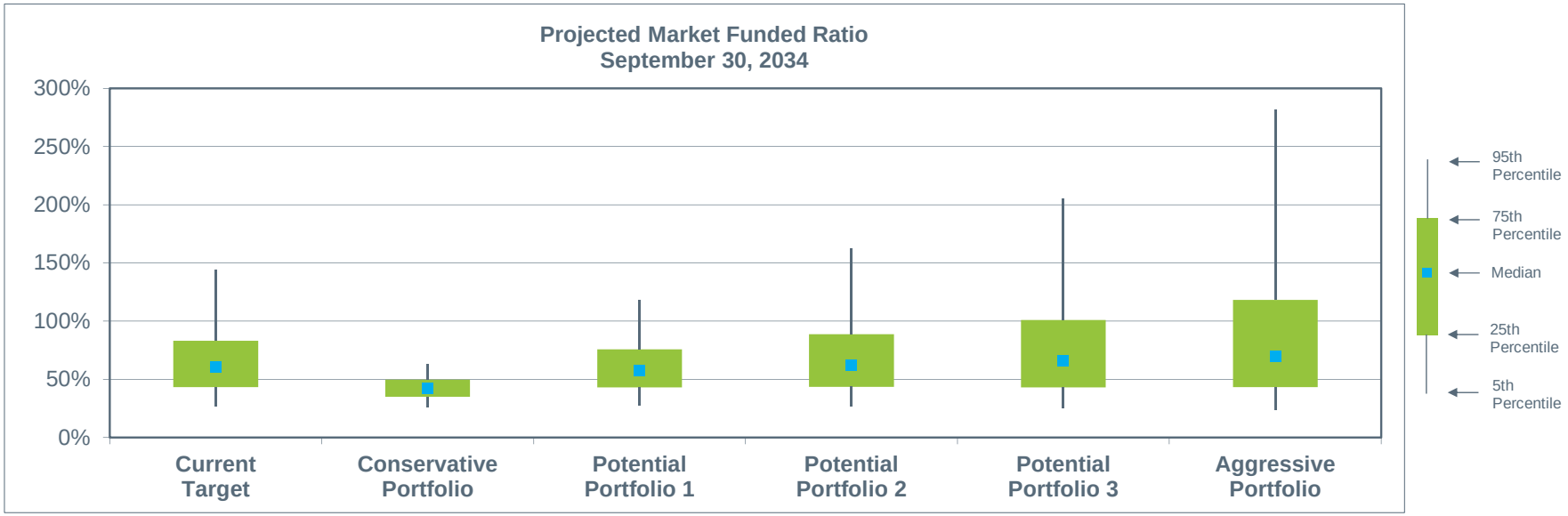


RVK

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio | Unfunded Liability (Bil) | Funded Ratio |
| 5th Percentile | $9 | 27% | $9 | 30% | $9 | 29% | $9 | 26% | $10 | 24% | $10 | 22% |
| 25th Percentile | $7 | 43% | $8 | 38% | $7 | 44% | $7 | 43% | $7 | 42% | $8 | 41% |
| 50th Percentile | $6 | 58% | $7 | 45% | $6 | 56% | $5 | 59% | $5 | 61% | $5 | 63% |
| 75th Percentile | $3 | 77% | $6 | 52% | $4 | 71% | $3 | 80% | $2 | 86% | $1 | 95% |
| 95th Percentile | ($2) | 114% | $5 | 65% | ($0) | 102% | ($3) | 124% | ($6) | 143% | ($10) | 171% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 67% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 5% | 64% | 10% | -37% | 17% |
| Conservative Portfolio | 0% | 95% | 4% | -22% | 16% |
| Potential Portfolio 1 | 2% | 69% | 7% | -32% | 17% |
| Potential Portfolio 2 | 7% | 62% | 11% | -39% | 18% |
| Potential Portfolio 3 | 11% | 58% | 14% | -44% | 18% |
| Aggressive Portfolio | 14% | 55% | 16% | -48% | 19% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 67% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 10% | 64% | 20% | -37% | 24% |
| Conservative Portfolio | 0% | 96% | 31% | -22% | 24% |
| Potential Portfolio 1 | 6% | 68% | 18% | -32% | 24% |
| Potential Portfolio 2 | 12% | 62% | 21% | -39% | 24% |
| Potential Portfolio 3 | 17% | 58% | 22% | -45% | 25% |
| Aggressive Portfolio | 22% | 55% | 24% | -50% | 26% |

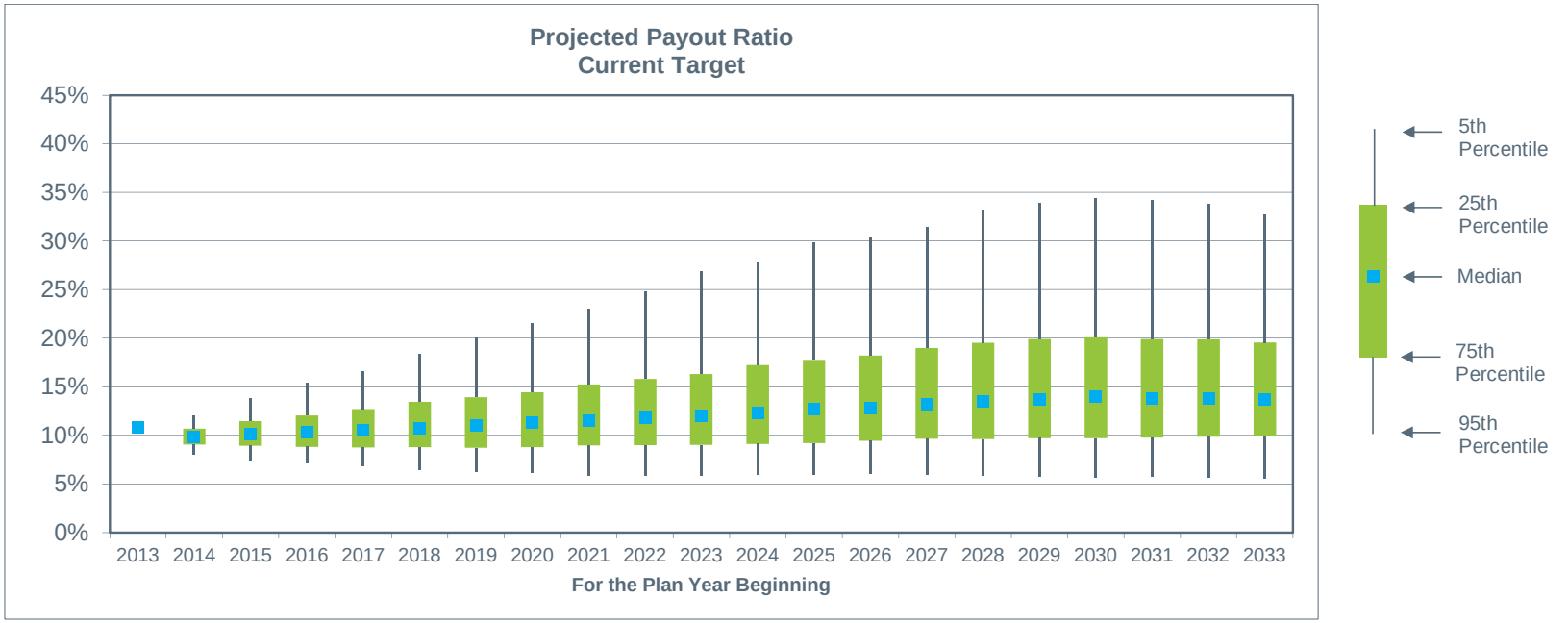
| 20 Years | Probability of Full Funding in 2034 | Probability of < 67% (Current) Funding in 2034 | Probability of < 40% (Current) Funding in 2034 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 16% | 58% | 20% | -38% | 36% |
| Conservative 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% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Current Target**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 14%. The worst-case scenario could reach 34% or higher.



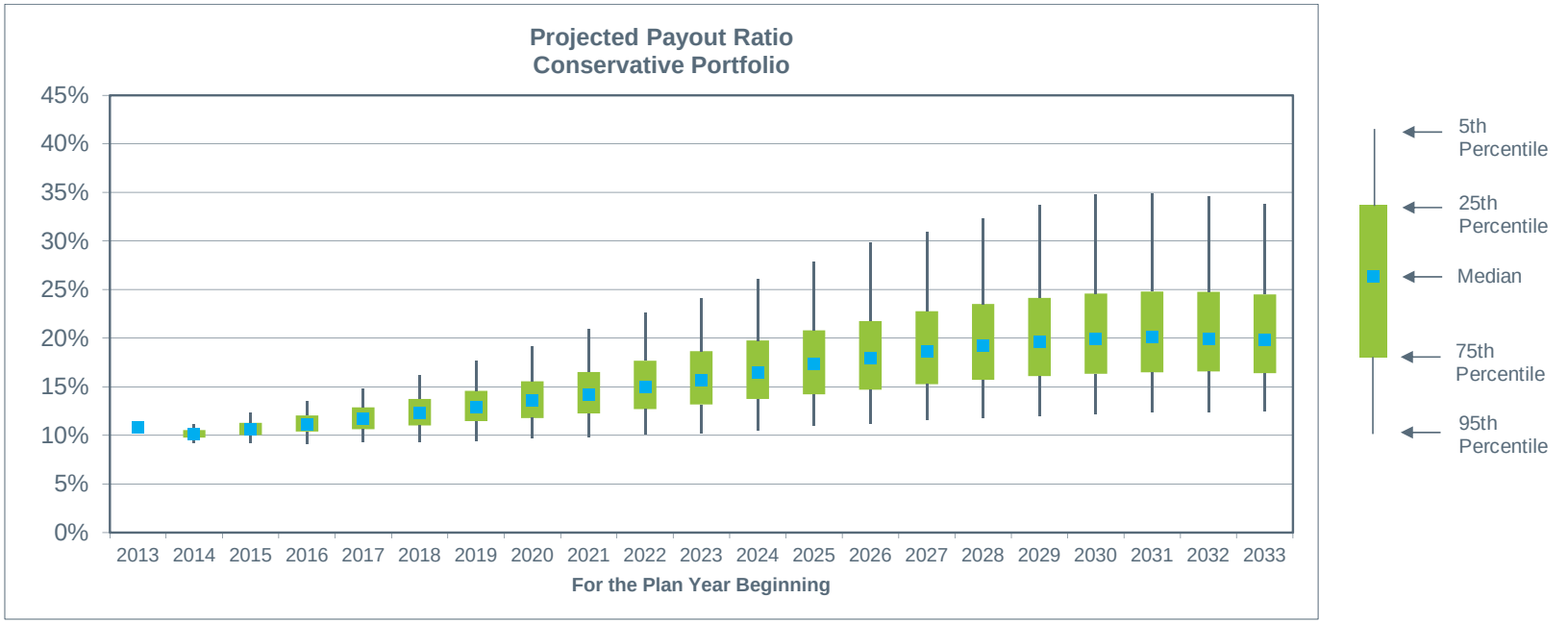

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 14% | 14% | 14% | 14% | 14% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Conservative Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 20%. The worst-case scenario could reach 35% or higher.



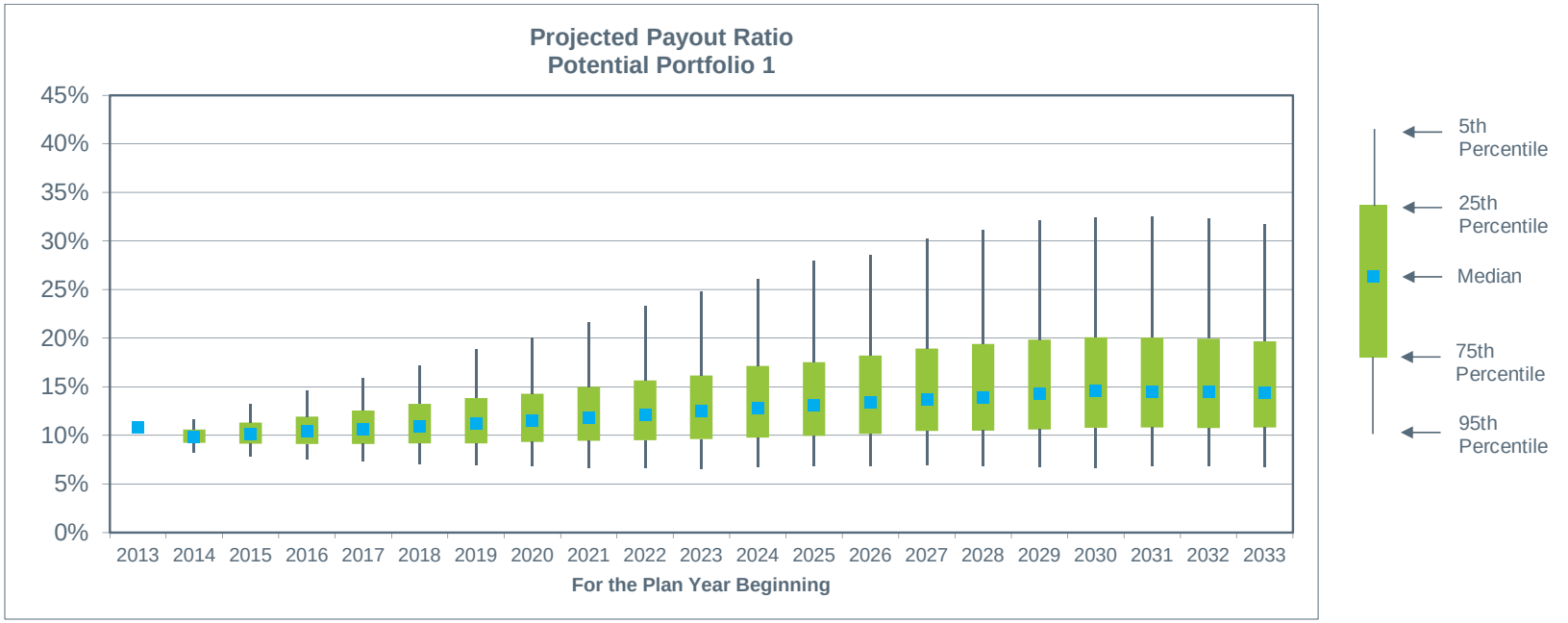

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 11% | 11% | 12% | 12% | 13% | 14% | 14% | 15% | 16% | 16% | 17% | 18% | 19% | 19% | 20% | 20% | 20% | 20% | 20% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 1**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 15%. The worst-case scenario could reach 32% or higher.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 10% | 10% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 14% | 14% | 14% | 15% | 14% | 14% | 14% |



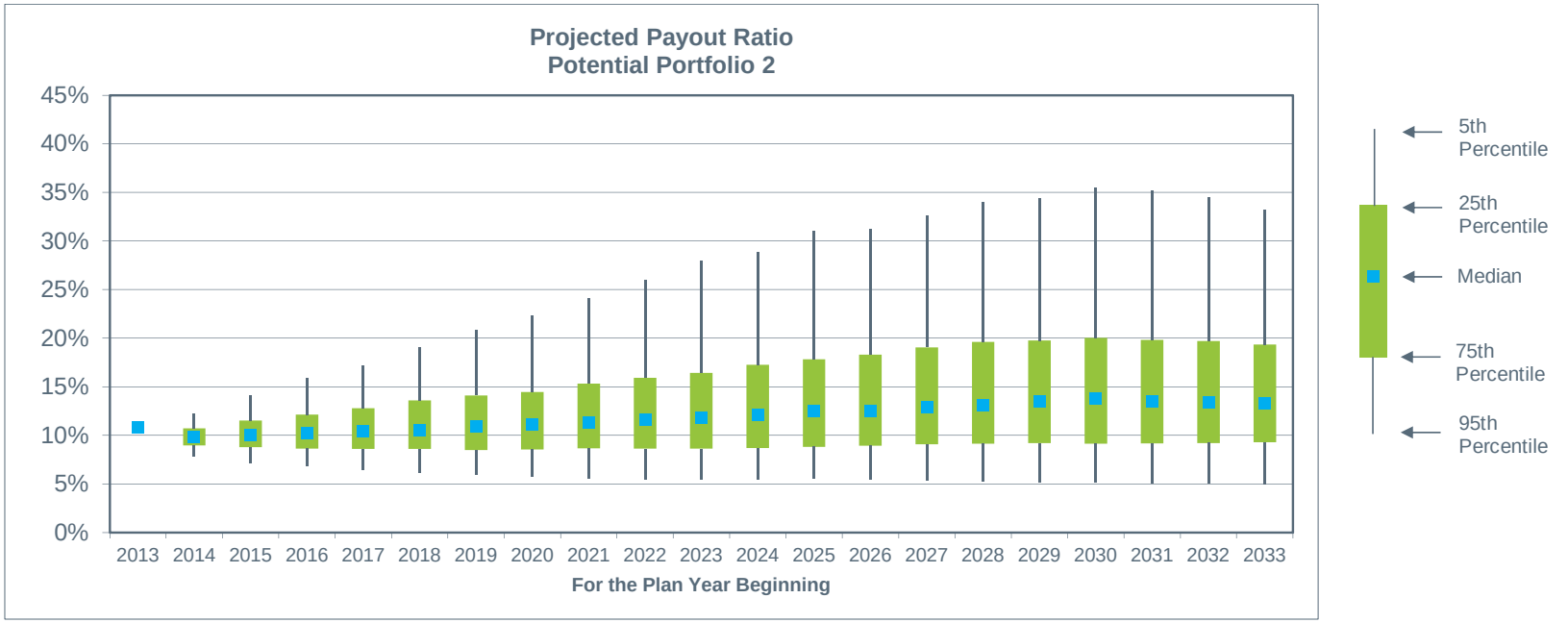
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 2**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 14%. The worst-case scenario could reach 35% or higher.



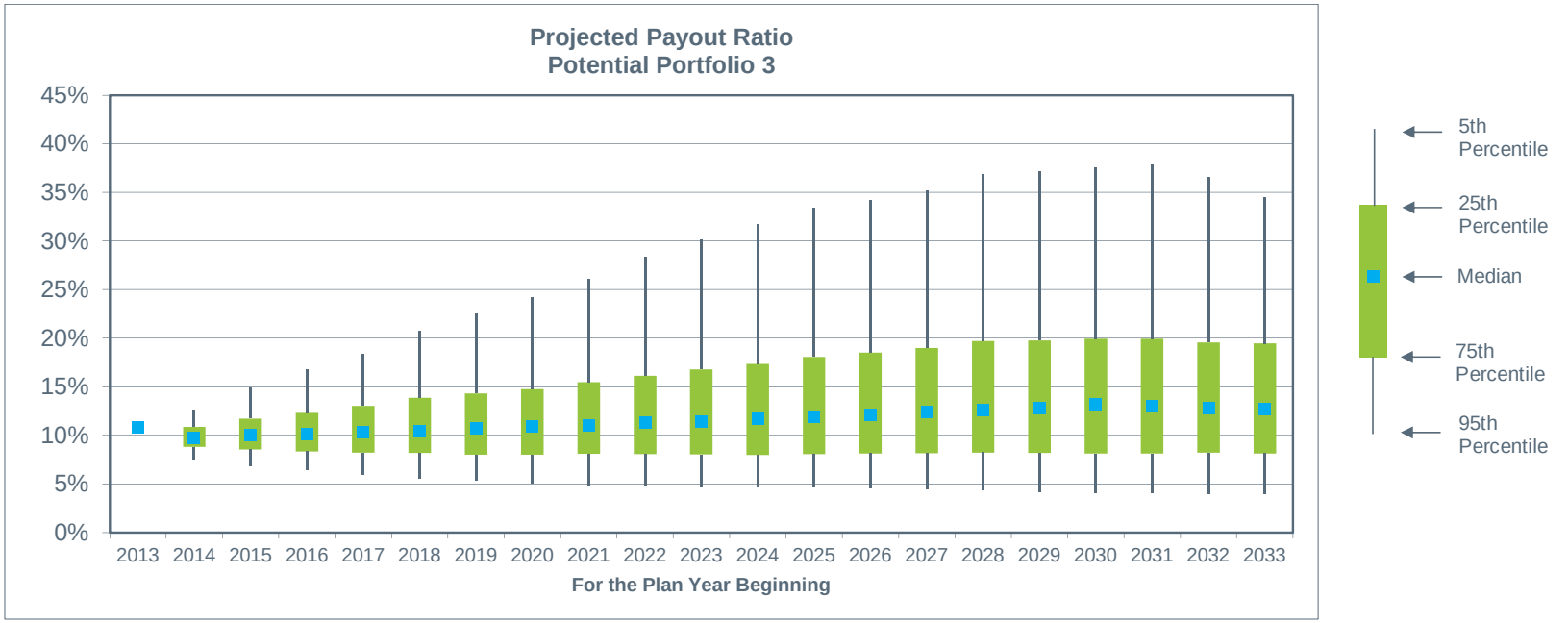

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 14% | 13% | 13% | 13% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 3**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 13%. The worst-case scenario could reach 38% or higher.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 13% | 13% |



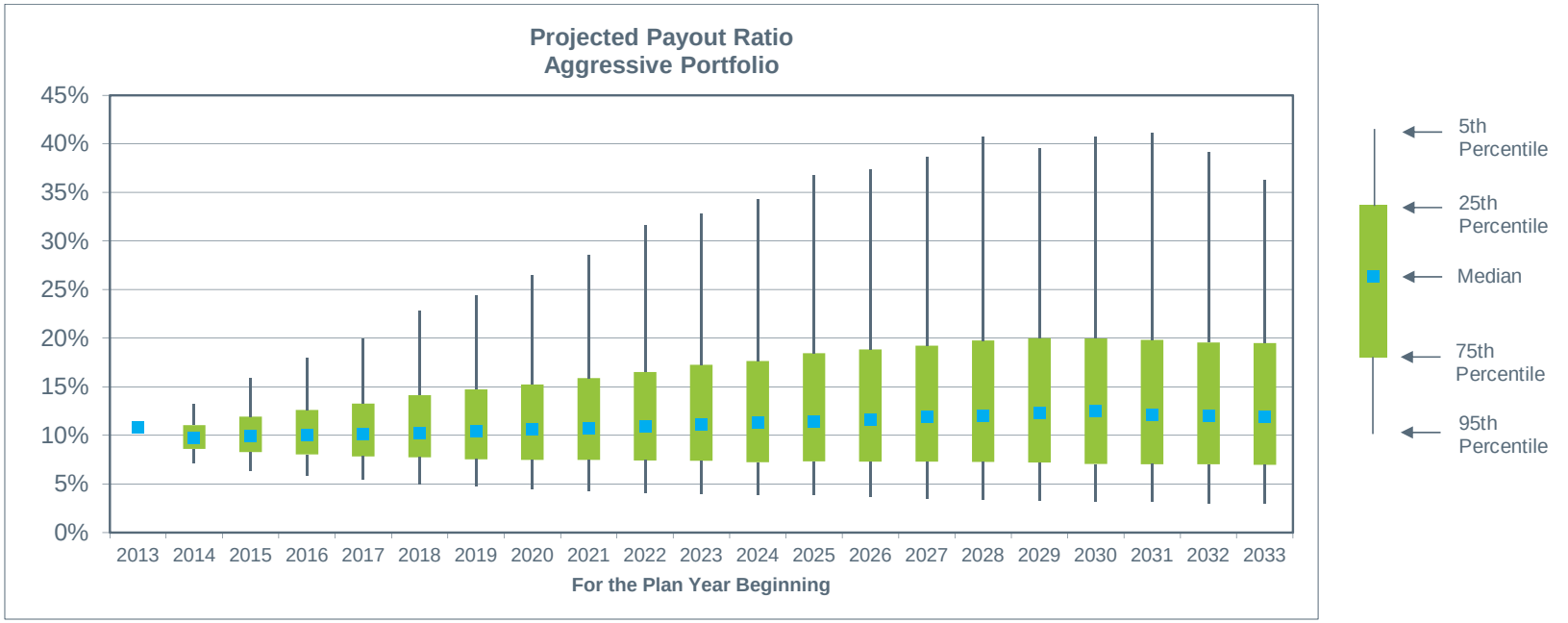
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Aggressive Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 12%. The worst-case scenario could reach 41% or higher.

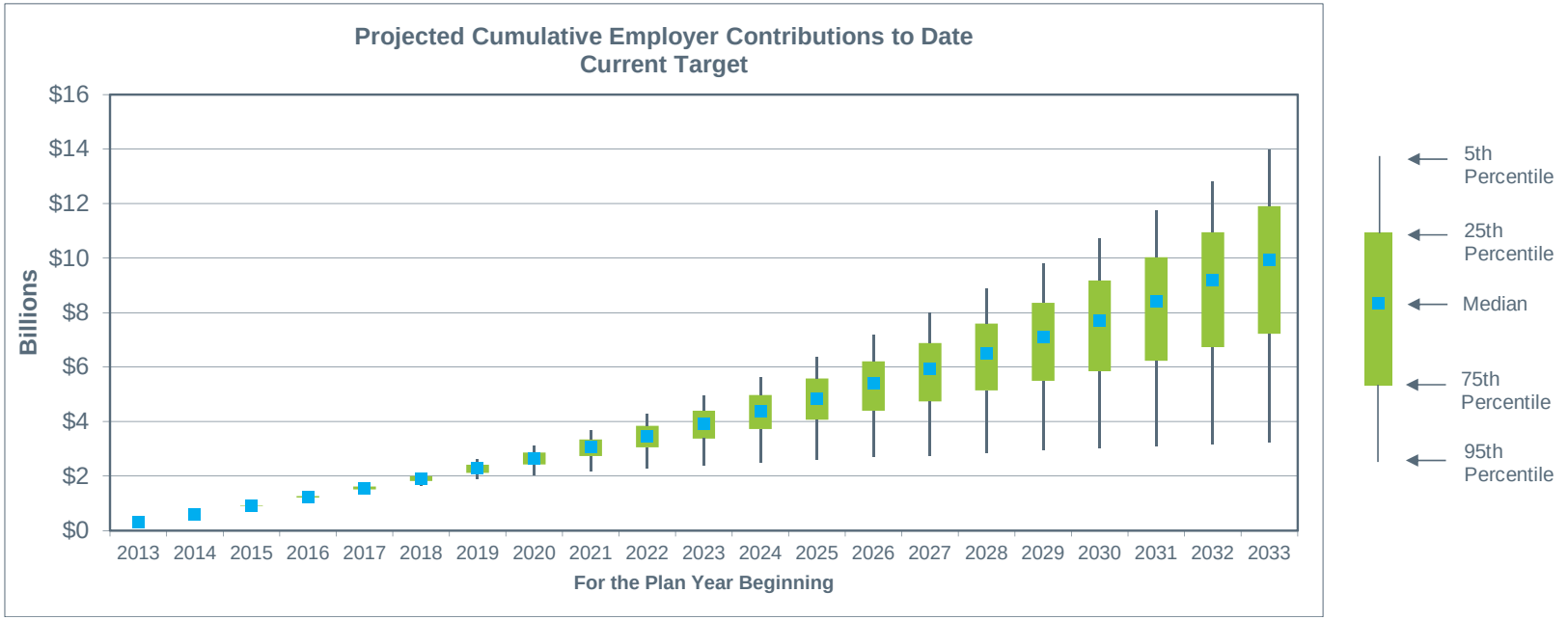



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 11% | 10% | 10% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 12% | 12% |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Current Target

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

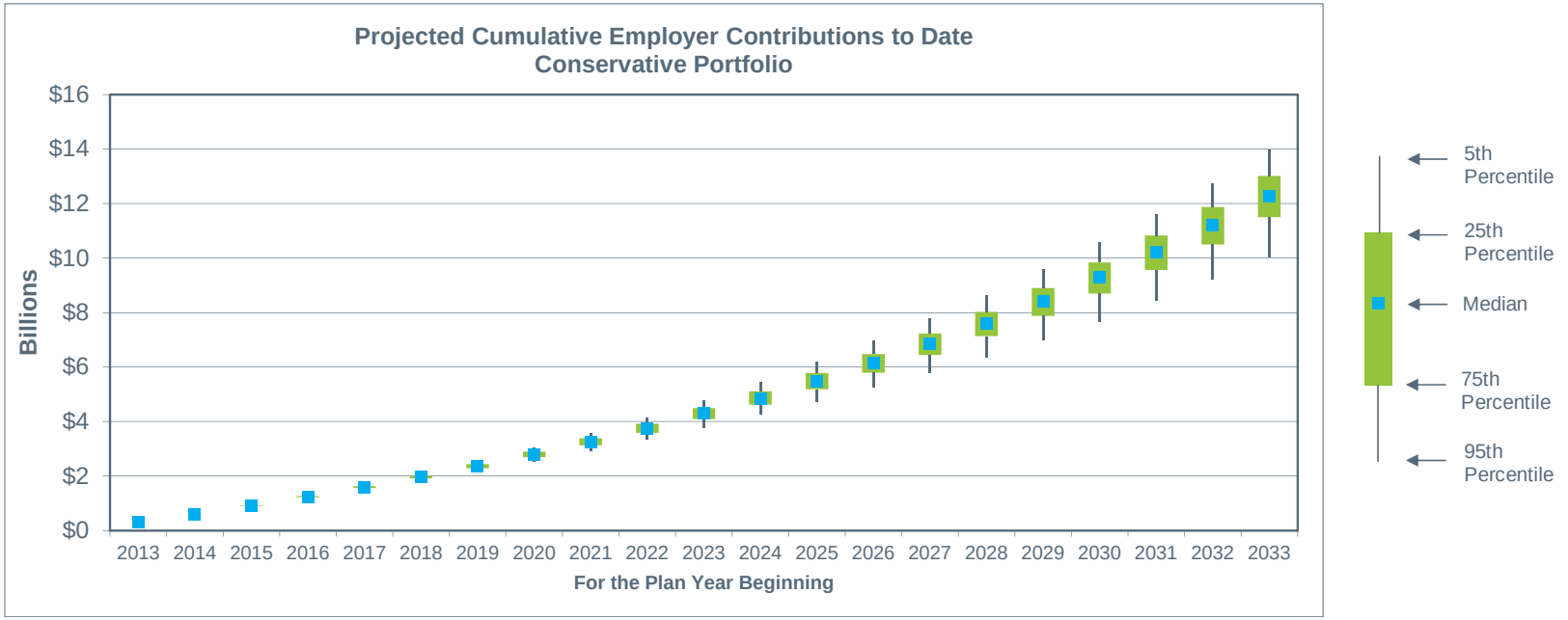



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 |
| 25th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 |
| Median | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $7 | $7 | $8 | $8 | $9 | $10 |
| 75th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $4 | $5 | $5 | $5 | $6 | $6 | $7 | $7 |
| 95th Percentile | $0 | $1 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $2 | $2 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Conservative Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

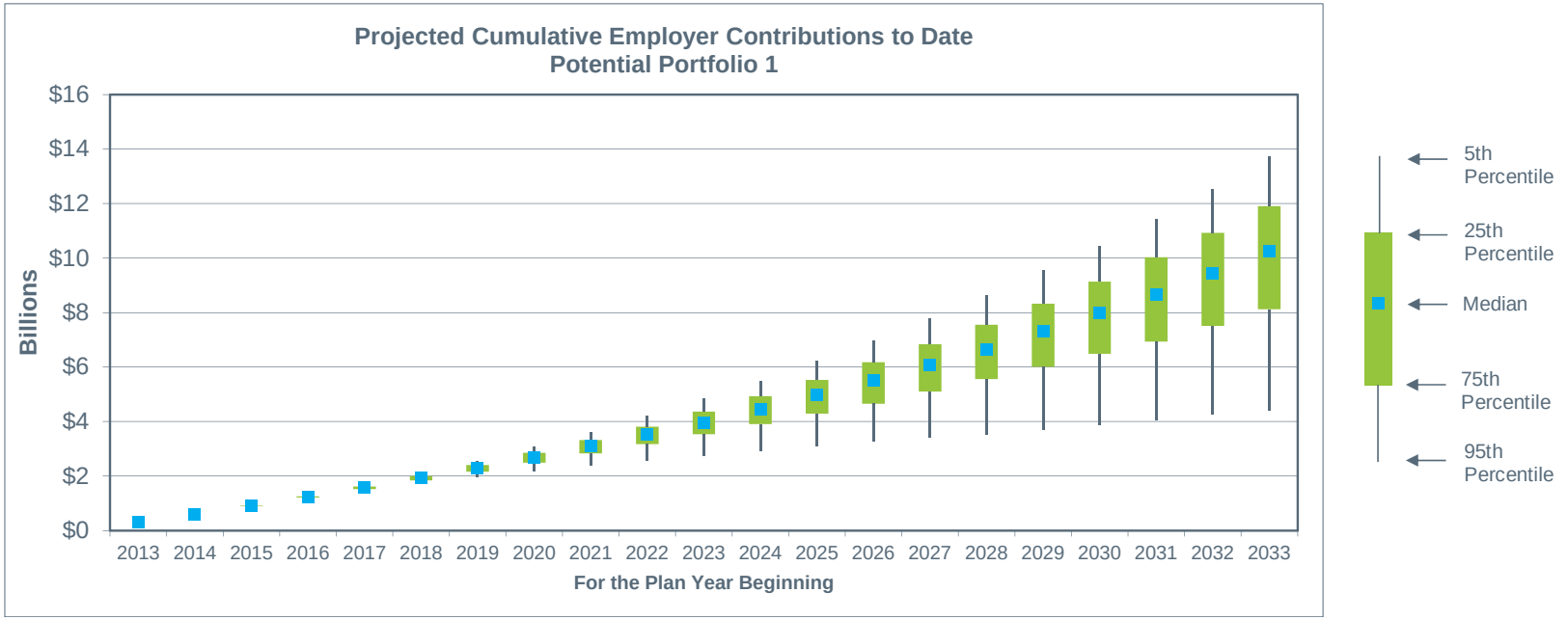



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 |
| 25th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 |
| Median | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 |
| 75th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 |
| 95th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 1

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

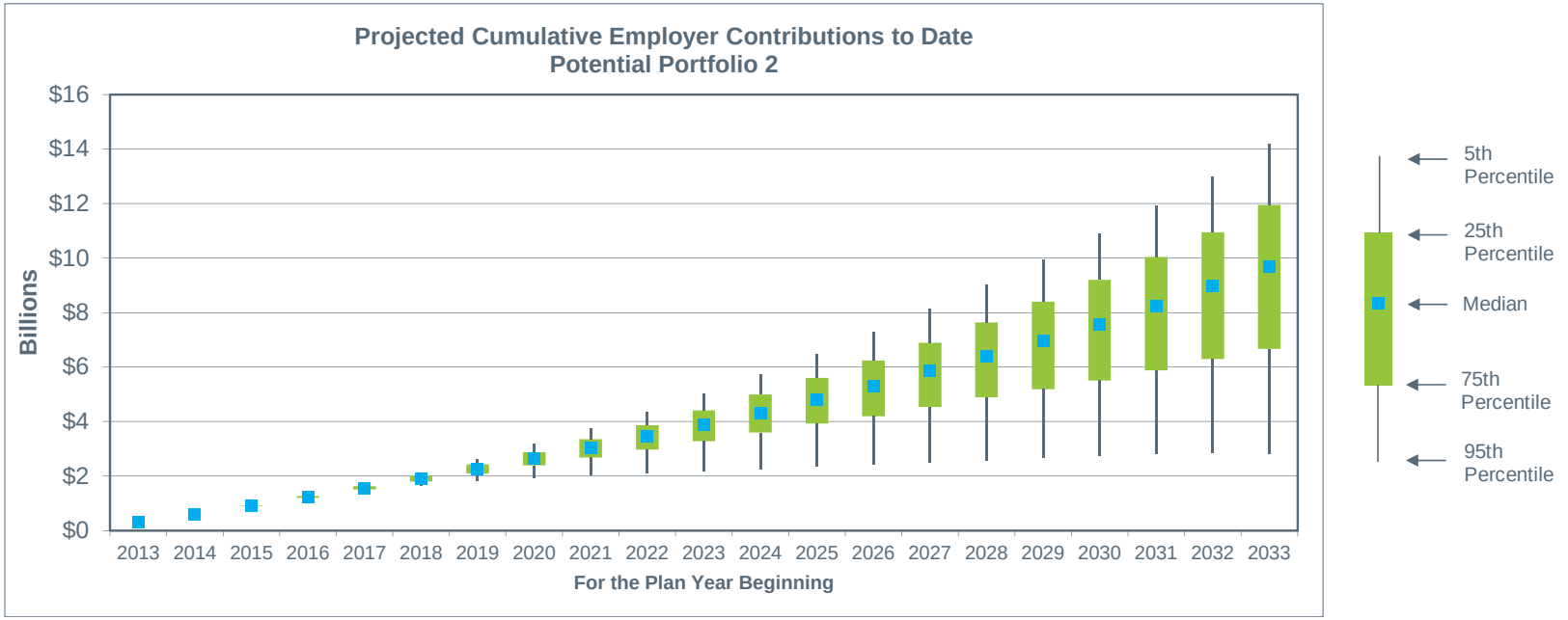



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $10 | $11 | $13 | $14 |
| **25th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 |
| **Median** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $4 | $5 | $5 | $6 | $7 | $7 | $8 | $9 | $9 | $10 |
| **75th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $4 | $5 | $5 | $6 | $6 | $6 | $7 | $8 | $8 |
| **95th Percentile** | $0 | $1 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $3 | $3 | $3 | $3 | $3 | $3 | $4 | $4 | $4 | $4 | $4 | $4 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 2

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

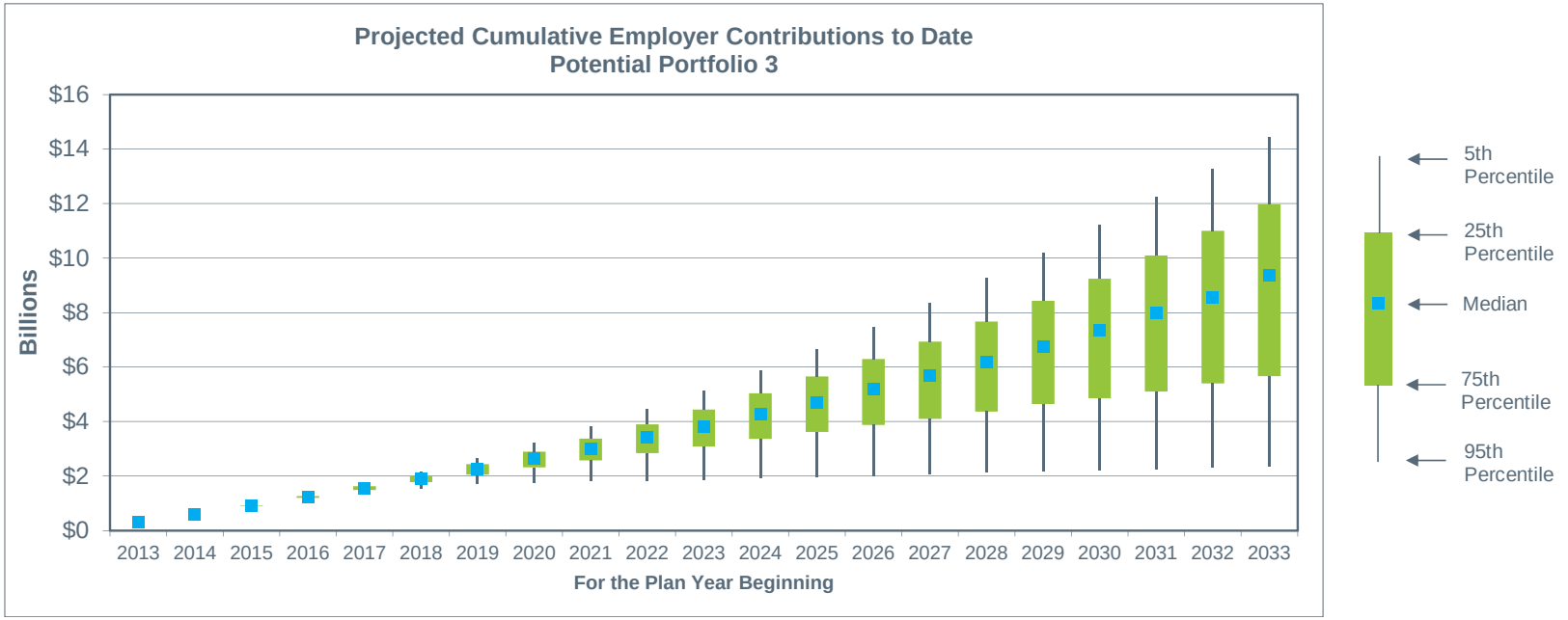



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 |
| **25th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 |
| **Median** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 |
| **75th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $4 | $5 | $5 | $5 | $6 | $6 | $6 | $7 |
| **95th Percentile** | $0 | $1 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $3 | $3 | $3 | $3 | $3 | $3 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 3

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

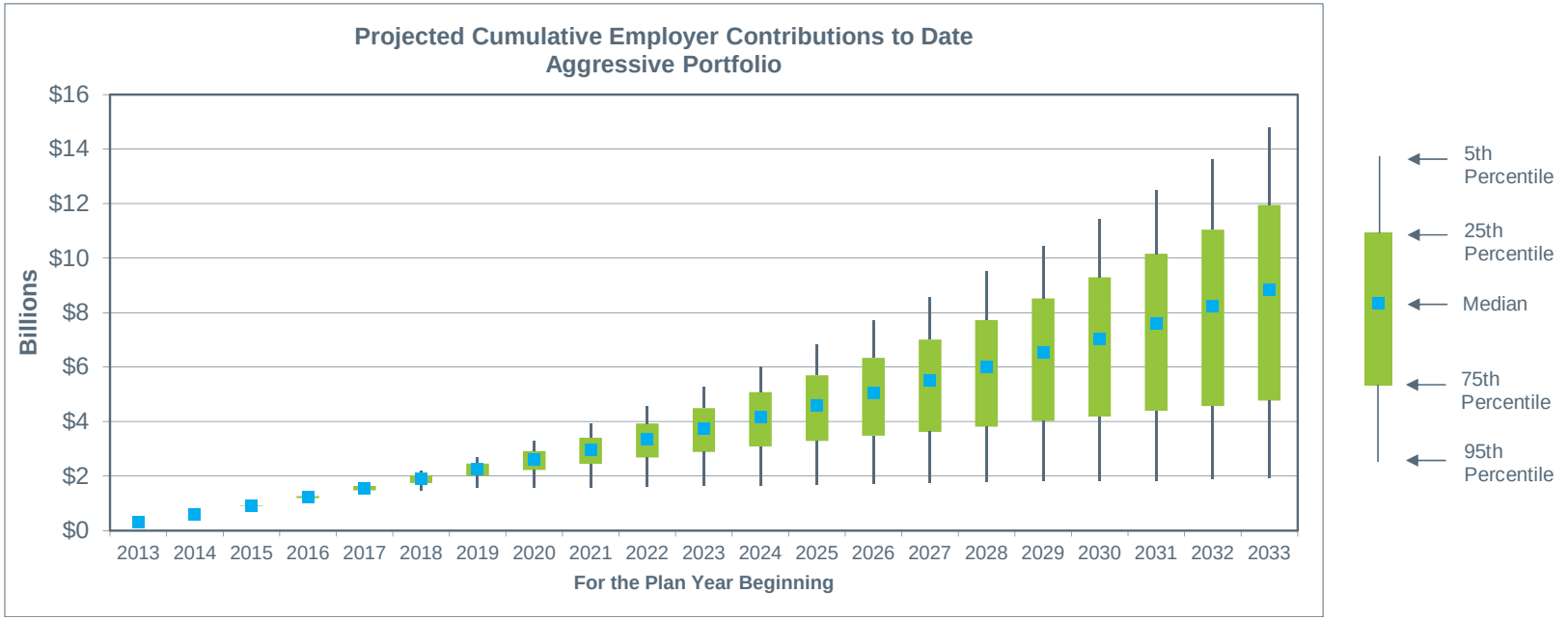



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $7 | $7 | $8 | $9 | $10 | $11 | $12 | $13 | $14 |
| **25th Percentile** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $8 | $9 | $10 | $11 | $12 |
| **Median** | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $6 | $7 | $7 | $8 | $9 | $9 |
| **75th Percentile** | $0 | $1 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $3 | $3 | $4 | $4 | $4 | $4 | $5 | $5 | $5 | $5 | $6 |
| **95th Percentile** | $0 | $1 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Aggressive Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $3 | $3 | $4 | $5 | $5 | $6 | $7 | $8 | $9 | $10 | $10 | $11 | $12 | $14 | $15 |
| 25th Percentile | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $4 | $4 | $5 | $6 | $6 | $7 | $8 | $9 | $9 | $10 | $11 | $12 |
| Median | $0 | $1 | $1 | $1 | $2 | $2 | $2 | $3 | $3 | $3 | $4 | $4 | $5 | $5 | $6 | $6 | $7 | $7 | $8 | $8 | $9 |
| 75th Percentile | $0 | $1 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $3 | $3 | $3 | $3 | $3 | $4 | $4 | $4 | $4 | $4 | $5 | $5 |
| 95th Percentile | $0 | $1 | $1 | $1 | $1 | $1 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 | $2 |

# Stochastic Analysis (continued)

**Employer Contributions** (as a weighted average percentage of salary)

The tables below show the range of required employer contributions (as a weighted average percentage of salary) assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Required Employer Contribution for Plan Year Beginning 2019 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 17% | 15% | 13% | 11% | 8% |
| Conservative Portfolio | 16% | 15% | 14% | 13% | 12% |
| Potential Portfolio 1 | 17% | 15% | 13% | 12% | 9% |
| Potential Portfolio 2 | 18% | 15% | 13% | 11% | 8% |
| Potential Portfolio 3 | 18% | 15% | 13% | 10% | 6% |
| Aggressive Portfolio | 19% | 15% | 13% | 10% | 5% |

| 10 Years | Required Employer Contribution for Plan Year Beginning 2024 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 24% | 19% | 14% | 10% | 1% |
| Conservative Portfolio | 24% | 20% | 17% | 15% | 11% |
| Potential Portfolio 1 | 24% | 19% | 15% | 11% | 4% |
| Potential Portfolio 2 | 24% | 19% | 14% | 9% | 0% |
| Potential Portfolio 3 | 25% | 19% | 14% | 8% | 0% |
| Aggressive Portfolio | 26% | 19% | 13% | 6% | 0% |

| 20 Years | Required Employer Contribution for Plan Year Beginning 2034 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 36% | 25% | 17% | 9% | 0% |
| Conservative Portfolio | 38% | 29% | 24% | 20% | 14% |
| Potential Portfolio 1 | 36% | 26% | 19% | 11% | 0% |
| Potential Portfolio 2 | 36% | 25% | 17% | 7% | 0% |
| Potential Portfolio 3 | 36% | 25% | 16% | 3% | 0% |
| Aggressive Portfolio | 36% | 25% | 15% | 0% | 0% |

# Stochastic Analysis (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 63% | 45% | 88% | 61% | 36% | 99% | $2 | $2 | $2 | 11% | 18% | 6% |
| Conservative Portfolio | 58% | 49% | 67% | 53% | 42% | 67% | $2 | $2 | $2 | 12% | 16% | 9% |
| Potential Portfolio 1 | 62% | 47% | 82% | 60% | 39% | 90% | $2 | $2 | $2 | 11% | 17% | 7% |
| Potential Portfolio 2 | 63% | 43% | 92% | 61% | 35% | 104% | $2 | $2 | $2 | 11% | 19% | 6% |
| Potential Portfolio 3 | 64% | 41% | 99% | 62% | 32% | 115% | $2 | $2 | $2 | 10% | 21% | 6% |
| Aggressive Portfolio | 65% | 39% | 107% | 63% | 29% | 130% | $2 | $2 | $1 | 10% | 23% | 5% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 60% | 32% | 110% | 58% | 27% | 114% | $4 | $5 | $2 | 12% | 27% | 6% |
| Conservative Portfolio | 49% | 35% | 67% | 45% | 30% | 65% | $4 | $5 | $4 | 16% | 24% | 9% |
| Potential Portfolio 1 | 58% | 34% | 97% | 56% | 29% | 102% | $4 | $5 | $3 | 12% | 25% | 7% |
| Potential Portfolio 2 | 61% | 31% | 119% | 59% | 26% | 124% | $4 | $5 | $2 | 12% | 28% | 5% |
| Potential Portfolio 3 | 63% | 28% | 134% | 61% | 24% | 143% | $4 | $5 | $2 | 11% | 30% | 5% |
| Aggressive Portfolio | 65% | 27% | 157% | 63% | 22% | 171% | $4 | $5 | $2 | 11% | 33% | 4% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 63% | 31% | 140% | 61% | 27% | 144% | $10 | $14 | $3 | 14% | 34% | 6% |
| Conservative Portfolio | 46% | 30% | 66% | 42% | 26% | 63% | $12 | $14 | $10 | 20% | 35% | 9% |
| Potential Portfolio 1 | 60% | 32% | 115% | 57% | 28% | 118% | $10 | $14 | $4 | 14% | 32% | 7% |
| Potential Portfolio 2 | 64% | 30% | 159% | 62% | 26% | 163% | $10 | $14 | $3 | 13% | 35% | 5% |
| Potential Portfolio 3 | 67% | 29% | 203% | 66% | 25% | 205% | $9 | $14 | $2 | 13% | 38% | 4% |
| Aggressive Portfolio | 70% | 28% | 267% | 70% | 24% | 281% | $9 | $15 | $2 | 12% | 41% | 3% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility"

This section provides a sensitivity analysis of the original stochastic projections by assuming the risk (as measured by standard deviation) of each asset class is doubled. These modified assumptions are outlined in the table below, compared to the original values:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption | Standard Deviation Assumption Doubled |
|---|---|---|---|
| Global Equity | 7.80 | 18.35 | 36.70 |
| Int. Duration Fixed Income | 3.50 | 6.00 | 12.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 | 21.58 |
| Core Real Estate | 6.75 | 12.50 | 25.00 |
| Diversified Hedge Funds | 6.50 | 9.50 | 19.00 |
| Private Equity | 10.50 | 26.00 | 52.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 | 22.90 |
| Cash Equivalents | 2.25 | 3.00 | 6.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that potential increased capital market volatility does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, exacerbating the potential best and worst-case scenarios.

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 67% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 19% | 57% | 26% | -62% | 22% |
| Conservative Portfolio | 1% | 80% | 18% | -41% | 19% |
| Potential Portfolio 1 | 14% | 59% | 23% | -56% | 21% |
| Potential Portfolio 2 | 21% | 55% | 27% | -65% | 23% |
| Potential Portfolio 3 | 25% | 54% | 29% | -70% | 24% |
| Aggressive Portfolio | 29% | 53% | 30% | -74% | 25% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 67% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 25% | 57% | 33% | -62% | 32% |
| Conservative Portfolio | 3% | 82% | 40% | -41% | 31% |
| Potential Portfolio 1 | 20% | 61% | 32% | -56% | 32% |
| Potential Portfolio 2 | 28% | 56% | 33% | -65% | 33% |
| Potential Portfolio 3 | 32% | 54% | 34% | -71% | 33% |
| Aggressive Portfolio | 35% | 51% | 34% | -76% | 34% |

| 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 | 33% | 51% | 32% | -63% | 54% |
| Conservative Portfolio | 4% | 83% | 46% | -41% | 54% |
| Potential Portfolio 1 | 27% | 55% | 32% | -56% | 54% |
| Potential Portfolio 2 | 36% | 50% | 31% | -67% | 54% |
| Potential Portfolio 3 | 40% | 47% | 30% | -72% | 54% |
| Aggressive Portfolio | 44% | 45% | 31% | -77% | 54% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 63% | 30% | 125% | 61% | 22% | 157% | $2 | $2 | $1 | 11% | 31% | 4% |
| Conservative Portfolio | 58% | 41% | 78% | 53% | 32% | 85% | $2 | $2 | $2 | 12% | 22% | 7% |
| Potential Portfolio 1 | 62% | 34% | 110% | 60% | 25% | 135% | $2 | $2 | $1 | 11% | 27% | 5% |
| Potential Portfolio 2 | 63% | 27% | 132% | 62% | 20% | 173% | $2 | $2 | $1 | 10% | 34% | 4% |
| Potential Portfolio 3 | 64% | 24% | 152% | 62% | 16% | 207% | $2 | $2 | $1 | 10% | 41% | 3% |
| Aggressive Portfolio | 65% | 20% | 179% | 63% | 14% | 254% | $2 | $3 | $1 | 10% | 50% | 2% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 60% | 16% | 204% | 59% | 12% | 220% | $4 | $6 | $1 | 12% | 60% | 3% |
| Conservative Portfolio | 49% | 24% | 90% | 45% | 20% | 91% | $4 | $5 | $3 | 16% | 39% | 7% |
| Potential Portfolio 1 | 58% | 19% | 163% | 57% | 15% | 179% | $4 | $6 | $2 | 12% | 51% | 4% |
| Potential Portfolio 2 | 62% | 15% | 232% | 60% | 11% | 258% | $4 | $6 | $1 | 12% | 66% | 3% |
| Potential Portfolio 3 | 64% | 13% | 289% | 62% | 9% | 335% | $4 | $6 | $1 | 11% | 79% | 2% |
| Aggressive Portfolio | 66% | 10% | 387% | 64% | 8% | 453% | $4 | $6 | $1 | 11% | 97% | 1% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 66% | 17% | 391% | 65% | 13% | 407% | $10 | $16 | $2 | 13% | 84% | 2% |
| Conservative Portfolio | 47% | 18% | 95% | 43% | 15% | 93% | $12 | $15 | $6 | 19% | 67% | 7% |
| Potential Portfolio 1 | 62% | 18% | 278% | 60% | 14% | 285% | $10 | $16 | $2 | 14% | 76% | 3% |
| Potential Portfolio 2 | 68% | 17% | 472% | 67% | 13% | 498% | $9 | $16 | $1 | 12% | 90% | 2% |
| Potential Portfolio 3 | 71% | 15% | 697% | 73% | 12% | 764% | $9 | $17 | $1 | 11% | 100% | 1% |
| Aggressive Portfolio | 77% | 14% | 1040% | 81% | 11% | 1164% | $9 | $17 | $1 | 10% | 100% | 1% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations"

This section provides a sensitivity analysis of the original stochastic projections by assuming that all asset classes are perfectly positively correlated (i.e. correlation = 1.00). A correlation matrix reflecting these modified assumptions is provided below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Int. Duration Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Custom KRS Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Core Real Estate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Hedge Funds | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Private Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Inflation Strategies | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Cash Equivalents | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that converging correlations across capital markets does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, indicating higher risk for all asset mixes given the dampened effects of total fund diversification.

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 67% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 12% | 60% | 16% | -41% | 19% |
| Conservative Portfolio | 0% | 85% | 10% | -23% | 18% |
| Potential Portfolio 1 | 9% | 62% | 15% | -38% | 19% |
| Potential Portfolio 2 | 14% | 59% | 16% | -43% | 20% |
| Potential Portfolio 3 | 16% | 57% | 18% | -47% | 20% |
| Aggressive Portfolio | 19% | 55% | 20% | -51% | 21% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 67% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 18% | 59% | 27% | -41% | 28% |
| Conservative Portfolio | 1% | 88% | 36% | -23% | 26% |
| Potential Portfolio 1 | 15% | 62% | 27% | -38% | 28% |
| Potential Portfolio 2 | 20% | 57% | 27% | -43% | 28% |
| Potential Portfolio 3 | 24% | 55% | 27% | -47% | 29% |
| Aggressive Portfolio | 28% | 53% | 27% | -51% | 30% |

| 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 | 24% | 57% | 30% | -48% | 42% |
| Conservative Portfolio | 1% | 89% | 46% | -29% | 42% |
| Potential Portfolio 1 | 20% | 61% | 30% | -46% | 42% |
| Potential Portfolio 2 | 27% | 55% | 29% | -50% | 43% |
| Potential Portfolio 3 | 32% | 52% | 28% | -54% | 43% |
| Aggressive Portfolio | 35% | 49% | 28% | -58% | 43% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 63% | 40% | 100% | 60% | 30% | 119% | $2 | $2 | $2 | 11% | 23% | 5% |
| Conservative Portfolio | 58% | 46% | 73% | 53% | 37% | 76% | $2 | $2 | $2 | 12% | 19% | 8% |
| Potential Portfolio 1 | 62% | 41% | 95% | 60% | 31% | 111% | $2 | $2 | $2 | 11% | 22% | 5% |
| Potential Portfolio 2 | 63% | 39% | 103% | 61% | 30% | 124% | $2 | $2 | $2 | 11% | 23% | 5% |
| Potential Portfolio 3 | 64% | 37% | 111% | 62% | 28% | 136% | $2 | $2 | $2 | 10% | 25% | 4% |
| Aggressive Portfolio | 65% | 35% | 120% | 63% | 26% | 151% | $2 | $2 | $1 | 10% | 27% | 4% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 60% | 25% | 141% | 58% | 21% | 149% | $4 | $5 | $2 | 12% | 37% | 4% |
| Conservative Portfolio | 49% | 30% | 78% | 45% | 25% | 76% | $4 | $5 | $4 | 16% | 30% | 8% |
| Potential Portfolio 1 | 59% | 25% | 128% | 56% | 22% | 134% | $4 | $5 | $2 | 13% | 35% | 5% |
| Potential Portfolio 2 | 61% | 24% | 150% | 59% | 20% | 160% | $4 | $5 | $2 | 12% | 38% | 4% |
| Potential Portfolio 3 | 63% | 23% | 171% | 61% | 19% | 184% | $4 | $5 | $2 | 12% | 41% | 4% |
| Aggressive Portfolio | 65% | 21% | 197% | 63% | 17% | 217% | $4 | $5 | $1 | 11% | 44% | 3% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Billions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 61% | 23% | 224% | 59% | 20% | 233% | $10 | $14 | $2 | 14% | 56% | 3% |
| Conservative Portfolio | 45% | 25% | 78% | 41% | 21% | 76% | $12 | $14 | $9 | 20% | 48% | 8% |
| Potential Portfolio 1 | 59% | 24% | 187% | 56% | 20% | 195% | $10 | $14 | $2 | 15% | 53% | 4% |
| Potential Portfolio 2 | 63% | 23% | 253% | 61% | 19% | 264% | $10 | $14 | $2 | 14% | 57% | 3% |
| Potential Portfolio 3 | 66% | 22% | 320% | 64% | 18% | 338% | $9 | $14 | $2 | 13% | 62% | 2% |
| Aggressive Portfolio | 70% | 21% | 418% | 69% | 17% | 444% | $9 | $14 | $2 | 12% | 67% | 2% |

# Appendix 3: Assumptions and Methods

**Actuarial Valuation Assumptions and Methods**: At the beginning of each projection year, an actuarial valuation is performed to determine employer contributions. The assumptions proposed in the 2013 Experience Study were used with actuarial valuations beginning in 2015 and beyond. These methods and assumptions are summarized below:

| | |
|---|---|
| **Actuarial Cost Method** | Entry-Age Normal (level % of pay). Funding policies and methods are described in the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Liability Discount Rate** | 7.50% per year, compounded annually. |
| **Future Pay Increases** | Future pay increases as recommended in the 2013 Experience Study. Pay increases include a 4.00% base wage inflation rate. |
| **Retirement** | Rates of retirement as recommended in the 2013 Experience Study. |
| **Mortality** | Rates of mortality as recommended in the 2013 Experience Study. |
| **Disability** | Rates of disability as recommended in the 2013 Experience Study. |
| **Withdrawal** | Rates of withdrawal as recommended in the 2013 Experience Study. |
| **Asset Valuation Method** | 5-Year smoothing of actual versus expected returns. The asset valuation method is described on page 36 of the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Contribution Policy** | For fiscal years 2017 and beyond, employer contributions are assumed to equal the full actuarially required contribution consisting of: (1) gross normal cost, less (2) expected employee contributions, plus (3) administrative expenses (0.81% of 2014-15 payroll, growing at inflation each year), plus (4) an amortization of the unfunded actuarial liability over 29 years beginning in 2014, calculated as a level percentage of payroll assuming 4.00% payroll growth. The amortization period was not assumed to reset at any point in the future, and was not allowed to fall below 10 years. |

# Appendix 3: Assumptions and Methods (continued)

**Projection Assumptions (used in the deterministic and stochastic asset/liability projections)**: These projections begin with the Plan's participant population as of June 30, 2014, as provided by Cavanaugh. The Plan's population is projected forward and assumed to change as a result of employment separation, death, disability, and retirement, as predicted by the assumptions recommended in the 2013 Experience Study (and described on the prior pages). New members are assumed to enter the Plan such that the active population remains level throughout the projection. Employee compensation is projected into the future in accordance with the assumptions described on the prior pages. Investment returns are projected into the future in accordance with the assumptions described below.

| | |
|---|---|
| **Employer Contributions** | For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013, and June 30, 2014 (12.75% and 12.42% of payroll, respectively). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study. |
| **Member Contributions** | Member contributions are determined based on current contribution rates, and projected pay. |
| **New Entrants** | New employees are assumed to join the Plan such that the active population remains level throughout the projection. New employees entering the Plan are assumed to have characteristics similar to recently hired participants. |
| **Rate of Return on Assets** | Deterministic Analysis: 7.50%, compounded annually.<br><br>Stochastic Analysis: Returns on the portfolio are based on the expected returns of each asset class and the correlations between each class which are detailed in the Stochastic Analysis section of this report. |
| **Cash Balance Interest Credit** | Deterministic Analysis: 7.00%, compounded annually.<br><br>Stochastic Analysis: Interest credits are based on the expected returns of a benchmark portfolio designed to mirror the overall portfolio return. |

# Appendix 3: Assumptions and Methods (continued)

**Inflation**

2.50% per year with a standard deviation of 3.00%.

**Other**

All other projection assumptions are the same as those recommended in the 2013 Experience Study.

Our work was based partly on original work prepared by Cavanaugh using the ProVal valuation software. This included their coding of benefit provisions and the methodology to generate liabilities under the entry age normal actuarial cost method. Cavanaugh provided us with an actuarial valuation as of June 30, 2014, using assumptions from the 2013 Experience Study. We reviewed this work for reasonableness, but we did not perform a complete audit of this work.

We started with Cavanaugh's base year valuation work. Certain changes to the coding of benefit provisions were required in order to facilitate a 20-year projection of liabilities and costs. For example, we added employee contribution definitions in order to offset gross normal cost calculations by expected employee contributions. In some cases, scaling of liabilities was used to approximate liabilities not valued directly in the work provided by Cavanaugh.

The participant data provided by Cavanaugh was the same as that used in the actuarial valuation as of June 30, 2014, for CERS Non-Hazardous funding purposes. This data was grouped on entry age and valuation age for efficient data processing.

We modeled contribution rates based on annual valuations with a one-year lag period.

May 2015

# Asset/Liability Study

## CERS Hazardous Pension Plan

# Memorandum

| | |
|---|---|
| To | Kentucky Employees Retirement System |
| From | RVK, Inc. |
| Subject | CERS-HPP Asset/Liability Study – Executive Summary |
| Date | May 5, 2015 |

## Introduction

The purpose of this memorandum is to summarize the key inferences we draw from the Asset/Liability ("A/L") study of the CERS Hazardous Pension Plan ("CERS-HPP" or the "Plan"). While this memorandum refers directly to points raised within the study, we emphasize that a full understanding of the A/L study and its implications requires a close review of the study in its entirety.

## Background and Key Conclusions

As of the fiscal year beginning June 30, 2014, the date of the most recent actuarial valuation and the start date of the projections in this study, the Plan was 63% funded (on a market value basis) meaning that assets were available to cover 63% of Plan liabilities as currently estimated by the Plan's actuary. This equates to a shortfall of approximately $1.2 billion. This is a significant concern for the future of the Plan's financial health, however, this study shows that the Plan remains solvent and while the Plan's funding ratio will fluctuate during this period, the study suggests the potential for reducing the funding gap over the next 20 years.

As highlighted below, this study suggests that continued diversification in the investment of Plan assets is desirable. The study, however, suggests caution in assuming that increased pursuit of higher expected returns, through even more aggressive (and hence even more volatile) asset allocations, is always beneficial. High expected return and high expected risk approaches bring with them increased risk of large declines in the value of the Plan and increased volatility in required contributions.

## The Purpose of an Asset Liability Study

The central purpose of an A/L study is to examine the probable future consequences, over extended periods of time, of applying alternative asset allocation strategies to the Plan's investment assets in order to fund the liabilities created by the benefit provisions of the Plan. A/L studies are unique in their ability to combine in a single analysis the three critical factors that drive the financial health of the Plan—benefit policy (liabilities), contribution policy, and investment strategy (asset allocation). Certainly this type of forward looking study—nor any others we are aware of—cannot indicate with any reliability what will happen in any given year over this extended period of time and its insights are dependent on the assumptions used. However, we have high conviction that the study's results paint a highly reliable view of the core long-term trends in the Plan's financial health. Best practice, in our judgment, is to take the

general direction suggested as most appropriate by this study with its unique consideration of liabilities, contribution policy and trending liquidity needs and refine it in an asset allocation study where implementing the Plan's structure can reflect the pragmatic considerations of investing in the capital markets present at any given point in time.

**Deterministic versus Stochastic**

In this study, we examined a series of related questions associated with this central purpose, projecting future outcomes under two distinctly different methodologies:

1. a **deterministic** basis (all underlying assumptions, liabilities, contributions and most critically investment returns, are achieved precisely and without variance in each and every year); and

2. a **stochastic** basis (outcomes for investment returns vary each year according to estimated volatility with contribution *requirements* following suit while *actual* contribution policy and liabilities remains in their current form).

**Key Results**

Below you will find a series of important findings, forecasts, and conclusions drawn from the body of the study. While the remarks are presented here to allow a quick assessment of some of the key findings, they represent only a sampling of the fundamental elements of the study. We emphasize that a solid understanding of each element requires that they be reviewed as they are presented in the study itself within their surrounding context (please note the frequent page references to the full study). This is especially important to understanding the findings which represent *probable, but not certain,* outcomes as analyzed in the stochastic section of the study.

*At the Outset:*

- As of June 30, 2014 (the date of the actuarial valuation used to model liabilities), the Plan's market value funded ratio (available assets to fund benefit obligations) was 63% (page 6).

- The number of active members currently exceeds the number of inactive members by approximately 20%. Over time, the inactive population is projected to grow and begin to quickly outnumber the active member population (page 8). The maturing demographics of the Plan is an important factor when considering the findings on Plan risk/return options and the projected status of Plan liquidity below.

*Deterministic Analysis: A deterministic analysis assumes full certainty about the future, in particular, certainty of investment returns. Its 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.*

- Benefit payments to Plan participants are expected to increase by about 98% over the next 20 years (page 9). Annual increases are projected to range between 1.5% and 4.5%.

- Total annual dollar contributions (employer and employee) based on actuarially required rates are expected to almost double over the next 20 years; from $137 million in 2014 to $261 million in 2034 (page 10). *Please note however*, that precise actuarially required rates as they unfold are the purview of the Plan's actuary and are affected by factors other than investment returns and resulting asset values of the Plan.

- Beginning in 2016, contributions expressed as a weighted average percentage of salary are projected to remain constant (page 11).

- Aggregate benefit payments are expected to increase by about 98% over the next 20 years but actually remain roughly constant as a percentage of Plan assets over this same time period (pages 9 and 12). Not only do benefit payments as a percentage of Plan assets not increase, they are also healthy and sustainable on an absolute basis during this period. This is an important and positive indication, because increased payout ratios, if they rise sufficiently high, can potentially impose liquidity constraints on the management of the portfolio (inhibiting the ability of the Plan to invest with a long-term horizon) therefore limiting the opportunity to invest in less liquid asset classes regardless of the return or risk reducing diversification benefits they offer. The payout ratio is projected to fluctuate between 10% and 11%% during the projection period. These levels do not, in our opinion, materially inhibit investment opportunities for the Plan (page 12).

- As assets grow each and every year without exception at the assumed rate of return (7.50%), the funding ratio on a market value basis is expected to gradually increase to approximately 77% by 2034 from the current value of 63% (page 17).

- Assuming the current contribution policy remains unchanged, the Plan would need to experience annual returns in excess of 11% over the next 10 years or 9% over the next 20 years *without exception in each and every year* in order to reach full funding (page 18). Achieving such lofty returns on such a sustained basis is extremely unlikely in our judgment and underscores our conclusion that investment returns alone cannot move the Plan to full funding.

- Experiencing a return of 100 basis points below the Plan's current assumed rate of return of 7.50% (i.e., 6.50%) each year for the 20 year projection period would result in a moderate decline in the projected funding ratio to 66% in year 20 versus 77% at the current assumed rate of return (page 19). Additionally, under this scenario cumulative employer contributions would be $400 million higher over the 20 year period. Given the widely shared concerns about the prospects for a low return environment in the capital markets over the foreseeable future, this is a conclusion that should be thoroughly

understood and appreciated. In the event that capital markets do not support returns commensurate with the assumed rate of return, reliance on contributions to complete the payout of the Plan's liabilities effectively increases, especially in later years.

*Stochastic Analysis: Unlike a deterministic analysis, a stochastic analysis does not assume an unvarying stream of expected investment returns year after year. Instead, it reflects the realistic view that pension plan investment returns are—like the investment markets themselves—volatile and always uncertain. This means that there are a range of possible outcomes for CERS-HPP; some are more likely, others less likely, but still possible.*

*The deterministic approach is useful for gauging the general direction of change and associated consequences, but adding the element of uncertainty—more specifically year to year variability in the performance of the capital markets and the value of the Plan's assets over time—can offer additional insights, albeit along with considerable complexity.*

Uncertainty in future investment returns is taken into account via a stochastic analysis of six different investment approaches (in the table below and on page 25) ranging from highly conservative (low risk, asset protective) to highly aggressive (high return seeking with substantial associated risk), including the Current Target allocation CERS-HPP. The reason for testing such a broad range of approaches is that at the heart of the CERS-HPP situation is a simple question that is difficult to answer: whether the Plan is 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).

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | 30 | 70 | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | 0 | 30 | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | 0 | 30 | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | 5 | 15 | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | 2 | 15 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | 2 | 5 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

Essential to answering this question is to ask precisely how CERS-HPP and the Plan's broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plan is "better off" under one approach versus another are as follows:

(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 Plan's ability to pay annual benefits without major disruption of its strategic asset allocation, the driver of its investment strategy).

(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 Plan's assets over the course of time and the associated effects on contributions and potentially investment decisions.

The results of this analysis are displayed on pages 26 through 46 of the accompanying A/L study. For purposes of this summary, the consequences of choosing A versus B, as described above, is summarized most clearly in the tables on pages 32 and 46 of the study (copied below followed by explanatory comments).

| 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% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 63% | 32% | 138% | 60% | 28% | 142% | $3,278 | $4,624 | $1,055 | 13% | 34% | 5% |
| Conservative Portfolio | 46% | 31% | 67% | 43% | 27% | 63% | $4,046 | $4,578 | $3,268 | 19% | 34% | 9% |
| Potential Portfolio 1 | 60% | 33% | 114% | 58% | 29% | 118% | $3,386 | $4,523 | $1,433 | 14% | 32% | 7% |
| Potential Portfolio 2 | 64% | 31% | 156% | 62% | 27% | 161% | $3,210 | $4,676 | $904 | 13% | 35% | 5% |
| Potential Portfolio 3 | 66% | 30% | 202% | 66% | 26% | 199% | $3,090 | $4,781 | $742 | 12% | 38% | 4% |
| Aggressive Portfolio | 70% | 29% | 261% | 69% | 25% | 271% | $2,935 | $4,870 | $599 | 11% | 42% | 3% |

- The median expected funding ratio at the end of the 20 year study period is lower than the current funding level all but Potential Portfolio 3 and the Aggressive Portfolio (pages 31, 32, and 46). The Current Target and Potential Portfolio 1 result in expected funding ratios that are substantially similar to the current level. This is supportive of the continued utilization of diversified investment approach.

- With the exception of the Conservative Portfolio all portfolios analyzed show a moderate (from 10% to 31%) probability of full funding in 20 years (page 32). The Conservative Portfolio shows a no probability of full funding in 20 years.

- None of the portfolios show significant probability of extreme payout ratios over the next 20 years (pages 33-38 and 46). However, the peak value for all portfolios is above 30%, a level that does inhibit asset allocation decisions as they relate to illiquid asset classes.

- As you incrementally increase the expected risk and return of the fund (from Potential Portfolio 1 to Potential Portfolio 3), the outcomes do appear to gradually improve at the cost of slightly reduced worst-case outcomes.

- The cumulative cost of providing the Plan's benefits is met through a combination of contributions and the investment returns on those contributions. The Conservative Portfolio requires the largest increase in cumulative contributions (i.e., the direct funding of benefits) (pages 40, 45, and 46). Even under the very unlikely best-case scenario the Plan would have a funded ratio of about 43%, far lower than any of the other portfolios (page 46). The only redeeming virtue of such an ultra-conservative approach is that the potential for large declines in the value of the fund is significantly mitigated albeit at much higher ongoing costs (contributions) and chronic poor Plan financial health.

- The Aggressive Portfolio does appear to have the highest *probability* of producing full funding by 2034 at 31% (page 32). *However*, it also has a maximum theoretical one-year portfolio decline of 51%—a loss of almost one half of the Plan's assets, significant we believe by any standard. This likelihood of notably larger one year declines within the study period gives pause to the desirability of a far more aggressive approach simply from a quantitative viewpoint. It also suggests it may be a strategy that is extremely difficult for decision makers to sustain over a long period of time. Declines in the total fund market value of this magnitude are a disruptive event from all aspects of Plan management. Yet, the benefit of such an aggressive approach that makes it superficially attractive can only be realized with any probability if the aggressive and highly volatile

approach is maintained for several decades through good times, bad times, and unnerving times. Furthermore, this type of strategy could prove difficult to maintain in future years should demographic (early retirement incentives for example) or financial events create higher liquidity demands on the Plan. For all these reasons, it is not an approach that should be seriously considered without full recognition of the significant risks.

- While RVK supports the conclusions of the study using our current capital market assumptions, we also model for extreme market scenarios to stress test the results of the study. The summary of this analysis can be found in Appendices 1 and 2 (beginning on pages 47 and 50 respectively). The first test models the case of extreme market volatility by doubling the assumed standard deviations of all asset classes. The second test models converging market returns by assuming all assets are perfectly correlated (i.e. correlations equal +1.00). The results of these additional analyses show that the *relative* portfolio outcomes do not change, but that the range of potential results widens, indicating higher risk for all asset mixes given the increased systemic volatility and the reduced dampening effects of total fund diversification we assume under these stress scenarios.

**Final Comments**

This A/L study shows that CERS-HPP is currently underfunded but significant improvements in financial health are possible. The Plan can best meet its objectives through the continued use of a well-diversified investment portfolio. However, positive outcomes are extremely dependent on the contribution policy. The study is not supportive of a long-term, ultra-conservative approach. The increasing potential for large one-year declines suggests that there is likely a limit to the net benefits of adding increased risk in pursuit of additional return. Progress should be monitored periodically through studies such as these, particularly if the Plan encounters a sustained period of lower returns in the capital markets (and thus for the Plan's assets) as well as material changes in contribution policy or benefit levels.

Additionally, this study assumes no further changes are made to the benefit policy at any point during the 20 year projection period. Such changes would fall outside the reach of an Asset/Liability study. However, we do note that even small changes to the benefit policy can have a meaningful long-term impact on the likely future outcomes of the Plan.

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RVK

# Acknowledgements

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# Introduction

RVK, Inc. (RVK) has prepared this report for the County Employees Retirement System Hazardous Pension Plan (CERS) to:

- Present projected valuation results with respect to the funded status of the Plan.
- Present projected benefit payments of the Plan.
- Investigate asset mixes to determine those which best serve to protect and increase funding levels, while providing adequate liquidity for benefit payments.

The valuation projections are shown using both a deterministic and stochastic process.

The deterministic process provides an open group analysis of projected valuation results based on a fixed set of future assumptions (see summary in the Assumptions and Methods section of this report).

The stochastic process provides an open group analysis of projected valuation results under many capital market environments based on expected asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation. Expected values, variances of the returns and inflation, and correlations are used to generate 2,000 trials to produce a distribution of potential outcomes. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes.

# Introduction (continued)

## What is an Asset/Liability Study?

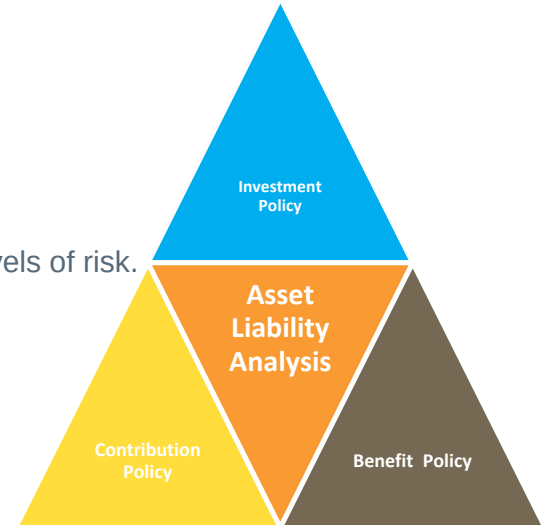
- Investment programs and the strategy they seek to implement (Investment Policy) do not exist in a vacuum. They seek to satisfy one or more investment objectives and operate within a plan framework that includes the investment objectives (Benefit Policy) and plan funding (Contribution Policy).

- The purpose of an Asset/Liability Study is to examine how well alternative investment strategies (i.e., differing asset allocations) address the objectives served by the Plan—the Plan's "liabilities" in the context of the Plan's funding streams—the Plan's Contribution Policy. It is the only standard analysis that fully links all three aspects of the Plan's key financial drivers.

- In doing so, it creates an important "guidepost" for the actual asset allocation for the Plan; the asset allocation chosen by the Plan's fiduciaries will likely reflect the nature of the liabilities but also numerous other factors including risk preferences, liquidity, implementation constraints, etc.

- For the CERS Asset/Liability Study, we assume the objectives are:

    1. Fund all participants' benefits over time.
    2. Assure sufficient liquidity to pay benefits at all times.
    3. Foster a stable contribution stream consistent with objectives 1 and 2.
    4. Achieve adequate returns without accepting unnecessary or imprudent levels of risk.




## An Asset/Liability Study is NOT . . .

- An actuarial study of the CERS liabilities—that is the purview of the Plan's actuary.

- A prescription for Plan benefits—that is the purview of the elected representatives.

- An assessment of the affordability of contribution levels—that is the purview of the elected officials and their constituents.

- The sole determinant of the final asset allocation adopted for the Plan—there are a number of factors, including insights from an Asset/Liability Study, which will bear on the optimal asset allocation.

# Introduction (continued)

## 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 Plan's financial needs.

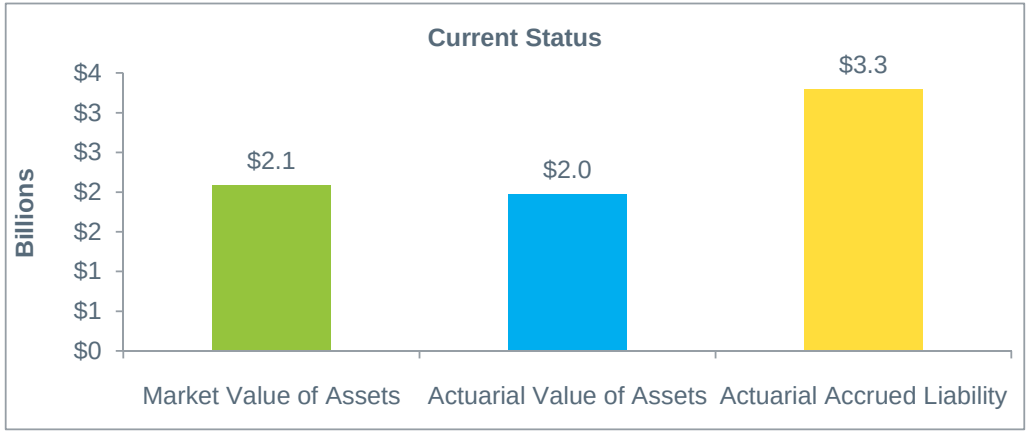
## This Asset/Liability Study . . .

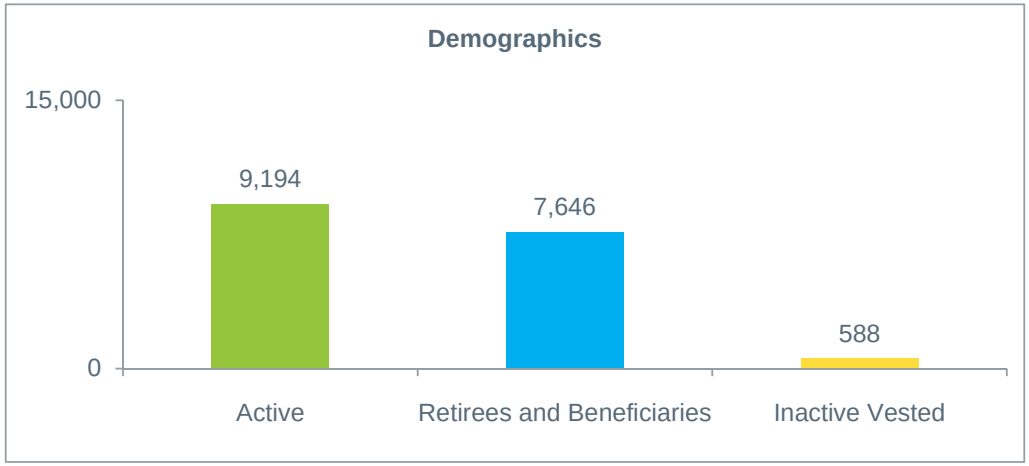
- Uses data from the June 30, 2014 CERS Actuarial Valuation to project pension liabilities.
- Uses the Actuarial Cost Method described in the June 30, 2014 CERS Actuarial Valuation, and the actuarial assumptions from the KRS Experience Study July 1, 2008 to June 30, 2013 ("the 2013 Experience Study") performed by Cavanaugh Macdonald Consulting, LLC (Cavanaugh).
- Compares these specific investment strategies—(A) the Current Target, (B) a conservative illustrative portfolio (Conservative Portfolio), (C) a diversified lower risk portfolio (Potential Portfolio 1), (D) a diversified moderate risk portfolio (Potential Portfolio 2), (E) a diversified higher risk portfolio (Potential Portfolio 3), and (F) an aggressive illustrative portfolio (Aggressive Portfolio).
- Assumes the Plan's current benefit policy throughout the entire projection period—changes to the benefit policy are the purview of the elected representatives.
- Note: Does not assume any actuarial adjustments that may take place in future years.

# Current Status

A summary of the Plan follows:

| | |
|---|---|
| **Valuation Date** | June 30, 2014 |
| **Market Value of Assets (MVA)** | $2.1 billion |
| **Actuarial Value of Assets (AVA)** | $2.0 billion |
| **Actuarial Accrued Liability (AAL)** | $3.3 billion |
| **Market Value Funded Ratio (MVA/AAL)** | 63% |
| **Actuarial Value Funded Ratio (AVA/AAL)** | 60% |
| **Active** | 9,194 |
| **Retirees and Beneficiaries** | 7,646 |
| **Inactive Vested** | 588 |



# Deterministic Analysis

This section provides an analysis of the Plan's assets, liabilities, funded status, and benefit payments based on a fixed set of future assumptions. Each analysis that follows in this deterministic section rests on the critical assumptions below and must be read and interpreted with them in mind—particularly assumptions #2, #3 and #4.

The deterministic assumptions are as follows:

1. Current Plan provisions (see Summary of Main Benefit and Contribution Provisions beginning on page 38 of the CERS June 30, 2014 actuarial valuation report prepared by Cavanaugh).

2. The participant data used by Cavanaugh in its June 30, 2014 actuarial valuation.

3. Actuarially assumed rate of return on Plan assets for all projection years: 7.50%.

4. For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuations as of June 30, 2013, and June 30, 2014 (20.73% and 20.26% of payroll, respectively). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study.

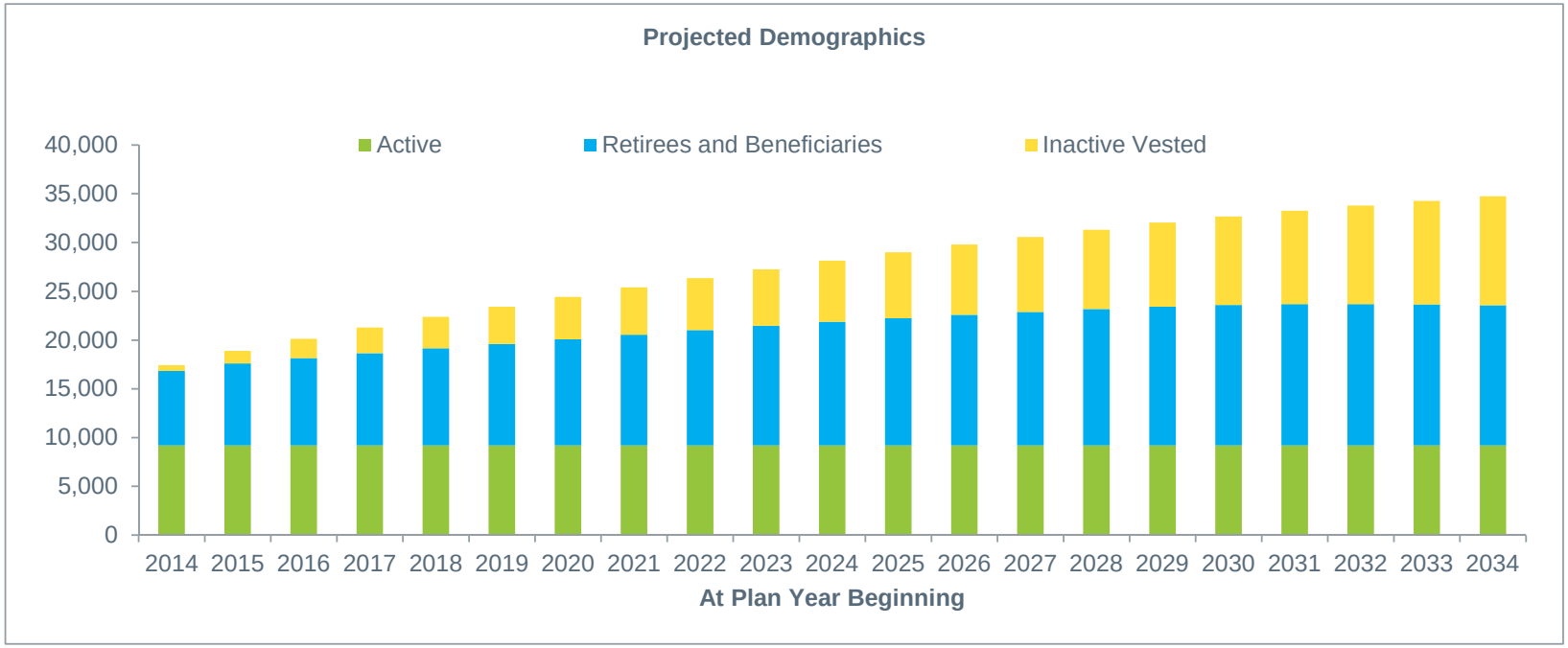
5. Assumes demographic experience projected in accordance with the actuarial assumptions proposed in the 2013 Experience Study.

6. Open group analysis: level active population. New active participants entering the Plan are assumed to have similar characteristics to recently hired participants.

# Deterministic Analysis (continued)

## Demographics

Following are the projected number of active and inactive participants at the beginning of each Plan year from 2014 through 2034 (2014 is actual). These projections are based on an open group analysis. Using the actuary's assumptions for death, termination, retirement, and disability, current participants are assumed to leave the Plan in the future. The number of total inactive participants (Retirees and Beneficiaries and Vested Inactive) increases by approximately 210% during the 20-year projection period shown.

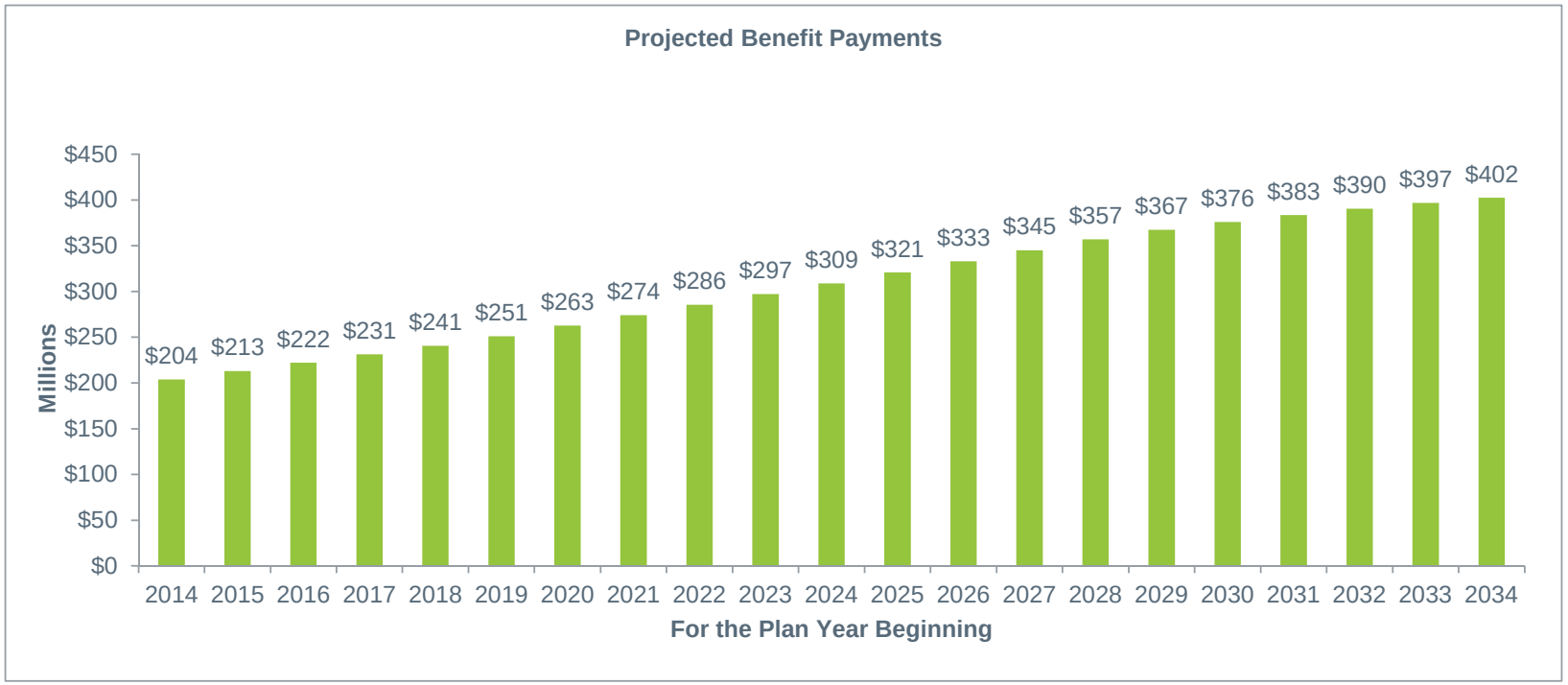



| Total Population | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 8.5% | 6.5% | 5.7% | 5.2% | 4.6% | 4.2% | 4.0% | 3.8% | 3.5% | 3.3% | 3.0% | 2.8% | 2.6% | 2.4% | 2.3% | 2.0% | 1.8% | 1.6% | 1.4% | 1.3% |

# Deterministic Analysis (continued)

## Benefit Payments

The Plan's projected annual benefit payments are shown in the chart below. The projected benefit payments are expected to increase by about 98% over the next 20 years. As a percentage of the market value of Plan assets, benefit payments are expected to remain roughly constant through the end of the projection period (see page 12).

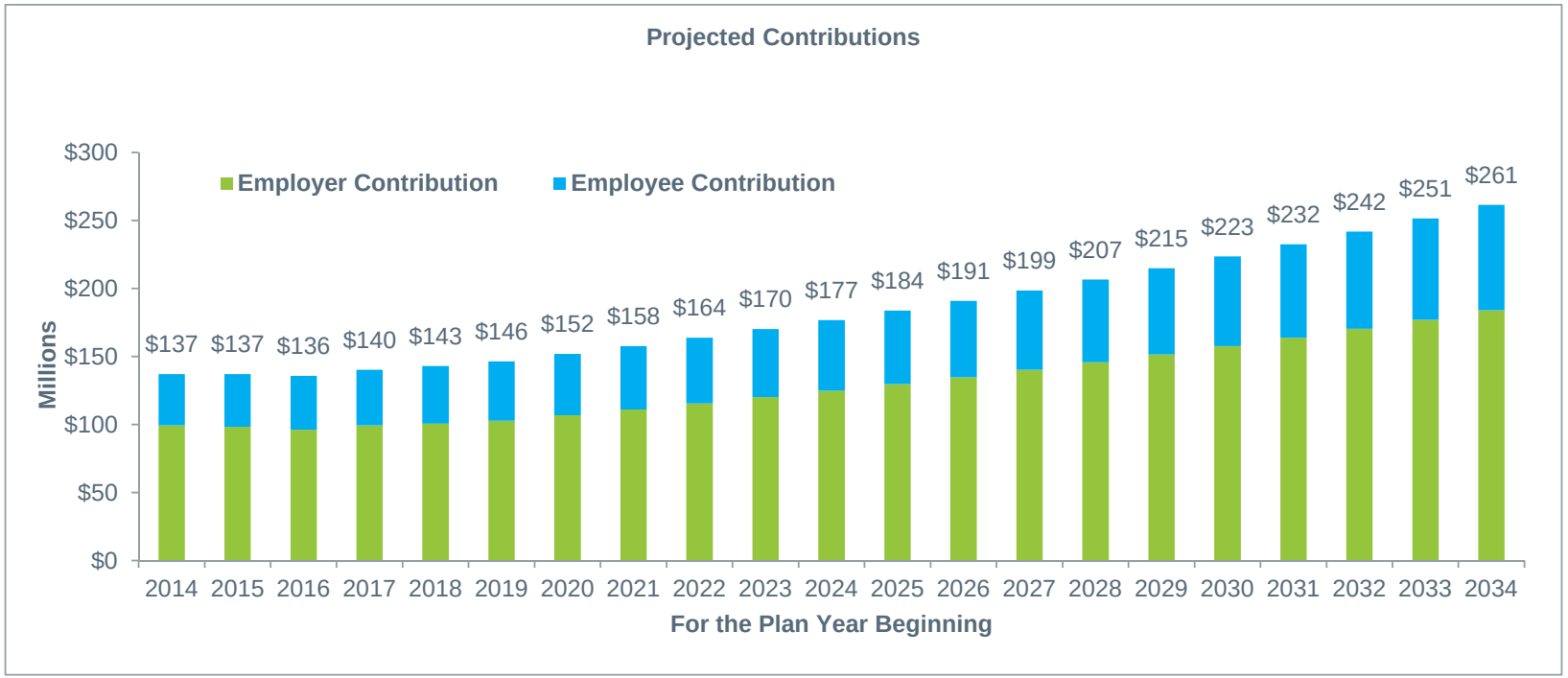



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 4.6% | 4.2% | 4.2% | 4.1% | 4.3% | 4.5% | 4.4% | 4.2% | 4.0% | 3.9% | 3.9% | 3.8% | 3.6% | 3.5% | 2.9% | 2.4% | 2.0% | 1.8% | 1.6% | 1.4% |

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as total dollar contributions, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.




| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | -0.1% | -0.9% | 3.2% | 2.0% | 2.4% | 3.7% | 3.8% | 3.9% | 3.9% | 3.9% | 4.0% | 3.9% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% |



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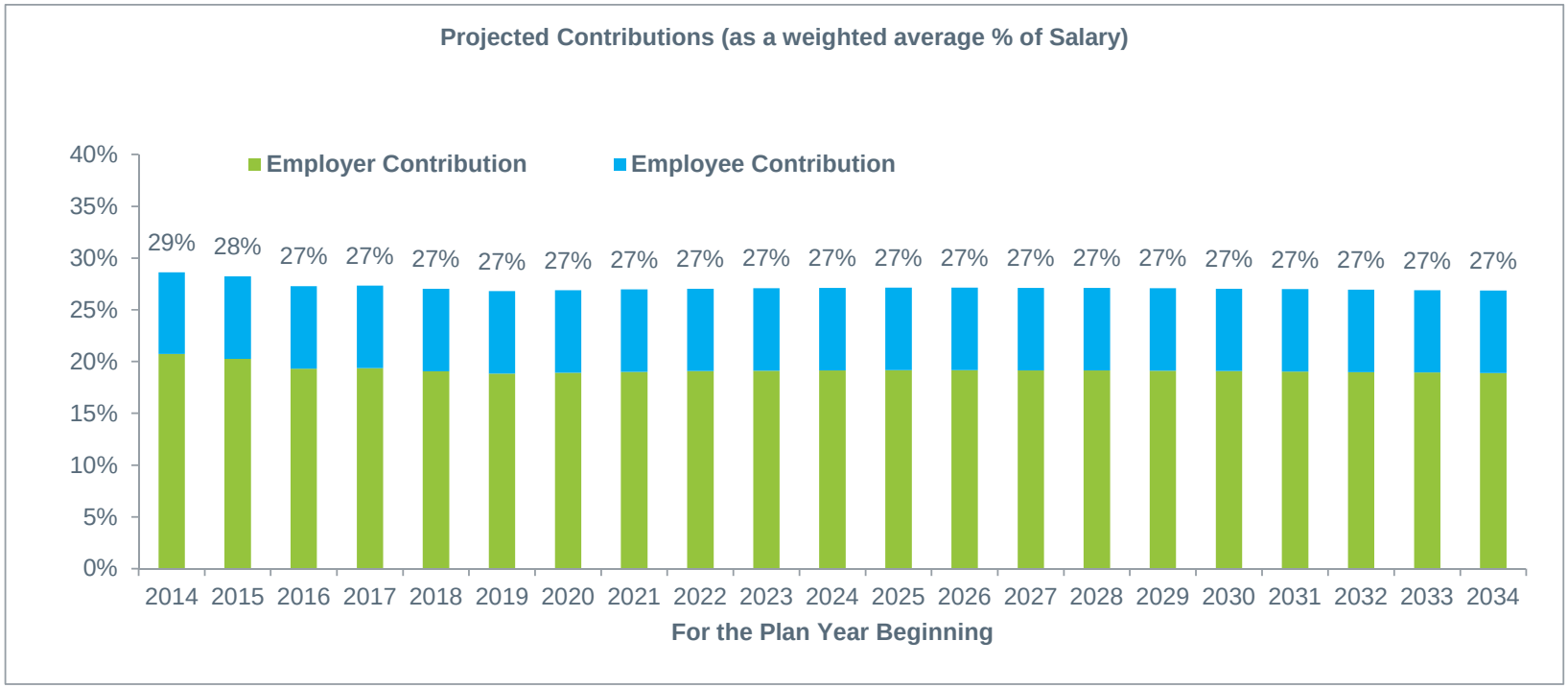
# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as a weighted average percentage of salary, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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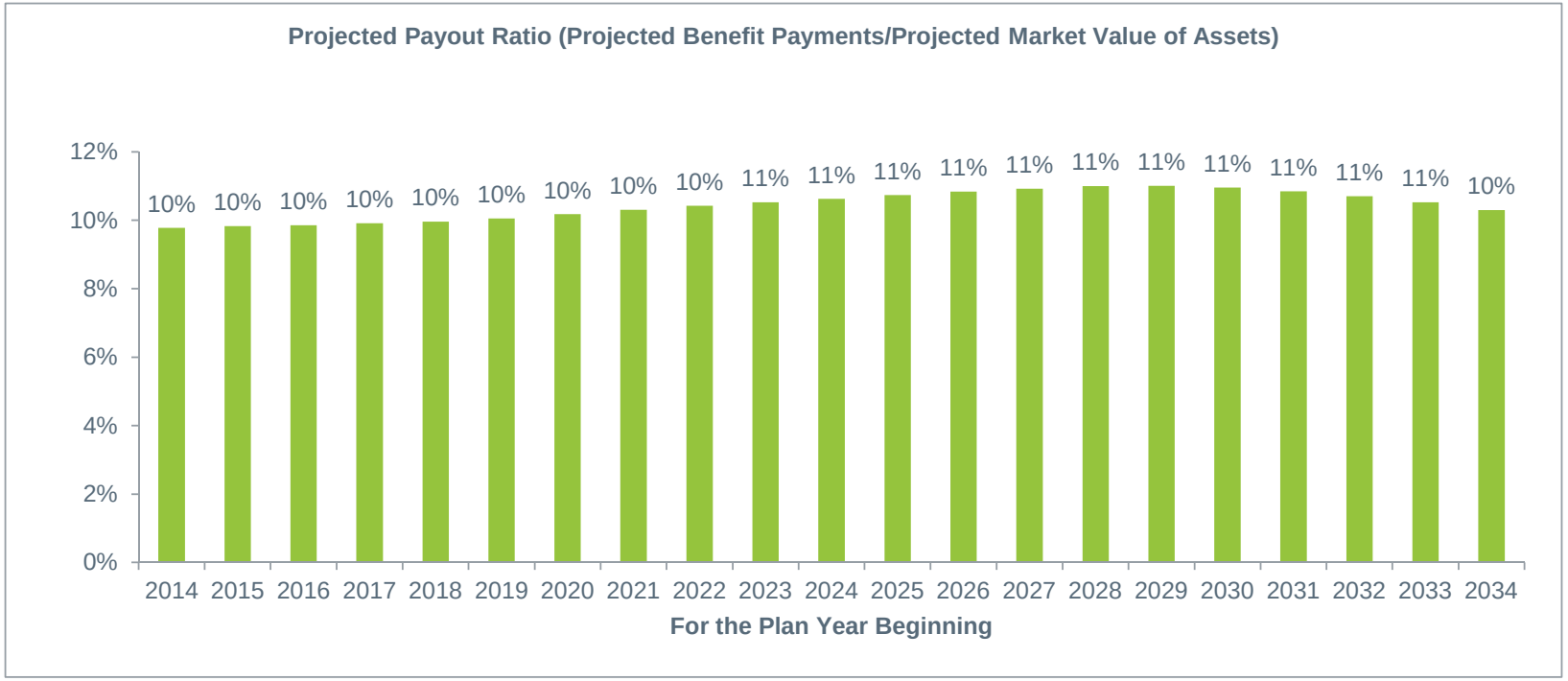
# Deterministic Analysis (continued)

## Payout Ratio (benefit payments/market value of assets)

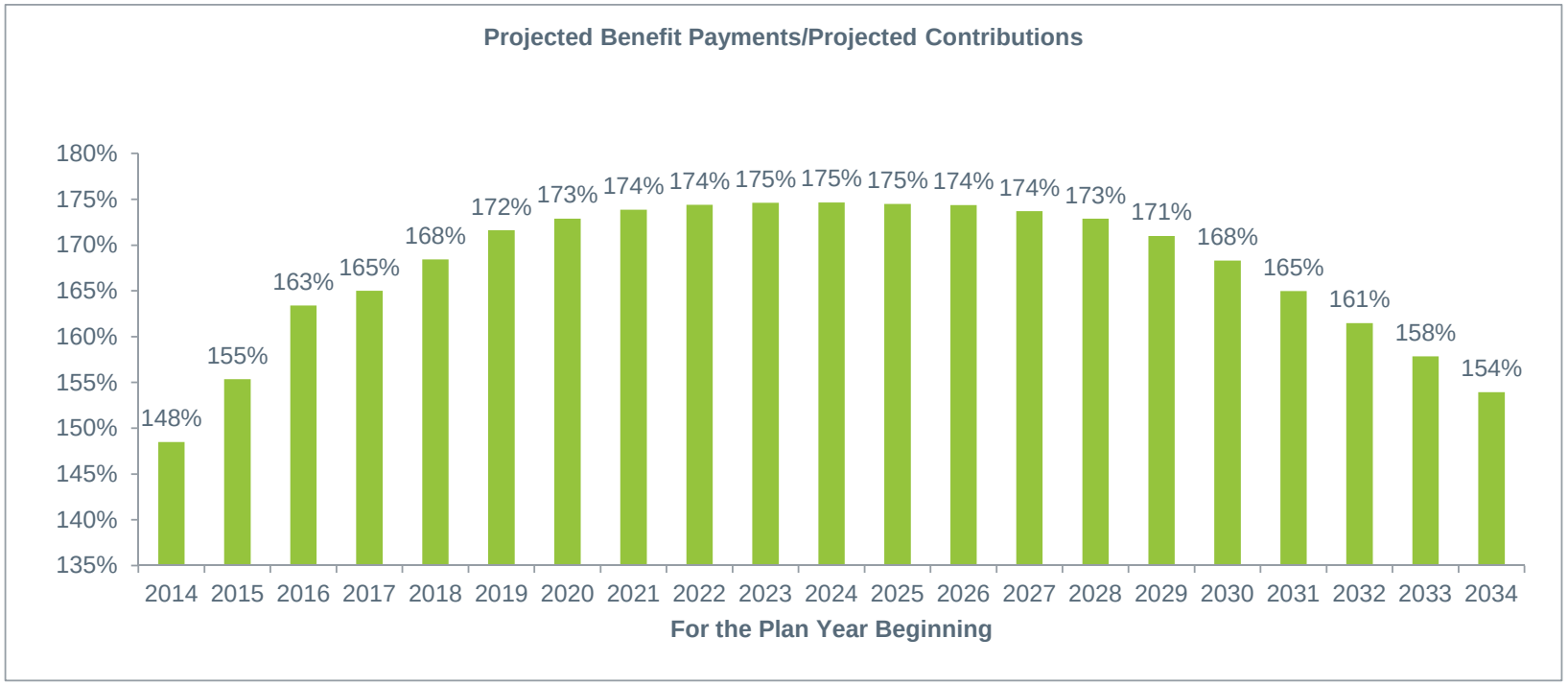
The Plan's projected payout ratios are shown in the chart below. The payout ratios are expected to remain roughly constant through the end of the projection period. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Benefit Payments/Contributions

The Plan's projected benefit payments divided by projected contributions are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



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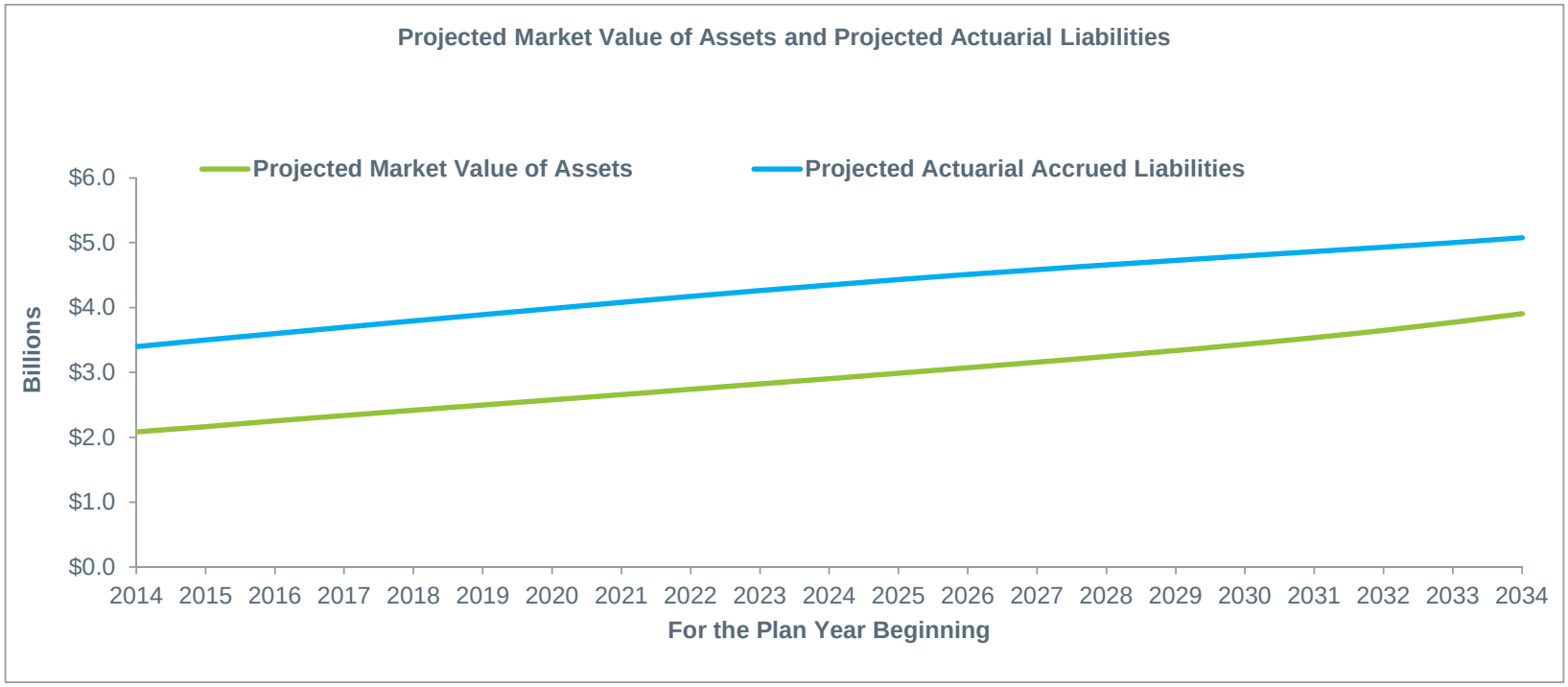
# Deterministic Analysis (continued)

## Actuarial Accrued Liabilities and Market Value of Assets

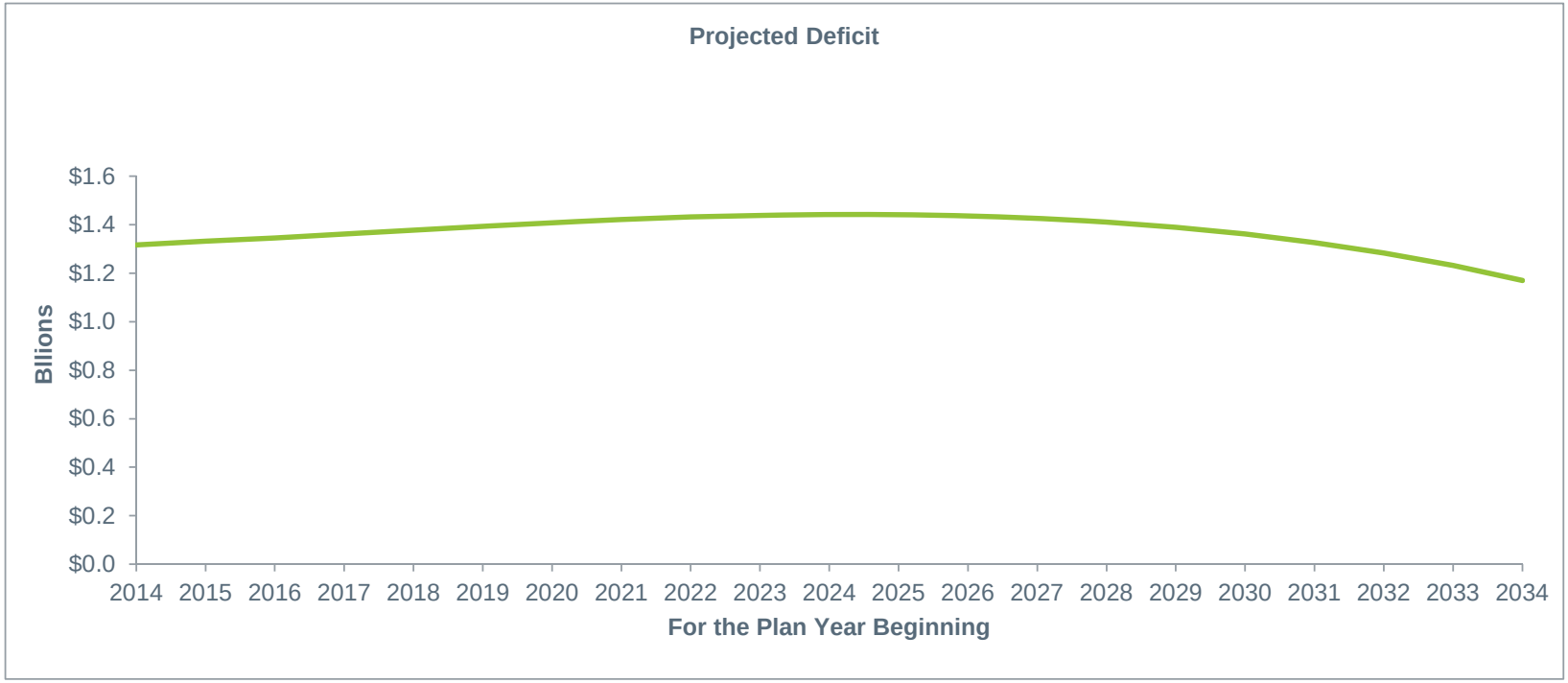
The Plan's projected actuarial accrued liabilities and market value of assets are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The relative disparity between the market value of assets and Plan liabilities is expected to decrease by 11% through the end of the projection period. The funded ratio (based on market value of assets) is expected to increase to approximately 77% by the end of the projection period. This is shown more clearly on the following pages.



# Deterministic Analysis (continued)

### Deficit (market value of assets – actuarial accrued liabilities)

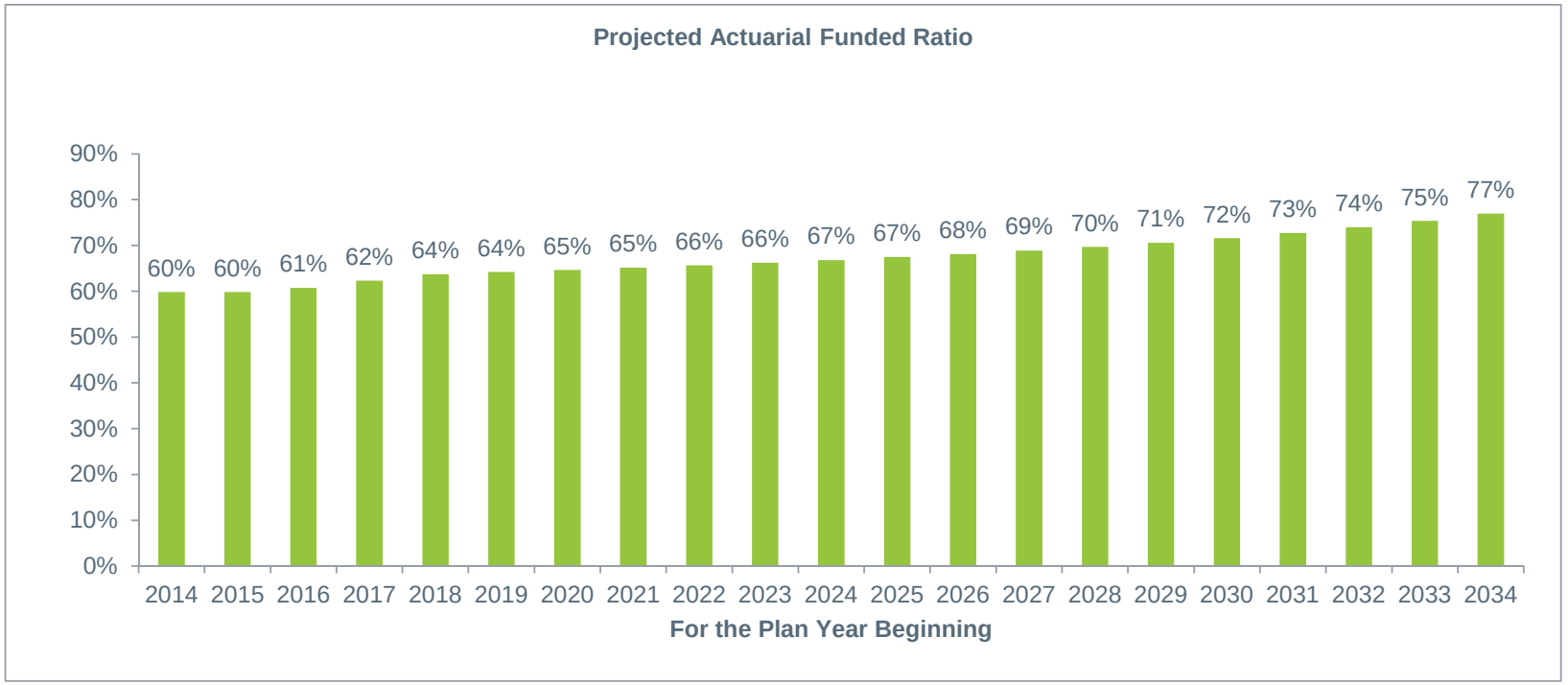
The Plan's projected deficit of assets is shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The disparity between the market value of assets and Plan liabilities is expected to decrease by the end of the projection period by 11%.



# Deterministic Analysis (continued)

## Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability)

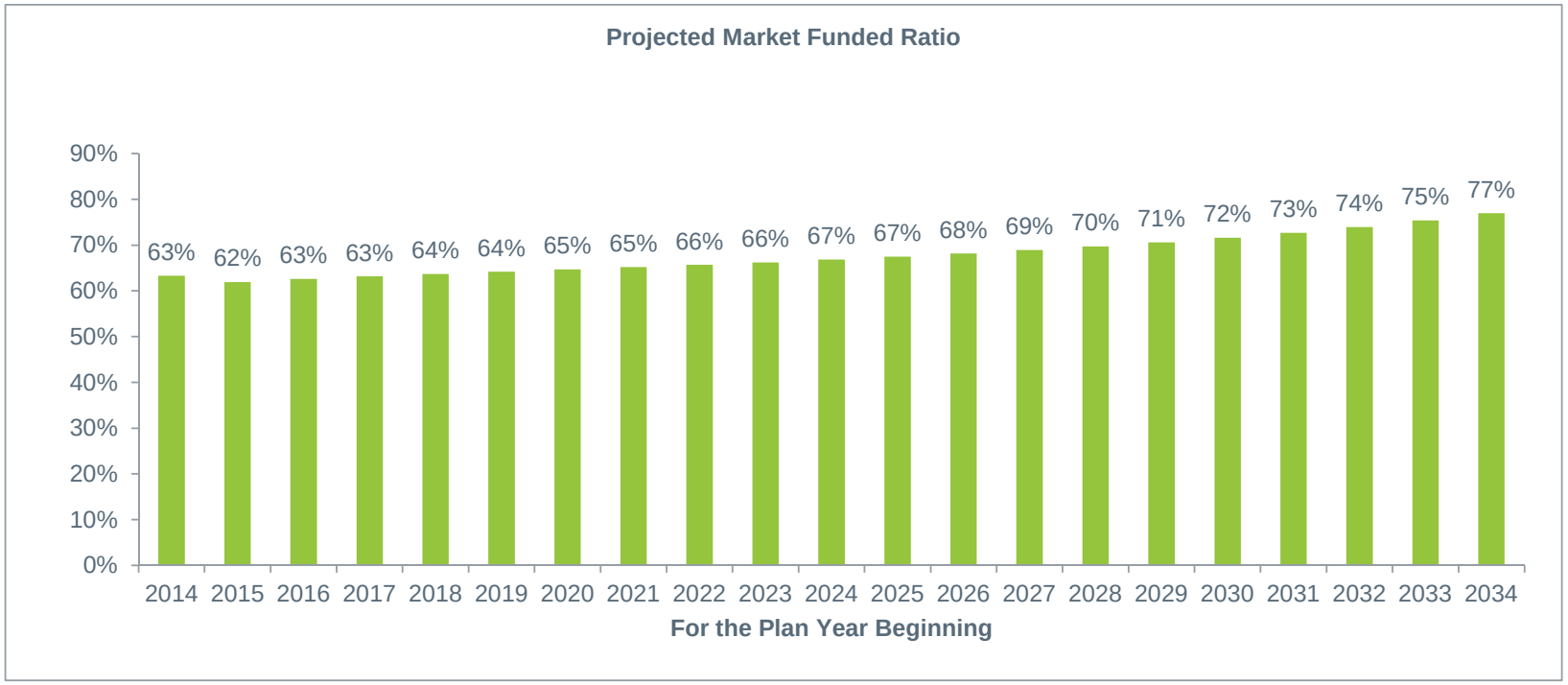
The Plan's projected actuarial funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 77% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Market Funded Ratio (market value of assets/actuarial accrued liability)

The Plan's projected market funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 77% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.

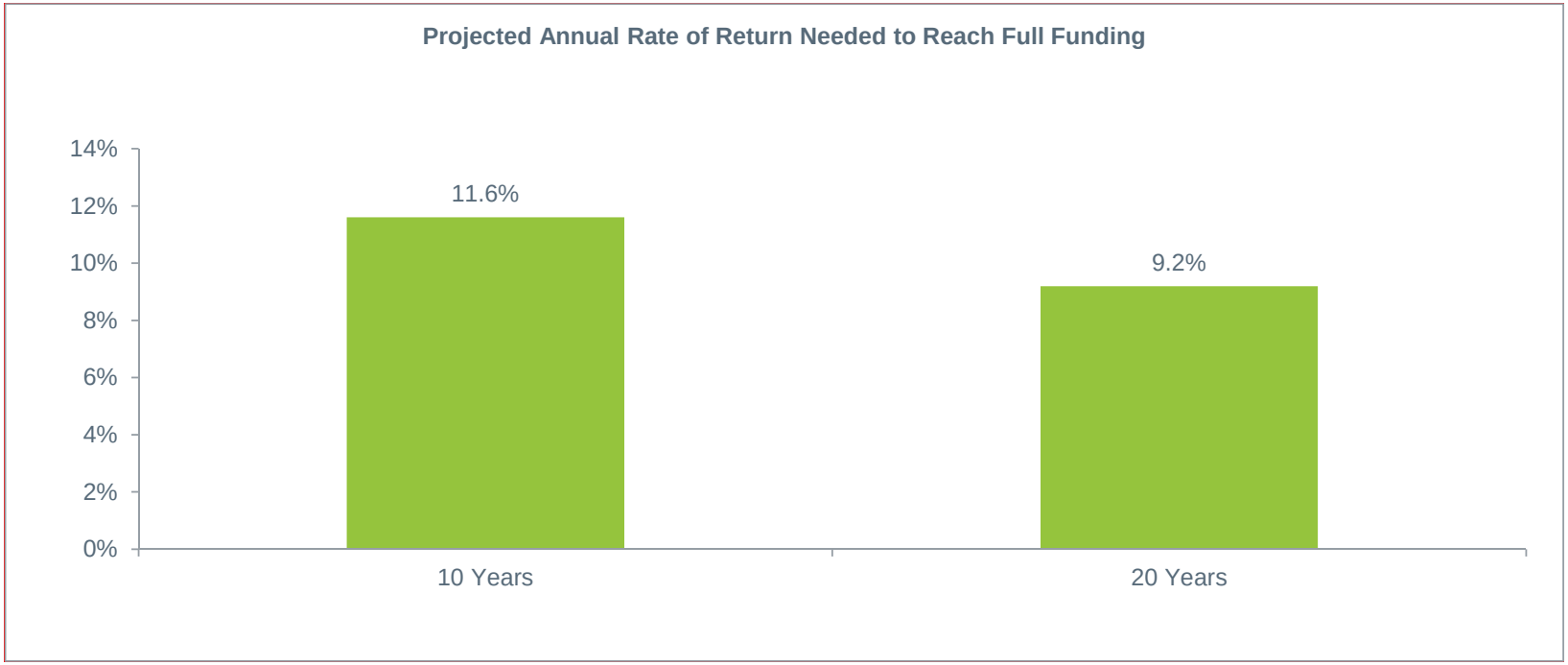


# Deterministic Scenario Analysis

## Full Funding Implied Returns

The figure below shows the projected investment return for the total fund needed to bring the Plan to 100% funding (on a market value basis) in 10 and 20 years, respectively. The results assume all other actuarial assumptions are precisely met over the time periods shown and that these returns are earned for every year, without variance.

Actuarially assumed rate of return – **7.50%**



# Deterministic Scenario Analysis (continued)

## Sensitivity Analysis – Decreased Return

Under the deterministic analysis presented in the preceding pages, the Plan is projected to have a market funded ratio of 77% in 20 years. The table below summarizes the projected funded ratio and other key statistics in 2034 assuming the Plan experiences an annualized investment return of 100 basis points lower (6.50%) than the current actuarially assumed rate of return (7.50%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

| | 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 | ▲ |

Values in impact column may not be additive to due rounding.

# Stochastic Analysis

In the previous section of this report, we assumed the Plan operated going forward with certain knowledge of the future investment returns earned by the Plan's assets. This section introduces the element of uncertainty in those future investment returns. This part of the analysis examines Plan assets and liabilities under many capital market environments based on expected future asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation.

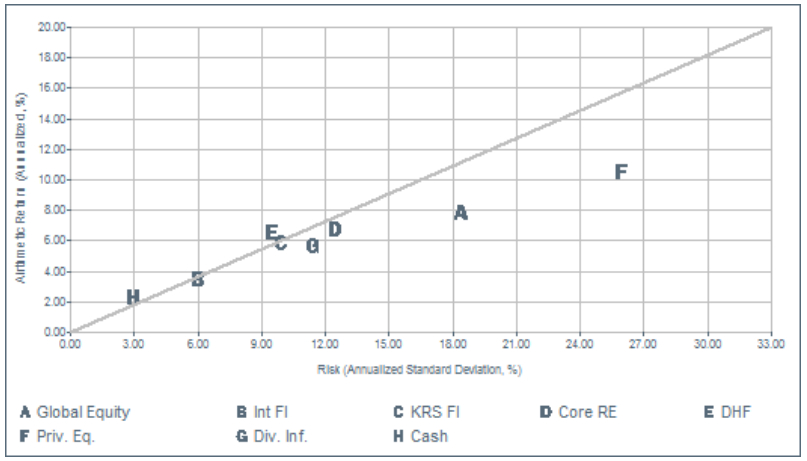
Using the current expected values and variances of the returns and inflation, along with their correlations, 2,000 trials are generated to produce a distribution of results. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes. This is contrasted with the deterministic analysis that provides an expected value if all current Plan assumptions are exactly met.

# Stochastic Analysis (continued)

## Long-Term Return and Risk Assumptions

In order to perform a stochastic analysis and create asset allocation alternatives, it is necessary to estimate, for each asset class, its probable return and risk. The expected returns are our best estimates of the average annual percentage increases in values of each asset class over a prospective long period of time, and assumed to be normally distributed. The risk of an asset class is measured by its standard deviation, or volatility. If asset returns are normally distributed, two-thirds (67%) of all returns are expected to lie within one standard deviation on either side of the mean. For example, we expect Global Equity to return, annually on average, 7.80% with a standard deviation of 18.35%, meaning that two-thirds of the time we expect its return to lie between -10.55% (= 7.80 – 18.35) and 26.15% (= 7.80 + 18.35). Moreover, we expect 95% of all return outcomes to lie within two standard deviations of the mean return, implying only a one-in-twenty chance that the return on Global Equity will either fall below -28.90% or rise above 44.50%. The risk and return assumptions used in this study are outlined in the below table and chart:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption |
|---|---|---|
| Global Equity | 7.80 | 18.35 |
| Int. Duration Fixed Income | 3.50 | 6.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 |
| Core Real Estate | 6.75 | 12.50 |
| Diversified Hedge Funds | 6.50 | 9.50 |
| Private Equity | 10.50 | 26.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 |
| Cash Equivalents | 2.25 | 3.00 |



# Stochastic Analysis (continued)

## Correlation Between Asset Classes

Creating a diversified portfolio of asset classes enables the investor to achieve a high rate of return while minimizing volatility of the portfolio. As defined on the previous page, volatility is "risk" or standard deviation. By minimizing the volatility of a portfolio, we produce asset returns that vary less from year to year. Diversification exists because the returns of different asset classes do not always move in the same direction, at the same time, or with the same magnitude. Correlation values are between 1.00 and –1.00. If returns of two asset classes rise or fall at the same time and in the same magnitude, they have a correlation value of 1.00. Conversely, two asset classes that simultaneously move in opposite directions, and in the same magnitude, have a correlation value of –1.00. A correlation of zero indicates no relationship between returns. The assumed correlations are largely based on historical index data, with some qualitative analysis applied. For instance, where appropriate, we have weighted current history more heavily. The correlation matrix used in this study is shown below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | -0.02 | 0.84 | 0.32 | 0.70 | 0.78 | 0.72 | -0.05 |
| Int. Duration Fixed Income | -0.02 | 1.00 | 0.28 | -0.06 | 0.12 | -0.26 | 0.22 | 0.24 |
| Custom KRS Fixed Income | 0.84 | 0.28 | 1.00 | 0.27 | 0.69 | 0.66 | 0.82 | -0.07 |
| Core Real Estate | 0.32 | -0.06 | 0.27 | 1.00 | 0.24 | 0.60 | 0.37 | 0.14 |
| Diversified Hedge Funds | 0.70 | 0.12 | 0.69 | 0.24 | 1.00 | 0.69 | 0.59 | 0.22 |
| Private Equity | 0.78 | -0.26 | 0.66 | 0.60 | 0.69 | 1.00 | 0.62 | 0.07 |
| Diversified Inflation Strategies | 0.72 | 0.22 | 0.82 | 0.37 | 0.59 | 0.62 | 1.00 | -0.03 |
| Cash Equivalents | -0.05 | 0.24 | -0.07 | 0.14 | 0.22 | 0.07 | -0.03 | 1.00 |

The fact that the correlations shown in the table are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others. This point is demonstrated on the following pages, which illustrate that diversification into less correlated asset classes can decrease the expected overall volatility of a portfolio.

# Stochastic Analysis (continued)

## Efficient Portfolios

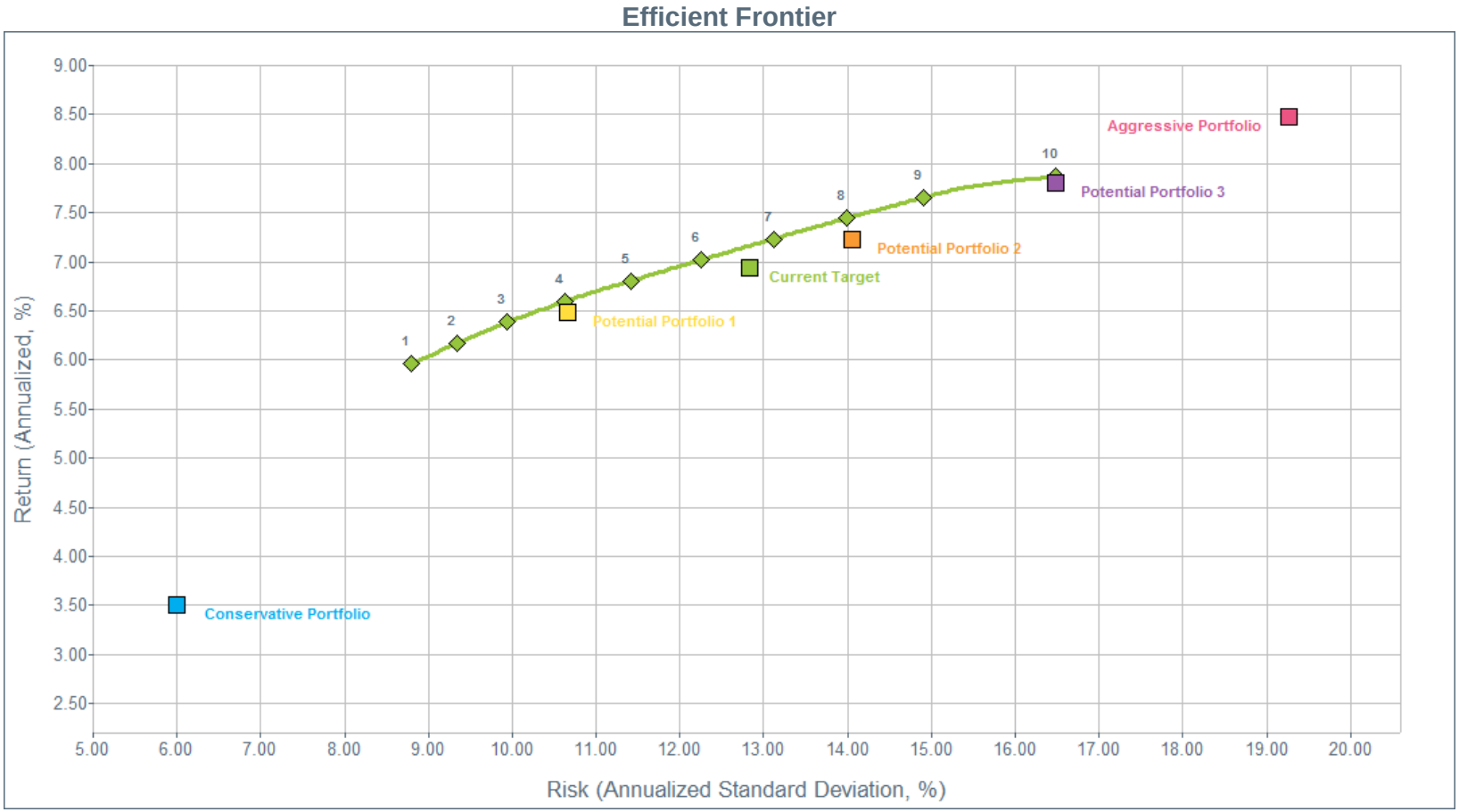
Each frontier portfolio (optimal allocation) is created using target rates of return both above and below the projected rate of return for the current allocation. This range illustrates the trade-off between return and risk; additional return can only be achieved by undertaking additional risk. The table below shows the possible optimal allocations given the selected asset classes and their constraints listed under "Min" and "Max." The table shows the Current Target allocation and highlights three potential targets (Potential Portfolios 1, 2, and 3) for consideration throughout this study. Two illustrative portfolios (Conservative and Aggressive Portfolios) are also shown for demonstrative purposes.

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | 30 | 70 | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | 0 | 30 | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | 0 | 30 | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | 5 | 15 | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | 2 | 15 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | 2 | 5 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

# Stochastic Analysis (continued)

## Efficient Frontier

The risk of each alternative allocation is plotted against the horizontal axis, while the return is measured on the vertical axis. The line connecting the points represents all the optimal portfolios subject to the given constraints and is known as the "efficient frontier." The upward slope of the efficient frontier indicates the direct relationship between return and risk.



# Stochastic Analysis (continued)

## Asset Mixes

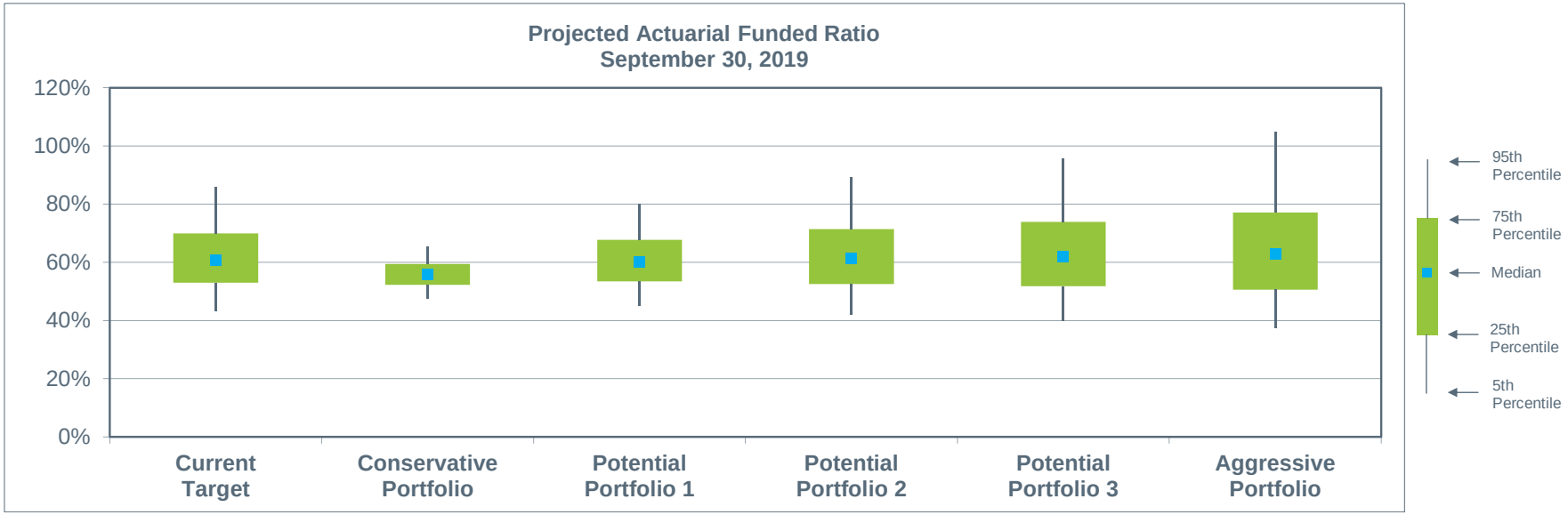
Outlined below are the Current Target allocation and five other mixes to be examined in this stochastic analysis. The expected return, expected risk (as measured by standard deviation), and RVK Liquidity Metric, for each is also shown.

| 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** |

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **5 Years**

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

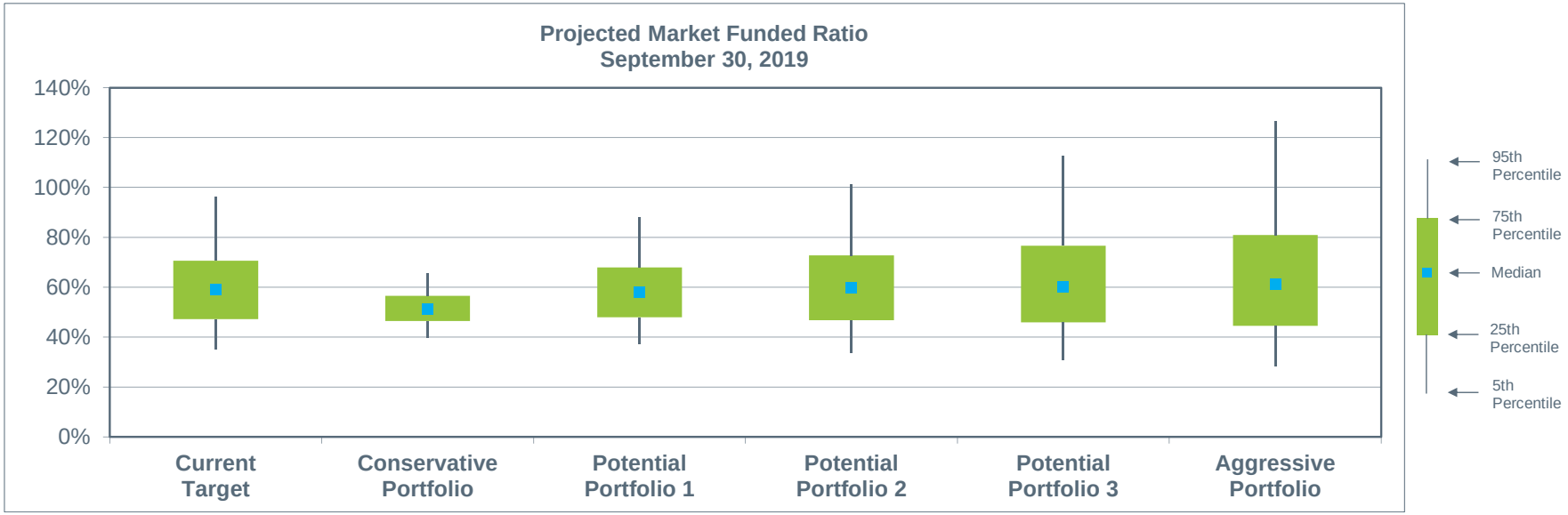



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $2,186 | 43% | $2,026 | 47% | $2,103 | 45% | $2,237 | 42% | $2,320 | 40% | $2,412 | 37% |
| 25th Percentile | $1,826 | 53% | $1,843 | 52% | $1,809 | 54% | $1,839 | 53% | $1,874 | 52% | $1,912 | 51% |
| Median | $1,528 | 61% | $1,720 | 56% | $1,551 | 60% | $1,508 | 61% | $1,490 | 62% | $1,452 | 63% |
| 75th Percentile | $1,177 | 70% | $1,579 | 59% | $1,265 | 68% | $1,118 | 71% | $1,016 | 74% | $894 | 77% |
| 95th Percentile | $558 | 86% | $1,378 | 65% | $784 | 80% | $424 | 89% | $160 | 96% | ($183) | 105% |

# Stochastic Analysis (continued)

## Projected Market Funded Ratio (market value of assets/actuarial accrued liability); 5 Years

The graph below shows the distribution of possible market funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

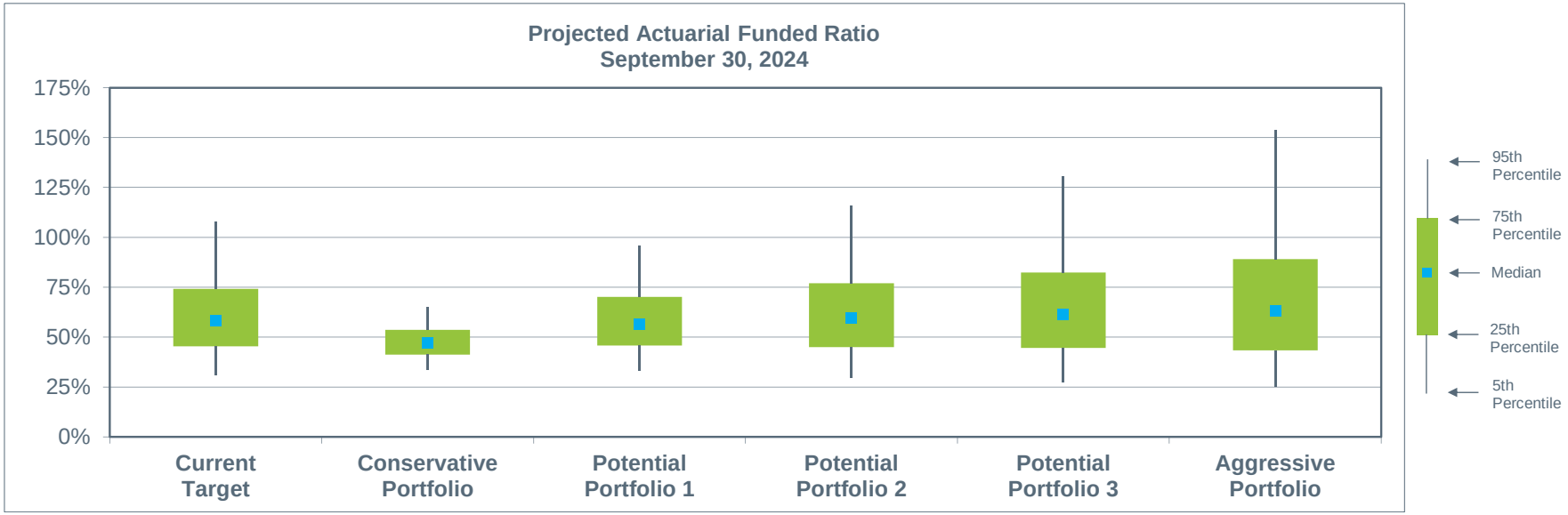



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $2,493 | 35% | $2,294 | 40% | $2,387 | 37% | $2,542 | 34% | $2,645 | 31% | $2,754 | 28% |
| 25th Percentile | $2,035 | 47% | $2,061 | 46% | $1,998 | 48% | $2,053 | 47% | $2,094 | 46% | $2,134 | 45% |
| 50th Percentile | $1,596 | 59% | $1,883 | 51% | $1,638 | 58% | $1,572 | 60% | $1,546 | 60% | $1,525 | 61% |
| 75th Percentile | $1,144 | 71% | $1,706 | 57% | $1,259 | 68% | $1,070 | 73% | $917 | 77% | $748 | 81% |
| 95th Percentile | $149 | 96% | $1,380 | 66% | $472 | 88% | ($52) | 101% | ($496) | 113% | ($1,041) | 127% |

# Stochastic Analysis (continued)

## Projected Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability); 10 Years

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

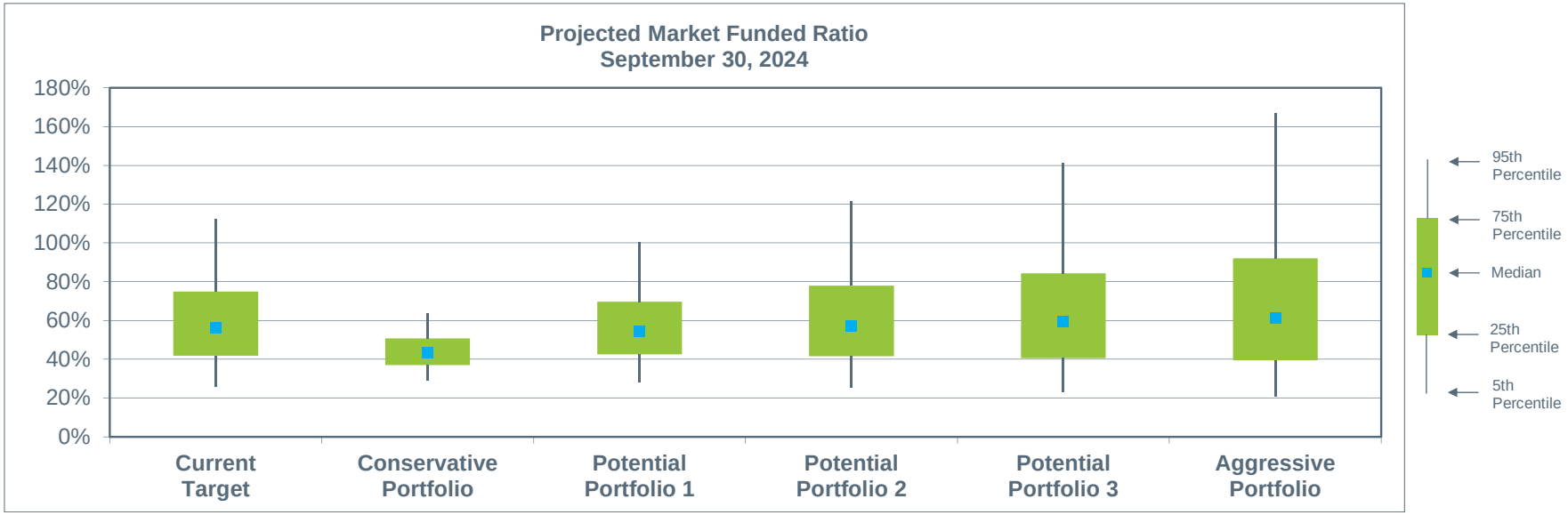



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $2,929 | 31% | $2,784 | 33% | $2,834 | 33% | $2,979 | 29% | $3,084 | 27% | $3,178 | 25% |
| 25th Percentile | $2,341 | 45% | $2,515 | 41% | $2,328 | 46% | $2,343 | 45% | $2,380 | 44% | $2,426 | 43% |
| Median | $1,814 | 58% | $2,291 | 47% | $1,891 | 57% | $1,775 | 59% | $1,693 | 61% | $1,605 | 63% |
| 75th Percentile | $1,133 | 74% | $2,055 | 54% | $1,313 | 70% | $1,017 | 77% | $792 | 82% | $468 | 89% |
| 95th Percentile | ($356) | 108% | $1,585 | 65% | $192 | 96% | ($687) | 116% | ($1,390) | 131% | ($2,328) | 154% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **10 Years**

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $3,081 | 26% | $2,950 | 29% | $2,994 | 28% | $3,151 | 25% | $3,252 | 23% | $3,345 | 21% |
| 25th Percentile | $2,493 | 42% | $2,692 | 37% | $2,470 | 42% | $2,509 | 42% | $2,557 | 41% | $2,578 | 40% |
| 50th Percentile | $1,906 | 56% | $2,460 | 43% | $1,972 | 55% | $1,867 | 57% | $1,782 | 59% | $1,686 | 61% |
| 75th Percentile | $1,119 | 75% | $2,186 | 51% | $1,351 | 70% | $977 | 78% | $693 | 84% | $345 | 92% |
| 95th Percentile | ($537) | 112% | $1,674 | 64% | ($20) | 100% | ($945) | 121% | ($1,871) | 141% | ($2,979) | 167% |

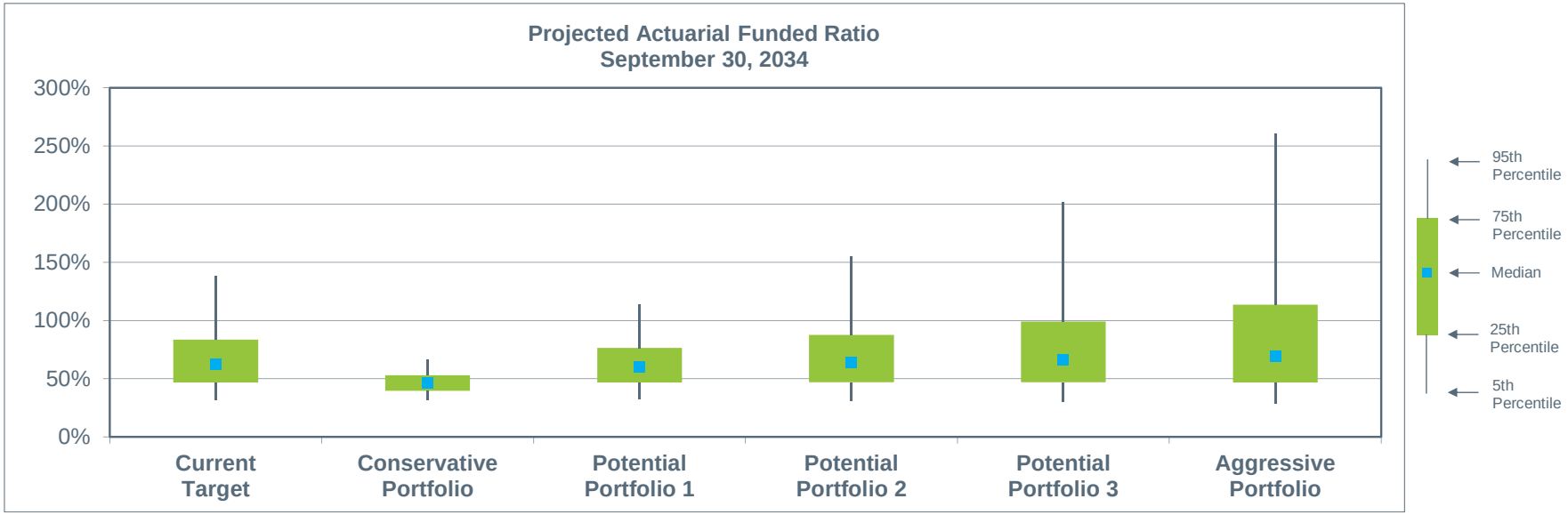


RVK

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

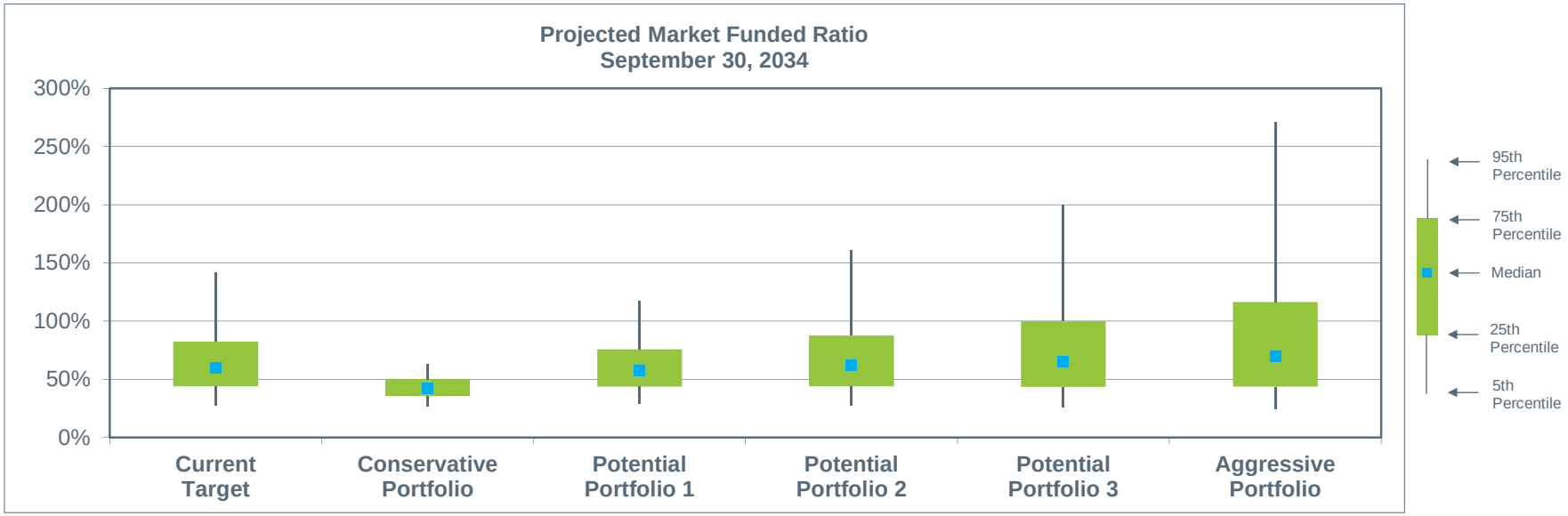



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $3,161 | 32% | $3,145 | 31% | $3,083 | 33% | $3,192 | 31% | $3,262 | 30% | $3,337 | 29% |
| 25th Percentile | $2,560 | 47% | $2,894 | 40% | $2,562 | 47% | $2,556 | 47% | $2,560 | 47% | $2,569 | 47% |
| Median | $1,866 | 63% | $2,683 | 46% | $1,990 | 60% | $1,794 | 64% | $1,680 | 66% | $1,533 | 70% |
| 75th Percentile | $831 | 84% | $2,417 | 53% | $1,202 | 76% | $631 | 88% | $45 | 99% | ($705) | 114% |
| 95th Percentile | ($2,110) | 138% | $1,871 | 67% | ($790) | 114% | ($2,968) | 156% | ($5,218) | 202% | ($8,850) | 261% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $3,333 | 28% | $3,327 | 27% | $3,242 | 29% | $3,371 | 27% | $3,469 | 26% | $3,557 | 25% |
| 25th Percentile | $2,715 | 44% | $3,072 | 36% | $2,703 | 44% | $2,708 | 44% | $2,701 | 44% | $2,705 | 44% |
| 50th Percentile | $1,951 | 60% | $2,859 | 43% | $2,096 | 58% | $1,868 | 62% | $1,731 | 66% | $1,519 | 69% |
| 75th Percentile | $900 | 82% | $2,578 | 50% | $1,264 | 76% | $627 | 88% | $15 | 100% | ($848) | 116% |
| 95th Percentile | ($2,273) | 142% | $2,036 | 63% | ($977) | 118% | ($3,216) | 161% | ($5,413) | 199% | ($8,931) | 271% |

# Stochastic Analysis (continued)

## Projected Market Funded Ratio and Maximum 1 Year Investment Loss (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 63% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 4% | 60% | 12% | -37% | 27% |
| Conservative Portfolio | 0% | 91% | 5% | -22% | 25% |
| Potential Portfolio 1 | 2% | 64% | 9% | -32% | 26% |
| Potential Portfolio 2 | 6% | 58% | 13% | -39% | 27% |
| Potential Portfolio 3 | 9% | 54% | 16% | -44% | 28% |
| Aggressive Portfolio | 13% | 52% | 18% | -48% | 29% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 63% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 9% | 61% | 22% | -37% | 38% |
| Conservative Portfolio | 0% | 95% | 37% | -22% | 38% |
| Potential Portfolio 1 | 5% | 65% | 20% | -32% | 37% |
| Potential Portfolio 2 | 11% | 59% | 23% | -39% | 38% |
| Potential Portfolio 3 | 16% | 55% | 24% | -45% | 40% |
| Aggressive Portfolio | 21% | 52% | 25% | -50% | 41% |

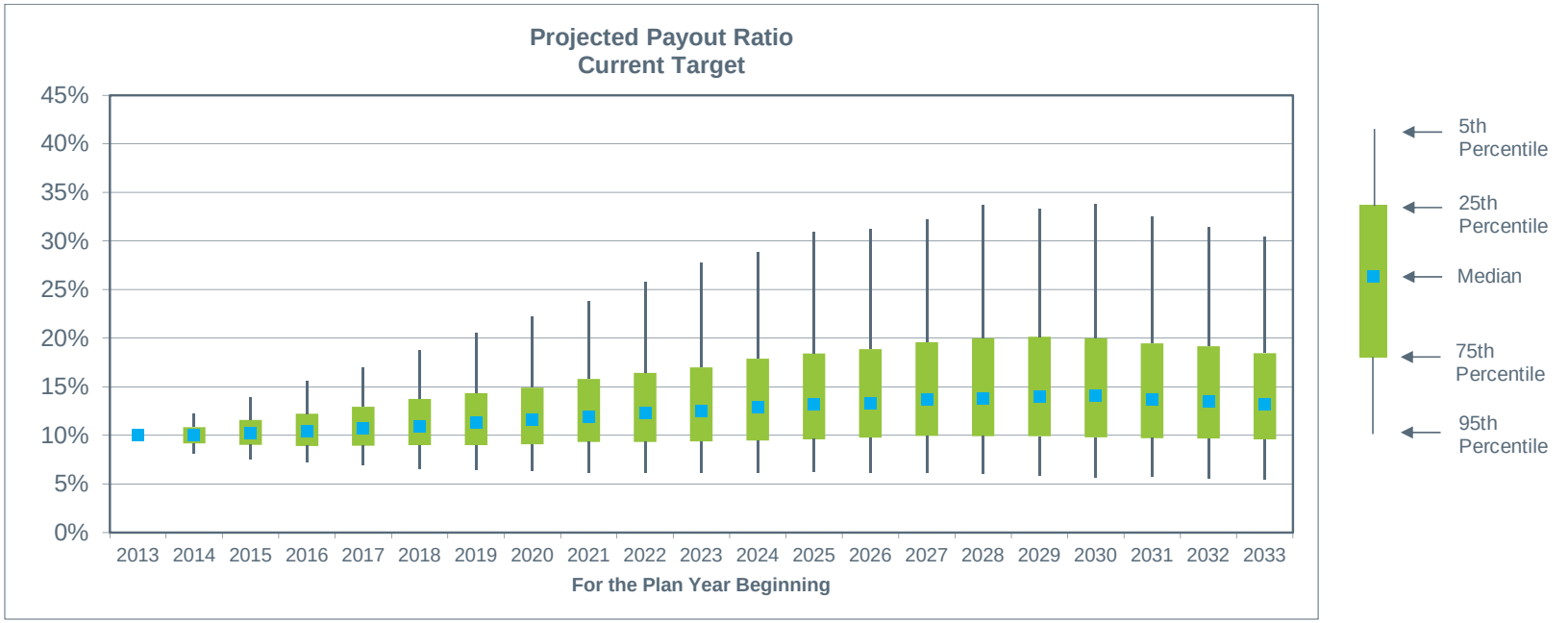
| 20 Years | Probability of Full Funding in 2034 | Probability of < 63% (Current) Funding in 2034 | Probability of < 40% (Current) Funding in 2034 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 15% | 54% | 20% | -38% | 55% |
| Conservative 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% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Current Target**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 14%. The worst-case scenario could reach 34% or higher.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 14% | 14% | 14% | 14% | 14% | 13% | 13% |



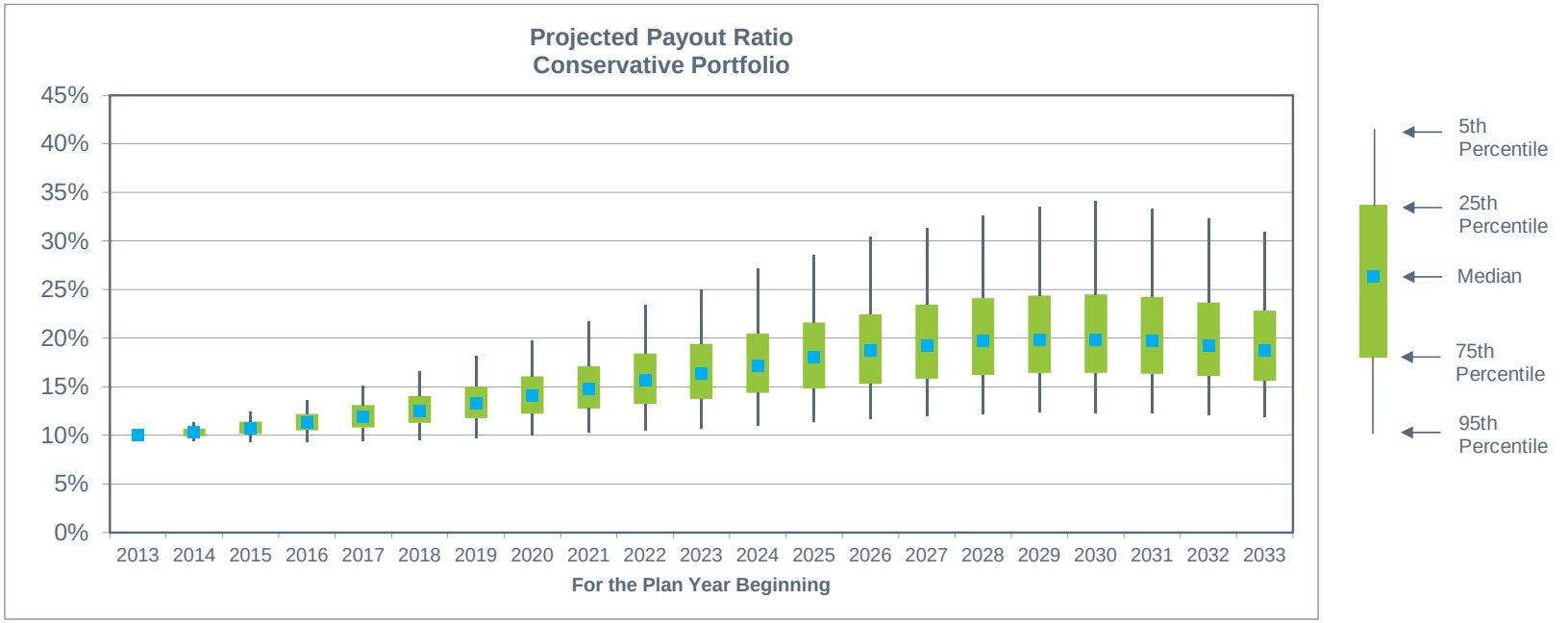
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Conservative Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 20%. The worst-case scenario could reach 34% or higher.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 10% | 10% | 11% | 11% | 12% | 13% | 13% | 14% | 15% | 16% | 16% | 17% | 18% | 19% | 19% | 20% | 20% | 20% | 20% | 19% | 19% |



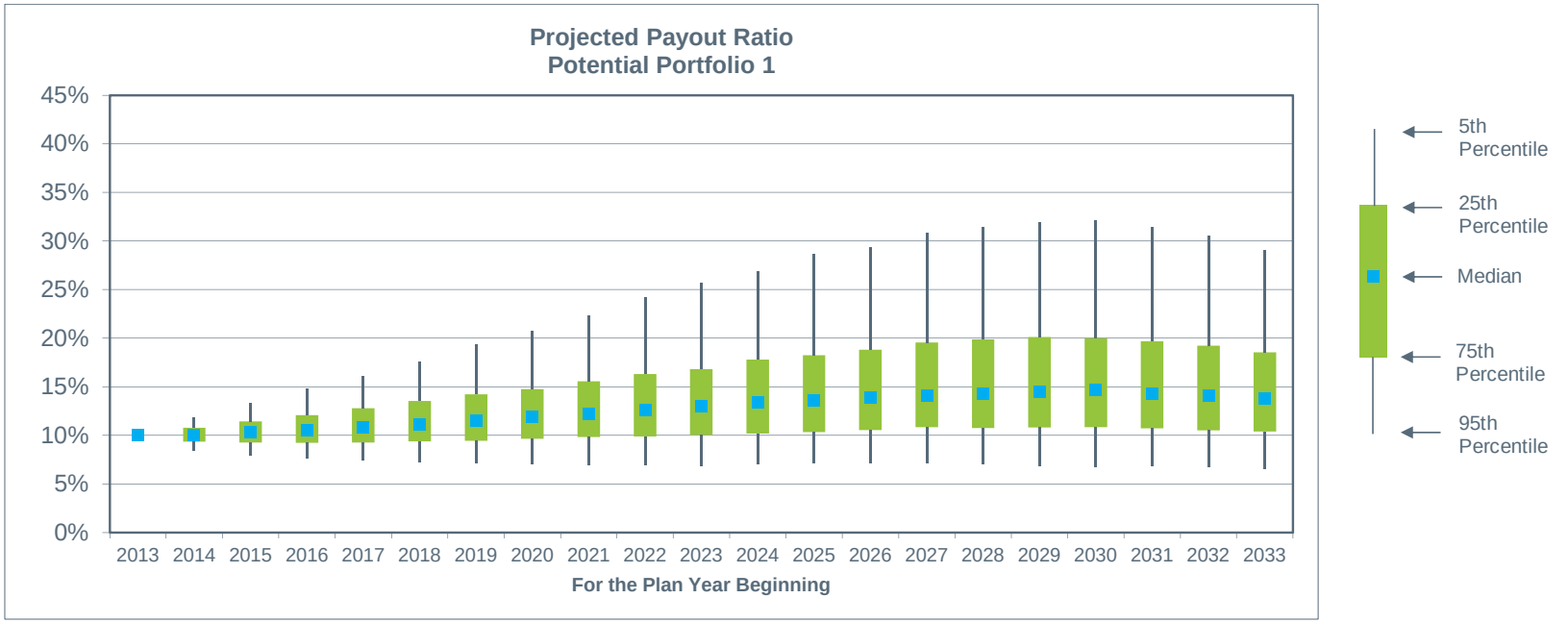
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 1**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 15%. The worst-case scenario could reach 32% or higher.



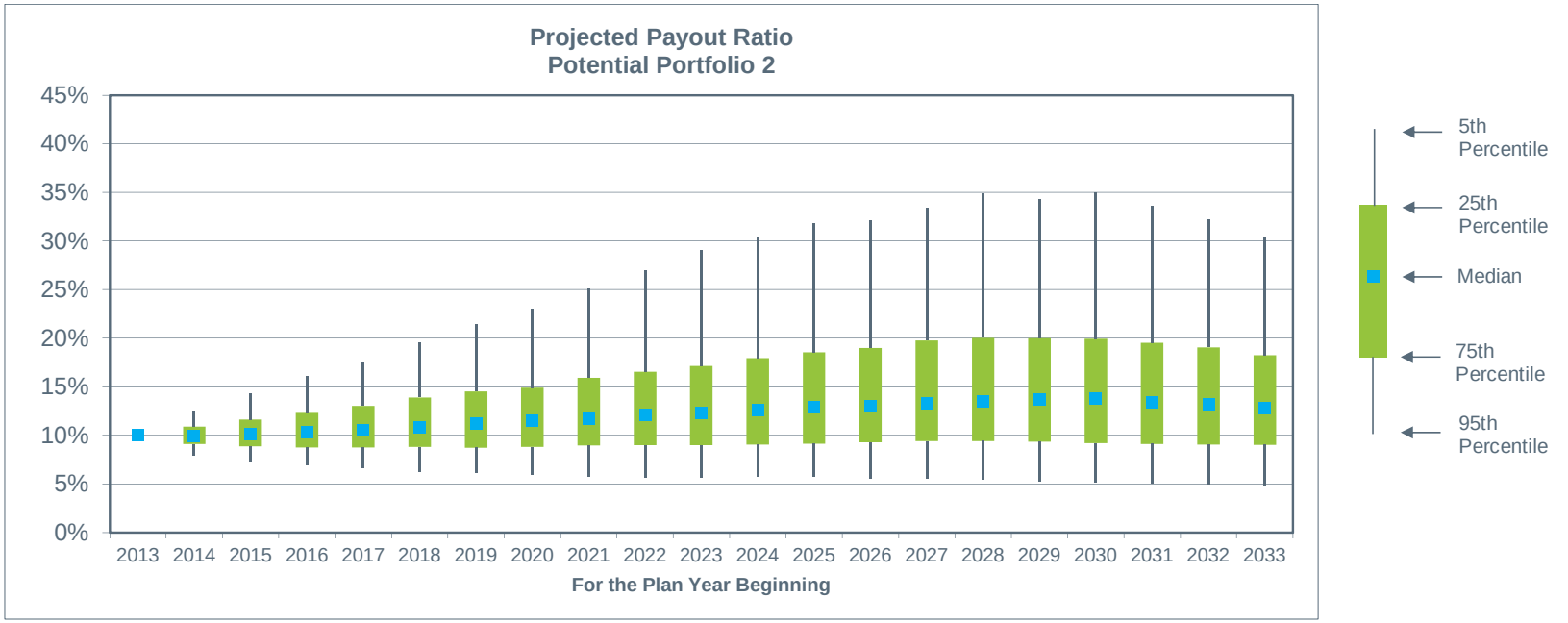

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 10% | 10% | 10% | 11% | 11% | 11% | 12% | 12% | 12% | 13% | 13% | 13% | 14% | 14% | 14% | 14% | 15% | 15% | 14% | 14% | 14% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 2**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 14%. The worst-case scenario could reach 35% or higher.



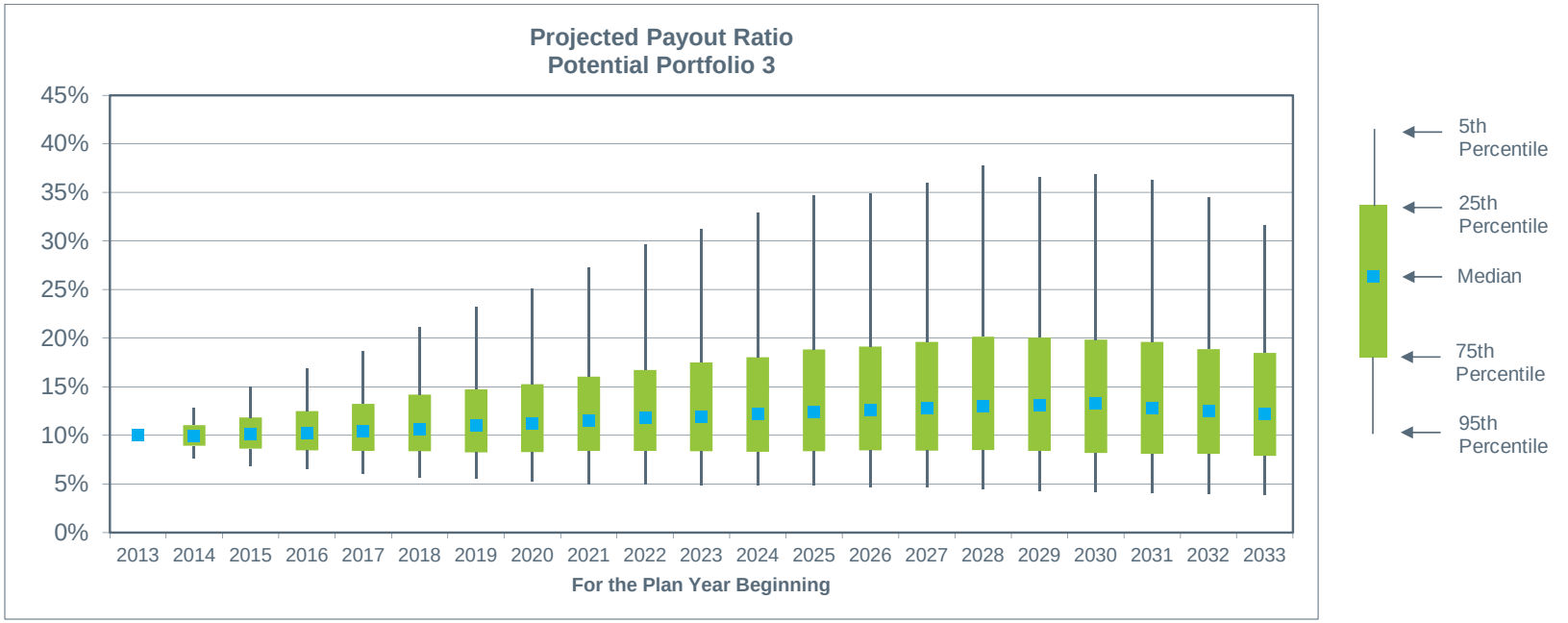

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 14% | 14% | 14% | 13% | 13% | 13% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 3**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 13%. The worst-case scenario could reach 38% or higher.



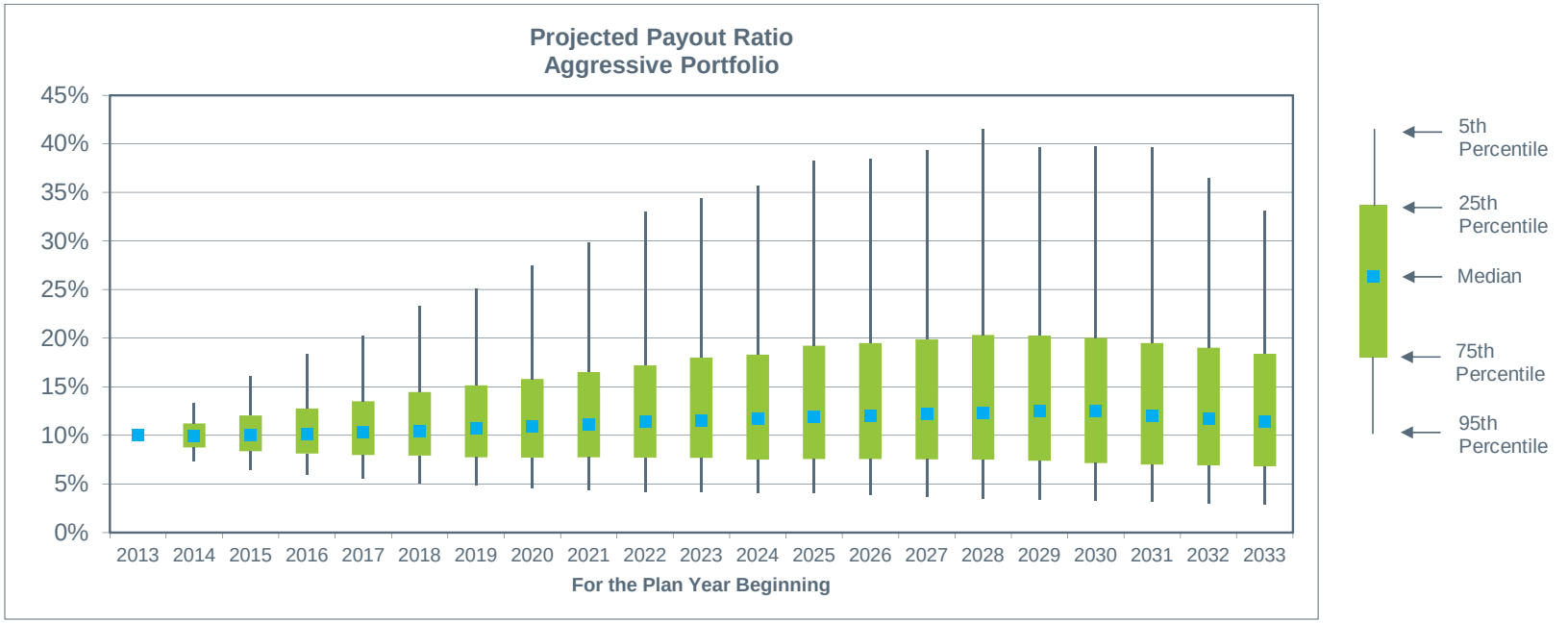

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 10% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 12% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Aggressive Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 10% and 13%. The worst-case scenario could reach 42% or higher.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 10% | 10% | 10% | 10% | 10% | 10% | 11% | 11% | 11% | 11% | 12% | 12% | 12% | 12% | 12% | 12% | 13% | 13% | 12% | 12% | 11% |



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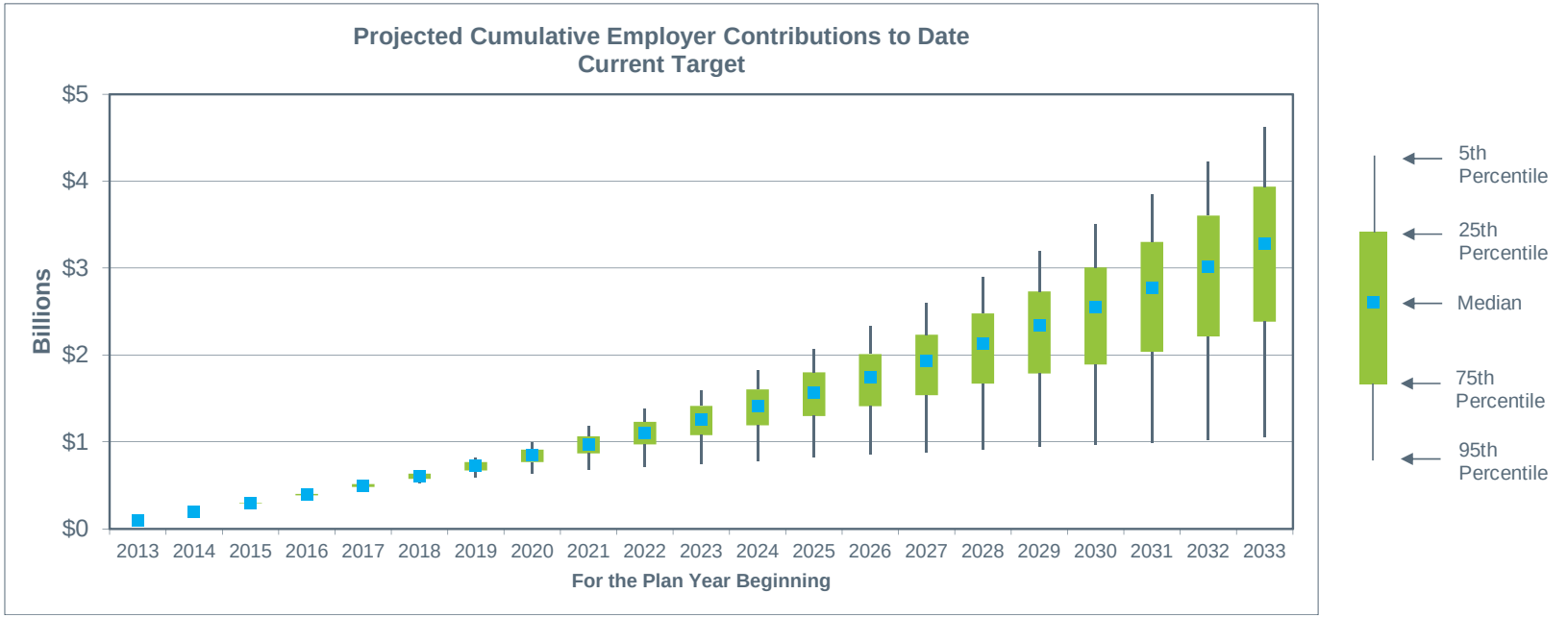
# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Current Target

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

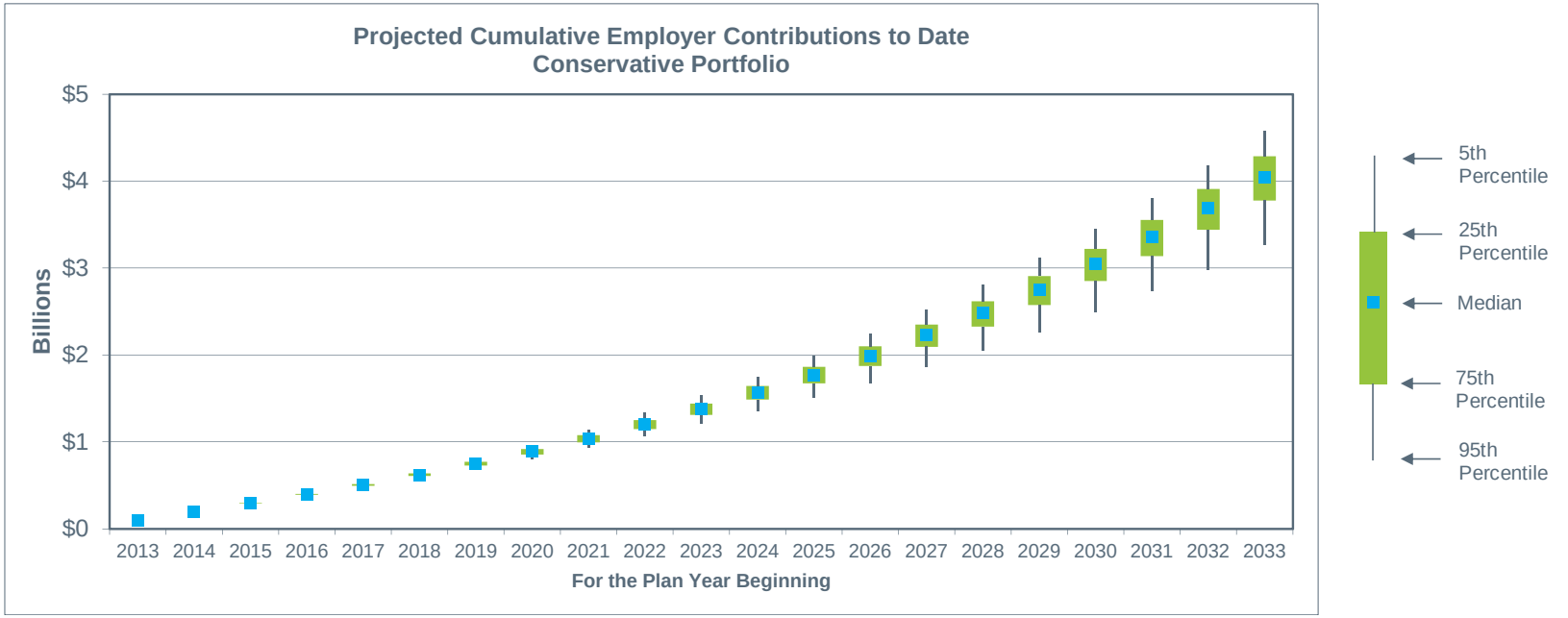



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $99 | $198 | $302 | $414 | $535 | $670 | $822 | $994 | $1,177 | $1,376 | $1,589 | $1,818 | $2,064 | $2,329 | $2,603 | $2,897 | $3,199 | $3,508 | $3,846 | $4,219 | $4,624 |
| 25th Percentile | $99 | $198 | $297 | $402 | $514 | $635 | $766 | $910 | $1,063 | $1,231 | $1,412 | $1,603 | $1,800 | $2,011 | $2,231 | $2,478 | $2,732 | $3,009 | $3,299 | $3,604 | $3,936 |
| Median | $99 | $198 | $294 | $395 | $498 | $606 | $721 | $843 | $974 | $1,109 | $1,255 | $1,406 | $1,570 | $1,744 | $1,928 | $2,127 | $2,334 | $2,550 | $2,777 | $3,019 | $3,278 |
| 75th Percentile | $99 | $198 | $291 | $386 | $481 | $575 | $670 | $767 | $867 | $970 | $1,076 | $1,189 | $1,297 | $1,408 | $1,536 | $1,671 | $1,785 | $1,889 | $2,035 | $2,212 | $2,381 |
| 95th Percentile | $99 | $198 | $287 | $375 | $455 | $524 | $588 | $637 | $678 | $710 | $746 | $779 | $820 | $853 | $883 | $909 | $939 | $966 | $995 | $1,020 | $1,055 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Conservative Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

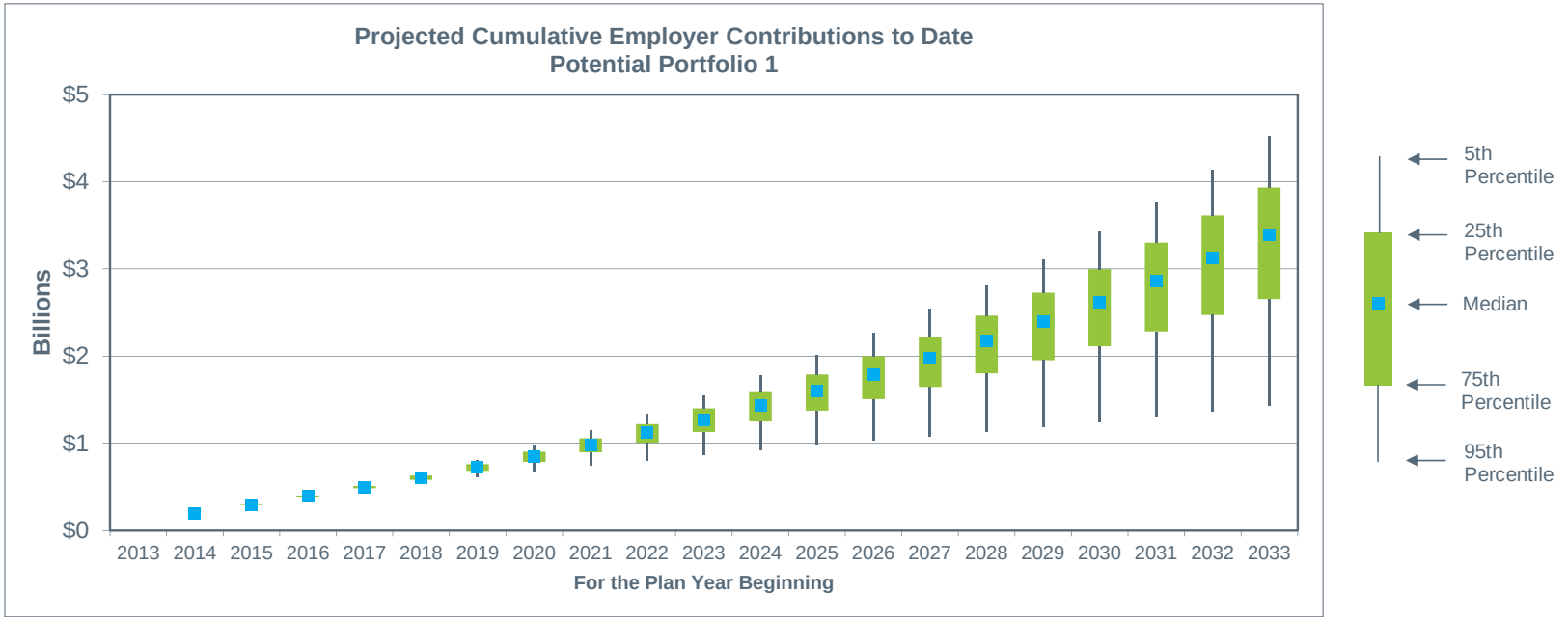



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $99 | $198 | $302 | $413 | $530 | $658 | $803 | $962 | $1,137 | $1,329 | $1,531 | $1,751 | $1,989 | $2,246 | $2,518 | $2,808 | $3,118 | $3,450 | $3,802 | $4,176 | $4,578 |
| 25th Percentile | $99 | $198 | $298 | $403 | $515 | $636 | $771 | $916 | $1,076 | $1,250 | $1,439 | $1,643 | $1,863 | $2,098 | $2,349 | $2,618 | $2,908 | $3,219 | $3,555 | $3,910 | $4,285 |
| Median | $99 | $198 | $295 | $398 | $506 | $621 | $748 | $887 | $1,037 | $1,199 | $1,374 | $1,563 | $1,768 | $1,990 | $2,227 | $2,484 | $2,756 | $3,047 | $3,361 | $3,692 | $4,046 |
| 75th Percentile | $99 | $198 | $292 | $392 | $496 | $607 | $726 | $855 | $994 | $1,146 | $1,311 | $1,486 | $1,672 | $1,873 | $2,091 | $2,324 | $2,576 | $2,852 | $3,138 | $3,440 | $3,777 |
| 95th Percentile | $99 | $198 | $289 | $384 | $482 | $584 | $694 | $809 | $934 | $1,067 | $1,207 | $1,356 | $1,514 | $1,680 | $1,860 | $2,051 | $2,259 | $2,493 | $2,732 | $2,986 | $3,268 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 1

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

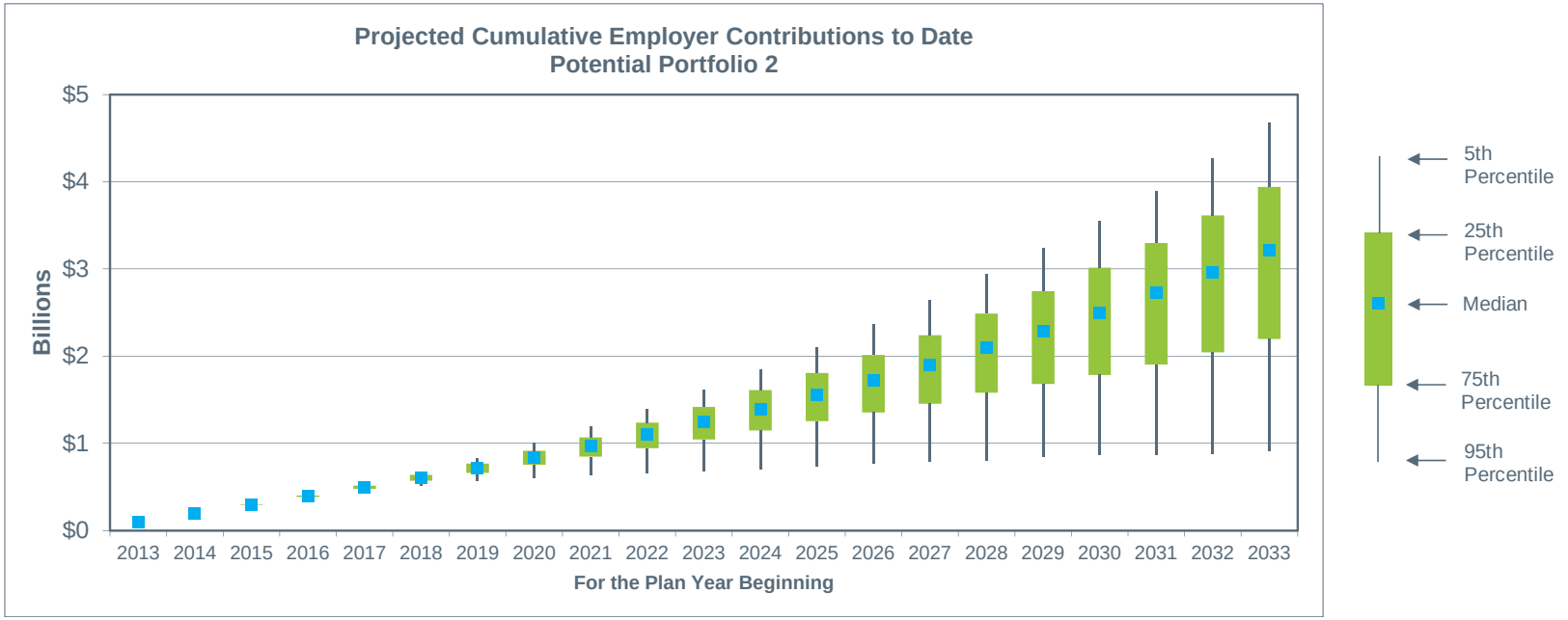



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $99 | $198 | $302 | $412 | $531 | $664 | $810 | $974 | $1,151 | $1,341 | $1,549 | $1,776 | $2,015 | $2,268 | $2,542 | $2,813 | $3,106 | $3,430 | $3,761 | $4,135 | $4,523 |
| 25th Percentile | $99 | $198 | $297 | $402 | $513 | $631 | $762 | $905 | $1,057 | $1,222 | $1,401 | $1,587 | $1,791 | $2,000 | $2,223 | $2,465 | $2,727 | $2,999 | $3,302 | $3,613 | $3,934 |
| Median | $99 | $198 | $294 | $395 | $499 | $608 | $724 | $850 | $982 | $1,121 | $1,270 | $1,430 | $1,601 | $1,782 | $1,973 | $2,178 | $2,392 | $2,618 | $2,862 | $3,121 | $3,386 |
| 75th Percentile | $99 | $198 | $291 | $388 | $484 | $582 | $684 | $788 | $896 | $1,008 | $1,129 | $1,251 | $1,375 | $1,505 | $1,647 | $1,804 | $1,954 | $2,112 | $2,281 | $2,472 | $2,656 |
| 95th Percentile | $99 | $198 | $288 | $377 | $464 | $542 | $619 | $683 | $745 | $808 | $869 | $924 | $980 | $1,033 | $1,079 | $1,129 | $1,187 | $1,243 | $1,313 | $1,364 | $1,433 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 2

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

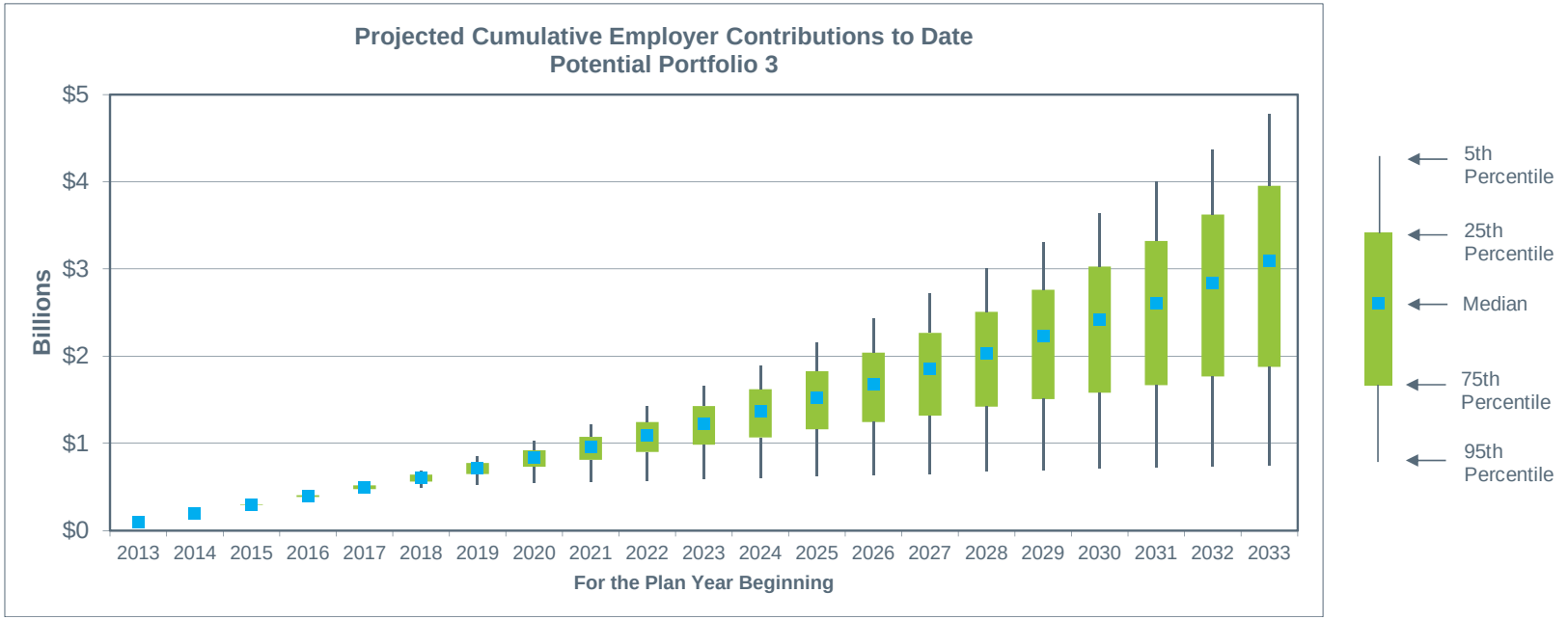



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $99 | $198 | $302 | $415 | $538 | $674 | $829 | $1,003 | $1,190 | $1,395 | $1,609 | $1,843 | $2,095 | $2,365 | $2,643 | $2,941 | $3,238 | $3,553 | $3,894 | $4,271 | $4,676 |
| 25th Percentile | $99 | $198 | $297 | $403 | $516 | $636 | $769 | $914 | $1,066 | $1,235 | $1,415 | $1,611 | $1,806 | $2,013 | $2,240 | $2,488 | $2,744 | $3,014 | $3,299 | $3,613 | $3,940 |
| Median | $99 | $198 | $294 | $394 | $497 | $605 | $719 | $840 | $968 | $1,101 | $1,244 | $1,391 | $1,553 | $1,724 | $1,901 | $2,092 | $2,289 | $2,494 | $2,725 | $2,957 | $3,210 |
| 75th Percentile | $99 | $198 | $291 | $385 | $478 | $570 | $662 | $755 | $849 | $944 | $1,043 | $1,148 | $1,253 | $1,353 | $1,454 | $1,579 | $1,678 | $1,782 | $1,901 | $2,044 | $2,194 |
| 95th Percentile | $99 | $198 | $286 | $373 | $449 | $513 | $568 | $608 | $636 | $657 | $683 | $703 | $735 | $767 | $785 | $806 | $846 | $863 | $874 | $882 | $904 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 3

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

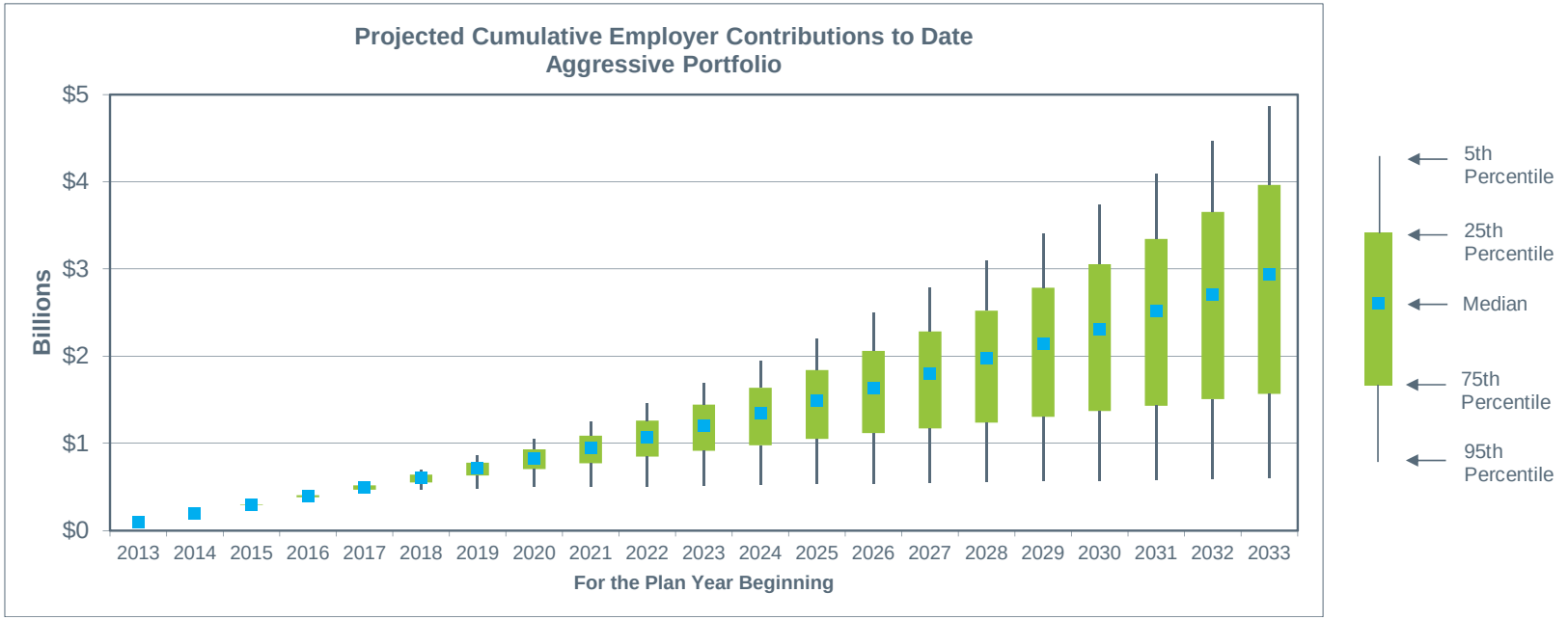



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $99 | $198 | $302 | $417 | $542 | $682 | $846 | $1,023 | $1,217 | $1,425 | $1,652 | $1,891 | $2,152 | $2,431 | $2,714 | $3,010 | $3,314 | $3,641 | $4,001 | $4,369 | $4,781 |
| 25th Percentile | $99 | $198 | $297 | $403 | $517 | $639 | $774 | $921 | $1,074 | $1,244 | $1,428 | $1,621 | $1,825 | $2,038 | $2,265 | $2,509 | $2,761 | $3,028 | $3,322 | $3,624 | $3,951 |
| Median | $99 | $198 | $294 | $394 | $496 | $602 | $715 | $833 | $957 | $1,087 | $1,225 | $1,368 | $1,522 | $1,674 | $1,850 | $2,033 | $2,224 | $2,417 | $2,612 | $2,842 | $3,090 |
| 75th Percentile | $99 | $198 | $291 | $384 | $474 | $561 | $647 | $731 | $812 | $901 | $983 | $1,068 | $1,159 | $1,242 | $1,318 | $1,419 | $1,506 | $1,579 | $1,665 | $1,768 | $1,877 |
| 95th Percentile | $99 | $198 | $285 | $368 | $438 | $492 | $528 | $550 | $560 | $571 | $586 | $604 | $621 | $635 | $647 | $677 | $687 | $706 | $723 | $737 | $742 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Aggressive Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $99 | $198 | $303 | $419 | $548 | $693 | $860 | $1,044 | $1,248 | $1,462 | $1,692 | $1,938 | $2,202 | $2,492 | $2,787 | $3,094 | $3,404 | $3,736 | $4,087 | $4,465 | $4,870 |
| 25th Percentile | $99 | $198 | $297 | $404 | $519 | $642 | $779 | $929 | $1,087 | $1,260 | $1,443 | $1,637 | $1,840 | $2,058 | $2,282 | $2,522 | $2,786 | $3,053 | $3,345 | $3,653 | $3,962 |
| Median | $99 | $198 | $294 | $393 | $495 | $600 | $710 | $826 | $946 | $1,073 | $1,199 | $1,343 | $1,490 | $1,634 | $1,797 | $1,971 | $2,136 | $2,312 | $2,516 | $2,702 | $2,935 |
| 75th Percentile | $99 | $198 | $290 | $381 | $469 | $551 | $630 | $703 | $772 | $848 | $913 | $976 | $1,051 | $1,117 | $1,171 | $1,237 | $1,302 | $1,371 | $1,429 | $1,508 | $1,566 |
| 95th Percentile | $99 | $198 | $284 | $364 | $424 | $465 | $483 | $494 | $496 | $500 | $509 | $524 | $530 | $542 | $549 | $559 | $563 | $569 | $579 | $592 | $599 |

# Stochastic Analysis (continued)

## Employer Contributions (as a weighted average percentage of salary)

The tables below show the range of required employer contributions (as a weighted average percentage of salary) assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Required Employer Contribution for Plan Year Beginning 2019 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 27% | 23% | 20% | 17% | 12% |
| Conservative Portfolio | 25% | 23% | 21% | 20% | 17% |
| Potential Portfolio 1 | 26% | 23% | 20% | 17% | 13% |
| Potential Portfolio 2 | 27% | 23% | 20% | 16% | 11% |
| Potential Portfolio 3 | 28% | 23% | 19% | 15% | 9% |
| Aggressive Portfolio | 29% | 23% | 19% | 15% | 7% |

| 10 Years | Required Employer Contribution for Plan Year Beginning 2024 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 38% | 29% | 22% | 15% | 2% |
| Conservative Portfolio | 38% | 31% | 27% | 23% | 17% |
| Potential Portfolio 1 | 37% | 29% | 23% | 17% | 6% |
| Potential Portfolio 2 | 38% | 29% | 22% | 14% | 0% |
| Potential Portfolio 3 | 40% | 30% | 21% | 12% | 0% |
| Aggressive Portfolio | 41% | 30% | 20% | 9% | 0% |

| 20 Years | Required Employer Contribution for Plan Year Beginning 2034 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 55% | 39% | 26% | 13% | 0% |
| Conservative Portfolio | 58% | 45% | 37% | 29% | 20% |
| Potential Portfolio 1 | 55% | 39% | 28% | 17% | 0% |
| Potential Portfolio 2 | 55% | 38% | 25% | 10% | 0% |
| Potential Portfolio 3 | 55% | 38% | 24% | 5% | 0% |
| Aggressive Portfolio | 56% | 38% | 22% | 0% | 0% |

# Stochastic Analysis (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 61% | 43% | 86% | 59% | 35% | 96% | $606 | $670 | $524 | 11% | 19% | 7% |
| Conservative Portfolio | 56% | 47% | 65% | 51% | 40% | 66% | $621 | $658 | $584 | 13% | 17% | 9% |
| Potential Portfolio 1 | 60% | 45% | 80% | 58% | 37% | 88% | $608 | $664 | $542 | 11% | 18% | 7% |
| Potential Portfolio 2 | 61% | 42% | 89% | 60% | 34% | 101% | $605 | $674 | $513 | 11% | 20% | 6% |
| Potential Portfolio 3 | 62% | 40% | 96% | 60% | 31% | 113% | $602 | $682 | $492 | 11% | 21% | 6% |
| Aggressive Portfolio | 63% | 37% | 105% | 61% | 28% | 127% | $600 | $693 | $465 | 10% | 23% | 5% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 58% | 31% | 108% | 56% | 26% | 112% | $1,255 | $1,589 | $746 | 12% | 28% | 6% |
| Conservative Portfolio | 47% | 33% | 65% | 43% | 29% | 64% | $1,374 | $1,531 | $1,207 | 16% | 25% | 9% |
| Potential Portfolio 1 | 57% | 33% | 96% | 55% | 28% | 100% | $1,270 | $1,549 | $869 | 13% | 26% | 7% |
| Potential Portfolio 2 | 59% | 29% | 116% | 57% | 25% | 121% | $1,244 | $1,609 | $683 | 12% | 29% | 6% |
| Potential Portfolio 3 | 61% | 27% | 131% | 59% | 23% | 141% | $1,225 | $1,652 | $586 | 12% | 31% | 5% |
| Aggressive Portfolio | 63% | 25% | 154% | 61% | 21% | 167% | $1,199 | $1,692 | $509 | 12% | 34% | 4% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 63% | 32% | 138% | 60% | 28% | 142% | $3,278 | $4,624 | $1,055 | 13% | 34% | 5% |
| Conservative Portfolio | 46% | 31% | 67% | 43% | 27% | 63% | $4,046 | $4,578 | $3,268 | 19% | 34% | 9% |
| Potential Portfolio 1 | 60% | 33% | 114% | 58% | 29% | 118% | $3,386 | $4,523 | $1,433 | 14% | 32% | 7% |
| Potential Portfolio 2 | 64% | 31% | 156% | 62% | 27% | 161% | $3,210 | $4,676 | $904 | 13% | 35% | 5% |
| Potential Portfolio 3 | 66% | 30% | 202% | 66% | 26% | 199% | $3,090 | $4,781 | $742 | 12% | 38% | 4% |
| Aggressive Portfolio | 70% | 29% | 261% | 69% | 25% | 271% | $2,935 | $4,870 | $599 | 11% | 42% | 3% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility"

This section provides a sensitivity analysis of the original stochastic projections by assuming the risk (as measured by standard deviation) of each asset class is doubled. These modified assumptions are outlined in the table below, compared to the original values:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption | Standard Deviation Assumption Doubled |
|---|---|---|---|
| Global Equity | 7.80 | 18.35 | 36.70 |
| Int. Duration Fixed Income | 3.50 | 6.00 | 12.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 | 21.58 |
| Core Real Estate | 6.75 | 12.50 | 25.00 |
| Diversified Hedge Funds | 6.50 | 9.50 | 19.00 |
| Private Equity | 10.50 | 26.00 | 52.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 | 22.90 |
| Cash Equivalents | 2.25 | 3.00 | 6.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that potential increased capital market volatility does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, exacerbating the potential best and worst-case scenarios.

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 63% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 17% | 54% | 27% | -62% | 35% |
| Conservative Portfolio | 1% | 77% | 20% | -41% | 30% |
| Potential Portfolio 1 | 14% | 57% | 25% | -56% | 33% |
| Potential Portfolio 2 | 20% | 53% | 28% | -65% | 36% |
| Potential Portfolio 3 | 24% | 52% | 30% | -70% | 37% |
| Aggressive Portfolio | 27% | 51% | 31% | -74% | 39% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 63% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 24% | 55% | 34% | -62% | 52% |
| Conservative Portfolio | 3% | 79% | 43% | -41% | 50% |
| Potential Portfolio 1 | 20% | 59% | 33% | -56% | 52% |
| Potential Portfolio 2 | 27% | 54% | 34% | -65% | 52% |
| Potential Portfolio 3 | 31% | 52% | 35% | -71% | 53% |
| Aggressive Portfolio | 34% | 50% | 35% | -76% | 55% |

| 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 | 33% | 49% | 31% | -63% | 85% |
| Conservative Portfolio | 4% | 78% | 44% | -41% | 86% |
| Potential Portfolio 1 | 27% | 52% | 31% | -56% | 86% |
| Potential Portfolio 2 | 36% | 48% | 31% | -67% | 85% |
| Potential Portfolio 3 | 40% | 45% | 30% | -72% | 84% |
| Aggressive Portfolio | 44% | 43% | 30% | -77% | 84% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 61% | 29% | 121% | 60% | 21% | 154% | $604 | $739 | $424 | 11% | 32% | 4% |
| Conservative Portfolio | 56% | 40% | 76% | 51% | 31% | 83% | $622 | $698 | $549 | 13% | 22% | 7% |
| Potential Portfolio 1 | 60% | 33% | 106% | 58% | 24% | 132% | $607 | $720 | $464 | 11% | 28% | 5% |
| Potential Portfolio 2 | 62% | 26% | 130% | 60% | 19% | 168% | $603 | $751 | $401 | 11% | 35% | 4% |
| Potential Portfolio 3 | 63% | 23% | 148% | 61% | 16% | 204% | $601 | $774 | $363 | 10% | 42% | 3% |
| Aggressive Portfolio | 64% | 19% | 176% | 62% | 13% | 247% | $599 | $799 | $332 | 10% | 51% | 3% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 59% | 16% | 202% | 57% | 12% | 222% | $1,242 | $1,836 | $447 | 12% | 62% | 3% |
| Conservative Portfolio | 48% | 23% | 88% | 43% | 19% | 91% | $1,372 | $1,674 | $1,000 | 16% | 40% | 7% |
| Potential Portfolio 1 | 57% | 18% | 163% | 55% | 14% | 181% | $1,257 | $1,761 | $518 | 13% | 52% | 4% |
| Potential Portfolio 2 | 61% | 14% | 228% | 59% | 11% | 252% | $1,229 | $1,874 | $419 | 12% | 68% | 3% |
| Potential Portfolio 3 | 63% | 12% | 287% | 61% | 9% | 334% | $1,208 | $1,943 | $379 | 12% | 81% | 2% |
| Aggressive Portfolio | 64% | 10% | 382% | 63% | 7% | 446% | $1,182 | $2,001 | $348 | 11% | 99% | 2% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 66% | 19% | 397% | 65% | 15% | 415% | $3,201 | $5,237 | $498 | 12% | 79% | 2% |
| Conservative Portfolio | 47% | 20% | 95% | 43% | 17% | 94% | $4,021 | $5,007 | $1,999 | 18% | 61% | 7% |
| Potential Portfolio 1 | 62% | 20% | 282% | 60% | 16% | 289% | $3,310 | $5,092 | $633 | 13% | 71% | 3% |
| Potential Portfolio 2 | 68% | 18% | 474% | 67% | 14% | 497% | $3,127 | $5,345 | $458 | 12% | 87% | 1% |
| Potential Portfolio 3 | 70% | 18% | 692% | 73% | 14% | 723% | $3,001 | $5,477 | $406 | 11% | 98% | 1% |
| Aggressive Portfolio | 77% | 16% | 1048% | 81% | 12% | 1111% | $2,842 | $5,590 | $365 | 10% | 100% | 1% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations"

This section provides a sensitivity analysis of the original stochastic projections by assuming that all asset classes are perfectly positively correlated (i.e. correlation = 1.00). A correlation matrix reflecting these modified assumptions is provided below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Int. Duration Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Custom KRS Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Core Real Estate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Hedge Funds | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Private Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Inflation Strategies | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Cash Equivalents | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that converging correlations across capital markets does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, indicating higher risk for all asset mixes given the dampened effects of total fund diversification.

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 63% (Current) Funding in 2019 | Probability of < 40% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 11% | 57% | 18% | -41% | 30% |
| Conservative Portfolio | 0% | 81% | 13% | -23% | 27% |
| Potential Portfolio 1 | 9% | 59% | 17% | -38% | 29% |
| Potential Portfolio 2 | 12% | 56% | 19% | -43% | 30% |
| Potential Portfolio 3 | 16% | 54% | 20% | -47% | 31% |
| Aggressive Portfolio | 19% | 53% | 22% | -51% | 32% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 63% (Current) Funding in 2024 | Probability of < 40% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 18% | 57% | 29% | -41% | 45% |
| Conservative Portfolio | 1% | 85% | 40% | -23% | 42% |
| Potential Portfolio 1 | 15% | 59% | 29% | -38% | 44% |
| Potential Portfolio 2 | 20% | 56% | 29% | -43% | 45% |
| Potential Portfolio 3 | 23% | 53% | 29% | -47% | 46% |
| Aggressive Portfolio | 27% | 52% | 29% | -51% | 47% |

| 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 | 24% | 53% | 28% | -48% | 65% |
| Conservative Portfolio | 1% | 86% | 45% | -29% | 64% |
| Potential Portfolio 1 | 20% | 56% | 29% | -46% | 65% |
| Potential Portfolio 2 | 27% | 51% | 28% | -50% | 66% |
| Potential Portfolio 3 | 32% | 49% | 28% | -54% | 66% |
| Aggressive Portfolio | 35% | 46% | 27% | -58% | 67% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 61% | 38% | 98% | 59% | 29% | 117% | $604 | $666 | $504 | 11% | 23% | 5% |
| Conservative Portfolio | 56% | 44% | 71% | 51% | 35% | 75% | $620 | $645 | $591 | 13% | 19% | 8% |
| Potential Portfolio 1 | 61% | 39% | 93% | 58% | 30% | 109% | $606 | $661 | $519 | 11% | 22% | 6% |
| Potential Portfolio 2 | 61% | 37% | 101% | 59% | 28% | 122% | $603 | $669 | $494 | 11% | 24% | 5% |
| Potential Portfolio 3 | 62% | 36% | 109% | 60% | 27% | 134% | $600 | $676 | $471 | 11% | 25% | 5% |
| Aggressive Portfolio | 63% | 33% | 117% | 61% | 25% | 148% | $598 | $685 | $443 | 11% | 27% | 4% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 59% | 24% | 140% | 56% | 20% | 149% | $1,254 | $1,607 | $573 | 13% | 38% | 5% |
| Conservative Portfolio | 47% | 28% | 77% | 44% | 24% | 76% | $1,371 | $1,532 | $1,098 | 16% | 31% | 8% |
| Potential Portfolio 1 | 57% | 24% | 127% | 54% | 21% | 134% | $1,270 | $1,591 | $612 | 13% | 36% | 5% |
| Potential Portfolio 2 | 60% | 23% | 149% | 57% | 19% | 160% | $1,244 | $1,619 | $547 | 12% | 39% | 4% |
| Potential Portfolio 3 | 61% | 22% | 170% | 59% | 18% | 184% | $1,227 | $1,647 | $495 | 12% | 42% | 4% |
| Aggressive Portfolio | 63% | 20% | 195% | 61% | 16% | 216% | $1,209 | $1,678 | $462 | 12% | 46% | 3% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 62% | 25% | 226% | 60% | 20% | 236% | $3,267 | $4,718 | $656 | 13% | 53% | 3% |
| Conservative Portfolio | 46% | 26% | 78% | 42% | 22% | 77% | $4,041 | $4,590 | $2,699 | 19% | 46% | 8% |
| Potential Portfolio 1 | 59% | 25% | 188% | 57% | 21% | 195% | $3,376 | $4,688 | $748 | 14% | 52% | 4% |
| Potential Portfolio 2 | 63% | 24% | 254% | 61% | 20% | 267% | $3,201 | $4,738 | $599 | 13% | 54% | 3% |
| Potential Portfolio 3 | 66% | 23% | 322% | 65% | 19% | 340% | $3,072 | $4,800 | $531 | 12% | 58% | 2% |
| Aggressive Portfolio | 70% | 22% | 421% | 69% | 18% | 448% | $2,926 | $4,862 | $484 | 12% | 64% | 2% |

# Appendix 3: Assumptions and Methods

**Actuarial Valuation Assumptions and Methods**: At the beginning of each projection year, an actuarial valuation is performed to determine employer contributions. The assumptions proposed in the 2013 Experience Study were used with actuarial valuations beginning in 2015 and beyond. These methods and assumptions are summarized below:

| | |
|---|---|
| **Actuarial Cost Method** | Entry-Age Normal (level % of pay). Funding policies and methods are described in the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Liability Discount Rate** | 7.50% per year, compounded annually. |
| **Future Pay Increases** | Future pay increases as recommended in the 2013 Experience Study. Pay increases include a 4.00% base wage inflation rate. |
| **Retirement** | Rates of retirement as recommended in the 2013 Experience Study. |
| **Mortality** | Rates of mortality as recommended in the 2013 Experience Study. |
| **Disability** | Rates of disability as recommended in the 2013 Experience Study. |
| **Withdrawal** | Rates of withdrawal as recommended in the 2013 Experience Study. |
| **Asset Valuation Method** | 5-Year smoothing of actual versus expected returns. The asset valuation method is described on page 36 of the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Contribution Policy** | For fiscal years 2017 and beyond, employer contributions are assumed to equal the full actuarially required contribution consisting of: (1) gross normal cost, less (2) expected employee contributions, plus (3) administrative expenses (0.36% of 2014-15 payroll, growing at inflation each year), plus (4) an amortization of the unfunded actuarial liability over 29 years beginning in 2014, calculated as a level percentage of payroll assuming 4.00% payroll growth. The amortization period was not assumed to reset at any point in the future, and was not allowed to fall below 10 years. |

# Appendix 3: Assumptions and Methods (continued)

**Projection Assumptions (used in the deterministic and stochastic asset/liability projections)**: These projections begin with the Plan's participant population as of June 30, 2014, as provided by Cavanaugh. The Plan's population is projected forward and assumed to change as a result of employment separation, death, disability, and retirement, as predicted by the assumptions recommended in the 2013 Experience Study (and described on the prior pages). New members are assumed to enter the Plan such that the active population remains level throughout the projection. Employee compensation is projected into the future in accordance with the assumptions described on the prior pages. Investment returns are projected into the future in accordance with the assumptions described below.

| | |
|---|---|
| **Employer Contributions** | For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuations as of June 30, 2013, and June 30, 2014 (20.73% and 20.26% of payroll, respectively). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study. |
| **Member Contributions** | Member contributions are determined based on current contribution rates, and projected pay. |
| **New Entrants** | New employees are assumed to join the Plan such that the active population remains level throughout the projection. New employees entering the Plan are assumed to have characteristics similar to recently hired participants. |
| **Rate of Return on Assets** | Deterministic Analysis: 7.50%, compounded annually.<br><br>Stochastic Analysis: Returns on the portfolio are based on the expected returns of each asset class and the correlations between each class which are detailed in the Stochastic Analysis section of this report. |
| **Cash Balance Interest Credit** | Deterministic Analysis: 7.00%, compounded annually.<br><br>Stochastic Analysis: Interest credits are based on the expected returns of a benchmark portfolio designed to mirror the overall portfolio return. |

# Appendix 3: Assumptions and Methods (continued)

**Inflation**

2.50% per year with a standard deviation of 3.00%.

**Other**

All other projection assumptions are the same as those recommended in the 2013 Experience Study.

Our work was based partly on original work prepared by Cavanaugh using the ProVal valuation software. This included their coding of benefit provisions and the methodology to generate liabilities under the entry age normal actuarial cost method. Cavanaugh provided us with an actuarial valuation as of June 30, 2014, using assumptions from the 2013 Experience Study. We reviewed this work for reasonableness, but we did not perform a complete audit of this work.

We started with Cavanaugh's base year valuation work. Certain changes to the coding of benefit provisions were required in order to facilitate a 20-year projection of liabilities and costs. For example, we added employee contribution definitions in order to offset gross normal cost calculations by expected employee contributions. In some cases, scaling of liabilities was used to approximate liabilities not valued directly in the work provided by Cavanaugh.

The participant data provided by Cavanaugh was the same as that used in the actuarial valuation as of June 30, 2014, for CERS Hazardous Plan funding purposes. This data was used without grouping or adjustment.

We modeled contribution rates based on annual valuations with a one-year lag period.

May 2015

# Asset/Liability Study

## State Police Retirement System

# Memorandum

| | |
|---|---|
| To | Kentucky Employees Retirement System |
| From | RVK, Inc. |
| Subject | State Police Pension Asset/Liability Study – Executive Summary |
| Date | May 5, 2015 |

## Introduction

The purpose of this memorandum is to summarize the key inferences we draw from the Asset/Liability ("A/L") study of the State Police Pension Plan ("SPPP" or the "Plan"). While this memorandum refers directly to points raised within the study, we emphasize that a full understanding of the A/L study and its implications requires a close review of the study in its entirety.

## Background and Key Conclusions

As of the fiscal year beginning June 30, 2014, the date of the most recent actuarial valuation and the start date of the projections in this study, the Plan was 38% funded (on a market value basis) meaning that assets were available to cover 38% of Plan liabilities as currently estimated by the Plan's actuary. This equates to a shortfall of approximately $420 million. By any measure, this is a significant concern for the future of the Plan's financial health. This study shows that the Plan faces substantial financial challenges over the next 20 years. By this we mean persistent funding shortfalls, elevated contribution levels, unsustainable payout ratios, and, in the worst-case scenario, the potential for complete depletion of the asset base.

As highlighted below, this study suggests that continued diversification in the investment of Plan assets is desirable. However, given the current financial health of the Plan, the results of this study suggest there is no reasonable investment strategy available to SPPP that would allow the plan to "invest its way to significantly improved financial status." By "reasonable" we mean an investment strategy that offers the probability of substantially higher returns—substantial enough to alone notably improve the SPPP funding status—without also courting substantial risk to the already diminished asset base of the Plan. The reason, outlined in more detail in the body of this report, is that the returns that might moderately, but notably, improve the funded status of the SPPP over the next 20 years can almost certainly only be achieved by taking substantial risk – and that risk, once taken, may lead to those improved outcomes, but also may lead to faster depletion of the Plan's assets should the investment markets provide a challenging and unrewarding climate for investors.

Additionally, this study suggests that the Plan will likely face liquidity constraints in the near future making investments in illiquid assets classes difficult to maintain. To the extent this reduces the expected return of the portfolio, the outcomes become less favorable.

## The Purpose of an Asset Liability Study

The central purpose of an A/L study is to examine the probable future consequences, over extended periods of time, of applying alternative asset allocation strategies to the Plan's investment assets in order to fund the liabilities created by the benefit provisions of the Plan. A/L studies are unique in their ability to combine in a single analysis the three critical factors that drive the financial health of the Plan—benefit policy (liabilities), contribution policy, and investment strategy (asset allocation). Certainly this type of forward looking study—nor any others we are aware of—cannot indicate with any reliability what will happen in any given year over this extended period of time and its insights are dependent on the assumptions used. However, we have high conviction that the study's results paint a highly reliable view of the core long-term trends in the Plan's financial health. Best practice, in our judgment, is to take the general direction suggested as most appropriate by this study with its unique consideration of liabilities, contribution policy and trending liquidity needs and refine it in an asset allocation study where implementing the Plan's structure can reflect the pragmatic considerations of investing in the capital markets present at any given point in time.

## Deterministic versus Stochastic

In this study, we examined a series of related questions associated with this central purpose, projecting future outcomes under two distinctly different methodologies:

1. a **deterministic** basis (all underlying assumptions, liabilities, contributions and most critically investment returns, are achieved precisely and without variance in each and every year); and

2. a **stochastic** basis (outcomes for investment returns vary each year according to estimated volatility with contribution *requirements* following suit while *actual* contribution policy and liabilities remains in their current form).

## Key Results

Below you will find a series of important findings, forecasts, and conclusions drawn from the body of the study. While the remarks are presented here to allow a quick assessment of some of the key findings, they represent only a sampling of the fundamental elements of the study. We emphasize that a solid understanding of each element requires that they be reviewed as they are presented in the study itself within their surrounding context (please note the frequent page references to the full study). This is especially important to understanding the findings which represent *probable, but not certain,* outcomes as analyzed in the stochastic section of the study.

*At the Outset:*

- As of June 30, 2014 (the date of the actuarial valuation used to model liabilities), the Plan's market value funded ratio (available assets to fund benefit obligations) was 38% (page 6).

- Inactive members currently outnumber active members, a trend that is projected to continue with inactive members making up a larger and larger share of the total population (page 8). The maturing demographics of the Plan is an important factor when considering the findings on Plan risk/return options and the projected status of Plan liquidity below.

*Deterministic Analysis: A deterministic analysis assumes full certainty about the future, in particular, certainty of investment returns. Its 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.*

- Benefit payments to Plan participants are expected to increase by about 17% over the next 20 years (page 9). Annual increases are projected to range between -1% and 2%. Benefit payments are actually projected to begin declining in 2030 as the number of inactive members also begins to slightly decline.

- Total annual dollar contributions (employer and employee) based on actuarially required rates are expected to more than double over the next 20 years; from $28 million in 2014 to $66 billion in 2034 (page 10). *Please note however*, that precise actuarially required rates as they unfold are the purview of the Plan's actuary and are affected by factors other than investment returns and resulting asset values of the Plan.

- Beginning in 2016, contributions expressed as a weighted average percentage of salary are projected to gradually decline (page 11).

- Aggregate benefit payments are expected to increase by about 17% over the next 20 years and increase as a percentage of Plan assets over this same time period from 21% in 2014 to 27% in 2025 (pages 9 and 12). After 2025, the payout ratio is projected to begin declining and end the projection period at 19%. While the payout ratio at the end of projection period is lower than current levels, absolute levels are high through the entire projection period. This is a critical observation as elevated payout ratios impose liquidity constraints on the management of the portfolio (inhibiting the ability of the Plan to invest with a long-term horizon). This limits the Plan's opportunity to invest in less liquid asset classes regardless of the potential return or risk reducing diversification benefits they offer. In our opinion, the levels projected in this study will begin to materially inhibit investment opportunities for the Plan, potentially causing investment constraints. In fact, these constraints may become so severe that they inhibit the Plan from reaching its long-term return assumption of 7.50%.

- As assets grow each and every year without exception at the assumed rate of return (7.50%), the funding ratio on a market value basis is expected to gradually increase to approximately 45% by 2034 from the current value of 38% (page 17). However, please note that before the funding ratio begins to increase, it is likely to decline to roughly 10% between 2021 and 2026.

- Assuming the current contribution policy remains unchanged, the Plan would need to experience annual returns in excess of 18% over the next 10 years or 12% over the next 20 years *without exception in each and every year* in order to reach full funding (page 18). Achieving such lofty returns on such a sustained basis is extremely unlikely in our judgment and underscores our conclusion that investment returns alone cannot move the Plan to full funding.

- Experiencing a return of 100 basis points below the Plan's current assumed rate of return of 7.50% (i.e., 6.50%) each year for the 20 year projection period would result in a moderate decline in the projected funding ratio to 38% in year 20 versus 45% at the current assumed rate of return (page 19). Additionally, under this scenario cumulative employer contributions would be $38 million higher over the 20 year period. Given the widely shared concerns about the prospects for a low return environment in the capital markets over the foreseeable future, this is a conclusion that should be thoroughly understood and appreciated. In the event that capital markets do not support returns commensurate with the assumed rate of return, reliance on contributions to complete the payout of the Plan's liabilities effectively increases, especially in later years.

*Stochastic Analysis: Unlike a deterministic analysis, a stochastic analysis does not assume an unvarying stream of expected investment returns year after year. Instead, it reflects the realistic view that pension plan investment returns are—like the investment markets themselves—volatile and always uncertain. This means that there are a range of possible outcomes for SPPP; some are more likely, others less likely, but still possible.*

*The deterministic approach is useful for gauging the general direction of change and associated consequences, but adding the element of uncertainty—more specifically year to year variability in the performance of the capital markets and the value of the Plan's assets over time—can offer additional insights, albeit along with considerable complexity.*

Uncertainty in future investment returns is taken into account via a stochastic analysis of six different investment approaches (in the table below and on page 25) ranging from highly conservative (low risk, asset protective) to highly aggressive (high return seeking with substantial associated risk), including the Current Target allocation SPPP. The reason for testing such a broad range of approaches is that at the heart of the SPPP situation is a simple question that is difficult to answer: whether the Plan is 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).

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | **30** | **70** | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | **0** | **30** | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | **0** | **30** | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | **5** | **10** | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | **10** | **15** | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | **5** | **15** | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | **2** | **15** | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | **2** | **5** | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

Essential to answering this question is to ask precisely how SPPP and the Plan's broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plan is "better off" under one approach versus another are as follows:

(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 Plan's ability to pay annual benefits without major disruption of its strategic asset allocation, the driver of its investment strategy).

(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 Plan's assets over the course of time and the associated effects on contributions and potentially investment decisions.

The results of this analysis are displayed on pages 26 through 46 of the accompanying A/L study. For purposes of this summary, the consequences of choosing A versus B, as described above, is summarized most clearly in the tables on pages 32 and 46 of the study (copied below followed by explanatory comments).

| 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% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 35% | 15% | 80% | 34% | 13% | 82% | $918 | $1,052 | $642 | 25% | 100% | 10% |
| Conservative Portfolio | 26% | 14% | 42% | 24% | 12% | 40% | $990 | $1,054 | $915 | 36% | 100% | 20% |
| Potential Portfolio 1 | 34% | 15% | 69% | 32% | 13% | 69% | $928 | $1,043 | $717 | 26% | 100% | 12% |
| Potential Portfolio 2 | 36% | 15% | 87% | 35% | 13% | 90% | $910 | $1,058 | $590 | 24% | 100% | 9% |
| Potential Portfolio 3 | 37% | 15% | 106% | 37% | 13% | 110% | $897 | $1,069 | $489 | 23% | 100% | 8% |
| Aggressive Portfolio | 39% | 14% | 133% | 39% | 12% | 138% | $883 | $1,080 | $387 | 22% | 100% | 6% |

- With the exception of the Aggressive Portfolio, the median expected funding ratio at the end of the 20 year study period is lower than the current funding level for all investment options analyzed (pages 31, 32, and 46). However, as you incrementally increase the expected risk and return of the fund (from Potential Portfolio 1 to Potential Portfolio 3), the outcomes do appear to gradually improve at the cost of slightly reduced worst-case outcomes. This is supportive of the continued utilization of diversified investment approach.

- All portfolios analyzed show at least a marginal probability (between 0.5% and 2%) of fully depleting the assets at some point during the projection period (not shown in the table). In other words, if the investment markets are significantly unfavorable over the next several years—certainly not an improbable forecast—neither adopting an exceedingly conservative, nor highly aggressive investment approach would prevent near or actual depletion of the Plan's assets. Assuming the very worst investment environment occurs, it is possible that benefit obligations in one or more years would exceed assets and normal contributions creating a need for additional cash flow into the Plan.

- Each of the portfolios show a significant probability of extreme payout ratios over the next 20 years with median values exceeding 30% during the projection period (pages 33-38 and 46). Payout ratios this high severely limit the Plan's ability to invest in illiquid strategies. For example, the Current Target contains a 25% allocation to illiquid investments (10% each to private equity and hedge funds and 5% to real estate). This leaves only 75% of the Plan's assets invested in liquid strategies limiting the options available when selecting sources for benefit payments and rebalancing the portfolio to the strategic asset allocation target. Combining this with the highest median peak projected payout ratio of over 30% makes the Current Allocation an undesirable long-term solution for investing Plan assets. In the event of a payout ratio over 30%, over 40% of the liquid portfolio would need to be liquidated to fund benefit payments (assuming they came due at a time when contribution were not coming in). In our view this is unsustainable for long periods of time and may inhibit the Plan's ability to invest with a long-term focus reducing the potential return opportunities. **In short, a heavy**

**reliance on illiquid investments risks turning even normal asset value declines into disruptive events.**

- The cumulative cost of providing the Plan's benefits is met through a combination of contributions and the investment returns on those contributions. The Conservative Portfolio requires the highest level of contributions (i.e., the direct funding of benefits) (pages 40, 45, and 46). Even under the very unlikely best-case scenario the Plan would have a funded ratio of about 24%, far lower than any of the other portfolios (page 46). The only redeeming virtue of such an ultra-conservative approach is that the potential for large declines in the value of the fund is significantly mitigated albeit at much higher ongoing costs (contributions) and chronic poor Plan financial health.

- The Aggressive Portfolio does appear to produce the most desirable outcomes. *However*, it also has a maximum theoretical one-year portfolio decline of 51%—a loss of more than one half of the Plan's assets, significant we believe by any standard. This likelihood of notably larger one year declines within the study period gives pause to the desirability of a far more aggressive approach simply from a quantitative viewpoint. It also suggests it may be a strategy that is extremely difficult for decision makers to sustain over a long period of time. Declines in the total fund market value of this magnitude are a disruptive event from all aspects of Plan management. Yet, the benefit of such an aggressive approach that makes it superficially attractive can only be realized with any probability if the aggressive and highly volatile approach is maintained for several decades through good times, bad times, and unnerving times. Furthermore, this type of strategy could prove difficult to maintain in future years should demographic (early retirement incentives for example) or financial events create higher liquidity demands on the Plan. For all these reasons, it is not an approach that should be seriously considered without full recognition of the significant risks.

- While RVK supports the conclusions of the study using our current capital market assumptions, we also model for extreme market scenarios to stress test the results of the study. The summary of this analysis can be found in Appendices 1 and 2 (beginning on pages 47 and 50 respectively). The first test models the case of extreme market volatility by doubling the assumed standard deviations of all asset classes. The second test models converging market returns by assuming all assets are perfectly correlated (i.e. correlations equal +1.00). The results of these additional analyses show that the *relative* portfolio outcomes do not change, but that the range of potential results widens, indicating higher risk for all asset mixes given the increased systemic volatility and the reduced dampening effects of total fund diversification we assume under these stress scenarios.

## Final Comments

This A/L study shows that SPPP is currently underfunded and may face liquidity concerns in the future. The Plan can best meet its objectives through the continued use of a well-diversified investment portfolio that focuses on increasing liquidity. However, positive outcomes are

extremely dependent on the contribution policy. The study is not supportive of a long-term, ultra-conservative approach. The increasing potential for large one-year declines suggests that there is likely a limit to the net benefits of adding increased risk in pursuit of additional return. Progress should be monitored periodically through studies such as these, particularly if the Plan encounters a sustained period of lower returns in the capital markets (and thus for the Plan's assets) as well as material changes in contribution policy or benefit levels.

Additionally, this study assumes no further changes are made to the benefit policy at any point during the 20 year projection period. Such changes would fall outside the reach of an Asset/Liability study. However, we do note that even small changes to the benefit policy can have a meaningful long-term impact on the likely future outcomes of the Plan.

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RVK

## Acknowledgements


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# Introduction

RVK, Inc. (RVK) has prepared this report for the State Police Retirement System pension plan (SPRS) to:

- Present projected valuation results with respect to the funded status of the Plan.
- Present projected benefit payments of the Plan.
- Investigate asset mixes to determine those which best serve to protect and increase funding levels, while providing adequate liquidity for benefit payments.

The valuation projections are shown using both a deterministic and stochastic process.

The deterministic process provides an open group analysis of projected valuation results based on a fixed set of future assumptions (see summary in the Assumptions and Methods section of this report).

The stochastic process provides an open group analysis of projected valuation results under many capital market environments based on expected asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation. Expected values, variances of the returns and inflation, and correlations are used to generate 2,000 trials to produce a distribution of potential outcomes. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes.

# Introduction (continued)

## What is an Asset/Liability Study?

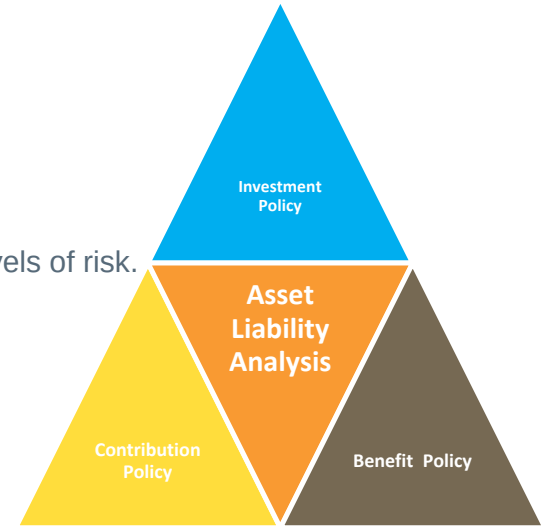
- Investment programs and the strategy they seek to implement (Investment Policy) do not exist in a vacuum. They seek to satisfy one or more investment objectives and operate within a plan framework that includes the investment objectives (Benefit Policy) and plan funding (Contribution Policy).

- The purpose of an Asset/Liability Study is to examine how well alternative investment strategies (i.e., differing asset allocations) address the objectives served by the Plan—the Plan's "liabilities" in the context of the Plan's funding streams—the Plan's Contribution Policy. It is the only standard analysis that fully links all three aspects of the Plan's key financial drivers.

- In doing so, it creates an important "guidepost" for the actual asset allocation for the Plan; the asset allocation chosen by the Plan's fiduciaries will likely reflect the nature of the liabilities but also numerous other factors including risk preferences, liquidity, implementation constraints, etc.

- For the SPRS Asset/Liability Study, we assume the objectives are:

    1. Fund all participants' benefits over time.
    2. Assure sufficient liquidity to pay benefits at all times.
    3. Foster a stable contribution stream consistent with objectives 1 and 2.
    4. Achieve adequate returns without accepting unnecessary or imprudent levels of risk.




## An Asset/Liability Study is NOT . . .

- An actuarial study of the SPRS liabilities—that is the purview of the Plan's actuary.

- A prescription for Plan benefits—that is the purview of the elected representatives.

- An assessment of the affordability of contribution levels—that is the purview of the elected officials and their constituents.

- The sole determinant of the final asset allocation adopted for the Plan—there are a number of factors, including insights from an Asset/Liability Study, which will bear on the optimal asset allocation.



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# Introduction (continued)

## 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 Plan's financial needs.

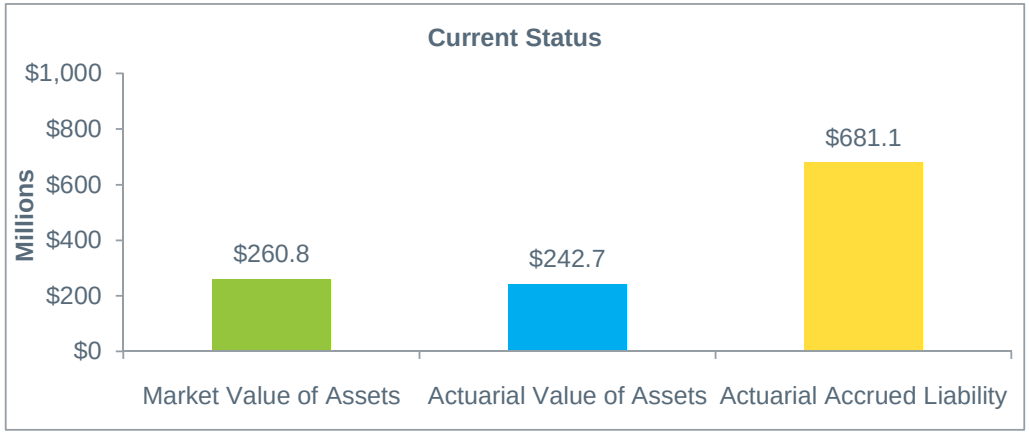
## This Asset/Liability Study . . .

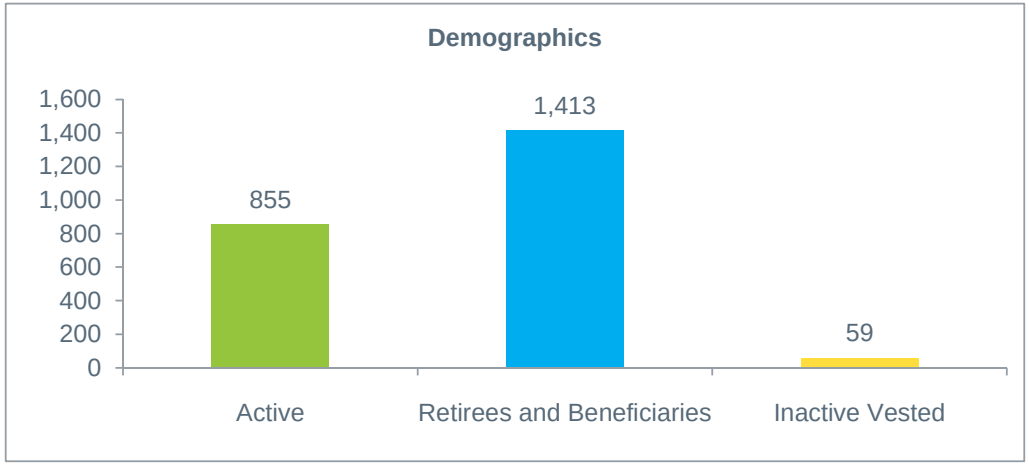
- Uses data from the June 30, 2014 SPRS Actuarial Valuation to project pension liabilities.
- Uses the Actuarial Cost Method described in the June 30, 2014 SPRS Actuarial Valuation, and the actuarial assumptions from the KRS Experience Study July 1, 2008 to June 30, 2013 ("the 2013 Experience Study") performed by Cavanaugh Macdonald Consulting, LLC (Cavanaugh).
- Compares these specific investment strategies—(A) the Current Target, (B) a conservative illustrative portfolio (Conservative Portfolio), (C) a diversified lower risk portfolio (Potential Portfolio 1), (D) a diversified moderate risk portfolio (Potential Portfolio 2), (E) a diversified higher risk portfolio (Potential Portfolio 3), and (F) an aggressive illustrative portfolio (Aggressive Portfolio).
- Assumes the Plan's current benefit policy throughout the entire projection period—changes to the benefit policy are the purview of the elected representatives.
- Note: Does not assume any actuarial adjustments that may take place in future years.

# Current Status

A summary of the Plan follows:

| | |
|---|---|
| **Valuation Date** | June 30, 2014 |
| **Market Value of Assets (MVA)** | $261 million |
| **Actuarial Value of Assets (AVA)** | $243 million |
| **Actuarial Accrued Liability (AAL)** | $681 million |
| **Market Value Funded Ratio (MVA/AAL)** | 38% |
| **Actuarial Value Funded Ratio (AVA/AAL)** | 36% |
| **Active** | 855 |
| **Retirees and Beneficiaries** | 1,413 |
| **Inactive Vested** | 59 |



# Deterministic Analysis

This section provides an analysis of the Plan's assets, liabilities, funded status, and benefit payments based on a fixed set of future assumptions. Each analysis that follows in this deterministic section rests on the critical assumptions below and must be read and interpreted with them in mind—particularly assumptions #2, #3 and #4.

The deterministic assumptions are as follows:

1. Current Plan provisions (see Summary of Main Benefit and Contribution Provisions beginning on page 25 of the SPRS June 30, 2014 actuarial valuation report prepared by Cavanaugh).

2. The participant data used by Cavanaugh in its June 30, 2014 actuarial valuation.

3. Actuarially assumed rate of return on Plan assets for all projection years: 7.50%.

4. For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013 (53.90% of payroll). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study.

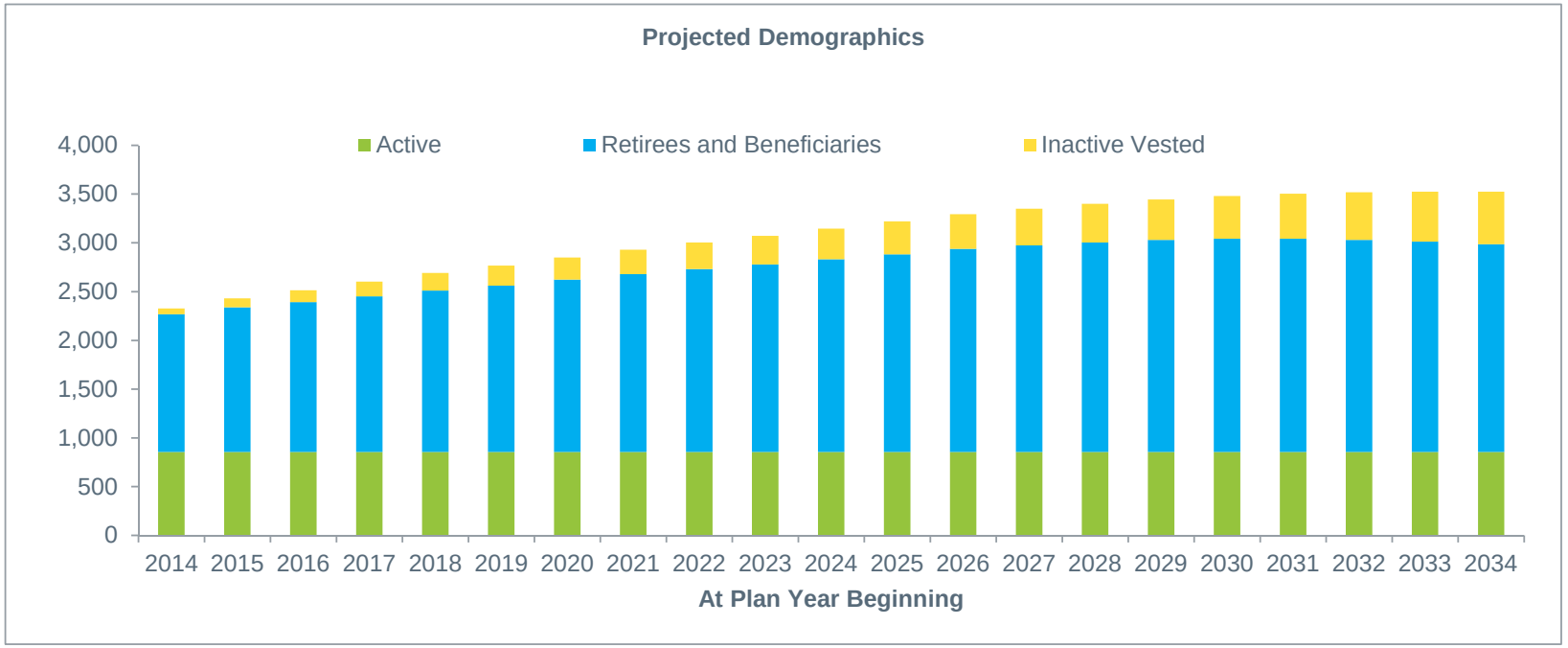
5. Assumes demographic experience projected in accordance with the actuarial assumptions proposed in the 2013 Experience Study.

6. Open group analysis: level active population. New active participants entering the Plan are assumed to have similar characteristics to recently hired participants.

# Deterministic Analysis (continued)

## Demographics

Following are the projected number of active and inactive participants at the beginning of each Plan year from 2014 through 2034 (2014 is actual). These projections are based on an open group analysis. Using the actuary's assumptions for death, termination, retirement, and disability, current participants are assumed to leave the Plan in the future. The number of total inactive participants (Retirees and Beneficiaries and Vested Inactive) increases by approximately 81% during the 20-year projection period shown.

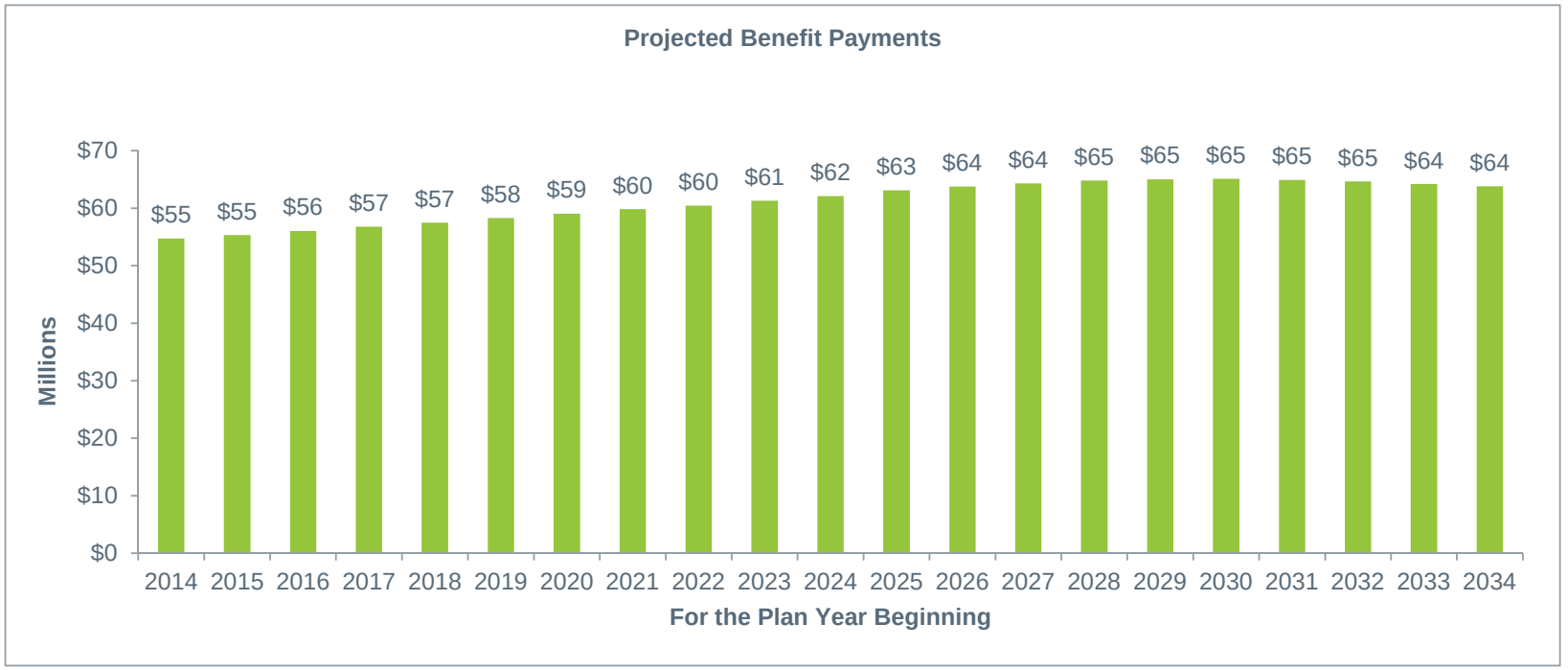



| Total Population | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 4.4% | 3.4% | 3.5% | 3.4% | 2.9% | 3.0% | 2.8% | 2.6% | 2.2% | 2.5% | 2.3% | 2.3% | 1.7% | 1.5% | 1.4% | 1.0% | 0.6% | 0.4% | 0.2% | 0.0% |

# Deterministic Analysis (continued)

## Benefit Payments

The Plan's projected annual benefit payments are shown in the chart below. The projected benefit payments are expected to increase by about 17% over the next 20 years. As a percentage of the market value of Plan assets, benefit payments are expected to increase through approximately 2026 before beginning to decline through the end of the projection period (see page 12).




| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 1.2% | 1.2% | 1.3% | 1.2% | 1.4% | 1.3% | 1.3% | 1.0% | 1.4% | 1.3% | 1.6% | 1.0% | 0.9% | 0.8% | 0.4% | 0.1% | -0.3% | -0.3% | -0.8% | -0.6% |

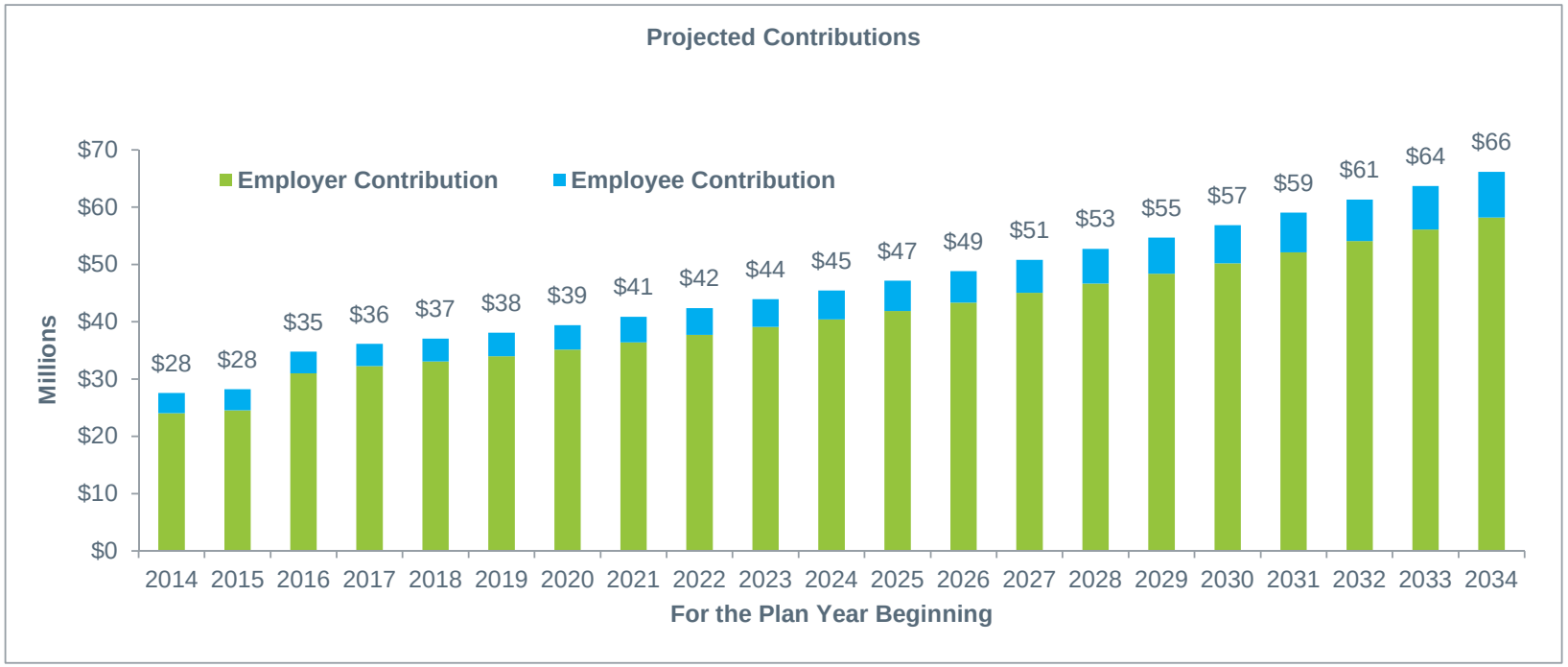


RVK

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as total dollar contributions, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.

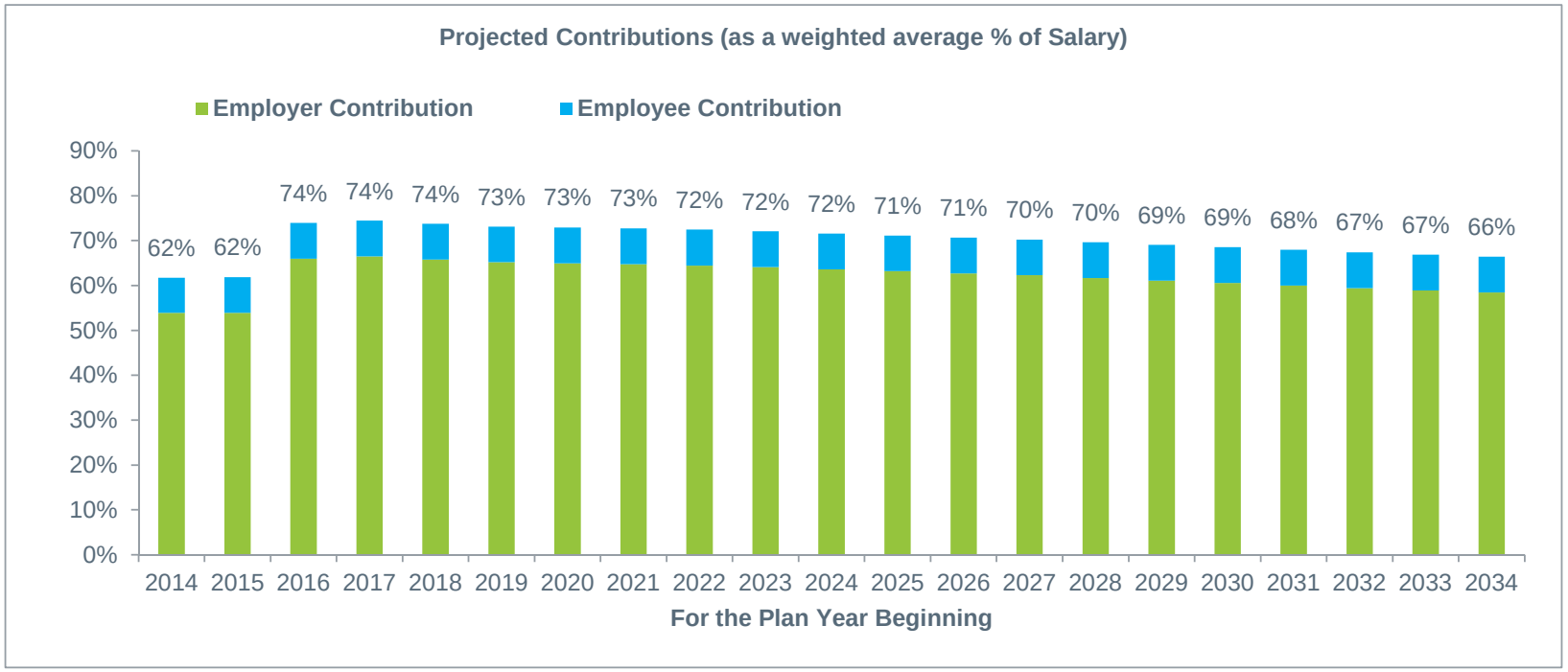



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Percent Change | N/A | 2.3% | 23.2% | 4.0% | 2.6% | 2.8% | 3.5% | 3.7% | 3.7% | 3.7% | 3.5% | 3.7% | 3.6% | 4.0% | 3.7% | 3.7% | 3.9% | 3.9% | 3.9% | 3.8% | 3.9% |

# Deterministic Analysis (continued)

## Contributions

The Plan's projected contributions, expressed as a weighted average percentage of salary, are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



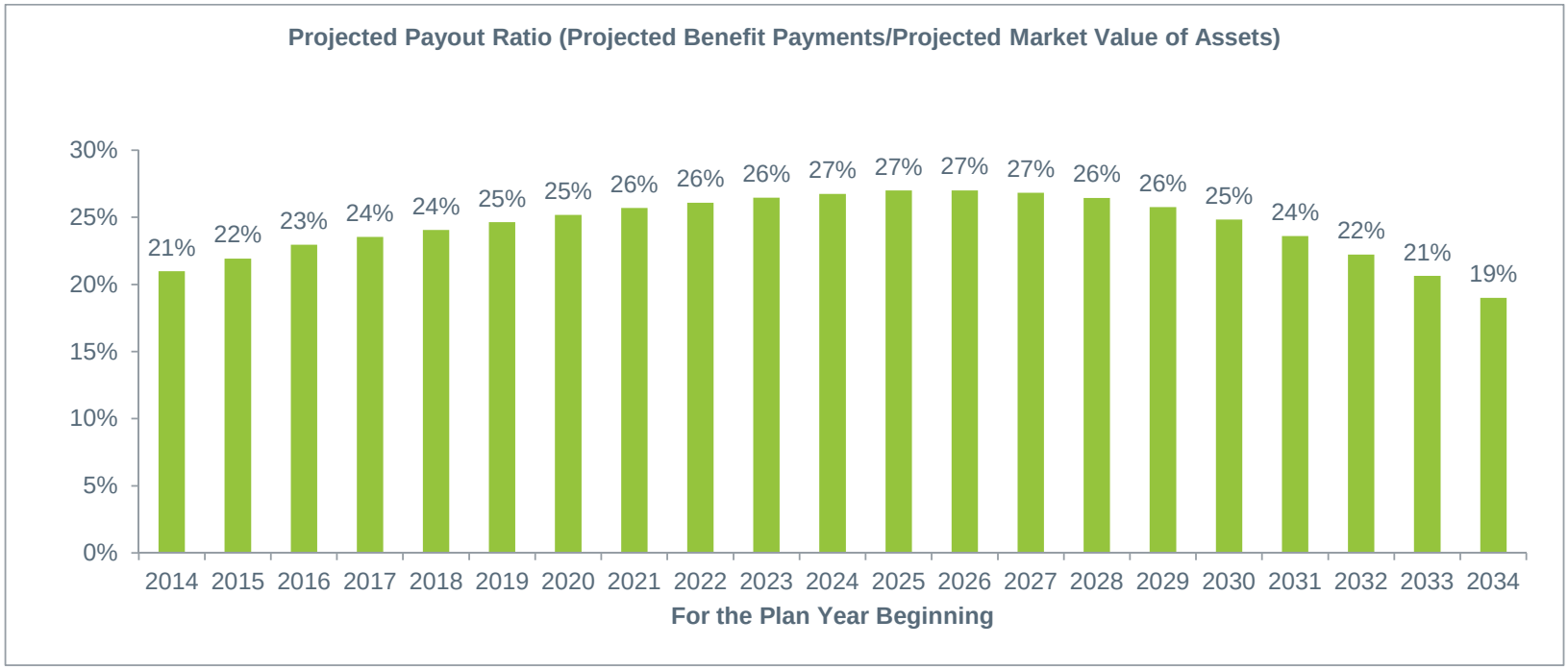



RVK

# Deterministic Analysis (continued)

## Payout Ratio (benefit payments/market value of assets)

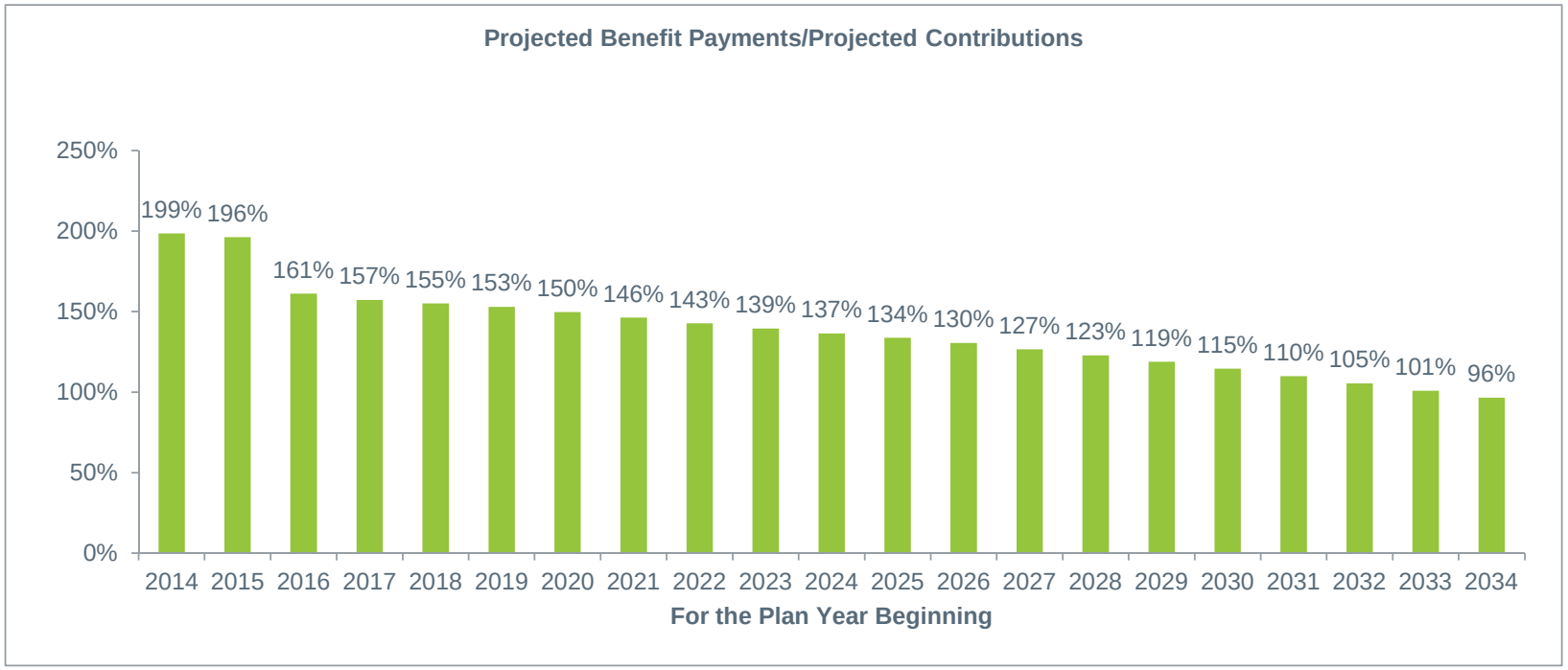
The Plan's projected payout ratios are shown in the chart below. The payout ratios are expected to increase through 2026 before beginning to decline through the end of the projection period. The results assume the current contribution policy remains unchanged and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



# Deterministic Analysis (continued)

## Benefit Payments/Contributions

The Plan's projected benefit payments divided by projected contributions are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



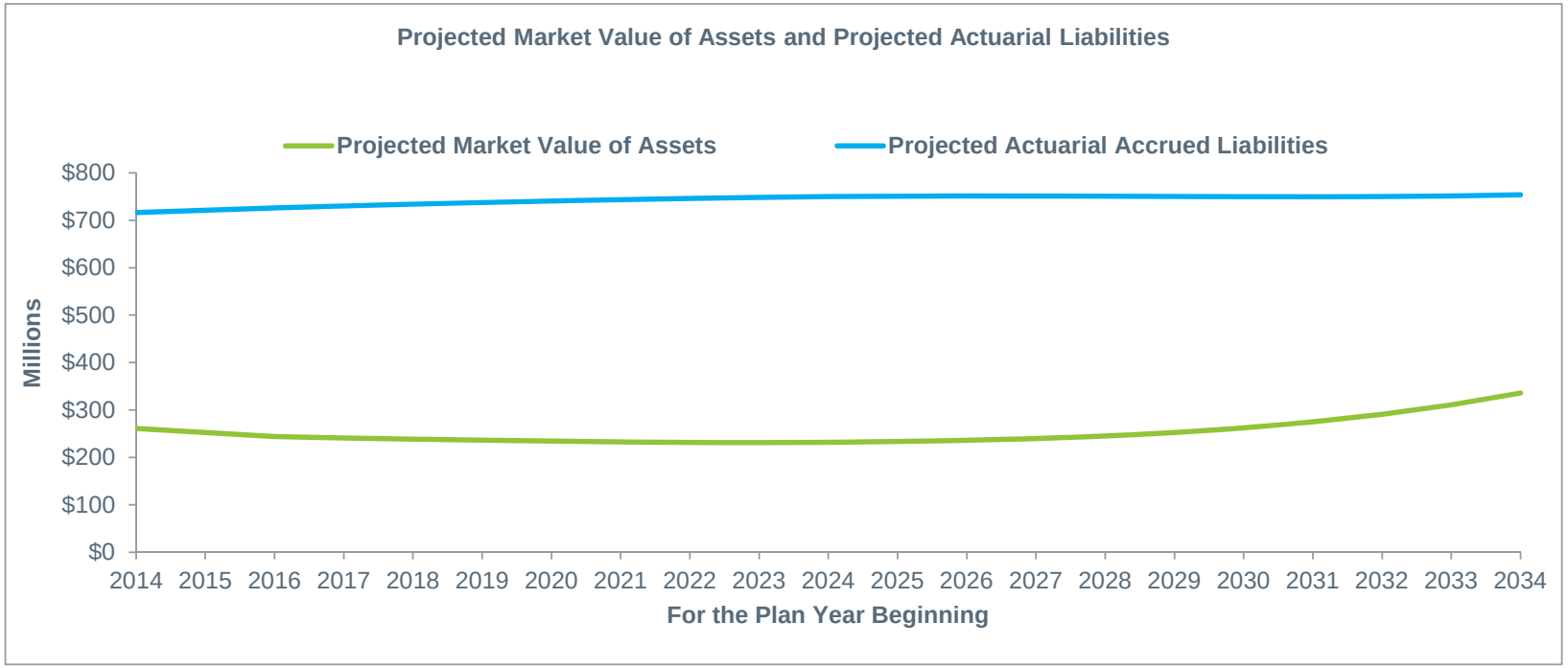



RVK

# Deterministic Analysis (continued)

## Actuarial Accrued Liabilities and Market Value of Assets

The Plan's projected actuarial accrued liabilities and market value of assets are shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The relative disparity between the market value of assets and Plan liabilities is expected to decrease by 8% through the end of the projection period. The funded ratio (based on market value of assets) is expected to increase to approximately 45% by the end of the projection period. This is shown more clearly on the following pages.



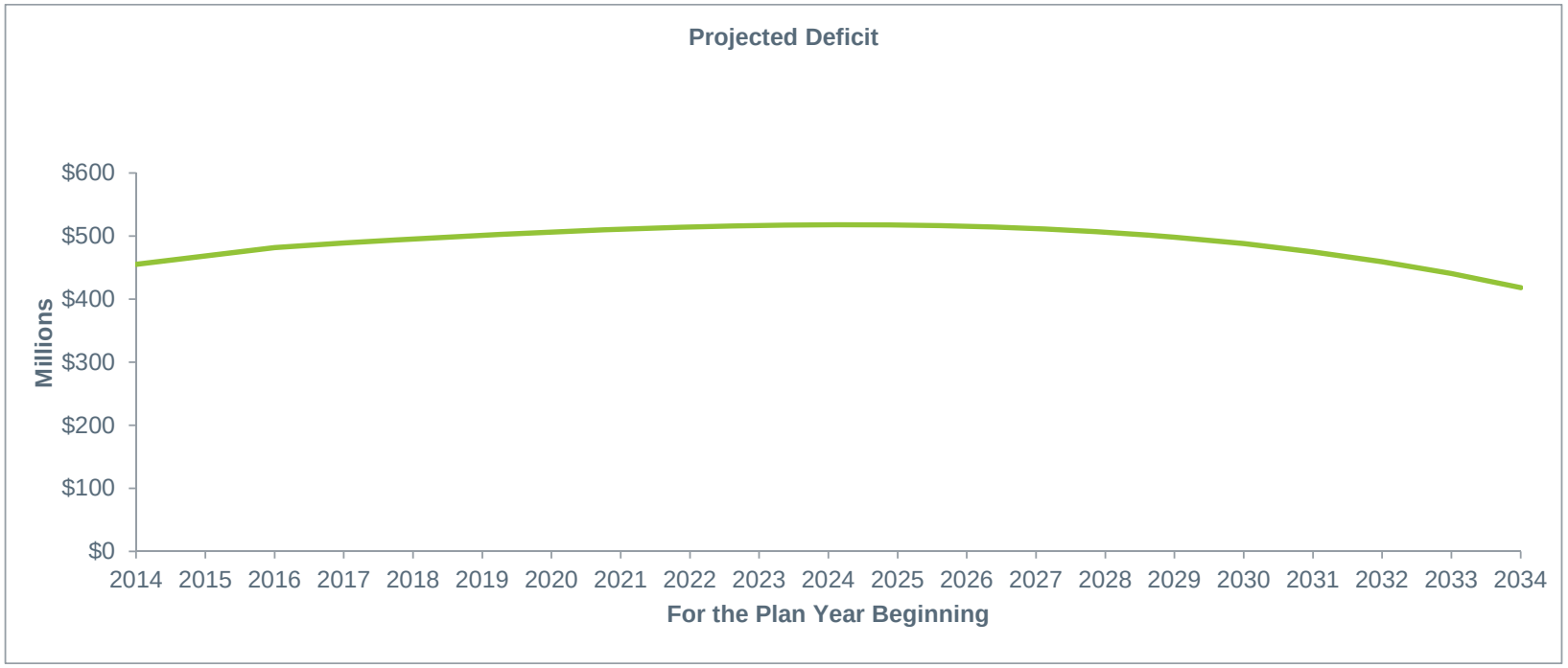



RVK

# Deterministic Analysis (continued)

### Deficit (market value of assets – actuarial accrued liabilities)

The Plan's projected deficit of assets is shown in the chart below. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years. The disparity between the market value of assets and Plan liabilities is expected to decrease by the end of the projection period by 8%.



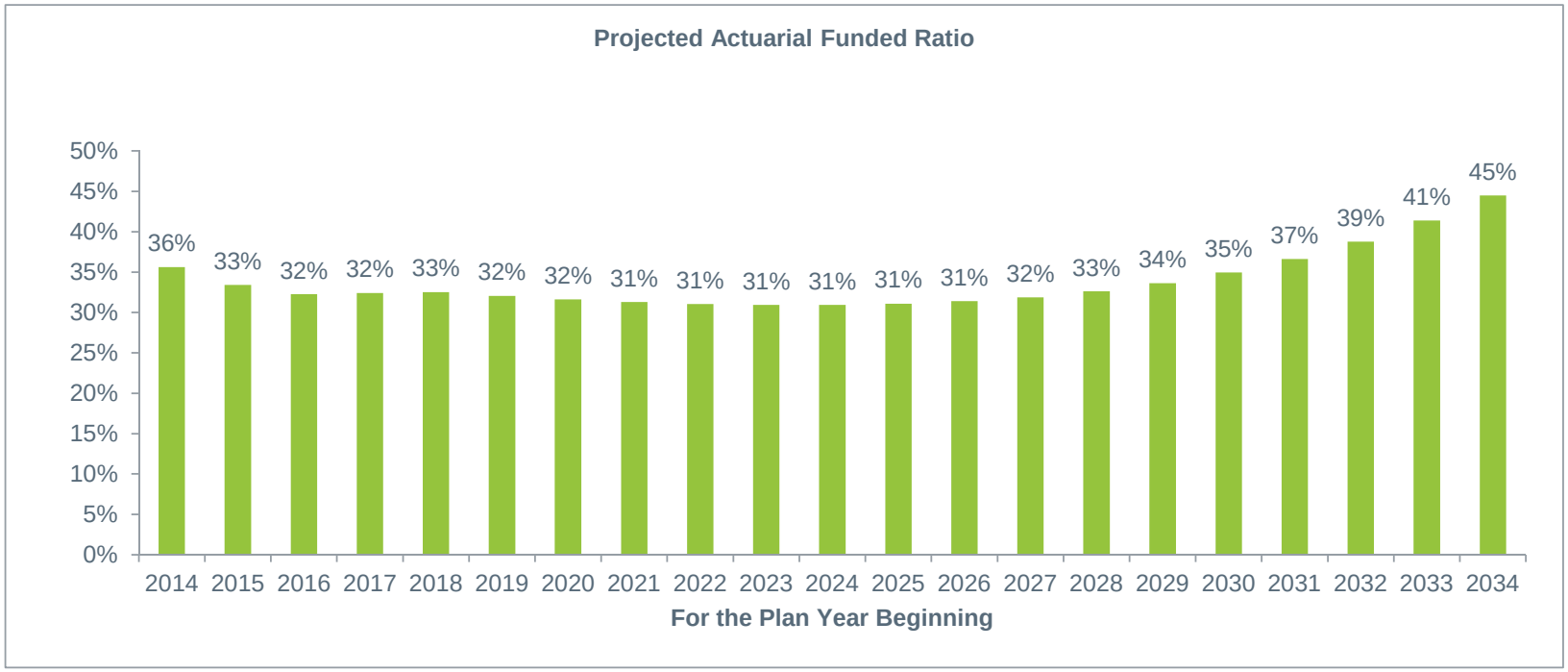



RVK

# Deterministic Analysis (continued)

## Actuarial Funded Ratio (actuarial value of assets/actuarial accrued liability)

The Plan's projected actuarial funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 45% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.



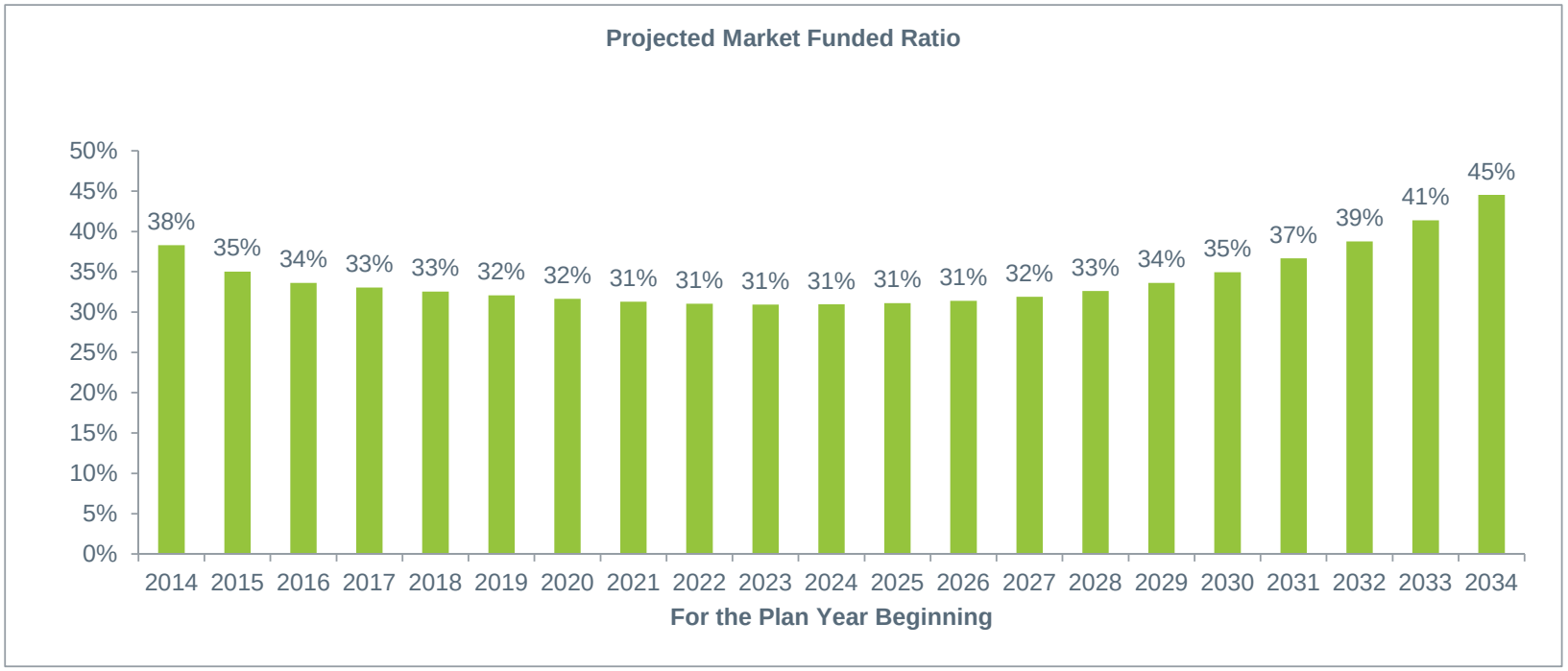



RVK

# Deterministic Analysis (continued)

### Market Funded Ratio (market value of assets/actuarial accrued liability)

The Plan's projected market funded ratio is shown in the chart below. The Plan is expected to end the projection period at approximately 45% funded. The results assume the contribution policy remains unchanged, and that the Plan's assets return precisely the actuarially assumed rate each year without exception for all projection years.





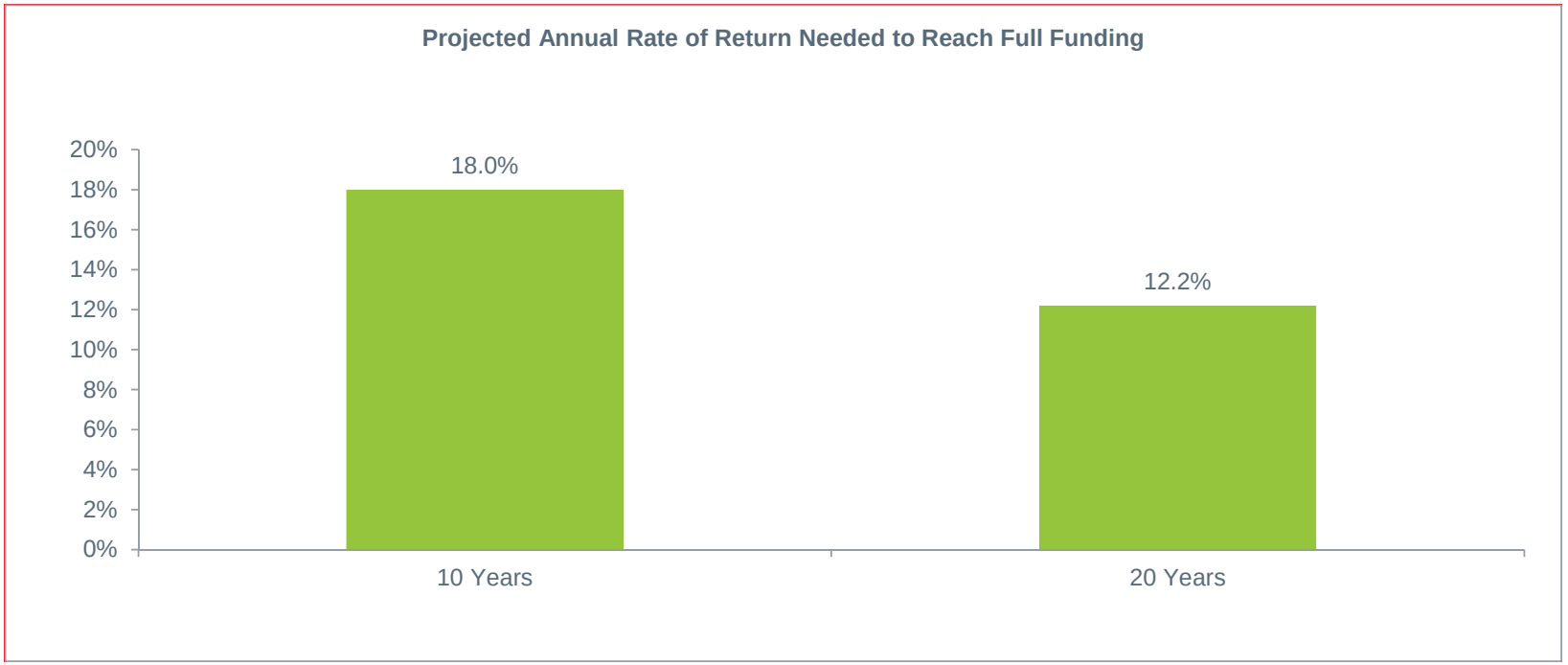

RVK

# Deterministic Scenario Analysis

## Full Funding Implied Returns

The figure below shows the projected investment return for the total fund needed to bring the Plan to 100% funding (on a market value basis) in 10 and 20 years, respectively. The results assume all other actuarial assumptions are precisely met over the time periods shown and that these returns are earned for every year, without variance.

Actuarially assumed rate of return – **7.50%**



# Deterministic Scenario Analysis (continued)

## Sensitivity Analysis – Decreased Return

Under the deterministic analysis presented in the preceding pages, the Plan is projected to have a market funded ratio of 45% in 20 years. The table below summarizes the projected funded ratio and other key statistics in 2034 assuming the Plan experiences an annualized investment return of 100 basis points lower (6.50%) than the current actuarially assumed rate of return (7.50%). The values assume all other actuarial assumptions are exactly met. The original values are also presented in the table for comparison.

| | 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 | ▲ |

Values in impact column may not be additive to due rounding.



RVK

# Stochastic Analysis

In the previous section of this report, we assumed the Plan operated going forward with certain knowledge of the future investment returns earned by the Plan's assets. This section introduces the element of uncertainty in those future investment returns. This part of the analysis examines Plan assets and liabilities under many capital market environments based on expected future asset returns and inflation, and their expected volatility. Using a Monte Carlo simulation technique, both assets and liabilities are assumed to vary stochastically, linked together by changes in inflation.

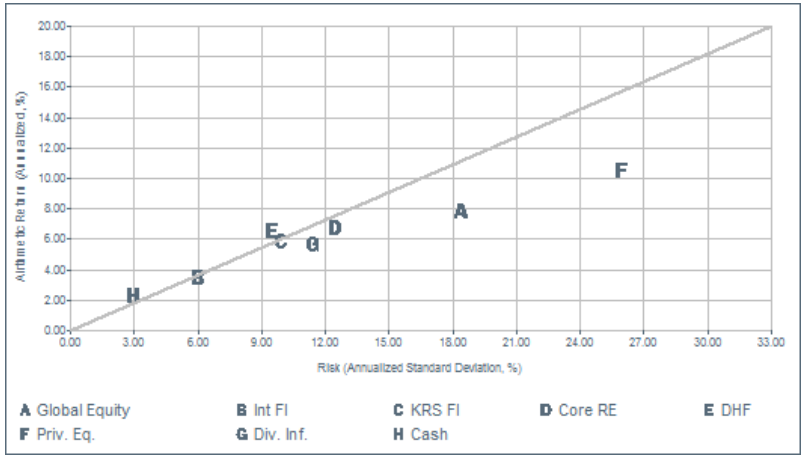
Using the current expected values and variances of the returns and inflation, along with their correlations, 2,000 trials are generated to produce a distribution of results. A stochastic analysis can answer questions about the best/worst case outcomes along with the probability of such outcomes. This is contrasted with the deterministic analysis that provides an expected value if all current Plan assumptions are exactly met.

# Stochastic Analysis (continued)

## Long-Term Return and Risk Assumptions

In order to perform a stochastic analysis and create asset allocation alternatives, it is necessary to estimate, for each asset class, its probable return and risk. The expected returns are our best estimates of the average annual percentage increases in values of each asset class over a prospective long period of time, and assumed to be normally distributed. The risk of an asset class is measured by its standard deviation, or volatility. If asset returns are normally distributed, two-thirds (67%) of all returns are expected to lie within one standard deviation on either side of the mean. For example, we expect Global Equity to return, annually on average, 7.80% with a standard deviation of 18.35%, meaning that two-thirds of the time we expect its return to lie between -10.55% (= 7.80 – 18.35) and 26.15% (= 7.80 + 18.35). Moreover, we expect 95% of all return outcomes to lie within two standard deviations of the mean return, implying only a one-in-twenty chance that the return on Global Equity will either fall below -28.90% or rise above 44.50%. The risk and return assumptions used in this study are outlined in the below table and chart:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption |
|---|---|---|
| Global Equity | 7.80 | 18.35 |
| Int. Duration Fixed Income | 3.50 | 6.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 |
| Core Real Estate | 6.75 | 12.50 |
| Diversified Hedge Funds | 6.50 | 9.50 |
| Private Equity | 10.50 | 26.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 |
| Cash Equivalents | 2.25 | 3.00 |






RVK

# Stochastic Analysis (continued)

## Correlation Between Asset Classes

Creating a diversified portfolio of asset classes enables the investor to achieve a high rate of return while minimizing volatility of the portfolio. As defined on the previous page, volatility is "risk" or standard deviation. By minimizing the volatility of a portfolio, we produce asset returns that vary less from year to year. Diversification exists because the returns of different asset classes do not always move in the same direction, at the same time, or with the same magnitude. Correlation values are between 1.00 and –1.00. If returns of two asset classes rise or fall at the same time and in the same magnitude, they have a correlation value of 1.00. Conversely, two asset classes that simultaneously move in opposite directions, and in the same magnitude, have a correlation value of –1.00. A correlation of zero indicates no relationship between returns. The assumed correlations are largely based on historical index data, with some qualitative analysis applied. For instance, where appropriate, we have weighted current history more heavily. The correlation matrix used in this study is shown below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | -0.02 | 0.84 | 0.32 | 0.70 | 0.78 | 0.72 | -0.05 |
| Int. Duration Fixed Income | -0.02 | 1.00 | 0.28 | -0.06 | 0.12 | -0.26 | 0.22 | 0.24 |
| Custom KRS Fixed Income | 0.84 | 0.28 | 1.00 | 0.27 | 0.69 | 0.66 | 0.82 | -0.07 |
| Core Real Estate | 0.32 | -0.06 | 0.27 | 1.00 | 0.24 | 0.60 | 0.37 | 0.14 |
| Diversified Hedge Funds | 0.70 | 0.12 | 0.69 | 0.24 | 1.00 | 0.69 | 0.59 | 0.22 |
| Private Equity | 0.78 | -0.26 | 0.66 | 0.60 | 0.69 | 1.00 | 0.62 | 0.07 |
| Diversified Inflation Strategies | 0.72 | 0.22 | 0.82 | 0.37 | 0.59 | 0.62 | 1.00 | -0.03 |
| Cash Equivalents | -0.05 | 0.24 | -0.07 | 0.14 | 0.22 | 0.07 | -0.03 | 1.00 |

The fact that the correlations shown in the table are nearly all positive does not imply that these asset classes do not diversify one another. Their correlations are significantly less than 1.00, meaning we expect a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others. This point is demonstrated on the following pages, which illustrate that diversification into less correlated asset classes can decrease the expected overall volatility of a portfolio.

# Stochastic Analysis (continued)

## Efficient Portfolios

Each frontier portfolio (optimal allocation) is created using target rates of return both above and below the projected rate of return for the current allocation. This range illustrates the trade-off between return and risk; additional return can only be achieved by undertaking additional risk. The table below shows the possible optimal allocations given the selected asset classes and their constraints listed under "Min" and "Max." The table shows the Current Target allocation and highlights three potential targets (Potential Portfolios 1, 2, and 3) for consideration throughout this study. Two illustrative portfolios (Conservative and Aggressive Portfolios) are also shown for demonstrative purposes.

| | Min | Max | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Current Target | Conservative Portfolio | Potential Portfolio 1 | Potential Portfolio 2 | Potential Portfolio 3 | Aggressive Portfolio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Equity | 30 | 70 | 30 | 30 | 30 | 30 | 30 | 30 | 32 | 40 | 51 | 66 | 43 | 0 | 30 | 53 | 67 | 75 |
| Int. Duration Fixed Income | 0 | 30 | 30 | 30 | 30 | 27 | 18 | 9 | 2 | 0 | 0 | 0 | 10 | 100 | 20 | 6 | 2 | 0 |
| Custom KRS Fixed Income | 0 | 30 | 0 | 3 | 0 | 0 | 8 | 17 | 23 | 16 | 5 | 0 | 10 | 0 | 8 | 6 | 2 | 0 |
| Core Real Estate | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 0 | 10 | 5 | 5 | 0 |
| Diversified Hedge Funds | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Private Equity | 5 | 15 | 5 | 7 | 11 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 0 | 10 | 10 | 15 | 25 |
| Diversified Inf. Strategies | 2 | 15 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 0 | 10 | 8 | 2 | 0 |
| Cash Equivalents | 2 | 5 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 0 |
| Total | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | | | | | | | | | | | | | | | | | | |
| Capital Appreciation | | | 35 | 37 | 41 | 44 | 45 | 45 | 47 | 55 | 66 | 81 | 53 | 0 | 40 | 63 | 82 | 100 |
| Capital Preservation | | | 35 | 35 | 32 | 29 | 28 | 28 | 26 | 18 | 7 | 2 | 22 | 100 | 30 | 14 | 6 | 0 |
| Alpha | | | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 10 | 0 | 10 | 10 | 5 | 0 |
| Inflation | | | 15 | 13 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 7 | 15 | 0 | 20 | 13 | 7 | 0 |
| | | | | | | | | | | | | | | | | | | |
| **Expected Return** | | | **5.96** | **6.17** | **6.38** | **6.60** | **6.81** | **7.02** | **7.23** | **7.44** | **7.66** | **7.87** | **6.93** | **3.50** | **6.49** | **7.23** | **7.81** | **8.47** |
| **Risk (Standard Deviation)** | | | **8.80** | **9.35** | **9.94** | **10.62** | **11.42** | **12.26** | **13.11** | **13.99** | **14.91** | **16.48** | **12.83** | **6.00** | **10.67** | **14.06** | **16.48** | **19.27** |
| | | | | | | | | | | | | | | | | | | |
| Return (Compound) | | | 5.60 | 5.76 | 5.92 | 6.07 | 6.20 | 6.32 | 6.44 | 6.54 | 6.64 | 6.63 | 6.17 | 3.33 | 5.96 | 6.32 | 6.57 | 6.80 |
| Return/Risk Ratio | | | 0.68 | 0.66 | 0.64 | 0.62 | 0.60 | 0.57 | 0.55 | 0.53 | 0.51 | 0.48 | 0.54 | 0.58 | 0.61 | 0.51 | 0.47 | 0.44 |
| RVK Expected Equity Beta | | | 0.43 | 0.46 | 0.49 | 0.52 | 0.56 | 0.59 | 0.63 | 0.68 | 0.74 | 0.84 | 0.65 | 0.06 | 0.52 | 0.71 | 0.84 | 0.99 |
| RVK Liquidity Metric | | | 70 | 67 | 64 | 62 | 59 | 56 | 53 | 56 | 61 | 69 | 69 | 85 | 66 | 70 | 71 | 69 |

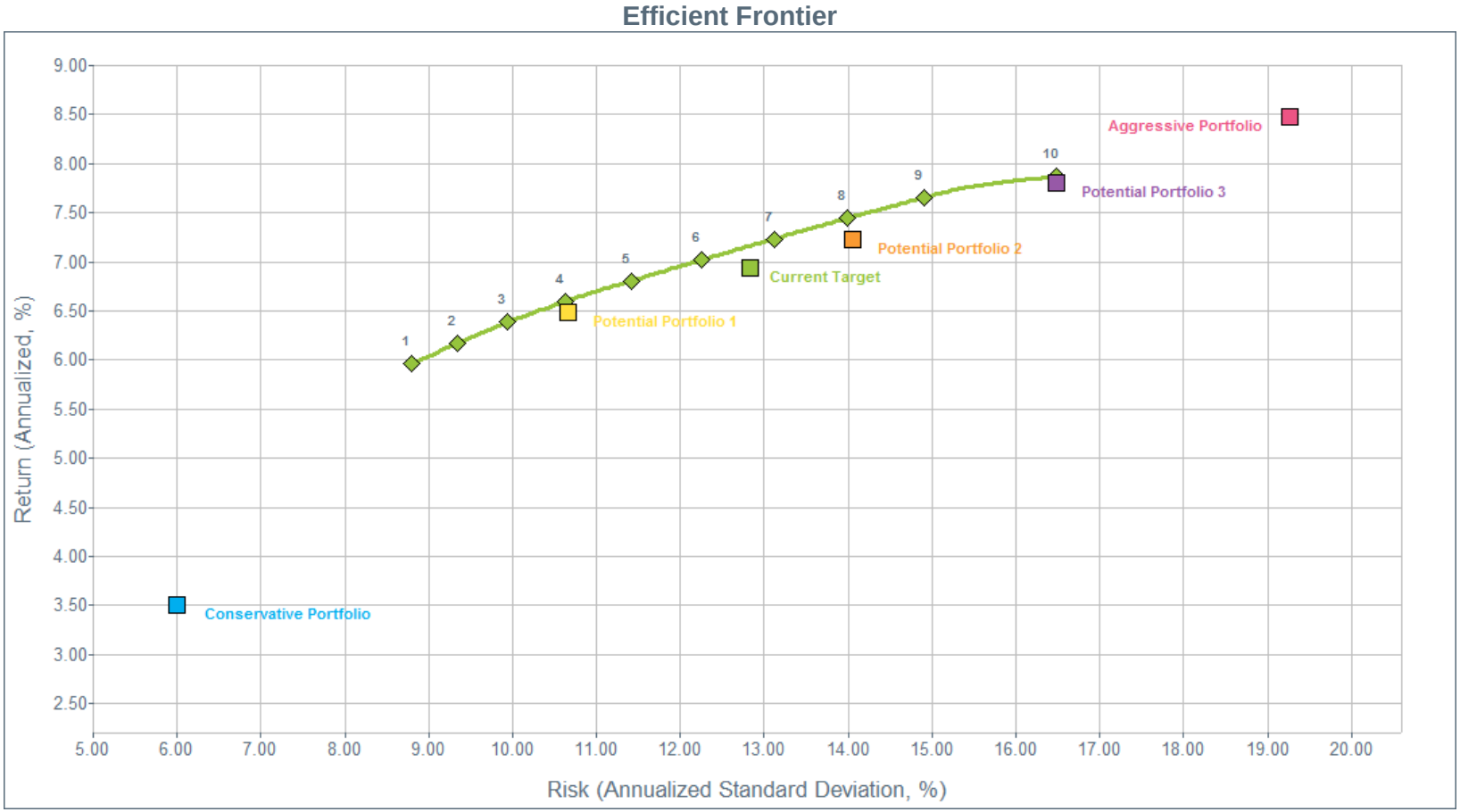


RVK

# Stochastic Analysis (continued)

## Efficient Frontier

The risk of each alternative allocation is plotted against the horizontal axis, while the return is measured on the vertical axis. The line connecting the points represents all the optimal portfolios subject to the given constraints and is known as the “efficient frontier.” The upward slope of the efficient frontier indicates the direct relationship between return and risk.






RVK

# Stochastic Analysis (continued)

## Asset Mixes

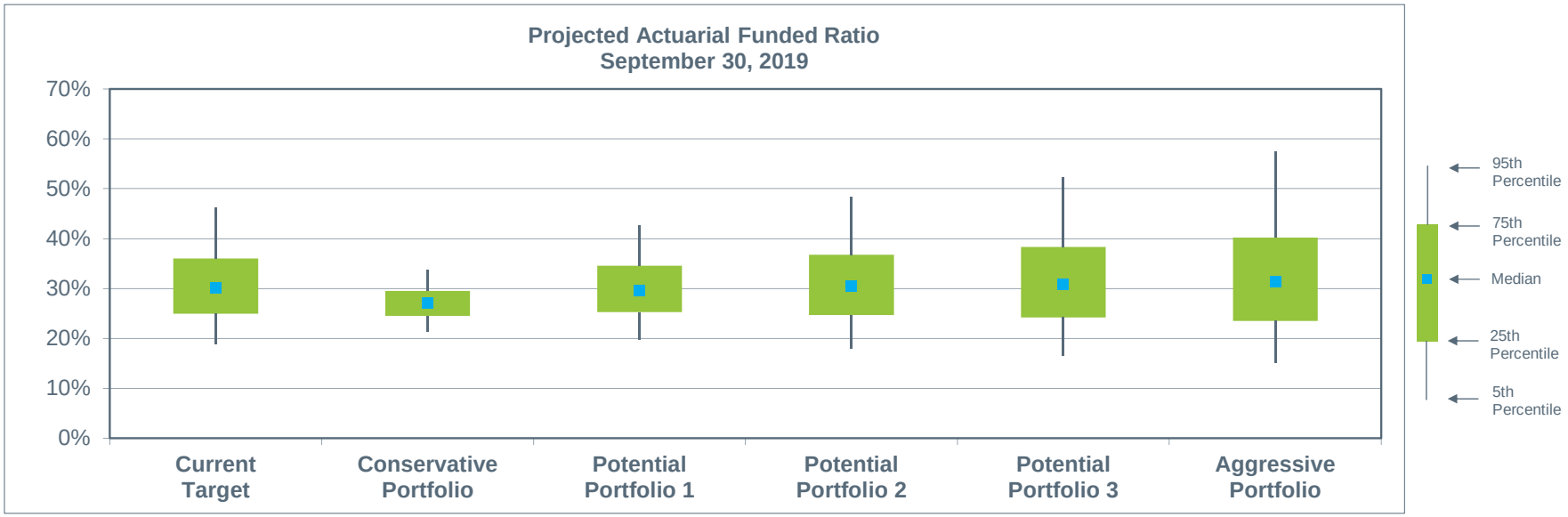
Outlined below are the Current Target allocation and five other mixes to be examined in this stochastic analysis. The expected return, expected risk (as measured by standard deviation), and RVK Liquidity Metric, for each is also shown.

| 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** |

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **5 Years**

The graph below shows the distribution of possible actuarial funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

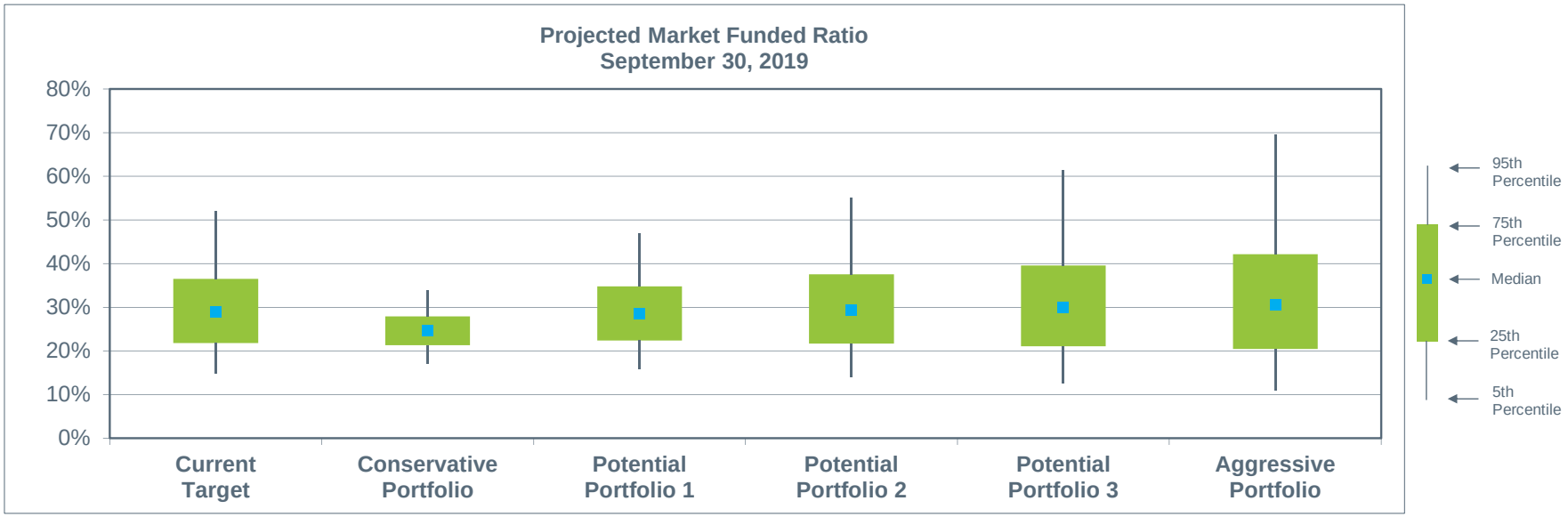



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $595 | 19% | $575 | 21% | $586 | 20% | $601 | 18% | $611 | 16% | $623 | 15% |
| 25th Percentile | $552 | 25% | $554 | 25% | $549 | 25% | $554 | 25% | $558 | 24% | $563 | 24% |
| Median | $517 | 30% | $539 | 27% | $520 | 30% | $515 | 30% | $511 | 31% | $508 | 31% |
| 75th Percentile | $475 | 36% | $522 | 30% | $485 | 35% | $468 | 37% | $456 | 38% | $443 | 40% |
| 95th Percentile | $403 | 46% | $496 | 34% | $428 | 43% | $388 | 48% | $355 | 52% | $317 | 57% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **5 Years**

The graph below shows the distribution of possible market funded ratios five years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

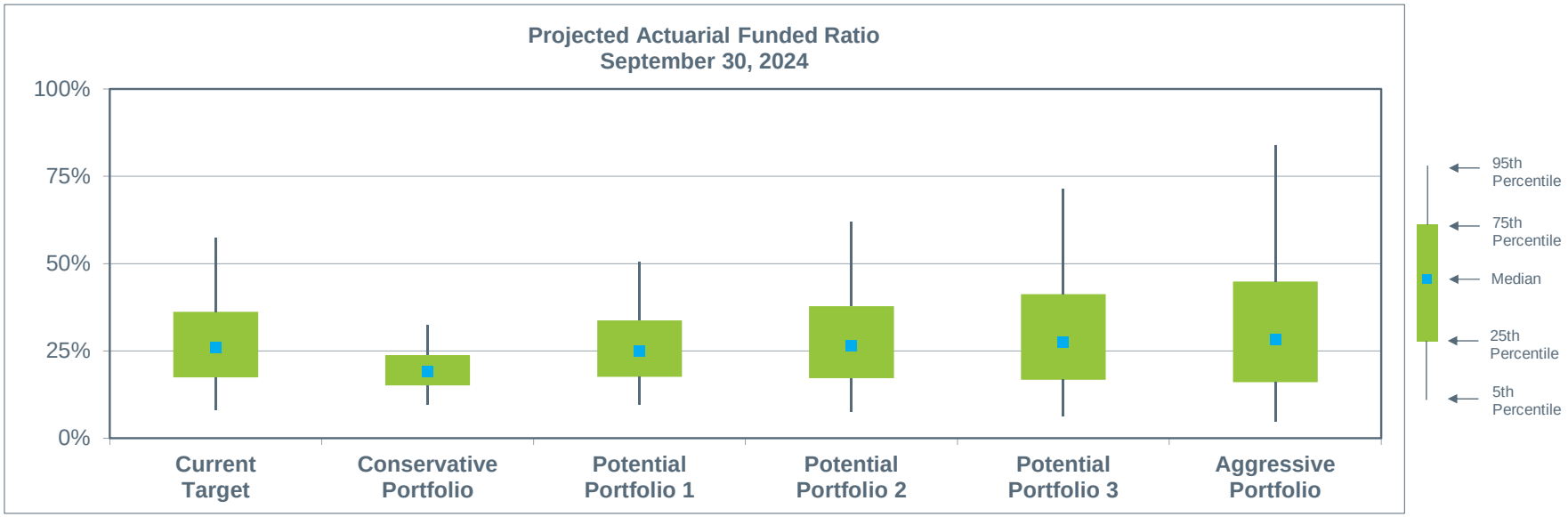



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $622 | 15% | $602 | 17% | $612 | 16% | $628 | 14% | $640 | 13% | $651 | 11% |
| 25th Percentile | $573 | 22% | $577 | 21% | $570 | 22% | $575 | 22% | $579 | 21% | $584 | 20% |
| 50th Percentile | $524 | 29% | $556 | 25% | $529 | 29% | $522 | 29% | $519 | 30% | $515 | 31% |
| 75th Percentile | $472 | 36% | $536 | 28% | $485 | 35% | $464 | 38% | $448 | 40% | $428 | 42% |
| 95th Percentile | $361 | 52% | $498 | 34% | $398 | 47% | $336 | 55% | $285 | 61% | $225 | 70% |

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **10 Years**

The graph below shows the distribution of possible actuarial funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

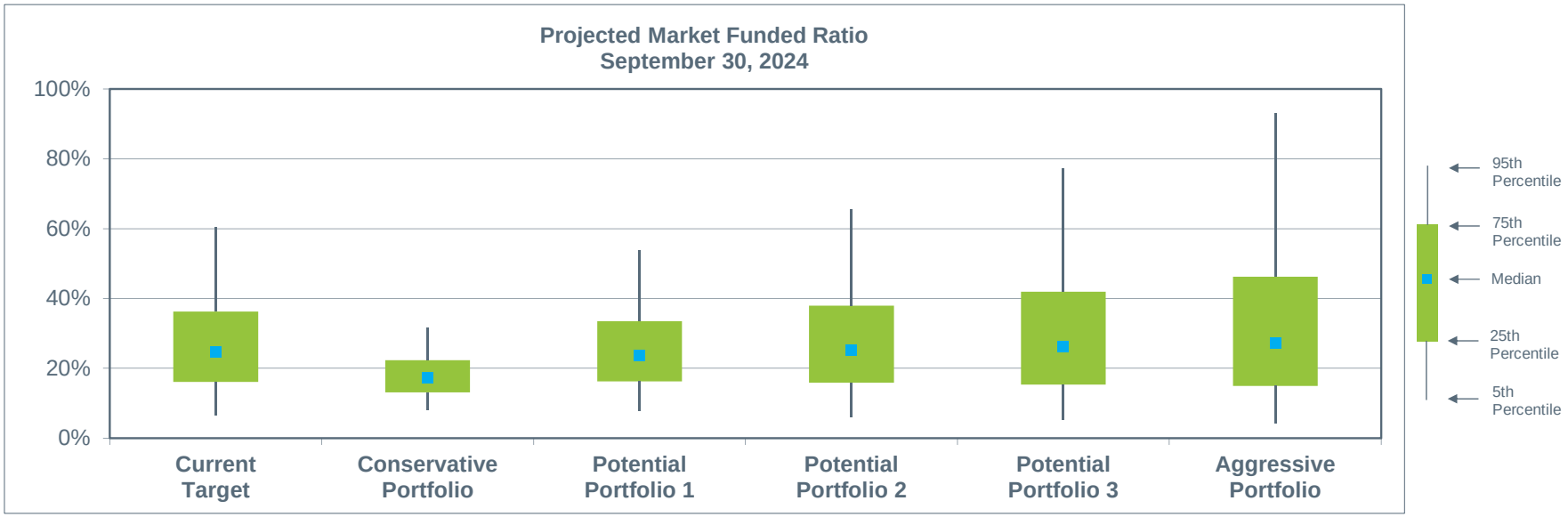



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $673 | 8% | $658 | 10% | $663 | 9% | $679 | 8% | $689 | 6% | $700 | 5% |
| 25th Percentile | $614 | 17% | $629 | 15% | $612 | 18% | $616 | 17% | $620 | 17% | $624 | 16% |
| Median | $558 | 26% | $606 | 19% | $565 | 25% | $553 | 26% | $545 | 27% | $539 | 28% |
| 75th Percentile | $483 | 36% | $581 | 24% | $502 | 34% | $469 | 38% | $445 | 41% | $416 | 45% |
| 95th Percentile | $330 | 58% | $530 | 32% | $389 | 50% | $294 | 62% | $219 | 72% | $124 | 84% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **10 Years**

The graph below shows the distribution of possible market funded ratios ten years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

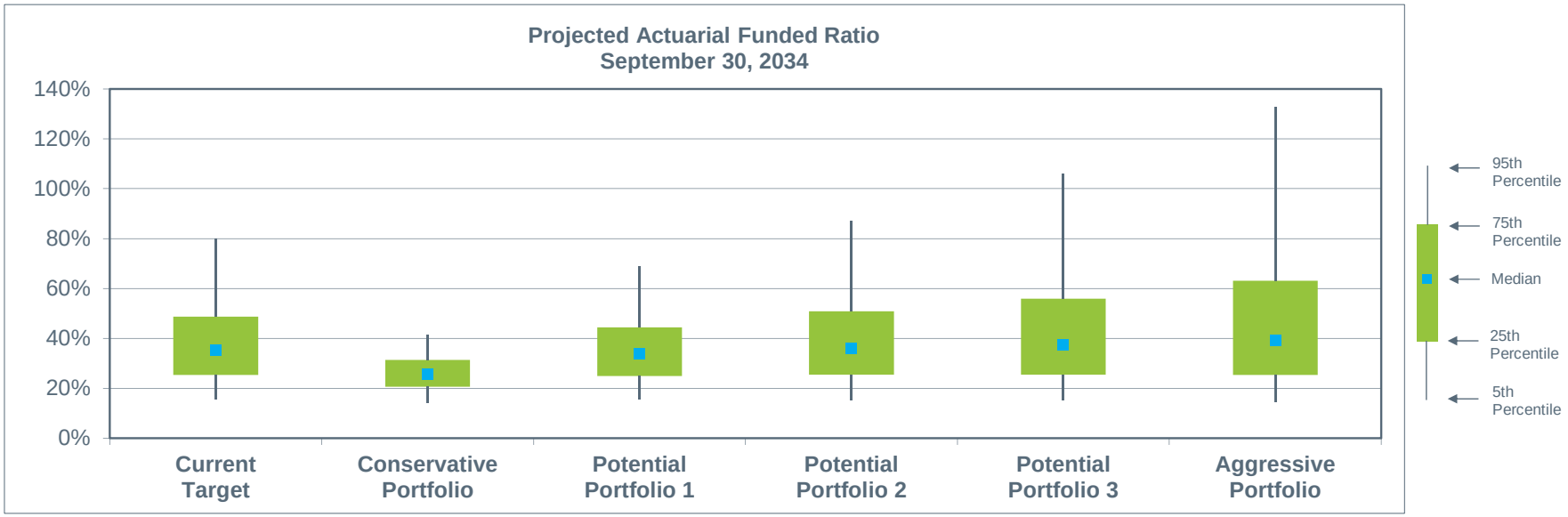



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $681 | 7% | $670 | 8% | $671 | 8% | $687 | 6% | $697 | 5% | $706 | 4% |
| 25th Percentile | $624 | 16% | $642 | 13% | $622 | 16% | $625 | 16% | $630 | 15% | $634 | 15% |
| 50th Percentile | $566 | 25% | $620 | 17% | $573 | 24% | $561 | 25% | $554 | 26% | $547 | 27% |
| 75th Percentile | $486 | 36% | $593 | 22% | $506 | 34% | $470 | 38% | $444 | 42% | $407 | 46% |
| 95th Percentile | $305 | 60% | $541 | 32% | $364 | 54% | $265 | 66% | $179 | 77% | $58 | 93% |

# Stochastic Analysis (continued)

**Projected Actuarial Funded Ratio** (actuarial value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible actuarial funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

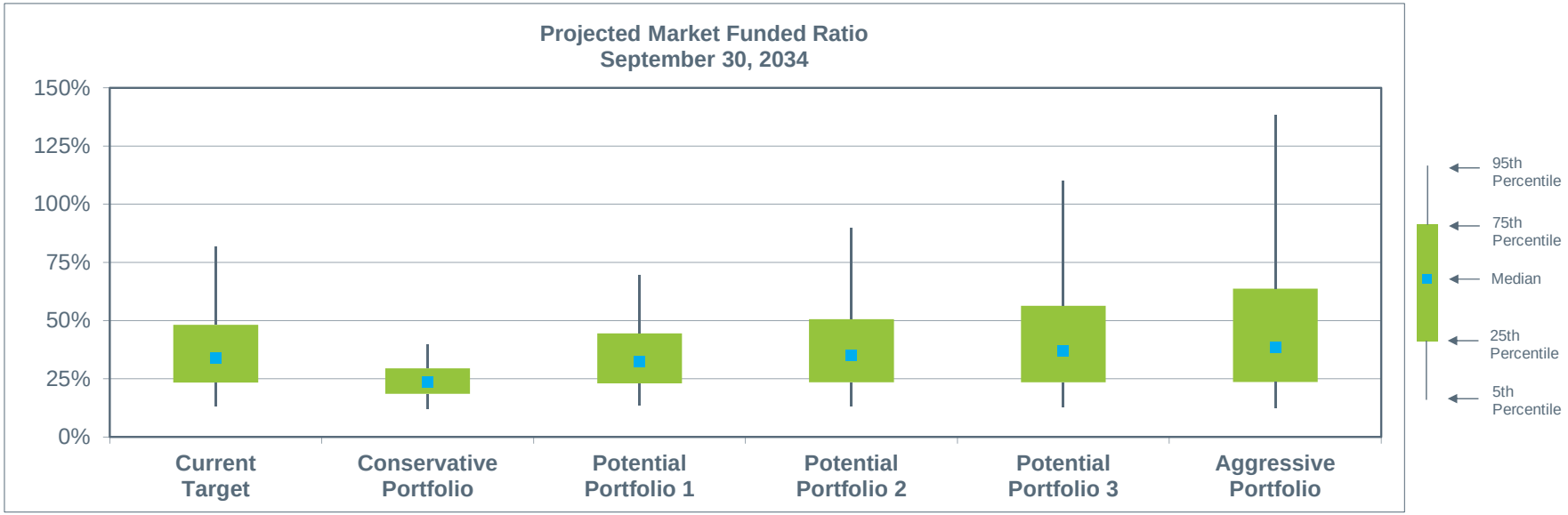



| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $585 | 15% | $592 | 14% | $580 | 15% | $588 | 15% | $594 | 15% | $599 | 14% |
| 25th Percentile | $540 | 25% | $568 | 21% | $540 | 25% | $540 | 25% | $540 | 25% | $542 | 25% |
| Median | $484 | 35% | $551 | 26% | $492 | 34% | $478 | 36% | $469 | 37% | $458 | 39% |
| 75th Percentile | $393 | 49% | $529 | 31% | $423 | 44% | $374 | 51% | $333 | 56% | $281 | 63% |
| 95th Percentile | $160 | 80% | $481 | 42% | $252 | 69% | $108 | 87% | ($47) | 106% | ($260) | 133% |

# Stochastic Analysis (continued)

**Projected Market Funded Ratio** (market value of assets/actuarial accrued liability); **20 Years**

The graph below shows the distribution of possible market funded ratios twenty years from now, assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.




| | Current Target | | Conservative Portfolio | | Potential Portfolio 1 | | Potential Portfolio 2 | | Potential Portfolio 3 | | Aggressive Portfolio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio | Unfunded Liability (Mil) | Funded Ratio |
| 5th Percentile | $601 | 13% | $606 | 12% | $594 | 13% | $605 | 13% | $613 | 13% | $620 | 12% |
| 25th Percentile | $554 | 23% | $583 | 18% | $553 | 23% | $553 | 23% | $553 | 23% | $552 | 24% |
| 50th Percentile | $491 | 34% | $565 | 24% | $502 | 32% | $483 | 35% | $472 | 37% | $458 | 39% |
| 75th Percentile | $398 | 48% | $544 | 29% | $428 | 44% | $378 | 51% | $334 | 56% | $278 | 64% |
| 95th Percentile | $148 | 82% | $498 | 40% | $249 | 69% | $87 | 90% | ($81) | 110% | ($314) | 138% |



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# Stochastic Analysis (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 38% (Current) Funding in 2019 | Probability of < 20% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 79% | 19% | -37% | 81% |
| Conservative Portfolio | 0% | 99% | 16% | -22% | 80% |
| Potential Portfolio 1 | 0% | 83% | 17% | -32% | 80% |
| Potential Portfolio 2 | 0% | 76% | 20% | -39% | 81% |
| Potential Portfolio 3 | 0% | 72% | 22% | -44% | 82% |
| Aggressive Portfolio | 1% | 67% | 24% | -48% | 83% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 38% (Current) Funding in 2024 | Probability of < 20% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 77% | 37% | -37% | 94% |
| Conservative Portfolio | 0% | 99% | 65% | -22% | 95% |
| Potential Portfolio 1 | 0% | 83% | 37% | -32% | 93% |
| Potential Portfolio 2 | 1% | 75% | 36% | -39% | 94% |
| Potential Portfolio 3 | 2% | 70% | 36% | -45% | 95% |
| Aggressive Portfolio | 4% | 66% | 35% | -50% | 96% |

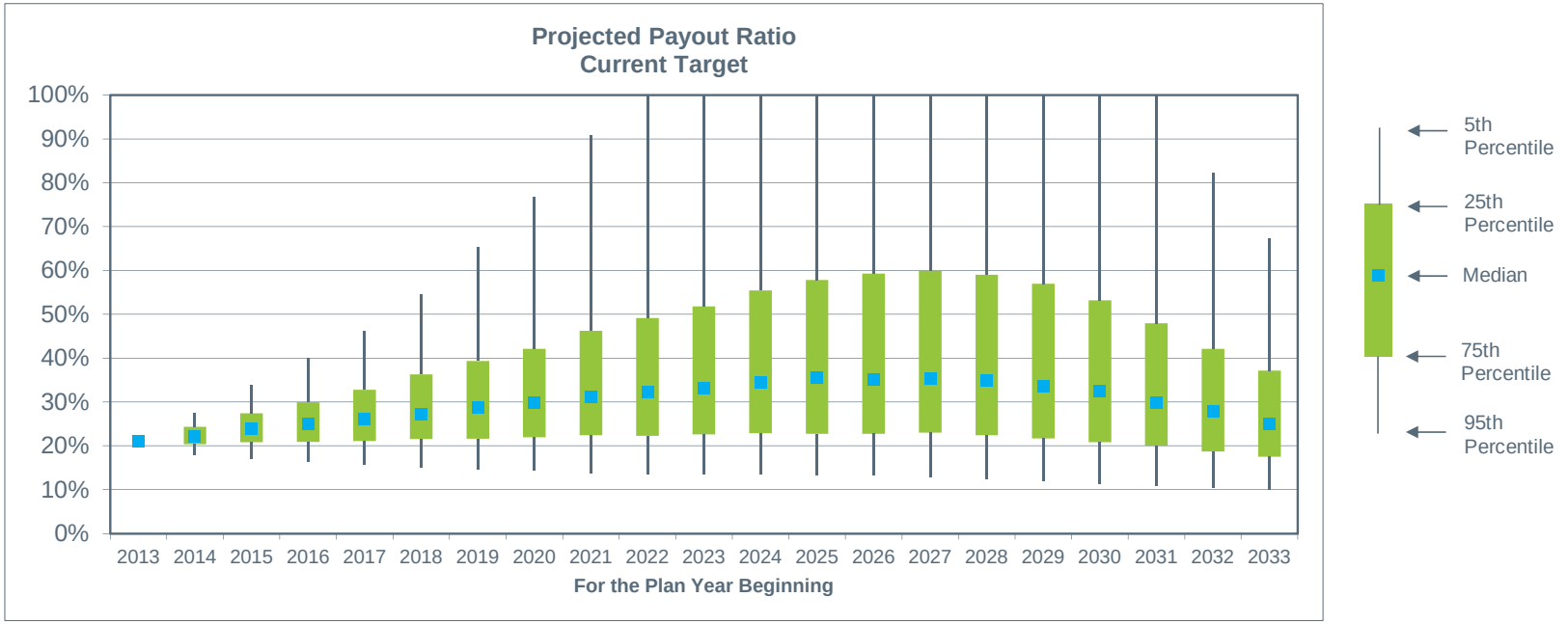
| 20 Years | Probability of Full Funding in 2034 | Probability of < 38% (Current) Funding in 2034 | Probability of < 20% (Current) Funding in 2034 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 2% | 58% | 18% | -38% | 108% |
| Conservative 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% |

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Current Target**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 21% and 35%. The worst-case scenario could reach 100%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 21% | 22% | 24% | 25% | 26% | 27% | 29% | 30% | 31% | 32% | 33% | 34% | 35% | 35% | 35% | 35% | 34% | 32% | 30% | 28% | 25% |



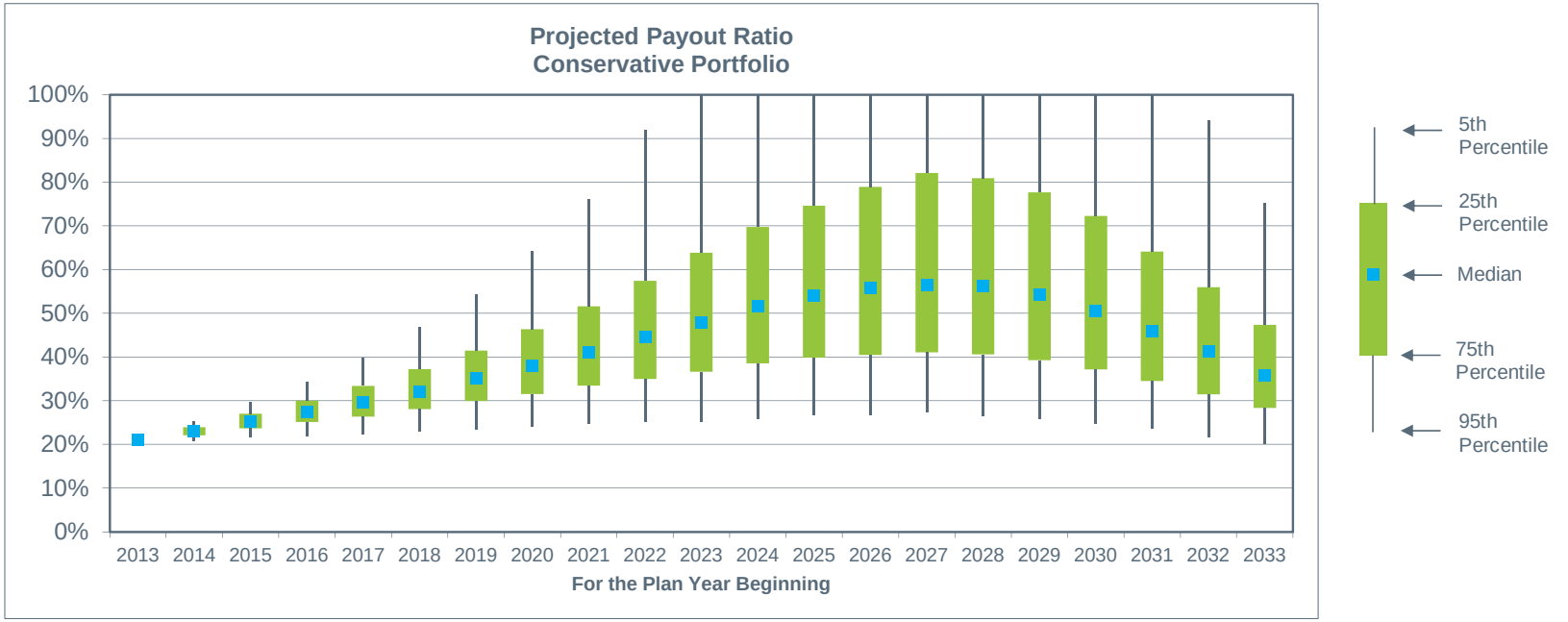
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Conservative Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 21% and 56%. The worst-case scenario could reach 100%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 21% | 23% | 25% | 27% | 30% | 32% | 35% | 38% | 41% | 44% | 48% | 52% | 54% | 56% | 56% | 56% | 54% | 51% | 46% | 41% | 36% |



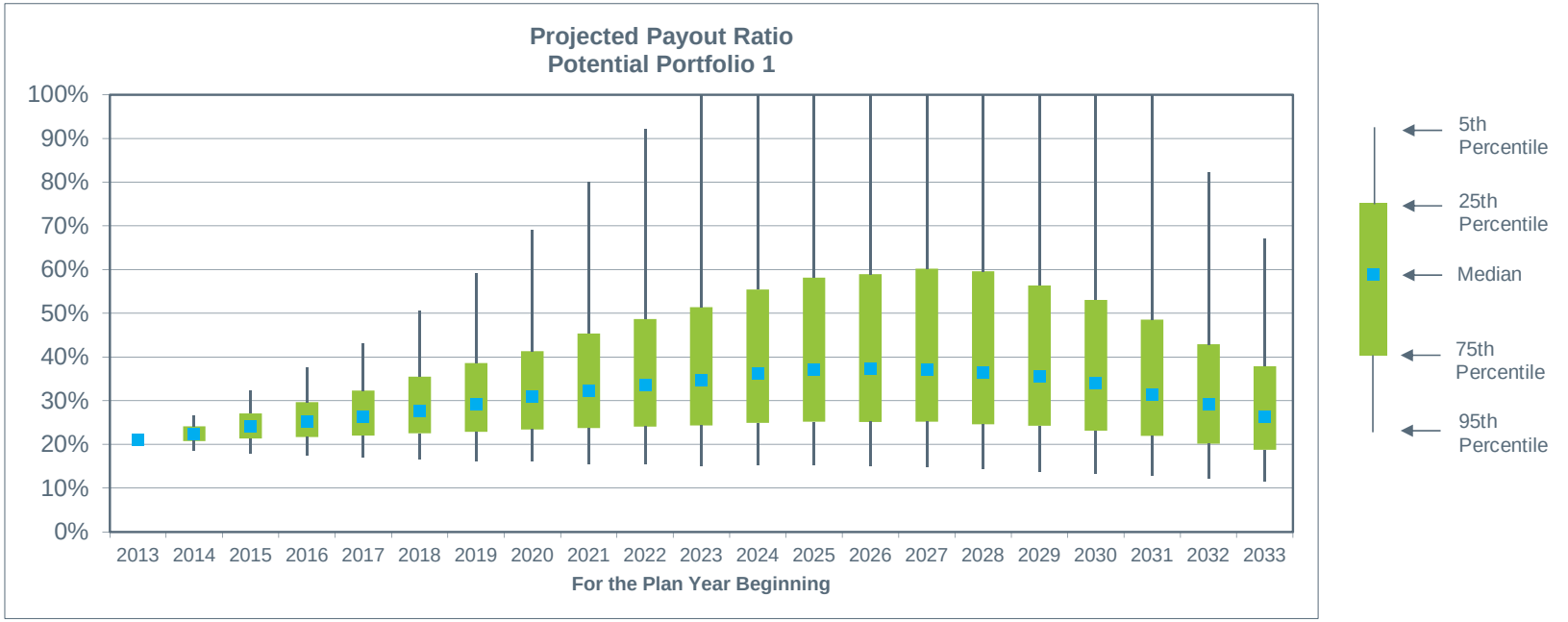
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 1**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 21% and 37%. The worst-case scenario could reach 100%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 21% | 22% | 24% | 25% | 26% | 28% | 29% | 31% | 32% | 34% | 35% | 36% | 37% | 37% | 37% | 37% | 36% | 34% | 31% | 29% | 26% |



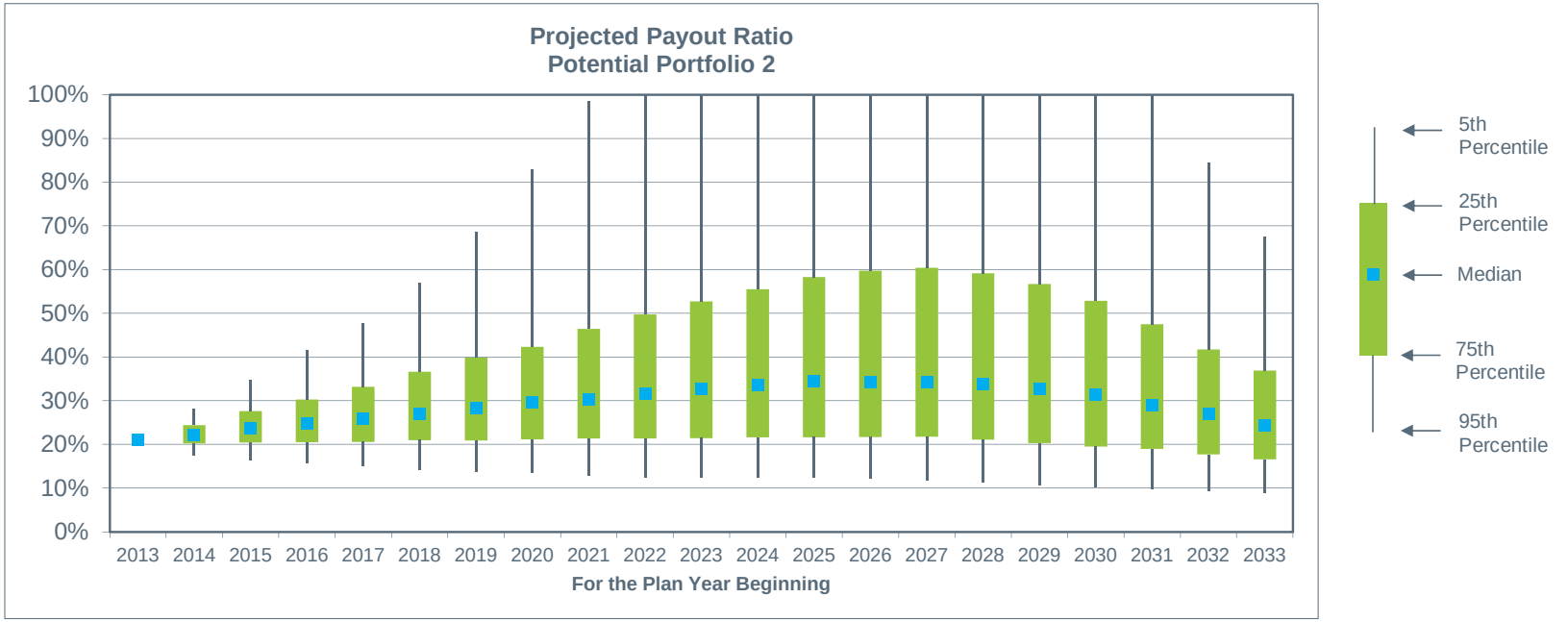
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 2**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 21% and 34%. The worst-case scenario could reach 100%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 21% | 22% | 24% | 25% | 26% | 27% | 28% | 30% | 30% | 32% | 33% | 34% | 34% | 34% | 34% | 34% | 33% | 31% | 29% | 27% | 24% |



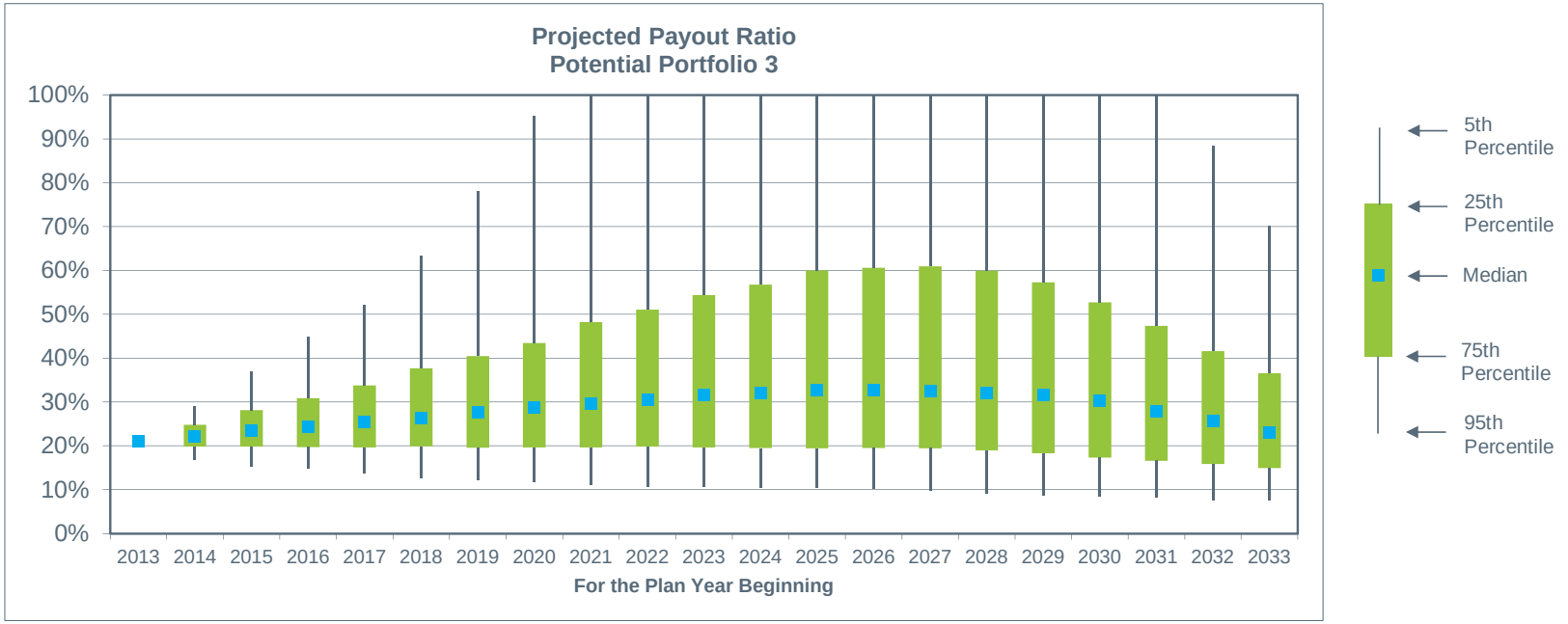
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Potential Portfolio 3**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 21% and 33%. The worst-case scenario could reach 100%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 21% | 22% | 24% | 24% | 25% | 26% | 28% | 29% | 30% | 31% | 32% | 32% | 33% | 33% | 32% | 32% | 32% | 30% | 28% | 26% | 23% |



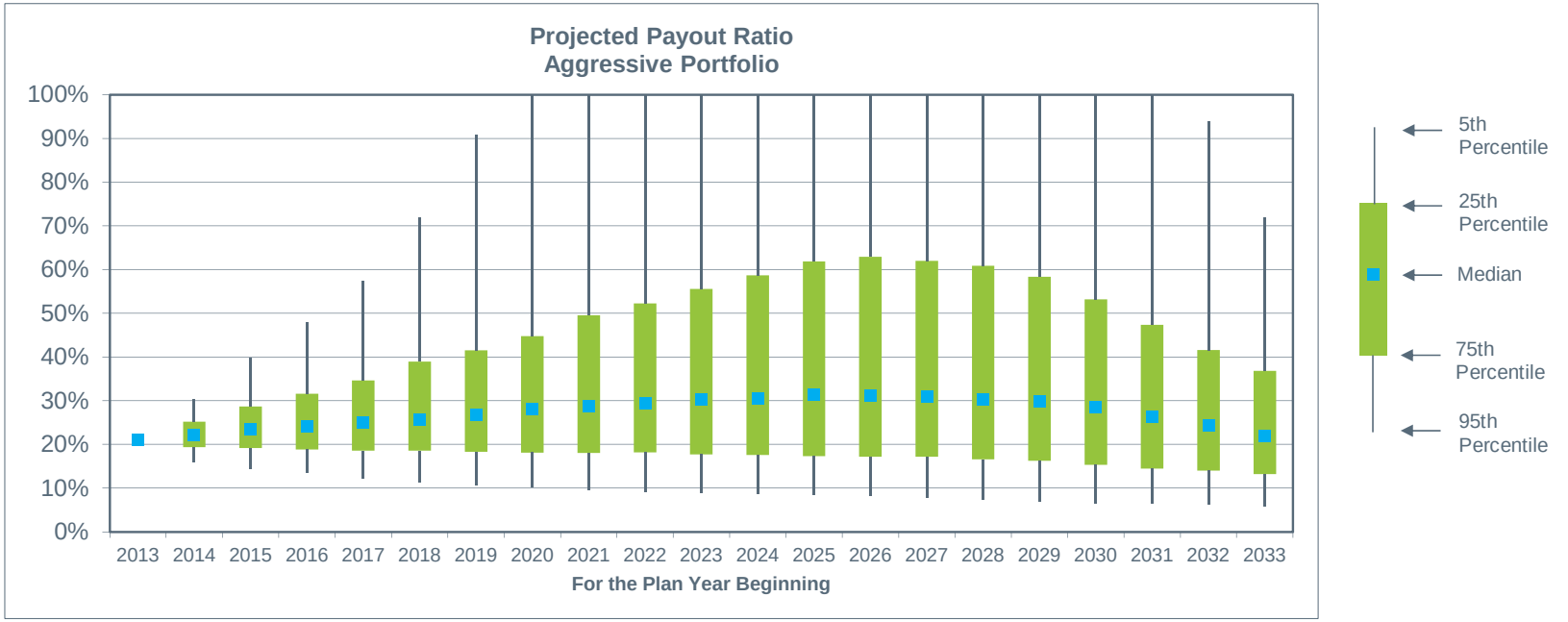
RVK

# Stochastic Analysis (continued)

**Projected Payout Ratio** (expected benefit payments/market value of assets); **Aggressive Portfolio**

The graph below displays the range of possible payout ratios over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio**. The results assume the current contribution policy remains unchanged for all projection years.

The median annual benefit payment as percentage of the market value of assets is expected to range between 21% and 31%. The worst-case scenario could reach 100%.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Median | 21% | 22% | 23% | 24% | 25% | 26% | 27% | 28% | 29% | 29% | 30% | 31% | 31% | 31% | 31% | 30% | 30% | 29% | 26% | 24% | 22% |

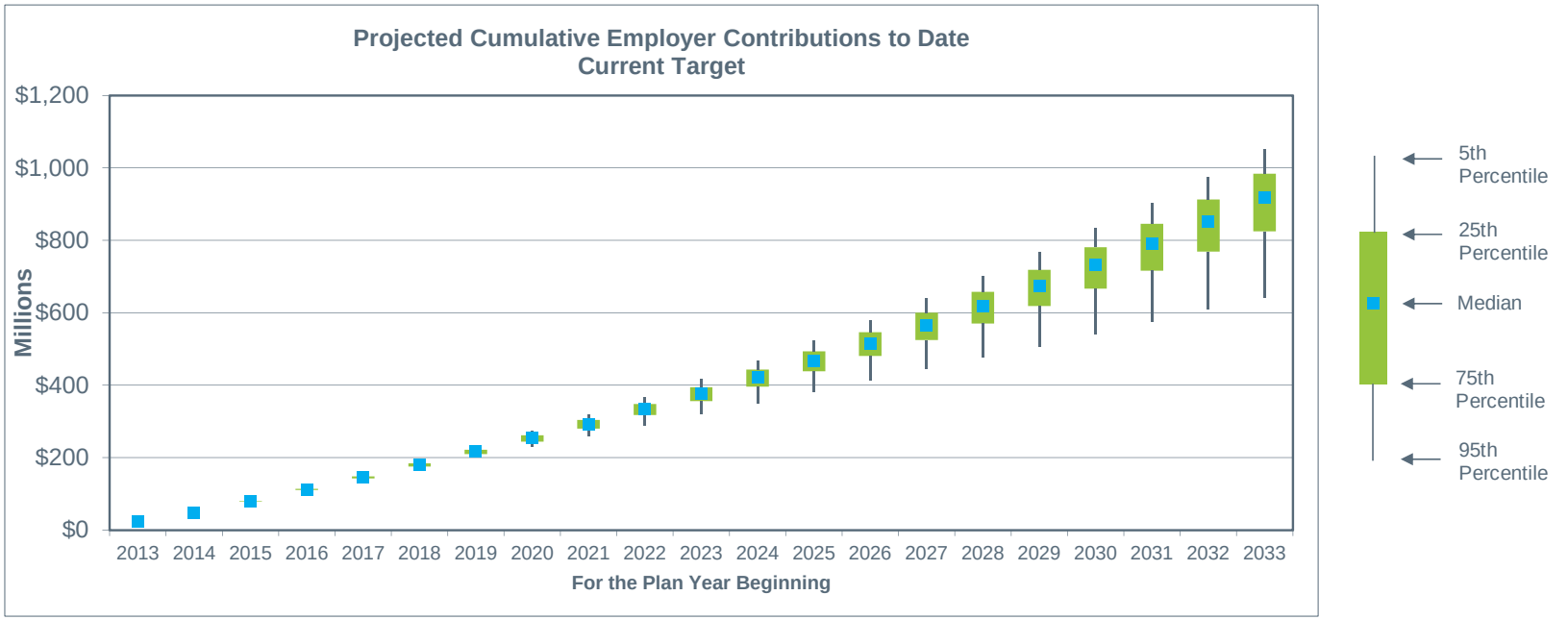


RVK

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Current Target

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Current Target** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

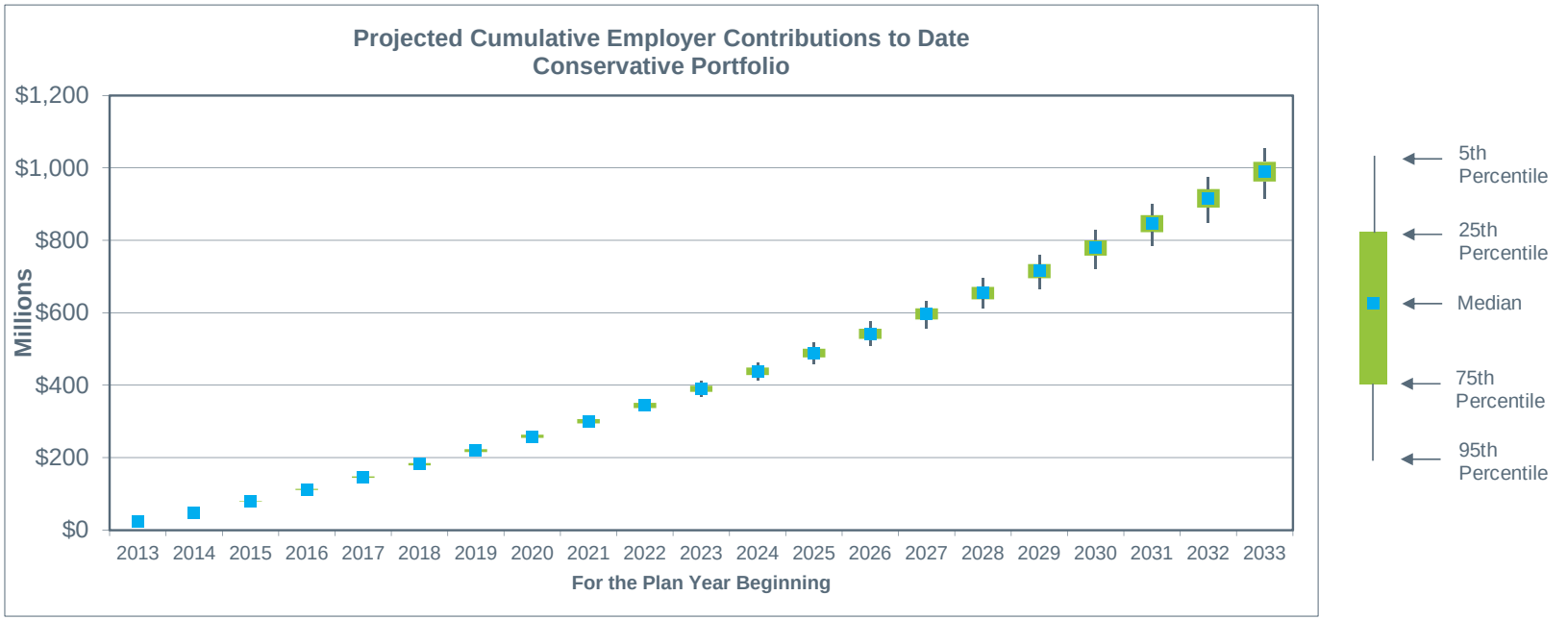



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $24 | $49 | $82 | $116 | $152 | $190 | $230 | $273 | $318 | $366 | $416 | $468 | $523 | $581 | $640 | $702 | $767 | $833 | $904 | $976 | $1,052 |
| 25th Percentile | $24 | $49 | $80 | $114 | $148 | $184 | $222 | $262 | $304 | $348 | $394 | $443 | $494 | $546 | $601 | $658 | $719 | $781 | $845 | $913 | $984 |
| Median | $24 | $49 | $80 | $112 | $145 | $180 | $216 | $254 | $293 | $334 | $377 | $421 | $467 | $515 | $566 | $618 | $673 | $731 | $791 | $853 | $918 |
| 75th Percentile | $24 | $49 | $79 | $110 | $143 | $176 | $209 | $244 | $280 | $317 | $356 | $396 | $438 | $481 | $524 | $570 | $619 | $667 | $716 | $769 | $825 |
| 95th Percentile | $24 | $49 | $78 | $108 | $139 | $169 | $199 | $230 | $259 | $288 | $320 | $349 | $382 | $413 | $446 | $476 | $507 | $542 | $574 | $610 | $642 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Conservative Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Conservative Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

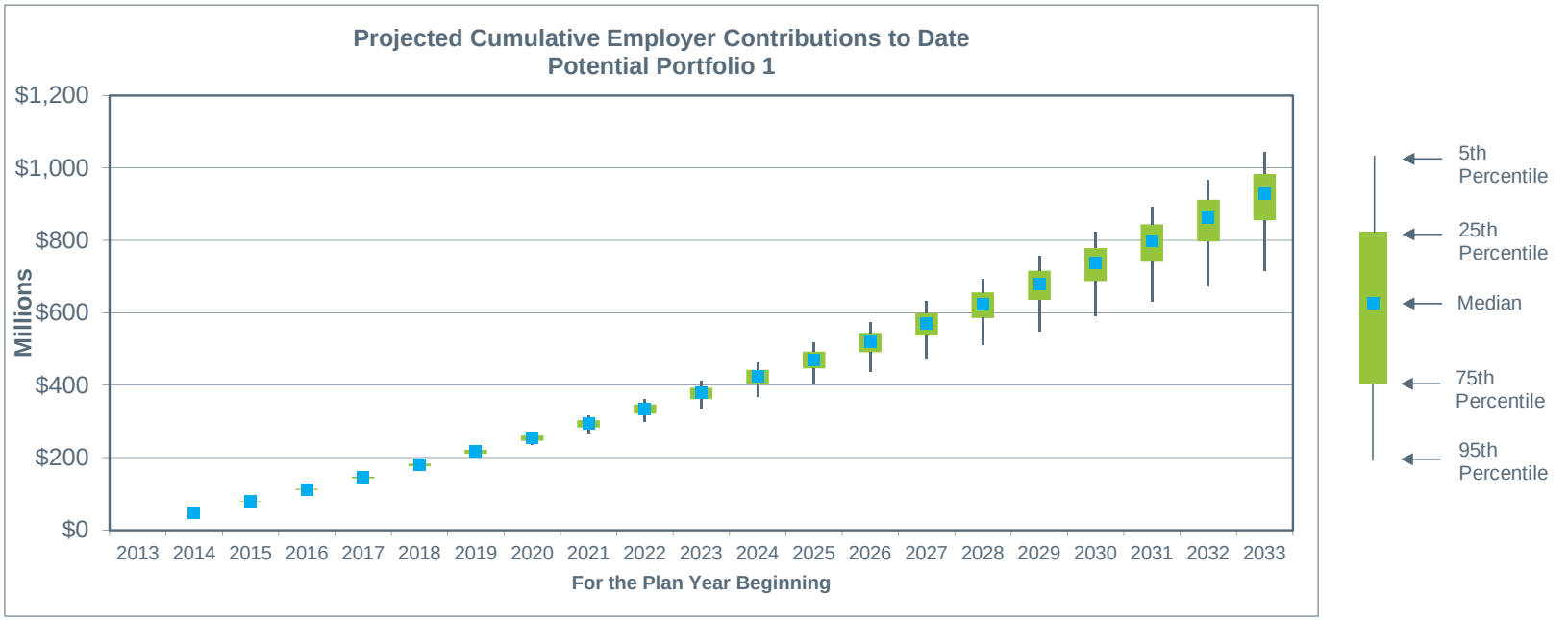



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $24 | $49 | $82 | $116 | $152 | $189 | $229 | $270 | $315 | $362 | $411 | $462 | $517 | $575 | $634 | $696 | $760 | $829 | $899 | $975 | $1,054 |
| **25th Percentile** | $24 | $49 | $80 | $114 | $148 | $185 | $223 | $263 | $306 | $351 | $399 | $448 | $501 | $555 | $612 | $672 | $734 | $800 | $869 | $941 | $1,017 |
| **Median** | $24 | $49 | $80 | $112 | $146 | $182 | $219 | $259 | $300 | $344 | $390 | $438 | $488 | $541 | $597 | $655 | $717 | $780 | $847 | $917 | $990 |
| **75th Percentile** | $24 | $49 | $79 | $111 | $144 | $179 | $216 | $254 | $295 | $337 | $381 | $428 | $477 | $528 | $581 | $637 | $696 | $758 | $822 | $891 | $962 |
| **95th Percentile** | $24 | $49 | $78 | $109 | $141 | $175 | $210 | $247 | $286 | $327 | $369 | $413 | $459 | $507 | $557 | $611 | $665 | $723 | $784 | $848 | $915 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 1

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 1** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

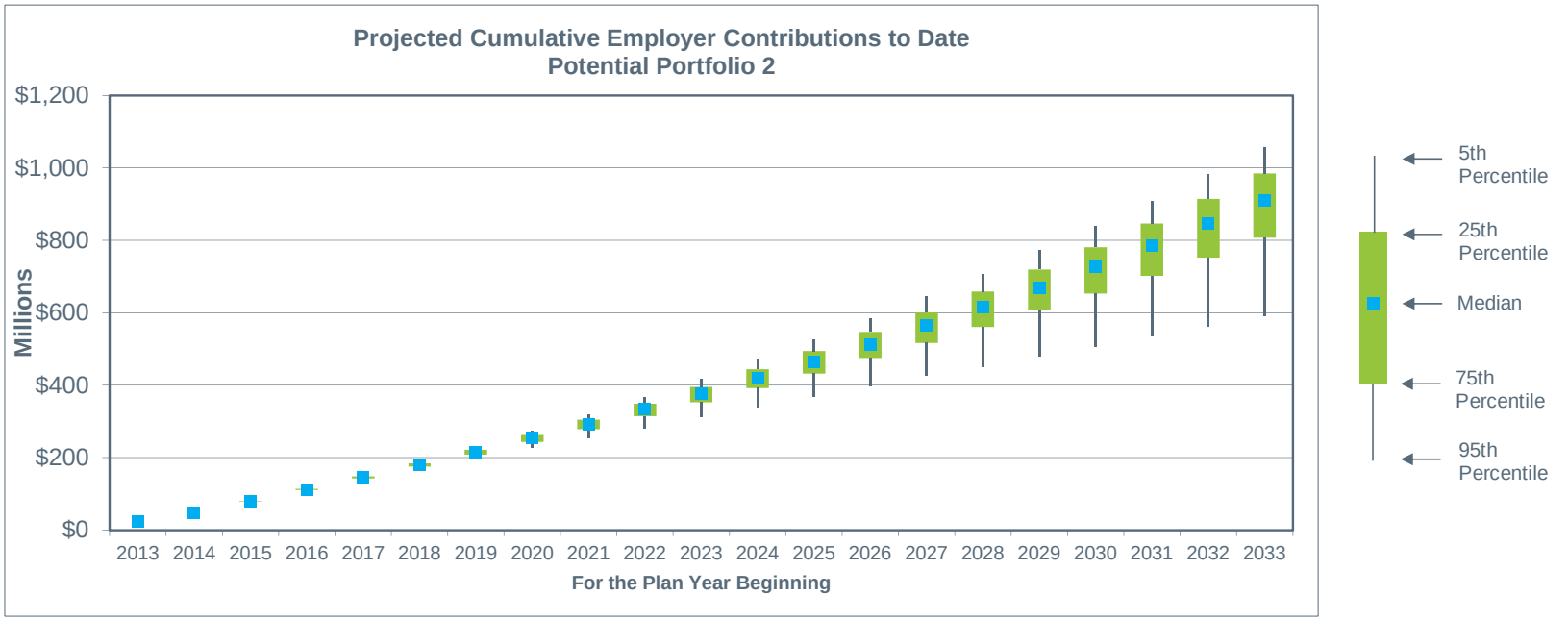



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $24 | $49 | $82 | $116 | $151 | $189 | $228 | $271 | $316 | $362 | $412 | $463 | $517 | $574 | $633 | $694 | $758 | $824 | $893 | $967 | $1,043 |
| 25th Percentile | $24 | $49 | $80 | $114 | $148 | $184 | $222 | $261 | $303 | $347 | $393 | $442 | $492 | $544 | $599 | $657 | $716 | $778 | $844 | $912 | $983 |
| Median | $24 | $49 | $80 | $112 | $145 | $180 | $216 | $254 | $294 | $336 | $378 | $423 | $470 | $519 | $570 | $623 | $679 | $738 | $799 | $863 | $928 |
| 75th Percentile | $24 | $49 | $79 | $111 | $143 | $176 | $211 | $246 | $284 | $322 | $362 | $403 | $446 | $491 | $537 | $585 | $636 | $688 | $741 | $797 | $855 |
| 95th Percentile | $24 | $49 | $78 | $109 | $140 | $171 | $203 | $235 | $266 | $298 | $333 | $366 | $402 | $438 | $475 | $511 | $548 | $591 | $631 | $674 | $717 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 2

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 2** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

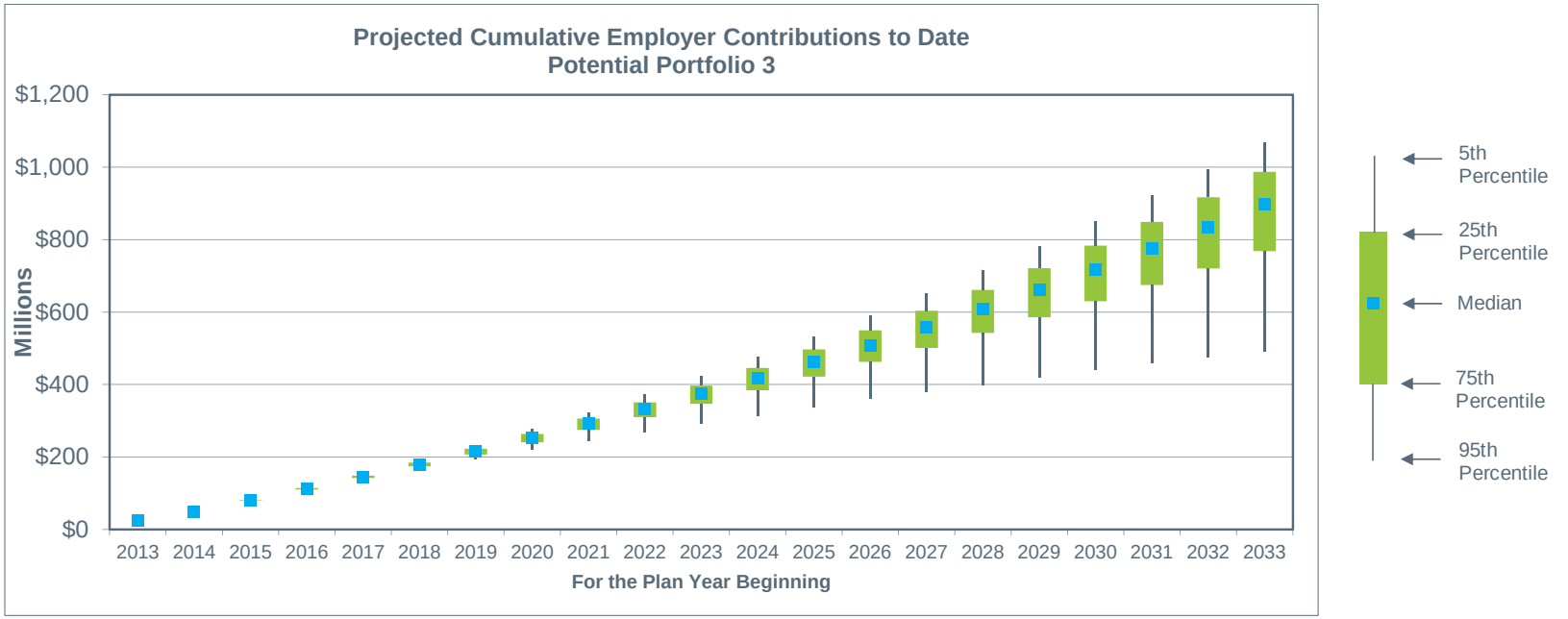



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $24 | $49 | $82 | $116 | $152 | $190 | $231 | $274 | $320 | $368 | $418 | $472 | $526 | $584 | $645 | $707 | $772 | $839 | $910 | $983 | $1,058 |
| **25th Percentile** | $24 | $49 | $80 | $114 | $148 | $184 | $222 | $262 | $304 | $349 | $395 | $444 | $494 | $547 | $602 | $659 | $719 | $781 | $846 | $914 | $985 |
| **Median** | $24 | $49 | $80 | $112 | $145 | $180 | $216 | $253 | $293 | $334 | $376 | $420 | $465 | $513 | $564 | $615 | $669 | $726 | $785 | $846 | $910 |
| **75th Percentile** | $24 | $49 | $79 | $110 | $142 | $175 | $208 | $243 | $278 | $314 | $352 | $392 | $432 | $475 | $517 | $560 | $607 | $653 | $702 | $752 | $807 |
| **95th Percentile** | $24 | $49 | $78 | $108 | $139 | $168 | $197 | $227 | $254 | $281 | $310 | $338 | $367 | $397 | $426 | $450 | $479 | $506 | $535 | $562 | $590 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Potential Portfolio 3

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to **Potential Portfolio 3** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.

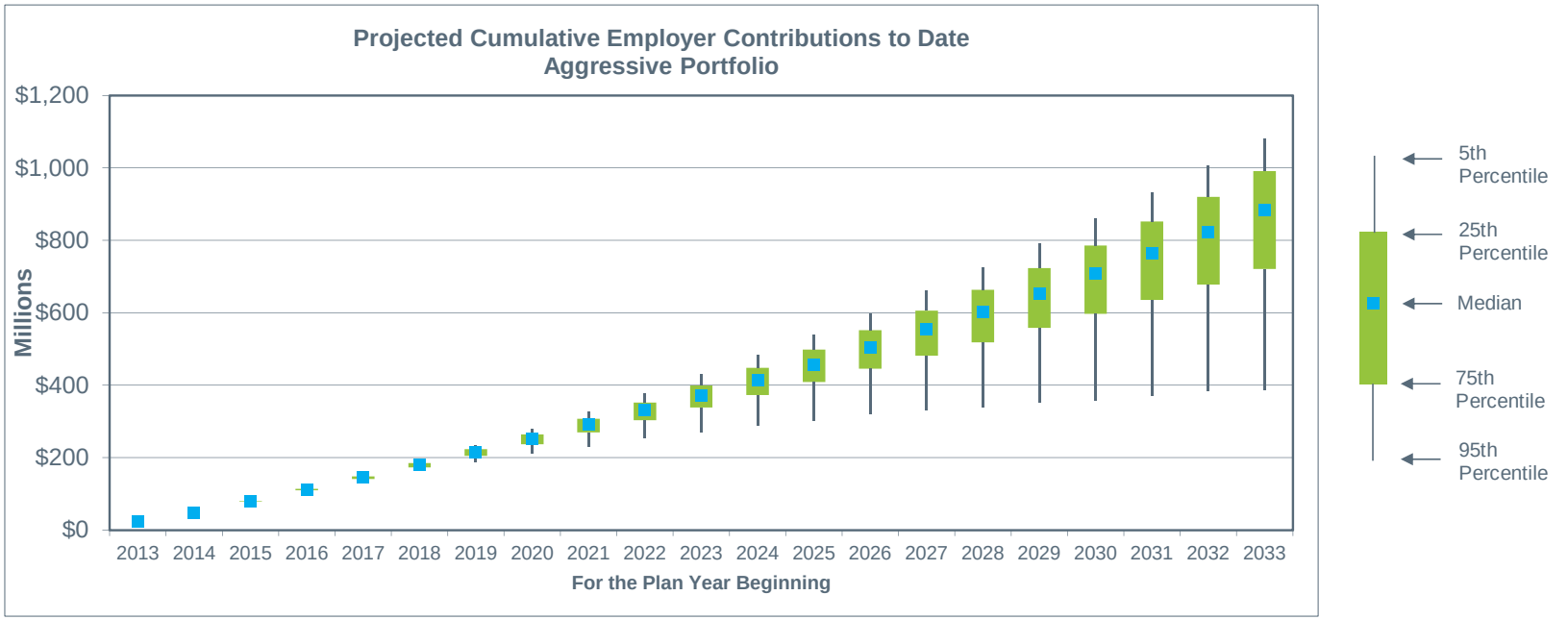



| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5th Percentile | $24 | $49 | $82 | $116 | $152 | $191 | $232 | $277 | $323 | $372 | $423 | $477 | $533 | $591 | $652 | $716 | $782 | $851 | $922 | $994 | $1,069 |
| 25th Percentile | $24 | $49 | $80 | $114 | $148 | $184 | $223 | $263 | $306 | $350 | $396 | $446 | $497 | $549 | $604 | $661 | $721 | $784 | $849 | $917 | $987 |
| Median | $24 | $49 | $80 | $112 | $145 | $179 | $215 | $253 | $292 | $332 | $374 | $417 | $462 | $509 | $559 | $610 | $661 | $717 | $775 | $835 | $897 |
| 75th Percentile | $24 | $49 | $79 | $110 | $142 | $174 | $207 | $240 | $274 | $309 | $346 | $384 | $422 | $462 | $501 | $542 | $585 | $630 | $674 | $720 | $768 |
| 95th Percentile | $24 | $49 | $78 | $108 | $137 | $165 | $193 | $220 | $243 | $268 | $292 | $315 | $338 | $361 | $379 | $397 | $419 | $439 | $458 | $475 | $489 |

# Stochastic Analysis (continued)

## Cumulative Employer Contributions to Date; Aggressive Portfolio

The graph and table below show the range of projected cumulative employer contributions over the next twenty years, assuming the Plan's assets are allocated according to the **Aggressive Portfolio** (highlighted on the prior pages). The results assume the current contribution policy remains unchanged for all projection years.




| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5th Percentile** | $24 | $49 | $82 | $116 | $153 | $192 | $234 | $279 | $327 | $377 | $429 | $483 | $540 | $598 | $660 | $725 | $791 | $860 | $932 | $1,006 | $1,080 |
| **25th Percentile** | $24 | $49 | $80 | $114 | $148 | $185 | $223 | $264 | $307 | $352 | $399 | $448 | $498 | $552 | $606 | $664 | $723 | $786 | $852 | $920 | $991 |
| **Median** | $24 | $49 | $80 | $112 | $145 | $179 | $215 | $252 | $290 | $330 | $371 | $414 | $458 | $504 | $554 | $602 | $654 | $708 | $764 | $822 | $883 |
| **75th Percentile** | $24 | $49 | $79 | $110 | $141 | $173 | $205 | $237 | $270 | $303 | $338 | $372 | $409 | $446 | $482 | $518 | $558 | $597 | $636 | $678 | $721 |
| **95th Percentile** | $24 | $49 | $78 | $107 | $136 | $163 | $188 | $211 | $230 | $253 | $269 | $288 | $301 | $320 | $333 | $340 | $352 | $356 | $371 | $383 | $387 |

# Stochastic Analysis (continued)

**Employer Contributions** (as a weighted average percentage of salary)

The tables below show the range of required employer contributions (as a weighted average percentage of salary) assuming the six different asset mixes highlighted on the prior pages. The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Required Employer Contribution for Plan Year Beginning 2019 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 81% | 72% | 66% | 61% | 54% |
| Conservative Portfolio | 80% | 73% | 69% | 64% | 59% |
| Potential Portfolio 1 | 80% | 72% | 67% | 62% | 55% |
| Potential Portfolio 2 | 81% | 72% | 66% | 61% | 53% |
| Potential Portfolio 3 | 82% | 73% | 66% | 60% | 51% |
| Aggressive Portfolio | 83% | 73% | 66% | 59% | 48% |

| 10 Years | Required Employer Contribution for Plan Year Beginning 2024 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 94% | 78% | 67% | 56% | 39% |
| Conservative Portfolio | 95% | 81% | 73% | 64% | 53% |
| Potential Portfolio 1 | 93% | 78% | 68% | 58% | 43% |
| Potential Portfolio 2 | 94% | 78% | 67% | 55% | 36% |
| Potential Portfolio 3 | 95% | 78% | 66% | 53% | 31% |
| Aggressive Portfolio | 96% | 78% | 65% | 51% | 22% |

| 20 Years | Required Employer Contribution for Plan Year Beginning 2034 | | | | |
|---|---|---|---|---|---|
| | 5th | 25th | 50th | 75th | 95th |
| Current Target | 108% | 81% | 64% | 49% | 22% |
| Conservative Portfolio | 112% | 87% | 74% | 62% | 48% |
| Potential Portfolio 1 | 108% | 82% | 66% | 51% | 29% |
| Potential Portfolio 2 | 108% | 80% | 63% | 47% | 16% |
| Potential Portfolio 3 | 108% | 79% | 61% | 42% | 4% |
| Aggressive Portfolio | 107% | 79% | 60% | 37% | 0% |

# Stochastic Analysis (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 30% | 19% | 46% | 29% | 15% | 52% | $180 | $190 | $169 | 27% | 55% | 15% |
| Conservative Portfolio | 27% | 21% | 34% | 25% | 17% | 34% | $182 | $189 | $175 | 32% | 47% | 21% |
| Potential Portfolio 1 | 30% | 20% | 43% | 29% | 16% | 47% | $180 | $189 | $171 | 28% | 51% | 17% |
| Potential Portfolio 2 | 30% | 18% | 48% | 29% | 14% | 55% | $180 | $190 | $168 | 27% | 57% | 14% |
| Potential Portfolio 3 | 31% | 16% | 52% | 30% | 13% | 61% | $179 | $191 | $165 | 26% | 63% | 13% |
| Aggressive Portfolio | 31% | 15% | 57% | 31% | 11% | 70% | $179 | $192 | $163 | 26% | 72% | 11% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 26% | 8% | 58% | 25% | 7% | 60% | $377 | $416 | $320 | 33% | 100% | 13% |
| Conservative Portfolio | 19% | 10% | 32% | 17% | 8% | 32% | $390 | $411 | $369 | 48% | 100% | 21% |
| Potential Portfolio 1 | 25% | 9% | 50% | 24% | 8% | 54% | $378 | $412 | $333 | 35% | 100% | 15% |
| Potential Portfolio 2 | 26% | 8% | 62% | 25% | 6% | 66% | $376 | $418 | $310 | 33% | 100% | 12% |
| Potential Portfolio 3 | 27% | 6% | 72% | 26% | 5% | 77% | $374 | $423 | $292 | 32% | 100% | 11% |
| Aggressive Portfolio | 28% | 5% | 84% | 27% | 4% | 93% | $371 | $429 | $269 | 30% | 100% | 9% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 35% | 15% | 80% | 34% | 13% | 82% | $918 | $1,052 | $642 | 25% | 100% | 10% |
| Conservative Portfolio | 26% | 14% | 42% | 24% | 12% | 40% | $990 | $1,054 | $915 | 36% | 100% | 20% |
| Potential Portfolio 1 | 34% | 15% | 69% | 32% | 13% | 69% | $928 | $1,043 | $717 | 26% | 100% | 12% |
| Potential Portfolio 2 | 36% | 15% | 87% | 35% | 13% | 90% | $910 | $1,058 | $590 | 24% | 100% | 9% |
| Potential Portfolio 3 | 37% | 15% | 106% | 37% | 13% | 110% | $897 | $1,069 | $489 | 23% | 100% | 8% |
| Aggressive Portfolio | 39% | 14% | 133% | 39% | 12% | 138% | $883 | $1,080 | $387 | 22% | 100% | 6% |



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# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility"

This section provides a sensitivity analysis of the original stochastic projections by assuming the risk (as measured by standard deviation) of each asset class is doubled. These modified assumptions are outlined in the table below, compared to the original values:

| Asset Class | Arithmetic Return Assumption | Standard Deviation Assumption | Standard Deviation Assumption Doubled |
|---|---|---|---|
| Global Equity | 7.80 | 18.35 | 36.70 |
| Int. Duration Fixed Income | 3.50 | 6.00 | 12.00 |
| Custom KRS Fixed Income | 5.83 | 10.79 | 21.58 |
| Core Real Estate | 6.75 | 12.50 | 25.00 |
| Diversified Hedge Funds | 6.50 | 9.50 | 19.00 |
| Private Equity | 10.50 | 26.00 | 52.00 |
| Diversified Inflation Strategies | 5.65 | 11.45 | 22.90 |
| Cash Equivalents | 2.25 | 3.00 | 6.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that potential increased capital market volatility does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, exacerbating the potential best and worst-case scenarios.

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 38% (Current) Funding in 2019 | Probability of < 20% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 3% | 65% | 32% | -62% | 98% |
| Conservative Portfolio | 0% | 87% | 31% | -41% | 93% |
| Potential Portfolio 1 | 2% | 69% | 31% | -56% | 97% |
| Potential Portfolio 2 | 5% | 64% | 33% | -65% | 99% |
| Potential Portfolio 3 | 8% | 61% | 35% | -70% | 101% |
| Aggressive Portfolio | 11% | 59% | 36% | -74% | 106% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 38% (Current) Funding in 2024 | Probability of < 20% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 9% | 65% | 43% | -62% | 130% |
| Conservative Portfolio | 0% | 88% | 58% | -41% | 129% |
| Potential Portfolio 1 | 6% | 68% | 43% | -56% | 128% |
| Potential Portfolio 2 | 10% | 64% | 42% | -65% | 129% |
| Potential Portfolio 3 | 15% | 61% | 42% | -71% | 131% |
| Aggressive Portfolio | 18% | 59% | 42% | -76% | 132% |

| 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 | 16% | 52% | 29% | -63% | 155% |
| Conservative Portfolio | 0% | 78% | 39% | -41% | 159% |
| Potential Portfolio 1 | 11% | 55% | 29% | -56% | 155% |
| Potential Portfolio 2 | 18% | 50% | 28% | -67% | 154% |
| Potential Portfolio 3 | 23% | 47% | 28% | -72% | 152% |
| Aggressive Portfolio | 29% | 45% | 27% | -77% | 151% |

# Appendix 1: Sensitivity Analysis: "Effect of Higher Volatility" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 30% | 9% | 69% | 29% | 6% | 89% | $180 | $200 | $156 | 27% | 100% | 9% |
| Conservative Portfolio | 27% | 16% | 42% | 25% | 11% | 46% | $182 | $198 | $169 | 32% | 71% | 17% |
| Potential Portfolio 1 | 30% | 11% | 61% | 29% | 8% | 74% | $180 | $198 | $161 | 27% | 100% | 10% |
| Potential Portfolio 2 | 31% | 8% | 75% | 30% | 6% | 98% | $179 | $202 | $153 | 27% | 100% | 8% |
| Potential Portfolio 3 | 31% | 6% | 87% | 30% | 4% | 117% | $179 | $206 | $146 | 26% | 100% | 7% |
| Aggressive Portfolio | 32% | 4% | 104% | 31% | 3% | 144% | $179 | $210 | $138 | 25% | 100% | 5% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 26% | 0% | 115% | 25% | 0% | 130% | $376 | $456 | $228 | 33% | 100% | 6% |
| Conservative Portfolio | 19% | 2% | 50% | 17% | 2% | 51% | $391 | $434 | $346 | 47% | 100% | 15% |
| Potential Portfolio 1 | 25% | 1% | 92% | 24% | 1% | 106% | $378 | $446 | $264 | 34% | 100% | 7% |
| Potential Portfolio 2 | 27% | 0% | 130% | 25% | 0% | 149% | $375 | $462 | $208 | 32% | 100% | 5% |
| Potential Portfolio 3 | 28% | 0% | 166% | 26% | 0% | 194% | $373 | $474 | $177 | 31% | 100% | 4% |
| Aggressive Portfolio | 28% | 0% | 223% | 27% | 0% | 268% | $371 | $485 | $153 | 30% | 100% | 3% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 36% | 8% | 210% | 36% | 6% | 226% | $910 | $1,129 | $299 | 23% | 100% | 3% |
| Conservative Portfolio | 27% | 7% | 65% | 24% | 6% | 63% | $988 | $1,111 | $794 | 35% | 100% | 12% |
| Potential Portfolio 1 | 35% | 8% | 155% | 33% | 6% | 158% | $924 | $1,114 | $375 | 25% | 100% | 5% |
| Potential Portfolio 2 | 38% | 8% | 262% | 37% | 6% | 280% | $902 | $1,139 | $271 | 23% | 100% | 3% |
| Potential Portfolio 3 | 40% | 8% | 402% | 41% | 6% | 403% | $886 | $1,153 | $221 | 21% | 100% | 2% |
| Aggressive Portfolio | 42% | 7% | 612% | 45% | 6% | 629% | $866 | $1,166 | $178 | 19% | 100% | 1% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations"

This section provides a sensitivity analysis of the original stochastic projections by assuming that all asset classes are perfectly positively correlated (i.e. correlation = 1.00). A correlation matrix reflecting these modified assumptions is provided below:

| | Global Equity | Int. Duration Fixed Income | Custom KRS Fixed Income | Core Real Estate | Diversified Hedge Funds | Private Equity | Diversified Inflation Strategies | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| Global Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Int. Duration Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Custom KRS Fixed Income | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Core Real Estate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Hedge Funds | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Private Equity | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Diversified Inflation Strategies | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Cash Equivalents | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

RVK supports the recommendations based on the original assumptions shown in the Stochastic Analysis section of this report. However, this stress-testing illustrates that converging correlations across capital markets does not change the asset allocation recommendations, based on the current status of the Plan. Instead it simply widens the range of potential results, indicating higher risk for all asset mixes given the dampened effects of total fund diversification.

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

**Projected Market Funded Ratio and Maximum 1 Year Investment Loss** (market value of assets/actuarial accrued liability)

The tables below show the probability that the Plan will be at various funding levels for each of the six different asset mixes highlighted on the prior pages. The tables also illustrate the maximum 1 year investment loss each portfolio is expected to experience during the given time period as well as the maximum one year employer contribution (shown as a weighted average percentage of salary). The results assume the current contribution policy remains unchanged for all projection years.

| 5 Years | Probability of Full Funding in 2019 | Probability of < 38% (Current) Funding in 2019 | Probability of < 20% (Current) Funding in 2019 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 0% | 71% | 26% | -41% | 86% |
| Conservative Portfolio | 0% | 92% | 25% | -23% | 83% |
| Potential Portfolio 1 | 0% | 73% | 25% | -38% | 86% |
| Potential Portfolio 2 | 1% | 69% | 26% | -43% | 87% |
| Potential Portfolio 3 | 2% | 67% | 27% | -47% | 88% |
| Aggressive Portfolio | 3% | 64% | 28% | -51% | 89% |

| 10 Years | Probability of Full Funding in 2024 | Probability of < 38% (Current) Funding in 2024 | Probability of < 20% (Current) Funding in 2024 | Maximum 1 Year Investment Loss | Maximum 1 Year Employer Contribution |
|---|---|---|---|---|---|
| Current Target | 2% | 71% | 41% | -41% | 104% |
| Conservative Portfolio | 0% | 94% | 60% | -23% | 100% |
| Potential Portfolio 1 | 2% | 73% | 42% | -38% | 103% |
| Potential Portfolio 2 | 3% | 69% | 41% | -43% | 105% |
| Potential Portfolio 3 | 6% | 65% | 40% | -47% | 107% |
| Aggressive Portfolio | 9% | 62% | 40% | -51% | 109% |

| 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 | 8% | 57% | 27% | -48% | 115% |
| Conservative Portfolio | 0% | 85% | 38% | -29% | 115% |
| Potential Portfolio 1 | 6% | 61% | 28% | -46% | 115% |
| Potential Portfolio 2 | 11% | 56% | 26% | -50% | 115% |
| Potential Portfolio 3 | 14% | 54% | 26% | -54% | 116% |
| Aggressive Portfolio | 17% | 52% | 26% | -58% | 116% |

# Appendix 2: Sensitivity Analysis: "Effect of Higher Correlations" (continued)

## Drawing Inferences

The tables below compare the projected actuarial and market funded ratios five, ten, and twenty years from now, under the median (50th percentile), worst-case (5th percentile), and best-case (95th percentile) scenarios, assuming the six different asset mixes highlighted on the prior pages. The table also displays for comparative purposes the median, peak, and trough projected payout ratios and cumulative employer contributions assuming the same six asset mixes being examined.

| 5 Years | Actuarial Funded Ratio in Year 5 | | | Market Funded Ratio in Year 5 | | | Cumulative Employer Contributions in Year 5 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 5 Median | 2014-2019 Peak | 2014-2019 Trough |
| Current Target | 30% | 15% | 55% | 29% | 11% | 66% | $180 | $187 | $170 | 28% | 75% | 12% |
| Conservative Portfolio | 27% | 19% | 38% | 25% | 14% | 40% | $182 | $186 | $177 | 32% | 56% | 19% |
| Potential Portfolio 1 | 30% | 15% | 52% | 28% | 11% | 61% | $180 | $186 | $171 | 28% | 71% | 12% |
| Potential Portfolio 2 | 30% | 14% | 57% | 29% | 10% | 69% | $179 | $187 | $169 | 27% | 79% | 11% |
| Potential Portfolio 3 | 31% | 13% | 62% | 30% | 9% | 77% | $179 | $188 | $166 | 27% | 87% | 10% |
| Aggressive Portfolio | 31% | 12% | 67% | 30% | 8% | 86% | $179 | $189 | $163 | 26% | 98% | 9% |

| 10 Years | Actuarial Funded Ratio in Year 10 | | | Market Funded Ratio in Year 10 | | | Cumulative Employer Contributions in Year 10 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 10 Median | 2014-2024 Peak | 2014-2024 Trough |
| Current Target | 26% | 3% | 79% | 25% | 2% | 84% | $377 | $416 | $285 | 34% | 100% | 9% |
| Conservative Portfolio | 19% | 6% | 40% | 18% | 4% | 39% | $389 | $407 | $364 | 47% | 100% | 19% |
| Potential Portfolio 1 | 25% | 3% | 72% | 24% | 3% | 75% | $378 | $414 | $299 | 35% | 100% | 11% |
| Potential Portfolio 2 | 26% | 3% | 85% | 25% | 2% | 90% | $376 | $418 | $275 | 33% | 100% | 9% |
| Potential Portfolio 3 | 27% | 2% | 97% | 26% | 1% | 105% | $374 | $423 | $253 | 32% | 100% | 8% |
| Aggressive Portfolio | 28% | 1% | 112% | 27% | 1% | 124% | $372 | $428 | $229 | 30% | 100% | 6% |

| 20 Years | Actuarial Funded Ratio in Year 20 | | | Market Funded Ratio in Year 20 | | | Cumulative Employer Contributions in Year 20 (Millions) | | | Payout Ratios | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50th | 5th | 95th | 50th | 5th | 95th | 50th | 5th | 95th | Year 20 Median | 2014-2034 Peak | 2014-2034 Trough |
| Current Target | 34% | 11% | 117% | 32% | 9% | 126% | $919 | $1,054 | $435 | 26% | 100% | 6% |
| Conservative Portfolio | 25% | 12% | 50% | 23% | 10% | 49% | $989 | $1,043 | $871 | 37% | 100% | 16% |
| Potential Portfolio 1 | 33% | 12% | 102% | 31% | 9% | 108% | $929 | $1,050 | $508 | 28% | 100% | 7% |
| Potential Portfolio 2 | 35% | 11% | 133% | 33% | 9% | 144% | $913 | $1,057 | $393 | 26% | 100% | 5% |
| Potential Portfolio 3 | 36% | 11% | 169% | 35% | 9% | 182% | $902 | $1,065 | $332 | 25% | 100% | 4% |
| Aggressive Portfolio | 37% | 11% | 233% | 36% | 9% | 242% | $889 | $1,073 | $279 | 24% | 100% | 3% |



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# Appendix 3: Assumptions and Methods

**Actuarial Valuation Assumptions and Methods**: At the beginning of each projection year, an actuarial valuation is performed to determine employer contributions. The assumptions proposed in the 2013 Experience Study were used with actuarial valuations beginning in 2015 and beyond. These methods and assumptions are summarized below:

| | |
|---|---|
| **Actuarial Cost Method** | Entry-Age Normal (level % of pay). Funding policies and methods are described in the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Liability Discount Rate** | 7.50% per year, compounded annually. |
| **Future Pay Increases** | Future pay increases as recommended in the 2013 Experience Study. Pay increases include a 4.00% base wage inflation rate. |
| **Retirement** | Rates of retirement as recommended in the 2013 Experience Study. |
| **Mortality** | Rates of mortality as recommended in the 2013 Experience Study. |
| **Disability** | Rates of disability as recommended in the 2013 Experience Study. |
| **Withdrawal** | Rates of withdrawal as recommended in the 2013 Experience Study. |
| **Asset Valuation Method** | 5-Year smoothing of actual versus expected returns. The asset valuation method is described on page 22 of the June 30, 2014 actuarial valuation report prepared by Cavanaugh. |
| **Contribution Policy** | For fiscal years 2017 and beyond, employer contributions are assumed to equal the full actuarially required contribution consisting of: (1) gross normal cost, less (2) expected employee contributions, plus (3) administrative expenses (0.48% of 2014-15 payroll, growing at inflation each year), plus (4) an amortization of the unfunded actuarial liability over 29 years beginning in 2014, calculated as a level percentage of payroll assuming 4.00% payroll growth. The amortization period was not assumed to reset at any point in the future, and was not allowed to fall below 10 years. |

# Appendix 3: Assumptions and Methods (continued)

**Projection Assumptions (used in the deterministic and stochastic asset/liability projections)**: These projections begin with the Plan's participant population as of June 30, 2014, as provided by Cavanaugh. The Plan's population is projected forward and assumed to change as a result of employment separation, death, disability, and retirement, as predicted by the assumptions recommended in the 2013 Experience Study (and described on the prior pages). New members are assumed to enter the Plan such that the active population remains level throughout the projection. Employee compensation is projected into the future in accordance with the assumptions described on the prior pages. Investment returns are projected into the future in accordance with the assumptions described below.

| | |
|---|---|
| **Employer Contributions** | For the fiscal years ending 2015 and 2016, assumes total employer contributions equal to the full actuarially required contributions as set forth in the actuarial valuation as of June 30, 2013 (53.90% of payroll). Thereafter, assumes employer contributions for each fiscal year are determined as of the prior year's valuation date in accordance with the actuarial funding policy and the assumptions from the 2013 Experience Study. |
| **Member Contributions** | Member contributions are determined based on current contribution rates, and projected pay. |
| **New Entrants** | New employees are assumed to join the Plan such that the active population remains level throughout the projection. New employees entering the Plan are assumed to have characteristics similar to recently hired participants. |
| **Rate of Return on Assets** | Deterministic Analysis: 7.50%, compounded annually.<br><br>Stochastic Analysis: Returns on the portfolio are based on the expected returns of each asset class and the correlations between each class which are detailed in the Stochastic Analysis section of this report. |
| **Cash Balance Interest Credit** | Deterministic Analysis: 7.00%, compounded annually.<br><br>Stochastic Analysis: Interest credits are based on the expected returns of a benchmark portfolio designed to mirror the overall portfolio return. |

# Appendix 3: Assumptions and Methods (continued)

**Inflation**

2.50% per year with a standard deviation of 3.00%.

**Other**

All other projection assumptions are the same as those recommended in the 2013 Experience Study.

Our work was based partly on original work prepared by Cavanaugh using the ProVal valuation software. This included their coding of benefit provisions and the methodology to generate liabilities under the entry age normal actuarial cost method. Cavanaugh provided us with an actuarial valuation as of June 30, 2014, using assumptions from the 2013 Experience Study. We reviewed this work for reasonableness, but we did not perform a complete audit of this work.

We started with Cavanaugh's base year valuation work. Certain changes to the coding of benefit provisions were required in order to facilitate a 20-year projection of liabilities and costs. For example, we added employee contribution definitions in order to offset gross normal cost calculations by expected employee contributions. In some cases, scaling of liabilities was used to approximate liabilities not valued directly in the work provided by Cavanaugh.

The participant data provided by Cavanaugh was the same as that used in the actuarial valuation as of June 30, 2014, for SPRS funding purposes. This data was used without grouping or adjustment.

It is our understanding that Kentucky law does not allow employer contribution rates to change in the second year of a biennium for the SPRS system. This means that an actuarial valuation every other year provides the funding rates for the following two fiscal years. We were not able to model this feature. Instead, we modeled contribution rates based on annual valuations with a one-year lag period.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the KRS Board of Trustees

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** KRS Contract for Administrative and Investment Benchmarking Study

Several times during meetings of the Public Pension Oversight Board the issue has arisen about how KRS' investment and administrative costs compare with comparable public retirement systems around the country. Likewise, questions have been asked about the how KRS investment and administrative functions and staffing compare to other retirement systems. It is also a good (best) practice to periodically provide such information to the KRS Board of Trustees so that board members remain aware of how KRS is performing vis-à-vis its peers and to allow the board and staff to determine whether adjustments are warranted.

In order to produce this information, I am requesting that the KRS Board of Trustees authorize staff to enter into a contract with CEM Benchmarking, Inc. (CEM) for administrative and investment cost and performance benchmarking studies. In my view, which is supported by KRS legal staff, this contract can be awarded without the issuance of a Request for Proposals (RFP) since CEM is a "sole source provider" of the specific services we are seeking.

The KRS Procurement Policy provides in pertinent part: VII. EXCEPTIONS TO SEALED BIDDING. . . . C. ***Some procedures (sic) are exempt from competitive bidding when there is only one (1) known capable supplier of a commodity or service, occasioned by the unique nature of the requirement, supplier or market condition.*** The following types of items have been determined to be exempt from bidding. ***However, a chief officer of KRS must authorize any procurement under this exemption in writing, including his or her basis for making such a determination***:

About CEM

CEM is a unique global benchmarking company. It is an independent provider of objective and actionable benchmarking information for large pools of capital including pension funds. CEM currently serves over 350 blue-chip corporate and government clients worldwide. In America, CEM has been collecting quality cost, return and risk data from funds since 1991. Currently, 195 U.S. pension funds participate in the database

including 60 large public pension funds. We estimate that Kentucky Retirement Systems has provided system data to CEM for approximately 20 years.

CEM specializes in benchmarking cost and performance of investments and administration, the factors that drive cost, how cost effects pension fund goals, and how a fund's costs and performance compare to its peers. The CEM database has a reputation among leading global funds, American public and corporate funds, and academics as the most respected cost database for the pension fund industry.

The factors that make CEM's database and services unique include:

- The cost information is complete. It includes consultant, audit, custody, external management fees and internal staff costs.

- As a company, CEM's sole focus is on cost benchmarking and it has 23 years of quality data in its proprietary database.

- CEM is not conflicted by seeking further consultation after report delivery. The set fee for the report and presentation of results is the complete service.

- CEM is privately owned and independent, thus is free from influence by parental companies, sister companies or other factors.

- CEM has 23 years of experience working with funds, collecting quality data, providing comparable and relevant cost analysis, and presenting results at multiple levels: trustee boards and other governing bodies, investment committees and management.

- CEM staff have acted as expert witnesses in legal cases that have focused on pension fund costs.

- The company has a staff of 28, many of whom have advanced degrees and professional designations. Staff turnover is low. CEM Board members include those who started the company and the Managing Principal has been with CEM for 23 years.

CEM's American defined benefit database includes 195 funds, representing $3.4 trillion dollars, with an average fund size of $18.5 billion and a median fund size of $6.4 billion. Sixty (60) funds are large defined benefit public funds representing $2.2 trillion dollars.

CEM's public retirement system administrative and investment cost and performance benchmarking, which recognizes and adjusts for each system's unique characteristics that drive costs, is a very specialized service. CEM has experience in performing this service and they also have the benefit of the participation of up to 75 other peer systems in pension administration and 400 in investment benchmarking.

To our knowledge, no other company offers a comprehensive investment cost and performance benchmarking service that utilizes actual cost and performance data collected from large U.S. pension funds. We have also been advised by the research director of the National Association of State Retirement Administrators (NASRA) that CEM is unique in this regard.

CEM Contract and Services

KRS staff contemplates awarding a sole source contract to CEM for a twenty-four (24) month period to provide complete public pension administration and investment benchmarking services. Services to be provided would include: preparation of draft and final benchmarking reports analyzing and comparing KRS investment cost and performance with a public pension fund peer group.

The benchmarking report will include analysis of performance and cost data from a minimum of 12-20 public pension plans of comparable size to KRS; analysis of common public pension administration activities; analysis of factors contributing to cost differences; and, sufficient statistical analysis to enable KRS to validate these conclusions. The final benchmarking reports will be presented to the KRS Board of Trustees by CEM staff, if desired. CEM will also coordinate a conference for public pension systems, which will cover current issues of interest to public pension administrators; prepare up to three (3) best practice analyses on a common public pension administrative services and, provide access to a peer network forum of other public pension systems.

CEM will charge a flat fee for all the services provided. The fee for the administrative cost and performance benchmarking will be $45,000. The fee for the investment cost and performance benchmarking will be $30,000.

**RECOMMENDATION**: The Executive Director recommends that the KRS Board approve the engagement of CEM via a sole source contract to perform the benchmarking studies outlined in this memorandum.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Initial Retirement Cases, Third Quarter, 14-15

The tables below show the distribution of new retirees who retired during this quarter of the fiscal year by retirement mode and the retirees with 27 or more years of service.

DISTRIBUTION BY RETIREMENT MODE

| MODE | KERS | CERS | SPRS | TOTAL | PERCENT |
|---|---|---|---|---|---|
| Normal Retirement | 151 | 400 | 1 | 552 | 32.0% |
| Early Retirement | 312 | 678 | 5 | 995 | 57.8% |
| Disability Retirement | 23 | 40 | 0 | 63 | 3.7% |
| Retirement Eligible Refund | 14 | 41 | 0 | 55 | 3.2% |
| Death of Members Eligible to Retire | 21 | 35 | 0 | 56 | 3.3% |
| **Grand Totals** | **521** | **1194** | **6** | **1721** | **100%** |

RETIREES WITH 27 OR MORE YEARS OF SERVICE

| | KERS | CERS | SPRS | TOTAL |
|---|---|---|---|---|
| Under Normal Retirement Age | 106 | 186 | 4 | 296 |
| At and Over Normal Retirement Age | 7 | 25 | 0 | 32 |
| **Grand Totals** | **113** | **211** | **4** | **328** |

**RECOMMENDATION:** This report is provided for informational purposes only.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Death Benefit Payments, Third Quarter, 14-15

The table below reflects the number of deceased retired members whose death benefit was paid during this quarter of the fiscal year and the total amount paid by each system.

DEATH BENEFIT PAYMENTS

| | Number of Deceased Retirees | Total Amount Paid |
|---|---|---|
| KERS | 298 | $1,490,000.00 |
| CERS | 339 | $1,695,000.00 |
| SPRS | 2 | $10,000.00 |
| **TOTALS** | **639** | **$3,195,000.00** |

**RECOMMENDATION:** This report is provided for informational purposes only.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Refund of Member Contributions for Quarter Ended March 31, 2015

The summary by system, age, and service credit of each person who received a refund during the third quarter of this fiscal year is attached.

There were 1,393 refunds totaling $8,735,671 paid to former members of the systems during the third quarter. Refund payments during the past (11) eleven quarters were as follows:

| Quarter Ended | Amount | Number of Refunds |
|---|---|---|
| **03/31/2015** | $8,735,671 | 1,393 |
| **12/31/2014** | $7,953,236 | 1,338 |
| **09/30/2014** | $11,208,677 | 2,465 |
| **06/30/2014** | $8,829,317 | 2,167 |
| **03/31/2014** | $8,595,267 | 1,605 |
| **12/31/2013** | $8,063,089 | 1,696 |
| **09/30/2013** | $9,525.226 | 1,791 |
| **06/30/2013** | $7,892,029 | 1,986 |
| **03/31/2013** | $8,854,181 | 1,592 |
| **12/31/2012** | $7,712,097 | 1,241 |
| **09/30/2012** | $7,781,898 | 1,493 |

**RECOMMENDATION:** This report is provided for informational purposes only.

# Kentucky Retirement Systems

## Refund Distribution by Age and Service

Start Date: 1/1/2015 End Date: 3/31/2015



| | Years of Services | | | | | CERSHZ |
|---|---|---|---|---|---|---|
| **Age** | **0 < 5** | **5 < 10** | **10 < 15** | **15 < 20** | **20 - Up** | **Totals** |
| **0 - 19** | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 0.00% |
| | | | | | | 0 |
| | | | | | | 0.00% |
| **20 - 29** | 4 | 6 | 2 | 2 | 0 | 14 |
| | | | | | | 24.14% |
| | | | | | | 177498.5 |
| | | | | | | 18.75% |
| **30 - 39** | 8 | 2 | 8 | 5 | 3 | 26 |
| | | | | | | 44.83% |
| | | | | | | 398677.85 |
| | | | | | | 42.12% |
| **40 - 49** | 3 | 2 | 3 | 3 | 4 | 15 |
| | | | | | | 25.86% |
| | | | | | | 305980.91 |
| | | | | | | 32.33% |
| **50 - 59** | 0 | 2 | 0 | 0 | 1 | 3 |
| | | | | | | 5.17% |
| | | | | | | 64351.44 |
| | | | | | | 6.80% |
| **60 - Up** | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 0.00% |
| | | | | | | 0 |
| | | | | | | 0.00% |
| **CERSHZ** | | | | | | |
| **Totals** | 15 | 12 | 13 | 10 | 8 | 58 |
| | 25.86% | 20.69% | 22.41% | 17.24% | 13.79% | 100.00% |
| | 26527.7 | 110803.12 | 219911.64 | 267901.94 | 321364.3 | 946508.7 |
| | 2.80% | 11.71% | 23.23% | 28.30% | 33.95% | 100.00% |

# Kentucky Retirement Systems

## Refund Distribution by Age and Service

Start Date: 1/1/2015 End Date: 3/31/2015

| | Years of Services | | | | | CERSNHZ |
|---|---|---|---|---|---|---|
| **Age** | **0 < 5** | **5 < 10** | **10 < 15** | **15 < 20** | **20 - Up** | **Totals** |
| **0 - 19** | 6 | 1 | 0 | 0 | 0 | 7 |
| | | | | | | 1.01% |
| | | | | | | 4361.01 |
| | | | | | | 0.12% |
| **20 - 29** | 56 | 13 | 9 | 3 | 0 | 81 |
| | | | | | | 11.65% |
| | | | | | | 215503.28 |
| | | | | | | 5.80% |
| **30 - 39** | 56 | 43 | 23 | 26 | 11 | 159 |
| | | | | | | 22.88% |
| | | | | | | 917824.77 |
| | | | | | | 24.70% |
| **40 - 49** | 64 | 30 | 25 | 15 | 35 | 169 |
| | | | | | | 24.32% |
| | | | | | | 1215674.97 |
| | | | | | | 32.72% |
| **50 - 59** | 56 | 54 | 13 | 12 | 22 | 157 |
| | | | | | | 22.59% |
| | | | | | | 1038215.21 |
| | | | | | | 27.94% |
| **60 - Up** | 73 | 40 | 8 | 1 | 0 | 122 |
| | | | | | | 17.55% |
| | | | | | | 324273.46 |
| | | | | | | 8.73% |
| **CERSNHZ** | | | | | | |
| **Totals** | 311 | 181 | 78 | 57 | 68 | 695 |
| | 44.75% | 26.04% | 11.22% | 8.20% | 9.78% | 100.00% |
| | 384183.45 | 844731.89 | 571498.31 | 655505.15 | 1259933.9 | 3715852.7 |
| | 10.34% | 22.73% | 15.38% | 17.64% | 33.91% | 100.00% |

# Kentucky Retirement Systems

## Refund Distribution by Age and Service



Start Date: 1/1/2015 End Date: 3/31/2015

| | Years of Services | | | | | KERSHZ |
|---|---|---|---|---|---|---|
| **Age** | **0 < 5** | **5 < 10** | **10 < 15** | **15 < 20** | **20 - Up** | **Totals** |
| **0 - 19** | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 0.00% |
| | | | | | | 0 |
| | | | | | | 0.00% |
| **20 - 29** | 27 | 5 | 1 | 0 | 0 | 33 |
| | | | | | | 28.45% |
| | | | | | | 87689.14 |
| | | | | | | 17.35% |
| **30 - 39** | 26 | 6 | 4 | 1 | 3 | 40 |
| | | | | | | 34.48% |
| | | | | | | 208941.53 |
| | | | | | | 41.34% |
| **40 - 49** | 11 | 7 | 1 | 3 | 0 | 22 |
| | | | | | | 18.97% |
| | | | | | | 95411.23 |
| | | | | | | 18.88% |
| **50 - 59** | 6 | 9 | 1 | 2 | 0 | 18 |
| | | | | | | 15.52% |
| | | | | | | 83613.21 |
| | | | | | | 16.54% |
| **60 - Up** | 1 | 1 | 0 | 0 | 1 | 3 |
| | | | | | | 2.59% |
| | | | | | | 29772.87 |
| | | | | | | 5.89% |
| **KERSHZ** | | | | | | |
| **Totals** | 71 | 28 | 7 | 6 | 4 | 116 |
| | 61.21% | 24.14% | 6.03% | 5.17% | 3.45% | 100.00% |
| | 101078.73 | 127001.44 | 63494.2 | 113283.34 | 100570.27 | 505427.98 |
| | 20.00% | 25.13% | 12.56% | 22.41% | 19.90% | 100.00% |

# Kentucky Retirement Systems

## Refund Distribution by Age and Service

Start Date: 1/1/2015 End Date: 3/31/2015

| | Years of Services | | | | | KERSNHZ |
|---|---|---|---|---|---|---|
| **Age** | **0 < 5** | **5 < 10** | **10 < 15** | **15 < 20** | **20 - Up** | **Totals** |
| **0 - 19** | 1 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | 0.19% |
| | | | | | | 530.03 |
| | | | | | | 0.01% |
| **20 - 29** | 43 | 25 | 9 | 0 | 0 | 77 |
| | | | | | | 14.75% |
| | | | | | | 237087.6 |
| | | | | | | 6.65% |
| **30 - 39** | 55 | 57 | 26 | 18 | 16 | 172 |
| | | | | | | 32.95% |
| | | | | | | 1210410.99 |
| | | | | | | 33.95% |
| **40 - 49** | 36 | 25 | 21 | 21 | 16 | 119 |
| | | | | | | 22.80% |
| | | | | | | 1094896.96 |
| | | | | | | 30.71% |
| **50 - 59** | 36 | 25 | 19 | 4 | 7 | 91 |
| | | | | | | 17.43% |
| | | | | | | 745157.08 |
| | | | | | | 20.90% |
| **60 - Up** | 36 | 17 | 6 | 2 | 1 | 62 |
| | | | | | | 11.88% |
| | | | | | | 277239.27 |
| | | | | | | 7.78% |
| **KERSNHZ** | | | | | | |
| **Totals** | 207 | 149 | 81 | 45 | 40 | 522 |
| | 39.66% | 28.54% | 15.52% | 8.62% | 7.66% | 100.00% |
| | 310239.05 | 831746.62 | 812485.9 | 562694.53 | 1048155.83 | 3565321.93 |
| | 8.70% | 23.33% | 22.79% | 15.78% | 29.40% | 100.00% |

# Kentucky Retirement Systems

## Refund Distribution by Age and Service

Start Date: 1/1/2015 End Date: 3/31/2015

| | Years of Services | | | | | SPRSHZ |
|---|---|---|---|---|---|---|
| **Age** | **0 < 5** | **5 < 10** | **10 < 15** | **15 < 20** | **20 - Up** | **Totals** |
| **0 - 19** | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 0.00% |
| | | | | | | 0 |
| | | | | | | 0.00% |
| **20 - 29** | 1 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | 50.00% |
| | | | | | | 27.5 |
| | | | | | | 1.07% |
| **30 - 39** | 1 | 0 | 0 | 0 | 0 | 1 |
| | | | | | | 50.00% |
| | | | | | | 2532.4 |
| | | | | | | 98.93% |
| **40 - 49** | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 0.00% |
| | | | | | | 0 |
| | | | | | | 0.00% |
| **50 - 59** | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 0.00% |
| | | | | | | 0 |
| | | | | | | 0.00% |
| **60 - Up** | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 0.00% |
| | | | | | | 0 |
| | | | | | | 0.00% |
| **SPRSHZ** | | | | | | |
| **Totals** | 2 | 0 | 0 | 0 | 0 | 2 |
| | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 100.00% |
| | 2559.9 | 0 | 0 | 0 | 0 | 2559.9 |
| | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 100.00% |

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen, Executive Director

**DATE:** May 21, 2015

**SUBJECT**: Report of Decisions by the Medical Examiners

## DISABILITY

During the third quarter of the fiscal year, the Medical Examiners reviewed a total of 125 applicants for disability retirement. There were 84 (67.20%) recommended for denial and 41 (32.80%) recommended for approval.

### Approvals

| KERS | CERS | SPRS | TOTAL |
|---|---|---|---|
| 15 | 26 | 0 | 41 |

### Duty Related Approvals

| KERS | CERS | SPRS | TOTAL |
|---|---|---|---|
| 0 | 0 | 0 | 0 |

### Denials

| KERS | CERS | SPRS | TOTAL |
|---|---|---|---|
| 28 | 56 | 0 | 84 |

## HAZARDOUS DISABILITY

During the third quarter of the fiscal year, the Medical Examiners reviewed a total of 6 applicants for hazardous disability retirement. There were 3 (50.00%) recommended for denial and 3 (50.00%) recommended for approval.

### Approvals

| KERS | CERS | SPRS | TOTAL |
|---|---|---|---|
| 0 | 0 | 0 | 0 |

### In the Line of Duty Approvals

| KERS | CERS | SPRS | TOTAL |
|---|---|---|---|
| 0 | 2 | 0 | 2 |

### Total and Permanent Approvals

| KERS | CERS | SPRS | TOTAL |
|---|---|---|---|
| 1 | 0 | 0 | 1 |

## ANNUAL REVIEW OF DISABILITY RECIPIENTS

During the third quarter of the fiscal year, the Medical Examiners made final decisions on a total of 127 annual reviews of disability recipients. The disability benefits of 124 recipients (97.64%) were continued and the disability benefits of 3 recipients (2.36%) were terminated.

**RECOMMENDATION:** This is for informational purposes only. No action is required by the board.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Disability Appeals Committee Quarterly Report

The Disability Appeals Committee held meetings on January 27, February 27 and March 31, 2015. A total of 45 disability claims were acted upon during the quarter resulting in 31 denials, 8 approvals, 1 remand and 5 dismissals.

**Denials**

| KERS | CERS | SPRS |
|---|---|---|
| 9 | 22 | 0 |

**Approvals**

| KERS | CERS | SPRS |
|---|---|---|
| 3 | 5 | 0 |

**Dismissals**

| KERS | CERS | SPRS |
|---|---|---|
| 3 | 2 | 0 |

**Remands**

| KERS | CERS | SPRS |
|---|---|---|
| 1 | 0 | 0 |

**RECOMMENDATION:** This is for informational purposes only. No action is required by the Board.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Administrative Appeals Committee Quarterly Report

The Administrative Appeals Committee held meetings on January 27 and March 31, 2015. A total of 10 cases were acted upon in the quarter resulting in 4 continuances, 1 denial, and 5 dismissals.

**Denials**

| KERS | CERS | SPRS |
|---|---|---|
| 1 | 0 | 0 |

**Continuances**

| KERS | CERS | SPRS |
|---|---|---|
| 2 | 2 | 0 |

**Discontinuances**

| KERS | CERS | SPRS |
|---|---|---|
| 0 | 0 | 0 |

**Reinstatements**

| KERS | CERS | SPRS |
|---|---|---|
| 0 | 0 | 0 |

**Remands**

| KERS | CERS | SPRS |
|---|---|---|
| 0 | 0 | 0 |

**Dismissals**

| KERS | CERS | SPRS |
|---|---|---|
| 0 | 5 | 0 |

**RECOMMENDATION:** This is for informational purposes only. No action is required by the Board.

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**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the Board

**FROM:** William A. Thielen

**DATE:** May 21, 2015

**SUBJECT:** Participation of Additional Agencies and Hazardous Positions

PARTICIPATION—NONHAZARDOUS

There is one (1) new agency electing to participate with the County Employees Retirement System under non-hazardous coverage. Copies of minutes, resolution to participate and agency budget will be available at the meeting for review. Contract for Health Insurance has been received for the agency electing to participate in CERS.

**RECOMMENDATION:** The Executive Director recommends that the Board approve the participation of the Housing Authority of Catlettsburg.

**THE FOLLOWING AGENCIES ARE ASKING FOR HAZARDOUS DUTY COVERAGE ON POSITIONS FOR EMPLOYEES WHO HAVE A PARTICIPATION DATE PRIOR TO SEPTEMBER 1, 2008**.

The Allen County Fiscal Court has requested hazardous duty coverage for the following position with a **retroactive** date of **January 1, 2015**:

**Detective Investigations**

There is one (1) employee to be covered under hazardous duty at this time. Attached is a copy of the Position Questionnaire and Job Description.

The City of Georgetown has requested hazardous duty coverage for the following position with a **retroactive** date of **July 1, 2014**:

**Fire Inspector**

There is one (1) employee to be covered under hazardous duty at this time. Attached is a copy of the Position Questionnaire and Job Description.

The City of Fort Mitchell has requested hazardous duty coverage for the following positions with an effective date of June 1, 2015. They have also submitted new job titles and new job descriptions for previously approved positions:

**Police Officer (new position)**
**Police Sergeant (new title, updated job description)**
**Police Chief (updated job description)**
**Fire Lieutenant (updated job description)**
**Assistant Fire Chief (new position)**
**Fire Chief (new position)**
**Fire Captain (updated job description)**

Agency did not submit a list of employees to be covered under hazardous duty. Attached are copies of the Position Questionnaires and Job Descriptions.

The Franklin County Fiscal Court has requested hazardous duty coverage for the following position with an effective date of June 1, 2015:

**Assistant Fire Chief**

There are no employees to be covered under hazardous duty at this time. Attached is a copy of the Position Questionnaire and Job Description.

**HAZARDOUS POSITIONS (FOR EMPLOYEES HIRED 9/1/08 OR AFTER)**

Allen County Fiscal Court has requested hazardous duty coverage for the following positions with a **retroactive** date of **January 1, 2015**:

**Detective Investigations**

There is one (1) employee to be covered under hazardous duty at this time. Attached is a copy of the Position Questionnaire and Job Description.

The City of Fort Mitchell has requested hazardous duty coverage for the following position with an effective date of June 1, 2015 and also a title change for a previously approved position:

**Police Officer (new position)**
**Police Lieutenant (new position)**
**Firefighter/EMT (title change)**

There are no employees to be covered under hazardous duty at this time. Attached are copies of the Position Questionnaires and Job Descriptions.

The City of Highland Heights has requested hazardous duty coverage for the following positions with a **retroactive** date of **November 1, 2014**:

| | |
|---|---|
| **Police Lieutenant** | **Police Sergeant** |
| **Police Detective** | **Police Officer** |

There is one (1) employee to be covered under hazardous duty at this time. Attached are copies of the Position Questionnaires and Job Descriptions.

The Franklin County Fiscal Court has requested hazardous duty coverage for the following position with an effective date of June 1, 2015:

**Assistant Fire Chief**

There are no employees to be covered under hazardous duty at this time. Attached is a copy of the Position Questionnaire and Job Description.

The Louisville Airport Authority has requested hazardous duty coverage for the following positions with an effective date of June 1, 2015:

**Director of Public Safety** **Asst. Director of Public Safety**
**Public Safety Commander**

There are no employees to be covered under hazardous duty at this time. Attached are copies of the Position Questionnaires and Job Descriptions.

**HAZARDOUS POSITIONS – KERS AGENCY**

Northern Kentucky University has requested hazardous duty coverage for the following position with a **retroactive date of September 1, 2014:**

**Police Lieutenant – Emergency Planning**

There is one (1) employee to be covered under hazardous duty at this time. Attached is a copy of the Position Questionnaire and Job Description.

**RECOMMENDATION:** The positions for which hazardous duty has been requested are presented for discussion.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the KRS Board of Trustees

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Hazardous Duty Certification Dispute - City of Frankfort Fire Marshall

**SUMMARY:** City of Frankfort ("Frankfort"), a CERS agency, following inquiries from Employer Reporting Compliance and Education ("ERCE"), has asserted that their Fire Marshall should be considered a nonhazardous position pursuant to position description changes instituted in 2012. KRS legal and ERCE staff have reviewed this matter and made the recommendation found below.

**DESCRIPTION:** Beginning in early 2015, a KRS ERCE representative contacted the City of Frankfort regarding the improper reporting of a member working as their Fire Marshall. ERCE advised the City of Frankfort that their reporting of the Fire Marshall as "non-hazardous" was improper because the position had previously been certified as a hazardous position.

In response Frankfort requested review of the hazardous classification of the Fire Marshall position and asserted the following arguments in support of the Fire Marshall position being administered as a non-hazardous position:

1. That Frankfort has amended the job duties of the Fire Marshall so that the description is no longer eligible for hazardous duty coverage. Specifically, Frankfort asserted that the new job description no longer requires frequent exposure to a high degree of danger or peril and a high degree of physical conditioning, and the position is primarily clerical or administrative. Consequently, the position does not qualify as hazardous pursuant to KRS 61.592.

2. That Frankfort had posted the position as non-hazardous in 2012 when the current member was hired into the position; and

3. That Frankfort had reported the Fire Marshall position as non-hazardous since July 2012 without receiving any questions from KRS.

Staff does not consider the arguments put forth by Frankfort compelling as noted below.

KRS staff reviewed Frankfort's file and the history of the Frankfort Fire Marshall position and identified the following pertinent facts:

1. Pursuant to HB 398, Frankfort's Fire & Safety Inspector (later called a Fire Marshall) position was requested to be certified as hazardous by Frankfort and certified as a hazardous duty position on or about August 1, 1988;

2. In March 2006, the City changed the title of the position from Fire & Safety Inspector to Fire Marshall. The title change did not affect the hazardous coverage of the position.

3. Pursuant to HB 1, all previously certified hazardous positions were de-certified as non-hazardous. To renew hazardous coverage, employers were forced to re-certify any positions they wanted covered by hazardous coverage on or after September 1, 2008.

4. In January 2009 Frankfort requested KRS' Board to re-certify a number of positions for hazardous position coverage, including the Fire Marshal position, retroactive to September 1, 2008.

5. In May 2009 pursuant to Frankfort's request and the positions eligibility for hazardous coverage, KRS' Board certified the Fire Marshall position for hazardous coverage.

6. Two job descriptions were submitted by the City of Frankfort and reviewed by staff.

**CONCLUSION:** Regardless of Frankfort's alleged July 2012 job description amendment, the Frankfort Fire Marshall is a position that must participate in hazardous duty coverage.

- The position was covered under hazardous duty coverage prior to September 1, 2008; therefore, any member working in that position with a participation date prior to September 1, 2008 must be reported as a hazardous duty employee.

- The position was re-certified as a hazardous duty position on or after September 1, 2008. KRS 61.592. Therefore as long as the Frankfort Fire Marshall is considered a "firefighter" pursuant to KRS 61.315, the position must continue to be reported as a hazardous duty position regardless of the member's participation date.

    - The provisions of KRS 61.592 regarding a hazardous employee's duties requiring frequent exposure to a high degree of danger or peril, a high degree of physical conditioning and prohibiting duties that are primarily clerical or administrative are not applicable pursuant to OAG 08 08.

**RECOMMENDATION:** After review of the facts as documented by KRS' records, information received from Frankfort, information received from the current Frankfort Fire Marshall, and the applicable statutory/regulatory guidelines, KRS staff recommends the Board adopt the following motion:

**PROPOSED MOTION:** The position of Fire Marshall in Frankfort, pursuant to the application for hazardous duty coverage, the positions eligibility for coverage, and the subsequent certification of hazardous duty coverage, both before and after September 1, 2008, requires that the position of Frankfort Fire Marshall be administered as a hazardous duty position.

# KENTUCKY RETIREMENT SYSTEMS

**TO:** Members of the KRS Board of Trustees

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Ordinary Amendment to 105 KAR 1:200 – Retirement Procedures and Forms

**SUMMARY:** 105 KAR 1:200 provides the procedures and incorporates the forms a member must file for a member to retire. Staff recommends the following amendments be made to 105 KAR 1:200.

1) A new Form 6000 has been developed that contains all the forms necessary for a member to file for retirement. The amendment describes the sections of the Form 6000 rather than the individual forms. There is a section requiring employer certification of projected service and salary if it is to be utilized in the calculation of the member's estimated retirement allowance.

2) The provisions for the health insurance forms have been removed because those provisions have been incorporated into 105 KAR 1:410, the regulation providing procedures for Kentucky Retirement Systems Health Insurance and Kentucky Retirement Systems Insurance Fund Trust.

3) The provisions for a partial lump sum payment option are being removed because that payment option is no longer available on or after January 1, 2009, pursuant to HB 1 enacted during the 2008 Special Session.

4) A Kentucky Driver's License is being added to the list of acceptable documents for verification of birth date. Baptismal record, marriage license, and school record are being removed from the list.

5) Language regarding prior statutory amendments is being incorporated including the requirement for termination from all participating employers in KERS, CERS, and SPRS in accordance with KRS 61.637, and the requirement to file the Form 6010 within six months of being approved for disability in accordance with KRS 61.590

**RECOMMENDATION**: The Executive Director recommends the board authorize staff to file the ordinary amendment to 105 KAR 1:200 and make necessary non-substantive changes that might be required to complete the regulatory process.

FINANCE AND ADMINISTRATION CABINET

Kentucky Retirement Systems

(Amendment)

105 KAR 1:200 Retirement procedures and forms.

RELATES TO: KRS 16.576, 16.577, 16.645, 61.590, 61.595, 61.623, 61.637, 61.680 [~~61.702~~], 61.705, 78.545.

STATUTORY AUTHORITY: KRS 61.590(1), 61.645(9)(g)

NECESSITY, FUNCTION, AND CONFORMITY: KRS 61.645(9)(g) authorizes the Board of Trustees of Kentucky Retirement Systems to promulgate administrative regulations necessary or proper in order to carry out the provisions of KRS 61.510 to 61.705, 16.505 to 16.652, and 78.510 to 78.852. KRS 61.590(1) requires that a member or beneficiary eligible to receive retirement benefits have on file at the retirement office each form required by the board. This administrative regulation establishes the procedures and forms for application for and receipt of retirement benefits by members of the Kentucky Retirement Systems.

Section 1.(1)[~~(a)~~]The member shall submit a Form 6000, Notification of Retirement, to the retirement systems no earlier than six (6) months prior to the member's desired effective retirement date. If the member submits a Form 6000, Notification of Retirement, that is incomplete or is incorrect the retirement systems shall find the Form 6000, Notification of Retirement, to be invalid and shall notify the member

of the actions necessary for completion or correction. The retirement systems shall not process an invalid Form 6000, Notification of Retirement.

[~~(b) member shall provide current information regarding any sick or compensatory leave balances with the Form 6000, Notification of Retirement~~].

~~(c) The member shall file copy of the member's most recent check stub indicating the sick and compensatory leave balances or the member shall submit written verification by the member's employer of the member's sick and compensatory leave balances as of the member's actual or scheduled employment termination date~~].

(2) The member shall designate the beneficiary of the member's retirement allowance on the Form 6000, Notification of Retirement.

(3) The Form 6000, Notification of Retirement, shall be dated and the member's signature shall be witnessed.

(4) (a) The member shall designate on the Form 6000, Notification of Retirement, all other state administered retirement systems from which the member is simultaneously retiring with reciprocity.

(b) If the member fails to retire from all state administered retirement systems simultaneously or with an effective retirement date within one (1) month of the member's effective retirement date in the Kentucky Employees Retirement System, the County Employees Retirement System, or the State Police Retirement System the member shall not retire with reciprocity after the member's effective retirement date.

(5) (a) The member may designate a federal tax withholding preference on the Form 6000, Notification of Retirement.

(b) If the member fails to designate a federal tax withholding preference the retirement systems shall withhold federal tax based on married status with three (3) exemptions.

(c) A recipient of a monthly retirement allowance may submit a Form 6017, Federal Income Tax Withholding Preference for Periodic Payments to establish or change the recipient's federal tax withholding preference.

(d) A recipient of a monthly retirement allowance may establish or change the recipient's tax withholding preference via Retiree Self Service on the website maintained by Kentucky Retirement Systems.

(6) (a) The member may designate a beneficiary of the $5,000 Death Benefit on the Form 6000, Notification of Retirement.

(b) A retired member may file a Form 6030, Death Benefit Designation, to designate or change the beneficiary of the $5,000 Death Benefit at any time after the retired member begins receiving a monthly retirement allowance.

(c) If the member does not designate a beneficiary of the $5,000 Death Benefit, the member's estate shall be the beneficiary.

(d) If the member files a Form 6030, Death Benefit Designation, to change the beneficiary of the $5,000 Death Benefit that is incomplete or incorrect, the member's beneficiary designation on file at the retirement office shall remain in effect.

(7)(a) The member shall authorize the direct deposit of the member's retirement allowance on the Form 6000, Notification of Retirement.

(b) The member shall attach to the Form 6000, Notification of Retirement:

1. a voided personalized check for the account to which the retirement allowance is being deposited; or

2. verification from the financial institution receiving the electronic fund transfer.

(c) A recipient of a monthly retirement allowance may change the designated financial institution or account by filing a Form 6130, Authorization for Deposit of Retirement Payment, at the retirement office in Frankfort.

(d) A recipient of a monthly retirement allowance may establish or change the recipient's designated financial institution or account via Retiree Self Service on the website maintained by Kentucky Retirement Systems.

(e) The member shall submit a Form 6135, Request for Payment by Check, if the member does not currently have an account with a financial institution or the member's financial institution does not participate in the electronic funds transfer program.

(8) (a) The member's employer shall complete Section H of the Form 6000, Notification of Retirement. If the employer does not complete Section H of the Form 6000, Notification of Retirement, the retirement systems shall only utilize the information reported by the member's employer and former employers to the retirement systems in accordance with KRS 61.675 and 78.625 and shall not include any additional sick leave, compensatory time, or projected salary increases in its calculations of the member's retirement allowance or eligibility to retire.

(b) Section H of the Form 6000, Notification of Retirement, shall be signed by a person designated by the employer on file at the retirement office.

Section 2. (1)(a) The member shall provide the retirement system with a copy of the member's birth certificate or other verification of date of birth of the member and, if a

survivorship payment option is selected, a copy of the birth certificate or other verification of date of birth of the beneficiary named on the member's Form 6000, Notification of Retirement.

(b) If the member's or beneficiary's name is no longer the same as the name listed on the birth certificate or other verification of date of birth, the systems shall require the member or beneficiary to submit a marriage license, court order, or legally-binding documentation of the name change.

(2) The retirement system shall accept one (1) or more of the following as proof of date of birth of the member or beneficiary:

(a) Age record of the Social Security Administration;

(b) Immigration and naturalization service records;

(c) Birth certificate;

(d) Military discharge;

(e) U.S. passport;

(f) Driver's License issued by the Commonwealth of Kentucky; or

(g) Other reliable proof of date of birth that may be used by the courts to verify the person's date of birth.

Section 3[~~2~~]. (1) The retirement system shall provide an estimate of the member's retirement allowance based on the salary reported to the system and information [~~that may be supplied by the member or the~~] provided by the member's employer.

(2) The payment options and amounts available to the member shall be printed on the Form 6010, Estimated Retirement Allowance, and provided to the member with a place to designate the member's choice of payment option.

[~~Section 3. (1)~~](3)(a) The member shall designate a desired payment option and sign and date the Form 6010, Estimated Retirement Allowance.

(b) The member's signature on the Form 6010, Estimated Retirement Allowance, shall be witnessed and the Form 6010, Estimated Retirement Allowance, returned to the retirement office as required by subsection (4)(b) [~~(2)(c)~~] or (5)[~~(3)~~] of this section.

(4)[~~(2)~~](a) The member shall terminate employment with all employers participating in the Kentucky Employees Retirement System, the County Employees Retirement System, and the State Police Retirement System no later than the month before the member's effective retirement date if the member is retiring pursuant to KRS 61.590(5)(a) or (c). [~~The member's employment shall be terminated the month before the member's effective retirement date~~].

(b) The retirement office shall process the first payment in the month following the month in which the completed Form 6010, Estimated Retirement Allowance, and all other applicable forms and documents as provided in this administrative regulation, have been filed at the retirement office but not before the member's effective retirement date.

[~~(c) The Form 6010, Estimated Retirement Allowance, and all other applicable forms as provided in this administrative regulation, shall be filed in the retirement office on the last day of the month preceding the month of the member's effective retirement date.~~]

(5) [~~(3)~~] If the member is retiring pursuant to KRS 61.590(5)(c) [~~early retirement provisions~~], the member shall return the Form 6010, Estimated Retirement Allowance, within six (6) months of the member's effective retirement date as provided on the member's Form 6000, Notification of Retirement to retain the effective date of retirement shown on the form.

(6) [~~(4)(a)~~] If the member fails to return the Form 6010, Estimated Retirement Allowance, within six (6) months of the member's effective retirement date, the member's Form 6000, Notification of Retirement, shall be [~~considered~~] void and the member shall be required to submit a new Form 6000, Notification of Retirement and select a new effective retirement date. The member shall not select an effective retirement date prior to the date the Form 6000, Notification of Retirement is submitted.

(7) If a member who is approved for disability retirement benefits fails to return the member's Form 6010, Estimated Retirement Allowance within six (6) months of the date the member is notified that the member's disability application has been approved, then the member's Form 6000, Notification of Retirement, and the approval of the member's application for disability retirement benefits shall be considered void. The member may file a subsequent Form 6000, Notification of Retirement, to re-apply for disability retirement benefits.

(8) [~~(b)~~] If a member's Form 6000, Notification of Retirement, is withdrawn, invalid, or voided, the beneficiary or beneficiaries and contingent beneficiary or beneficiaries designated on the last Form 2035, Beneficiary Designation, on file at the retirement office shall remain in full force and effect.

Section 3. [~~4. (1)(a) The member shall provide the retirement system a copy of the member's birth certificate or other verification of age and, if a survivorship payment option is selected, a copy of the birth certificate or other verification of age of the beneficiary named on the member's Form 6000, Notification of Retirement.~~

~~(b) If the member's or beneficiary's name is no longer the same as the name listed on the birth certificate or other verification of age, the systems shall require the member or beneficiary to submit a marriage license, court order, or legally-binding documentation of the name change.~~

~~(2) The retirement system shall accept one (1) or more of the following as proof of age of the member or beneficiary:~~

~~(a) Age record of the Social Security Administration;~~

~~(b) Immigration and naturalization service records;~~

~~(c) Baptismal record;~~

~~(d) Marriage license;~~

~~(e) School record;~~

~~(f) Birth certificate;~~

~~(g) Military discharge;~~

~~(h) U.S. passport; or~~

~~(i) Other reliable proof of age that may be used by the courts to verify the person's age.~~

~~Section 5. (1)(a) A recipient shall complete a Form 6130, Authorization for Deposit of Retirement Payment, to have the monthly retirement allowance deposited to an account in a financial institution.~~

~~(b) The member or financial institution shall provide the information and authorizations required for the electronic transfer of funds from the State Treasurer's Office to the designated financial institution.~~

~~(2)(a) At any time while receiving a retirement allowance, the recipient may change the designated institution by completing a new Form 6130, Authorization for Deposit of Retirement Payment and filing the form at the retirement office in Frankfort.~~

~~(b) The last Form 6130, Authorization for Deposit of Retirement Payment on file at the retirement office shall control the electronic transfer of the recipient's retirement allowance.~~

~~(3) The recipient may complete a Form 6135, Request for Payment by Check, if the recipient does not currently have an account with a financial institution or the recipient's financial institution does not participate in the electronic funds transfer program.~~

~~(4) The retirement office shall not process the retirement allowance until the recipient has filed a completed:~~

~~(a) Form 6130, Authorization for Deposit of Retirement Payment; or~~

~~(b) Form 6135, Request for Payment by Check.~~

~~Section 6. (1) The retirement office shall provide a Form 6120, Certification of Service, to the member to certify service with another agency participating in the Kentucky Retirement Systems for which the member may be eligible to purchase credit prior to employment termination.~~

~~(2) The retirement office shall, upon request, provide the member with the cost of purchasing the service and an estimate of the benefits attributable to the additional service credit.~~

~~Section 7. (1)(a) The retirement office shall provide forms for the selection or waiver of medical insurance coverage for the member, the member's spouse, or the member's dependents pursuant to the group insurance plan upon retirement.~~

~~(b) The recipient shall complete the Kentucky Employees Health Plan Health Insurance Application for the Kentucky Retirement Systems or the Form 6200, Kentucky Retirement Systems Medicare Eligible Insurance Enrollment Form.~~

~~(2)(a) If the insurance form is received by the last day of the month prior to the month the initial retirement allowance is processed, the insurance coverage shall be effective the first day of the month the recipient becomes eligible for insurance coverage.~~

~~(b) If the form is received or if changes are made within thirty (30) days following the first day of the month in which the initial retirement allowance is processed, coverage shall be effective the first day of the month following the month in which the initial retirement allowance is processed.~~

~~(3) A recipient who fails to submit a form selecting medical insurance coverage within thirty (30) days following the first day of the month in which the initial retirement allowance is processed shall not be eligible for benefits pursuant to the insurance plan until the following open enrollment period.~~

~~Section 8. (1) The retirement office shall provide a Form 6017, Federal Income Tax Withholding Preference for Periodic Payments, to the member to request that~~

~~federal income taxes be withheld or not withheld from the member's retirement allowance.~~

~~(2) If the member is eligible for benefits from the excess benefit plan, the member shall provide the information required by 26 U.S.C. 3402 for purposes of federal income tax withholding from the member's retirement allowance.~~

~~Section 9. (1) The retirement office shall provide a Form 6030, Death Benefit Designation, to the member to designate a beneficiary for the death benefit provided by the Kentucky Retirement Systems.~~

~~(2) If the member does not file or incorrectly completes a Form 6030, Death Benefit Designation, the member's estate shall become the default beneficiary.~~

~~Section 10.~~] (1) ~~The retirement office shall not process a monthly retirement allowance until the member has filed at the retirement office:~~

~~(a) A Form 2001, Membership Information;~~

~~(b) A properly signed, witnessed, and dated Form 6010, Estimated Retirement Allowance;~~

~~(c) A copy of the member's birth verification;~~ and

~~(d) A copy of the birth verification for the beneficiary if selecting a survivorship option; [and~~

~~(e)1. A completed Form 6130, Authorization for Deposit of Retirement Payment; or~~

~~2. A completed Form 6135, Request for Payment by Check.]~~

~~(2)~~ (a)The retirement office shall not process a lump sum retirement benefit until [~~: (a) The~~] the member has filed at the retirement office:

1. A Form 2001, Membership Information Form;

2. A properly signed, witnessed, and dated Form 6010, Estimated Retirement Allowance;

3. A Form 6025, Direct Rollover/Direct Payment Election Form for a Member or a Spouse Beneficiary of an Eligible Rollover Distribution; and

[~~4. A copy of member's birth verification; and~~]

(b) The member's employer has filed at the retirement office proof of the member's employment termination and reported all creditable compensation and accumulated sick leave.

[~~(3) The retirement office shall not process a partial lump sum options retirement benefit until:~~

~~(a) The member has filed at the retirement office:~~

~~1. A Form 2001, Membership Information Form;~~

~~2. A properly signed, witnessed, and dated Form 6010, Estimated Retirement Allowance;~~

~~3. A Form 6025, Direct Rollover/Direct Payment Election Form for a Member or a Spouse Beneficiary of an Eligible Rollover Distribution;~~

~~4. A copy of the member's birth verification; and~~

~~5. A copy of the birth verification for the beneficiary if selecting a survivorship option; and~~

~~(b) The recipient has filed a completed:~~

~~1. Form 6130, Authorization for Deposit of Retirement Payment; or~~

~~2. Form 6135, Request for Payment by Check~~.]

Section 4.[~~11.~~] Incorporation by Reference. (1) The following material is incorporated by reference:

(a) Form 6000, "Notification of Retirement", May 2015 [~~July 2004~~];

(b) Form 6010, "Estimated Retirement Allowance", May 2015 [~~July 2004~~];

(c) Form 6130, "Authorization for Deposit of Retirement Payment", May 2015 [~~May 2008~~];

(d) [~~Form 6120, "Certification of Service", July 2000;~~

~~(e) Form 6200, "Kentucky Retirement Systems Medicare Eligible Insurance Enrollment Form", October 2006;~~

~~(f)~~] Form 6017, "Federal Income Tax Withholding Preference for Periodic Payments", May 2015 [~~May 2008~~];

(e) [~~(g)~~] Form 6030, "Death Benefit Designation", May 2015 [~~May 2008~~];

(f) [~~(h)~~] Form 6135, "Request for Payment by Check", May 2015 [~~February 2002~~];

[~~(i) "Kentucky Employees Health Plan Health Insurance Application for the Kentucky Retirement Systems (KRS)"; August 2007;~~

(g) [~~(j)~~] Form 2001 "Membership Information", May 2015 [~~February 2002~~];

(h) [~~(k)~~] Form 2035, "Beneficiary Designation", May 2015 [~~June 2003~~]; and

(i) [~~(l)~~] Form 6025, "Direct Rollover/Direct Payment Election Form for a Member or a Spouse Beneficiary of an Eligible Rollover Distribution", May 2015 [~~May 2008~~].

(2) This material may be inspected, copied, or obtained, subject to applicable copyright law, at the Kentucky Retirement Systems, Perimeter Park West, 1260 Louisville Road, Frankfort, Kentucky 40601, Monday through Friday, 8 a.m. to 4:30 p.m.

_____ _____

DATE THOMAS ELLIOTT, CHAIR
BOARD OF TRUSTEES OF
KENTUCKY RETIREMENT SYSTEMS

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the KRS Board of Trustees

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** KRS Board of Trustees 2015 Retreat

We have solicited proposals to host the retreat from a number of hotels in various central locations around the State. Attached you will find a spreadsheet that provides the details regarding cost and other information related to these proposals.

**RECOMMENDATION**: The Executive Director recommends that the KRS Board select the dates on which to hold the 2015 retreat and select the site where the retreat will be held.

Proposed Dates: October 21-23, 2015

| Venue | Guest room (daily) | Meeting Room (daily) | Food & Beverage | WiFi | Parking | Breakfast | Notes |
|---|---|---|---|---|---|---|---|
| Louisville East Marriott | | | | | | | October dates unavailable due to citywide events |
| Galt House | | | | | | | October dates unavailable due to citywide events |
| Hyatt Downtown Louisville | | | | | | | October dates unavailable due to citywide events |
| Marriott Covington | $189.00 King Suite | $300.00 for Covington I | Minimum $2200 for rooms/meeting rooms | Available | $24/day in garage | Onsite restaurant or options nearby | 2013 renovation |
| Embassy Suites Covington | $155.00 King Suite | $250.00 for Captain's View | Minimum $1000 for room/meeting rates | Available- | Complimentary self/$22 valet in attached garage | Complimentary onsite or options nearby | Nightly complimentary Manager Reception in lobby |

*Lexington not considered due to Keeneland and Breeders' Cup events*

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the KRS Board of Trustees

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Report of the KRS Board of Trustees Executive Search Committee

The KRS Board of Trustees Executive Search Committee held its first meeting on May 14, 2015. The Committee members voted to issue the attached Request for Proposals – Executive Director Search Firm.

**RECOMMENDATION**: The Executive Director recommends that the KRS Board of Trustees ratify the action of the KRS Executive Director Search Committee.

# REQUEST FOR PROPOSALS


## Kentucky Retirement Systems

## Executive Director Search Firm

## May 26, 2015

## Section I

## General Information

### A. Issuing Office

This Request for Proposals ("RFP") is being issued by the Kentucky Retirement Systems ("KRS"). The only entity having the authority to obligate KRS in regard to this solicitation is the Board of Trustees of the Kentucky Retirement Systems.

### B. Purpose of Document

KRS intends to retain a firm to conduct research, screen and make recommendations of qualified candidates for the position of Executive Director of the Kentucky Retirement Systems to the Executive Director Search Committee.

### C. Commitment of KRS

KRS reserves the right to withdraw this RFP at any time and for any reason.

Receipt of proposal materials by KRS or submission of a proposal to KRS confers no rights upon the Proposer nor obligates KRS in any manner.

A personal service contract, based on this RFP, may or may not be awarded. Any contract resulting in an award from this RFP is invalid until properly approved and executed by KRS. Any agreements shall be construed and interpreted according to the laws of the Commonwealth of Kentucky. This RFP and the Proposer's proposal shall become a part of the contract, if and when issued.

### D. Inquiries

Contact with KRS or other agency personnel except as specified below is prohibited. All inquiries in regard to this solicitation shall be made in writing to:

Marlane F. Robinson, PHR
Human Resources Director
Kentucky Retirement Systems
1260 Louisville Road
Frankfort, KY 40601
FAX: (502) 696-8801

Or by e-mail to:

marlane.robinson@kyret.ky.gov

No verbal representations made or assumed to be made during any discussions held between representatives of potential Proposers and any KRS personnel are binding.

**E. Submission Date for Proposals**

To be considered for contract award, copies of the proposal requested by this RFP shall be on file at the office of Kentucky Retirement Systems, 1260 Louisville Road, Frankfort, Kentucky 40601, **by 4:30 p.m. EDT on June 26 , 2015**. At its discretion after review of proposals, KRS may invite selected Proposers to introduce members of a proposed project team and make an oral presentation of the proposed plan of work.

**F. Period of Contract**

The term of the initial contract will be for up to twelve (12) months from date of approval by the Board of Trustees of the Kentucky Retirement Systems. This engagement may be cancelled upon thirty (30) days written notice by KRS.

**G. Payment for Services**

1. Payment Procedures

Payments are predicated upon completion of the described work and delivery of the required reports. KRS will consider payment based on agreed upon deliverables.

2. Method of Payment

Each invoice for services shall contain an itemization of services performed and the rates associated with each activity. Reimbursement for travel shall be made in accordance with the Travel Policy adopted by the KRS Board of Trustees. A copy of the KRS Travel Policy is included as **Attachment A** to this RFP and is incorporated by reference into and shall be a part of this RFP. KRS will make every reasonable effort to make payments within thirty (30) business days after receipt of a properly supported invoice.

**H. Verification of Information**

KRS may request documentation from Proposers of any information provided in their proposals.

**I. References**

Proposers shall submit a list of at least three (3) current and former clients and describe the work performed for each. Provide a brief summary of the engagement and indicate whether the client is a current client (i.e., one with whom a search is currently underway) or a former client. For all references, include the site name, the name / phone / address of a client representative who is familiar with that work and may be contacted regarding the firm's qualifications and past performance.

All references may be contacted by KRS to verify the Proposer's claims. Proposers are advised to ensure that the contact person's telephone number is current and that each reference contact is willing to discuss the Proposer's performance with the evaluation committee.

**J. Principal Firm Responsibility**

Any contracts that may result from the RFP shall specify that the principal individual or individuals solely responsible for fulfillment of the contract with KRS. The principal individual or individuals shall be designated in the proposal.

**K. Cost of Preparing Proposal**

Costs for developing the proposal are solely the responsibility of the Proposer. KRS shall provide no reimbursement for those costs.

KRS may ask Proposers to conduct oral presentations relating to their proposals. If a Proposer is invited to make an oral presentation, any costs associated with any oral presentations shall be the responsibility of the Proposer and shall in no way be billable to KRS.

## Section II

## Overview

KRS is a $15.7 billion dollar state administered retirement system. KRS administers three (3) retirement systems under Kentucky Revised Statutes Chapter 16.505 et seq., Chapter 61.510 et seq. and Chapter 78.510 et seq. that provide pension and health insurance benefits to state and local government retirees. Each plan is a tax qualified defined benefit governmental retirement plan in accordance with applicable federal statutes. A thirteen-member Board of Trustees, who has the authority to appoint an Executive Director as the Chief Administrative Officer, governs the Systems. Additional information concerning the Systems can be obtained from the Comprehensive Annual Financial Report at the following web site: http://www.kyret.ky.gov.

## Section III

## Statement of Work

**A. General Nature of Services Required**

1. Research, source, screen, interview and reference qualified candidate pool (4-6), so KRS can conduct a minimum of two (2) rounds of interviews.

2. Provide a detailed explanation of the search process you would employ. This should include how you identify, process, and evaluate the candidates.
3. Explain documentation procedures and reference checking methodology.
4. Provide a proposed timetable. The Board expects to have the final candidates for the position within one hundred twenty (120) days after selection of a firm. The

timetable should include a schedule of progress reports that would be submitted to the Board.

5. Assist with the preparation of a job description and provide salary competitiveness analysis.

## Section IV

## Terms and Conditions

### A. General

The contract shall be construed according to the laws of the Commonwealth of Kentucky. Any legal proceedings against KRS regarding this RFP or any resulting contract shall be brought in a Commonwealth of Kentucky judicial forum. Venue shall be in Franklin County, Kentucky.

### B. Proposals - Acceptance and Disposition

All proposals properly submitted shall be accepted by KRS for consideration. However, KRS reserves the right to request amendments, reject all proposals, reject any proposal that does not meet mandatory requirements, or cancel this RFP, according to what is in the best interests of KRS.

This RFP is the property of KRS and may not be sold or copied without the express written consent of KRS. The successful proposal shall be incorporated into the resulting contract by reference.

### C. Advertising Award

The Proposer shall agree not to refer to awards in commercial advertising in a manner that states or implies that the individual or firm or its services are endorsed or preferred by the Kentucky Retirement Systems or the Commonwealth of Kentucky.

### D. Pricing

The personal service contract proposed in response to this RFP shall be priced as follows:

Proposer should provide a specific explanation of a pricing scheme, including any methodology used to determine the pricing scheme.

### E. Personnel

The Proposer shall warrant that all persons assigned by it to the performance of this contract shall be employees of the Proposer and shall be fully qualified to perform the work required by the contract. KRS reserves the right to approve any change to key individuals assigned to service the contract with KRS.

**F. Independent Contractor**

It is expressly agreed that the Proposer and agents, officers, and employees of the Proposer in the performance of this contract shall act in an independent contractor capacity, and not as officers or employees of KRS or the Commonwealth of Kentucky.

**G. Subcontracts**

No contract shall be made by the Proposer with any other party for furnishing any of the work or services hereunder.

**H. Hold Harmless**

The Proposer shall indemnify, defend, and hold harmless the Kentucky Retirement Systems, the Commonwealth of Kentucky, and their officers, agents, and employees from:

- any claims or losses for service rendered by the Proposer, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the contract;
- any claims or losses to any person or firm injured or damaged by the erroneous or negligent act of the Proposer, its officers or employees in the performance of the contract;
- any claims or losses resulting to any person or firm injured or damaged by the Proposer, its officers or employees by the publication, translation, reproduction, delivery, performance, use, or disposition of any data processed under the contract in a manner not authorized by the contract, or by federal or state statutes or regulations; and
- any failure of the Proposer, its officers, or employees to observe Kentucky statutes, including but not limited to, labor laws and minimum wage laws.

**I. Employment Practices**

The Proposer shall not discriminate against any employee or applicant for employment because of race, religion, sex, national origin, age (except as provided by law), marital status, political affiliations, or disability. The Proposer shall take affirmative action to ensure that employees, as well as applicants for employment, are treated without discrimination because of their race, color, religion, sex, national origin, age, (except as provided by law), marital status, political affiliation, or disability. This action shall include, but is not limited to, the following: layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. Proposer agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provision of this clause.

## Section V

## Instructions for Proposal Preparation

### A. Proposer Response and Proprietary Information

This RFP specifies the format, required information, and general content for proposals submitted in response to the RFP. KRS shall not disclose any portions of the proposals prior to contract award to anyone outside KRS' contract award process. After a contract is awarded in whole or in part, KRS shall have the right to duplicate, use or disclose all proposal data submitted by Proposers in response to this RFP as a matter of public record. KRS recognizes the Proposer's possible interest in preserving selected data which may be part of a proposal. KRS shall treat any requests to maintain the confidentiality of selected information as required by the Kentucky Open Records Act, KRS 61.870 et seq., and other applicable statutes.

Informational areas that might be considered proprietary shall be limited to individual personnel data, customer references, selected financial data, formulas, and financial audits, which, if disclosed, would permit an unfair advantage to competitors. If a proposal contains information in these areas that a Proposer declares proprietary in nature and not available for public disclosure, each sheet containing such information shall be clearly designated as proprietary at the top and bottom of the page and shall be submitted under separate cover marked "Proprietary Data." Proposals containing information declared by the Proposer to be proprietary, either in whole or in part, outside the areas listed above, may be deemed non-responsive to this RFP and may be rejected.

KRS shall have the right to use all system ideas, or adaptations of those ideas, contained in any proposal received in response to this RFP. Selection or rejection of the proposal shall not affect this right.

### B. Proposal Submission Requirements

Each qualified Proposer shall submit only one proposal. Alternate proposals shall not be allowed.

Ten (10) hard copies and one electronic copy (via email, flash drive or CD) of the proposal under sealed cover shall be on file **no later than 4:30 p.m.** on the date indicated in Section I. Any proposal received after this date and time shall be rejected and returned unopened to the Proposer. Proposals shall be mailed to:

Marlane F. Robinson, PHR
Human Resources Director
Kentucky Retirement Systems
1260 Louisville Road
Frankfort, Kentucky 40601

OR

Hand-Delivered to:

Marlane F. Robinson, PHR
Human Resources Director
Kentucky Retirement Systems
1270 Louisville Road
Frankfort, Kentucky 40601

The package shall be marked: **EXECUTIVE DIRECTOR SEARCH FIRM RFP**

**C. Transmittal Letter**

The transmittal letter shall be on the Proposer's official business letterhead. It shall include the following, in the order given:

- a signed statement certifying that no personnel currently employed by, under contract with, or in any way associated with the Commonwealth of Kentucky or KRS have participated in any activities relating to the preparation of the Proposer's proposal, except as provided for in this RFP;
- a statement that acknowledges and agrees to all of the rights of KRS, including terms and conditions, and all other rights and terms specified in this RFP;
- the Proposer's guarantee that the proposal as submitted shall remain in full force and effect as specified in this RFP for at least two (2) months after the closing date for responses or until a contract is approved, whichever comes first;
- a statement explaining any exceptions taken to the requirements of this RFP;
- a statement that acknowledges if proprietary data is included;
- a statement that contains the Proposer's contact person, address, phone, and fax numbers;
- a statement that the Proposer will abide by the non-discrimination provision of this RFP.

The letter shall be signed by the person with the authority to bind the individual or firm, answer questions, and provide clarification concerning its proposal.

## Section VI

## REVIEW CRITERIA

The engagement will be awarded based upon an evaluation of the responses by the Executive Director Search Committee of the Board of Trustees of KRS that provides the best value to KRS. The Executive Director Search Committee will evaluate each firm’s proposal in a fair,

consistent, and objective manner. Responses to questions or requirements identified in this RFP will form the basis of the Executive Director Search Committee's evaluation. The relative importance of particular qualifications and the evaluation factors to be used are identified below:

| | |
|---|---|
| Experience assisting large public pension plans with recruiting and hiring key executive positions | 50% |
| Reliability and Results, based upon feedback from references | 20% |
| Price and Service Terms | 10% |
| Availability of Staff | 10% |
| Completeness of Proposal | 10% |
| Total | 100% |

The final decision regarding proposal selection and contract award shall be made by the Board of Trustees of KRS.

## VII. TENTATIVE TIME TABLE

The following is the tentative time schedule for KRS' search for firms to provide executive search services. All dates are subject to modification by KRS.

| | |
|---|---|
| Issuance of RFP | May 26, 2015 |
| Question Deadline | June 5, 2015- 4:30 p.m. EDT |
| Response to Written Questions | June 12, 2015 |
| RFP Response Deadline | June 26, 2015 - 4:30 p.m. EDT |
| Evaluation Period | June 27-July 27, 2015 |
| Interviews, if desired, with Finalists | July 28-July 31, 2015 |
| Selection by KRS | July 31, 2015 |
| Projected Commencement Date | August 10, 2015 |

Any questions concerning this RFP should be addressed in writing to Marlane F. Robinson by e-mail or via fax at (502) 696-8801 no later than the close of business (4:30 p.m.) on June 5, 2015.

**KENTUCKY RETIREMENT SYSTEMS**

# ATTACHMENT A
# TO RFP FOR EXECUTIVE SEARCH FIRM

# TRAVEL POLICY

**KENTUCKY RETIREMENT SYSTEMS**

# TRAVEL POLICY AND PROCEDURES

**Approval Date: May 20, 2004**
Amended Dates: August 19, 2004; February 15, 2007;
February 19, 2009; August 18, 2011, September 11, 2014

## Section 1: Scope

A. This policy is enacted pursuant to KRS 61.645(9)(c)(4), which provides that employees of Kentucky Retirement Systems ("KRS") are to be reimbursed for all reasonable and necessary travel expenses and disbursements made in the performance of their official duties. Additionally, this policy is enacted pursuant to the Bylaws of the Board of Trustees of KRS, which provides for reimbursement of travel expenses of KRS Board of Trustee members which have been incurred in the performance of their official duties. Pursuant to Kentucky Revised Statute 61.645(13), the expenses incurred on or behalf of KRS and the Board during the fiscal year shall be paid from the retirement allowance account.

B. Pursuant to the provisions of KRS 61.645, the Board of Trustees is permitted to conduct the business of KRS as necessary, limited only by its fiduciary obligations.

C. Pursuant to KRS Chapter 11A, all actual and necessary reimbursements for any Traveler shall be consistent with the requirements of the Kentucky Executive Branch Code of Ethics.

D. Employees of KRS are entitled to the minimum protections provided in KRS Chapter 45, but the Board of Trustees may expand upon those provisions under KRS 61.645.

E. The term "Traveler" as used in this policy shall be construed to mean all KRS Board of Trustees members, employees, or contractors eligible for reimbursement, authorized to conduct business on behalf of the Retirement System.

## Section 2: Authorization and Reimbursement

A. Reimbursement under this policy shall only be made for expenses incurred by KRS' Travelers who have been authorized to conduct business on behalf of KRS.

Reimbursement shall be made only for those types of expenses specifically authorized by the terms of this policy. KRS will not pay for or reimburse for a Traveler's personal expenses; however, if personal expenses are inadvertently paid for or reimbursed by KRS, the Traveler who receives the reimbursement shall repay the amount of personal expense to KRS within ten (10) business days after notice to do so. If the Traveler fails to reimburse KRS, the failure shall be grounds for disciplinary action up to and including dismissal.

B. Reimbursement under this policy shall only be made up to the most reasonably economical, standard accommodation and transportation available. Reimbursement of expenses without prior authorization shall be at the discretion of the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Retirement Systems Board of Trustees or the Trustee designated by the Chair.

C. Requests for reimbursement shall be made within thirty (30) days of the Traveler's returning from travel. Additionally, requests for reimbursement for travel occurring within the thirty day period prior to the end of the fiscal year, shall be submitted within five (5) business days of the Traveler's return from travel. Approval of requests submitted outside of the reimbursement request submission period may be approved at the discretion of the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Board of Trustees, or the Trustee designated by the Chair.

D. Prior to travel, a KRS Traveler shall obtain authorization to travel on official business of KRS by a Division Director, Chief Officer and/or the Executive Director, or his or her designee. Prior to or after travel, the Executive Director shall obtain authorization to travel on official business of KRS outside the Commonwealth of Kentucky by the Chair of the Board of Trustees, or the Trustee designated by the Chair to approve travel reimbursements.

1. In the event of travel outside of Franklin County, but within the Commonwealth of Kentucky, the Traveler shall obtain pre-authorization through e-mail documentation or a Request for Travel Form.

2. In the event of travel outside the Commonwealth of Kentucky, the Traveler shall obtain prior written authorization on a Request for Travel Form.

3. The Request for Travel Form shall contain the following information:

   a) Name and Title of the Traveler requesting travel authorization;
   b) Purpose of the travel;
   c) Vicinity and length of time of travel;
   d) Estimated cost of travel;
   e) Signature and date of signature of person requesting authorization;

f) Signature and date of signature of Division Director;

g) Signature and date of signature of Chief Officer; and

h) Signature and date of signature of the Executive Director or person authorized by the Executive Director; or

i) If the Traveler is KRS' Executive Director, the signature and date of signature of the Chair of the Board of Trustees or Trustee authorized by the Chair.

E. A Traveler's "official workstation" shall be the street address of the Retirement System, unless otherwise designated by the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Retirement Systems Board of Trustees, or Trustee designated by the Chair. The "official workstation" for contractors eligible for reimbursement shall be their principal place of business as designed in the contract, unless otherwise designated by the Executive Director.

F. The "home" of a Traveler shall be the Traveler's principal place of residence, unless otherwise designated by the Executive Director.

G. A Traveler may add vacation days prior to or after travel, but reimbursement shall be limited to the expenses incurred over the time periods and distances required for Agency business.

H. A Traveler may travel with a companion; however, reimbursement shall be limited to the expenses attributable to the Traveler, excluding the companion, over the time periods and distances required for Agency business.

I. The Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Retirement Systems Board of Trustees, or Trustee authorized by the Chair, shall make a final determination regarding any controversy over travel reimbursement, including approval of travel without prior written authorization.

## Section 3: Transportation

A. *Economy required*.

(1) Travelers traveling on official business of KRS shall use the most economical, standard transportation reasonably available and take the most practicable direct and usually traveled routes. Additional expenses incurred by use of other transportation or routes shall be assumed by the Traveler.

(2) Round-trip, excursion or other negotiated reduced-rate rail or plane fares shall be obtained, if practicable.

(3) Tickets prepaid by KRS shall be purchased through agency business travel accounts provided by a major charge card company or commercial travel agencies.

(4) Tickets purchased through the Internet, a travel company, or a travel agency shall be paid by the traveler and reimbursed on a Travel Payment Voucher ("Voucher") or purchased with a ProCard issued under the KRS ProCard Policy.

(5) Change fees shall only be reimbursed to the Traveler if determined necessary by the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Retirement Systems Board of Trustees, or Trustee authorized by the Chair. Items considered change fees shall include, but not be limited to, fees for upgraded seat selection, priority boarding, or upgraded class.

(6) Exceptions may be made at the discretion of the Executive Director, or in the case of travel by the Executive Director, the Chair of the Board of Trustees, or the Trustee designated by the Chair, if other arrangements will be in the best interest of KRS.

B. *State vehicles.*
State-owned vehicles with their credit cards may be used for KRS business travel when available and feasible. Mileage payment shall not be claimed if state-owned vehicles are used.

C. *Privately owned vehicles.*
Mileage claims for use of privately owned vehicles shall be allowed if a state vehicle was not available or feasible.

D. *Buses, shuttles, subways, taxis.*
For city travel, travelers are encouraged to use buses, shuttles, and subways. Taxi fare shall be allowed when more economical transportation is not feasible.

Comment [bct1]: May need to expand to account for Uber other types of services.

E. *Airline travel.*
Commercial airline travel shall be the lowest negotiated coach or tourist class. Additional expense for first-class, business-class, or similar upgrades shall not be reimbursed or paid for by KRS. Payment shall be made in accordance with subsection (A) of this section.

F. *Special Transportation.*
(1) *Rental vehicles,*

a. The cost of rental vehicles, hiring cars, or other special conveyances in lieu of ordinary transportation shall be allowed if written justification from the traveler prior to travel is submitted and approved by the Executive Director, his or her designee. The Executive Director shall not be subject to the prior written approval requirement of this subsection.

b. The cost of renting a vehicles shall be purchased with a KRS ProCard, pursuant to the KRS ProCard Policy

c. Exceptions may be made to the required pre-approval and method of payment at the discretion of the Executive Director, or in the case of travel by the Executive Director, the Chair of the Board of Trustees, or the Trustee designated by the Chair, if other arrangements will be in the best interest of KRS.

(2) Privately owned aircraft may be used if, prior to travel, it is determined to be to the advantage of KRS, measured both by travel costs and travel time.

G *Mileage*

(1) KRS employees and contractors shall not be reimbursed for mileage from his or her home to workstation/workstation to home.

(2) KRS Board of Trustee members shall be eligible to receive reimbursement for mileage for the commute between his or her home and workstation.

(3) If the Traveler's point of origin for travel is the Traveler's home, mileage shall be paid for the shorter of mileage between: the home and travel destination, or workstation and travel destination. Vicinity travel and authorized travel within the area of a Traveler's workstation shall be listed on separate lines on the Voucher document

## Section 4: Accommodations

A. Lodging shall be the most reasonably economical, as determined by considering the reason for the travel as well as the location, state of repair, and amenities of the lodging.

B. Facilities providing special government rates or commercial rates shall be used, if feasible.

C. State-owned facilities shall be used for meetings and lodging if available, practicable and economical.

D. Cost for lodging within forty (40) miles of the Traveler's official workstation or home shall be reimbursed only if approved by the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Board of Trustees, or Trustee designated by the Chair.

E. *Group lodging, by contract*.

(1) KRS may contract with hotels, motels and other establishments for four (4) or more travelers to use rooms on official business. Government rates shall be requested.

(2) The contract may also apply to meals and gratuities. The contract rates and the cost of rooms and meals per person shall not exceed limits set in these policies and procedures.

(3) A Traveler shall not claim reimbursement or subsistence for room and meals paid directly to an establishment providing these services.

(4) Payment shall be made directly to the contracted vendor and shall not include personal charges of travelers or others in the official service of KRS.

(5) Contracted group meeting rooms and lodging and meal charges are exempt from Kentucky sales tax. The KRS sales-use tax number assigned by the Revenue Cabinet shall be specified on the payment document.

(6) Tax exempt numbers shall not be used by individual travelers to avoid point of sale payment of Kentucky sales tax connected with lodging costs. Sales tax payments shall be reimbursed on a travel voucher.

(7) When using state park facilities, reimbursement for rooms and meals may be made by an Interaccount Document subject to the limits of these policies and procedures.

**Section 5: Reimbursement Rates.**

A. The following persons may be exempt from the provisions of this section, subject to the provisions of Section 6:

(1) Executive Director;

(2) Board of Trustees members;

(3) Chief Officers and the General Counsel;

(4) Investment Division Directors; and/or

(5) A KRS Traveler, traveling on assignment with the Executive Director, Board of Trustees members, the General Counsel or Chief Officers.

B. *Lodging*.

(1) A traveler traveling on official KRS business shall be reimbursed for the actual cost of lodging, if the lodging is determined by KRS Controller or Chief Operations Officer to be the most economical; and the traveler has provided the hotel, motel, or other establishment's receipts to be reimbursed for the travel expenses. Reimbursement for lodging shall not exceed the cost of a single room rate or one-half the double rate.

(2) The request for travel form, if required, the lodging receipts, and any other relevant documentation, shall be attached to the travel voucher for reimbursement. All reasonable and necessary travel expenses shall be reimbursed if the travel was pre-approved as evidenced by a signed and dated request for travel form. Reimbursements shall not be limited by the estimates included on the request for travel form. If the employee or Board member fails to have the travel pre-approved, travel expenses shall not be reimbursed unless it is determined by the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Retirement Systems Board of Trustees, or Trustee authorized by the Chair, that the travel expenses were reasonable and necessary and should be reimbursed.

C. *Subsistence*.

(1) A Traveler traveling on official KRS business shall be eligible for subsistence for breakfast, lunch, or dinner expenses while traveling in or outside Kentucky, but within the United States, its possessions or Canada, at the rates established in these policies and procedures, if his or her authorized work requires travel during the mealtime hours established by this policy. Unless otherwise noted below, a Traveler eligible for subsistence reimbursement may request reimbursement of the applicable per diem amount or reimbursement of actual expenses up to the per diem amount.

(2) Under no circumstances shall a KRS Traveler be reimbursed for the cost of alcoholic beverages or other substances prohibited by the Kentucky Retirement Systems' Personnel Policy, Kentucky Revised Statutes, or applicable administrative regulation.

(3) A Traveler shall be eligible for reimbursement if he is in travel status during the entire mealtime. For example, to be eligible for breakfast reimbursement,

a traveler shall begin travel at or before 6:30 a.m. and return at or after 9 a.m. This requirement shall apply to all meals. To be eligible for lunch reimbursement, a traveler shall begin travel before 11:00 a.m. and return at or after 2:00 p.m. To be eligible for dinner reimbursement, a Traveler shall begin travel before 5:00 p.m. and return at or after 9:00 p.m.

(4) A Traveler shall be eligible for reimbursement for subsistence while traveling in Kentucky, if the authorized work requires overnight travel or authorized travel to a destination more than (40) miles from the Traveler's work station or home, and the Traveler remains in travel status during the mealtime hours established in this policy.

(5) Mealtime hours and per diem subsistence reimbursement rates are as follows:

a. Rates for **non-high rate areas**:
Breakfast: authorized travel 6:30 a.m. through 9 a.m. - - $8;
Lunch: authorized travel 11 a.m. through 2 p.m. - - $10;
Dinner: authorized travel 5 p.m. through 9 p.m. - - $18.

b. Rates for **high rate areas**:
Breakfast: authorized travel 6:30 a.m. through 9 a.m. - - $10;
Lunch: authorized travel 11 a.m. through 2 p.m. - - $12;
Dinner: authorized travel 5 p.m. through 9 p.m. - - $24.

For the purposes of this Travel Policy, "high rate areas" means the city, state, or metropolitan areas designated by the Secretary of the Finance and Administration Cabinet as a high rate area, and included in the Cabinet's policies and procedures manual incorporated by reference in 200 KAR 5:021 in effect at the time of travel. A Traveler is eligible for reimbursement at the "high rate area" reimbursement rate, if the Traveler was located within the high rate area for no less than one (1) hour of the applicable mealtime hours.

(6) Travelers authorized to travel outside the United States, its territories, or Canada shall be reimbursed for their actual and necessary expenses for subsistence.

(7) If a registration fee entitles the registrant to subsistence or subsistence is otherwise covered by KRS, no claims for reimbursement for those meals shall be submitted or paid.

(8) Subsistence reimbursement for a Traveler who does not travel overnight is a taxable fringe benefit, according to the Internal Revenue Service. For this reimbursement, KRS will withhold the applicable federal employment taxes and report this fringe benefit on the traveler's W-2

Form. A separate designated travel voucher shall be submitted for subsistence reimbursement for travelers who do not travel overnight.

D. *Transportation Rates.*

(1) Reimbursement for authorized use of a privately owned vehicle shall be made at the IRS established standard mileage rate which changes periodically; and shall not exceed the cost of commercial coach fare. The mileage reimbursement rate includes reimbursement for vehicle use, gas, maintenance, registration, and any personal automobile insurance coverage required by law.

(2) Calculation for mileage for travel shall be based on the calculation from a generally accepted mapping software or web-based mileage program.

(3) Reimbursement for the actual cost of commercial transportation shall be made upon submission of receipts with the travel voucher.

(4) Reimbursement for use of privately owned aircraft shall be made if, prior to use, written justification was submitted to and approved by the Executive Director, or a designated representative.

E. *Other Reimbursement.*

(1) Actual costs for parking, or bridge and highway toll charges shall be reimbursed upon submission of receipts with a completed travel voucher.

(2) Reimbursement shall be made for reasonable charges for baggage handling, delivery of baggage to or from a common carrier, lodging or storage, and overweight baggage charges, if the charges directly relate to official business.

(3) Registration fees required for admittance to approved meetings or conventions shall be reimbursed.

(4) Telephone, fax or electronic device connection costs for necessary official business shall be reimbursed. However, if KRS has provided reasonable access to telephone, fax or electronic device connection for the Traveler, additional unnecessary charges for similar access shall not be reimbursed.

(5) Telephone calls to KRS offices shall be made through the KRS toll free number, or lowest available service.

(6) Reasonable gratuities for baggage handling, parking, taxi/shuttle transportation, or concierge services not to exceed $3.00 per occurrence, unless otherwise reimbursed pursuant to this policy.

(7) Receipts for numerical paragraphs one (1) through six (6), for each cost less than ten dollars ($10.00), shall not be required; however, the Traveler shall provide written explanation of the items for which he or she is requesting reimbursement, including a brief description item, the date incurred, and the amount of the expense

**Section 6: Actual and Necessary Expenses**

A. The following persons are eligible for actual and necessary expenses, subject to the provisions of this Section:

(1) Executive Director;

(2) Board of Trustees members;

(3) Chief Officers and the General Counsel;;

Comment [bct2]: ID by C. Davis 11/2014.

(4) Investment Division Directors; and/or

(5) A KRS Traveler traveling on assignment with the Executive Director, Board of Trustees members, the General Counsel or Chief Officers.

B. Upon return from travel, travelers specified above must elect to receive either actual and necessary expense reimbursement or the per diem amount for meals as set out in Section 5 above for the entirety of the travel.

C. Actual and necessary expenses of official business travel, shall only be reimbursed upon submission of receipts. . Receipts shall contain a line item description of the items or services purchased. It is the Traveler's burden to produce adequate documentations to support a request for actual and necessary expenses. A credit card statement, unsupported by additional documentation, shall not be considered a valid receipt.

D. Actual and necessary expenses for official business travel shall include:

(1) Lodging;

(2) Meals, (not to exceed twice the amounts provided in Section 5 above);

(3) Commercial transportation;

(4) Taxes related to actual and necessary expenses; and

(5) Reasonable gratuities, not to exceed 15% of the total cost of the service.

**Section 7: Reimbursement documents**

A. Reimbursement for authorized travel as outlined in these policy and procedures shall be requested for reimbursement on the approved travel voucher by all KRS Board of Trustees members and employees. The travel voucher should include the name of the Traveler, a detailed description of the travel, the amounts to be reimbursed, a description of the expenses to be reimbursed, and the date of preparation of the voucher.

B. Contractors, authorized to conduct business on behalf of the Retirement System and eligible for reimbursement for authorized travel as outlined in this policy and the applicable contractual agreement, shall submit the approved travel voucher or other documentation that includes the name of the Traveler, a detailed description of the travel, the amounts to be reimbursed, a description of the expenses to be reimbursed, and expense receipts.

C. A separate designated travel voucher shall be submitted for subsistence reimbursement for all KRS Board of Trustees members and employees who do not travel overnight.

D. The Traveler shall indicate whether the reimbursement should be in the form of check or direct deposit.

E. The Traveler, the Traveler's supervisor, and the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of

the Board of Trustees, or Trustee designated by the Chair, shall sign the travel voucher prior to reimbursement.

F. Necessary travel expenses incurred by a Traveler as a result of circumstances outside of the Traveler's control. Such expenses shall be accompanied by receipts and other relevant documentation, a written detailed explanation or the circumstances resulting in the expenses, and attached to a completed designated travel voucher. These expenses may be reimbursed to the Traveler by the Retirement System at the discretion of the Executive Director, his or her designee, or in the case of travel by the Executive Director, the Chair of the Retirement Systems Board of Trustees, or Trustee authorized by the Chair.

**CERTIFICATION**

We, the Chair of the Board of Trustees and the Executive Director, do hereby certify that this Board of Trustees Travel Policy and Procedures was amended by the Board on this the 11th day of September 2014.

Thomas K. Elliott, Chair — Date: Sept. 11, 2014

William A. Thielen, Executive Director — Date: 9-11-14

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Kentucky Retirement Systems Board of Trustees
(Meeting on behalf of the Shareholders of KRS Perimeter Park West, Inc.)

**FROM:** William A. Thielen
Interim Executive Director

DATE: May 21, 2015

**SUBJECT:** KRS Perimeter Park West, Inc. Annual Shareholders Meeting

In accordance with the corporate bylaws and the shareholder resolution dated May 21, 2009, KRS Perimeter Park West, Inc. (PPW) is governed by a board of directors consisting of three (3) members. The KRS Board of Trustees is the governing authority over the three shareholders of PPW – the Kentucky Employees Retirement System (KERS) pension trust, the County Employees Retirement System (CERS) pension trust, and the State Police Retirement System (SPRS) pension trust. As the governing authority over the shareholders, the KRS Board of Trustees has the responsibility of electing directors to the PPW Board of Directors to serve for a term of one (1) year, or until their successors shall be elected and qualify. The one-year terms of the current PPW Board members - Dr. Daniel Bauer, Joseph Hardesty and Vince Lang – are due to expire at the Annual Meeting of the PPW Board of Directors, which is scheduled to be held on May 21, 2015 immediately upon adjournment of the KRS Board of Trustees meeting.

**RECOMMENDATION:** The Executive Director recommends that the KRS Board of Trustees conduct an annual meeting on behalf of the shareholders of PPW during the KRS Board of Trustees meeting to be held on May 21, 2015 for the purpose of conducting the following business:

1. Approval of minutes from the May 15, 2014 annual shareholder meeting

2. Nomination and election of three (3) persons to serve as members of the PPW Board of Directors from May 21, 2015 until the next annual meeting of the shareholder in 2016, or until their successors are elected.

3. Reallocate the PPW shares among the KRS pension plans

4. Ratification of the lawful acts of the officers, directors and agents of PPW since the May 15, 2014 annual meeting.

**KENTUCKY RETIREMENT SYSTEMS BOARD OF TRUSTEES**

**ANNUAL MEETING ON BEHALF OF THE SHAREHOLDERS OF**

**KRS PERIMETER PARK WEST, INC.**

**May 21, 2015**
**1270 Louisville Road, Frankfort, Kentucky**

**Upon Recess of the Kentucky Retirement Systems**
**Board of Trustee Meeting at Approximately 12:00 p.m. EDT**

**AGENDA**

1. Call to order.

2. Roll call

3. Approval of minutes from the May 15, 2014 annual shareholders meeting

4. Nomination and election of three (3) persons to serve as members of the KRS Perimeter Park West, Inc. Board of Directors from May 21, 2015 until the next annual meeting of the shareholder in 2016, or until their successors are elected.

5. Reallocation of the PPW shares among the KRS pension plans.

6. Ratification of the lawful acts of the officers, directors and agents of KRS Perimeter Park West, Inc. since the May 15, 2014 annual meeting.

7. Adjournment.

**MINUTES**
**OF THE**
**KRS PERIMETER PARK WEST, INC.**
**2014 ANNUAL SHAREHOLDERS MEETING**
**Held May 15, 2014 at**
**1270 Louisville Road, Frankfort, Kentucky**

At the KRS Perimeter Park West, Inc. (PPW) annual shareholders meeting held on May 15, 2014, the following members of the KRS Board of Trustees were present: Thomas Elliott, Chair; Mike Cherry; Ed Davis; JT Fulkerson; Joseph Hardesty; Vince Lang; Timothy Longmeyer; Randy Overstreet; Mary Helen Peter; David Rich; Randy Stevens; and William Summer. The following PPW agents were present: William Thielen and Todd Coleman.

Upon recess of the KRS Board of Trustees meeting, Mr. Elliott called the PPW annual shareholders meeting to order. Mr. Cherry moved, second by Mr. Davis to elect Dr. Bauer, Mr. Lang, and Mr. Hardesty by acclamation to serve on the KRS Perimeter Park West, Inc. Board of Directors from May 15, 2014 for a one year term or until their successors were elected. The motion passed unanimously.

There being no further business to conduct, Mr. Elliott declared the PPW annual shareholders meeting adjourned.

**KENTUCKY RETIREMENT SYSTEMS**

**TO:** Members of the KRS Board of Trustees
(Meeting on behalf of the Shareholders of KRS Perimeter Park West, Inc.)

**FROM:** William A. Thielen
Executive Director

**DATE:** May 21, 2015

**SUBJECT:** Reallocation of Perimeter Park West, Inc. (PPW) Shares Among KRS Pension Funds

Consistent with the Perimeter Park West Update presented to KRS Investment Committee members at the May 7, 2013 Investment Committee Meeting and to the full KRS Board of Trustee at the May 30, 2013 Board meeting, this memo is being presented to notify the Board of Trustees of the need to reallocate PPW shares of stock among the KRS pension funds. The changes need to be made in order to be consistent with administrative expense accounting practices.

PPW is held by the various KRS pension plans in different amounts. The current share allocations do not reflect the KRS expense allocation methodology as of June 30, 2014. Administrative expenses are allocated based on the number of retirees participating in each pension plan and are updated annually at the beginning of each fiscal year. The reallocation of PPW shares should also be done annually..

It is recommended that the PPW shares should be allocated in the following manner:

**KERS Pension: 68.80 Shares**
**KERSH Pension: 5.60 Shares**
**KERS System Total: 74.40 shares**

**CERS Pension: 114.20 Shares**
**CERSH Pension: 9.80 Shares**
**CERS System Total: 124.00 Shares**

**SPRS Pension: 1.60 Shares**

**RECOMMENDATION:** The KRS Executive Director recommends that the KRS Board of Trustees, acting on behalf of shareholders of PPW, adopt the share allocation changes set forth above.