



# NDPERS Actuarial Audit & Plan Design Study - Preliminary Results

DOUG ANDERSON | JULY 1, 2014

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*This preliminary draft report is intended for use by the North Dakota Legislative Management Committee. The purpose of the report is to summarize preliminary results of an independent review by Gallagher Benefit Services, Inc. of information originally prepared by The Segal Company for the NDPERS relative to the cost of potential NDPERS changes.*

*Participant data for this review was provided by both NDPERS and The Segal Company and the results included herein are dependent on the accuracy of that data. Results were based on an attempted match of the July 1, 2013 actuarial valuation report, the plan provisions in effect at that time, and except as noted, the assumptions used for that valuation.*

*Gallagher Benefit Services, Inc. expresses no opinion on the proposed plan design changes other than providing a range of reasonable cost forecasts as noted in this report. The actuary preparing this report is a member of the American Academy of Actuaries and meets the Qualification Standards to provide the actuarial opinions contained in this report.*



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# Data File Comparison

# Data File Comparison

No issues found for 99.2% of population.

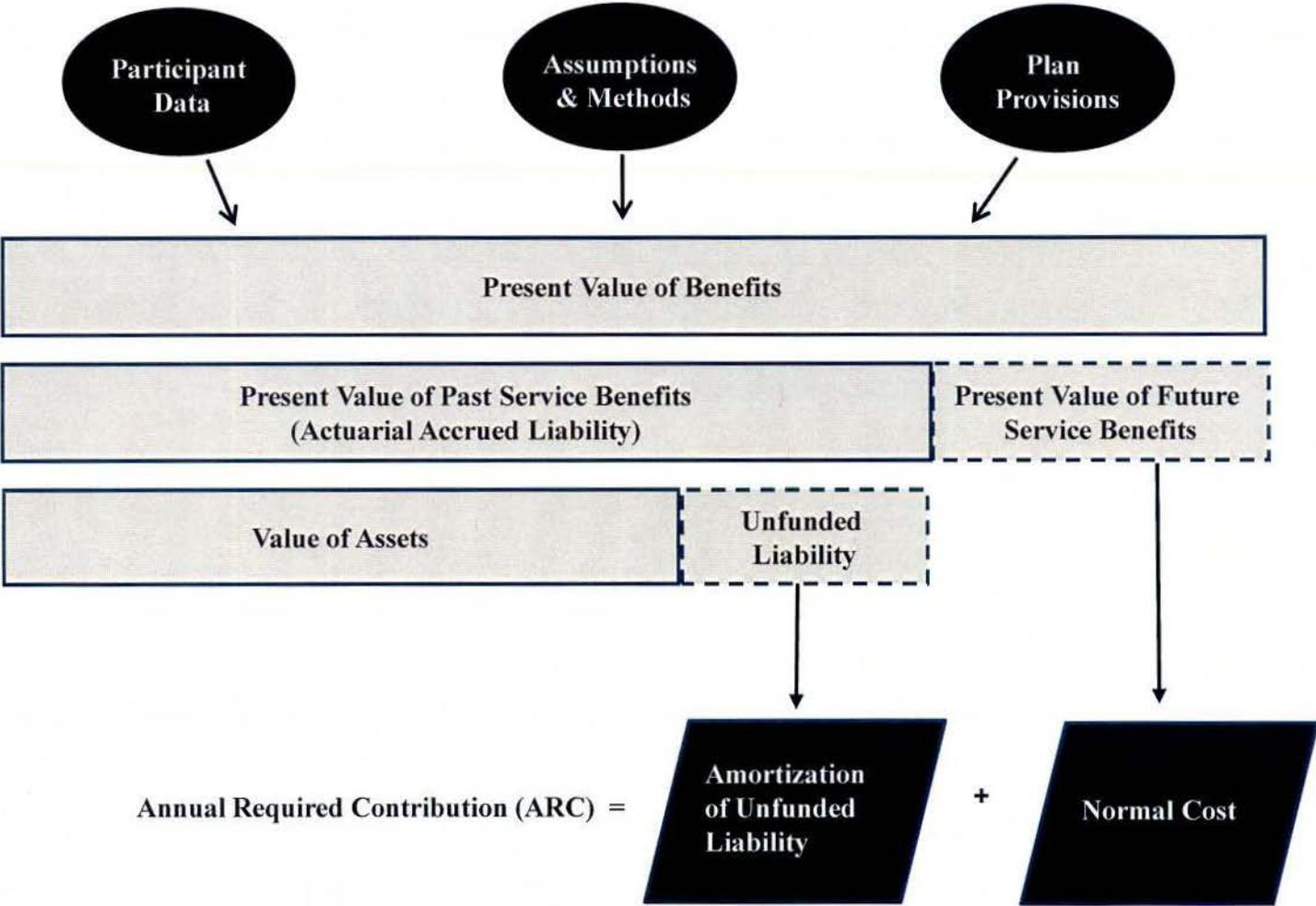
Issue	Count	Comments
Missing Records	63	Based on EEID, 60 records (mostly retirees) from NDPERS don't appear in Segal's file; 3 records from Segal don't appear in NDPERS file.
Spouse DOB	1	NDPERS reported year as 2080; Segal corrected to 1980
Benefit Amount	6	Benefit amount differs for 6 retirees; differences range from 5.6% high to 15.3% high.
Deferred Benefit Amount	138	NDPERS reports benefit amount for vested terminated participants as \$0; Segal shows benefit as >\$0. Presumed Segal calculation to be accurate.
Employee Contributions	38	NDPERS reports employee account balance as \$0; Segal shows balance as >\$0. 36 of 38 are new hires; 2 are retirees.
Benefit Service	37	NDPERS reports benefit service as 0; Segal shows service as >0. 36 of 37 are new hires; 1 is terminated vested.



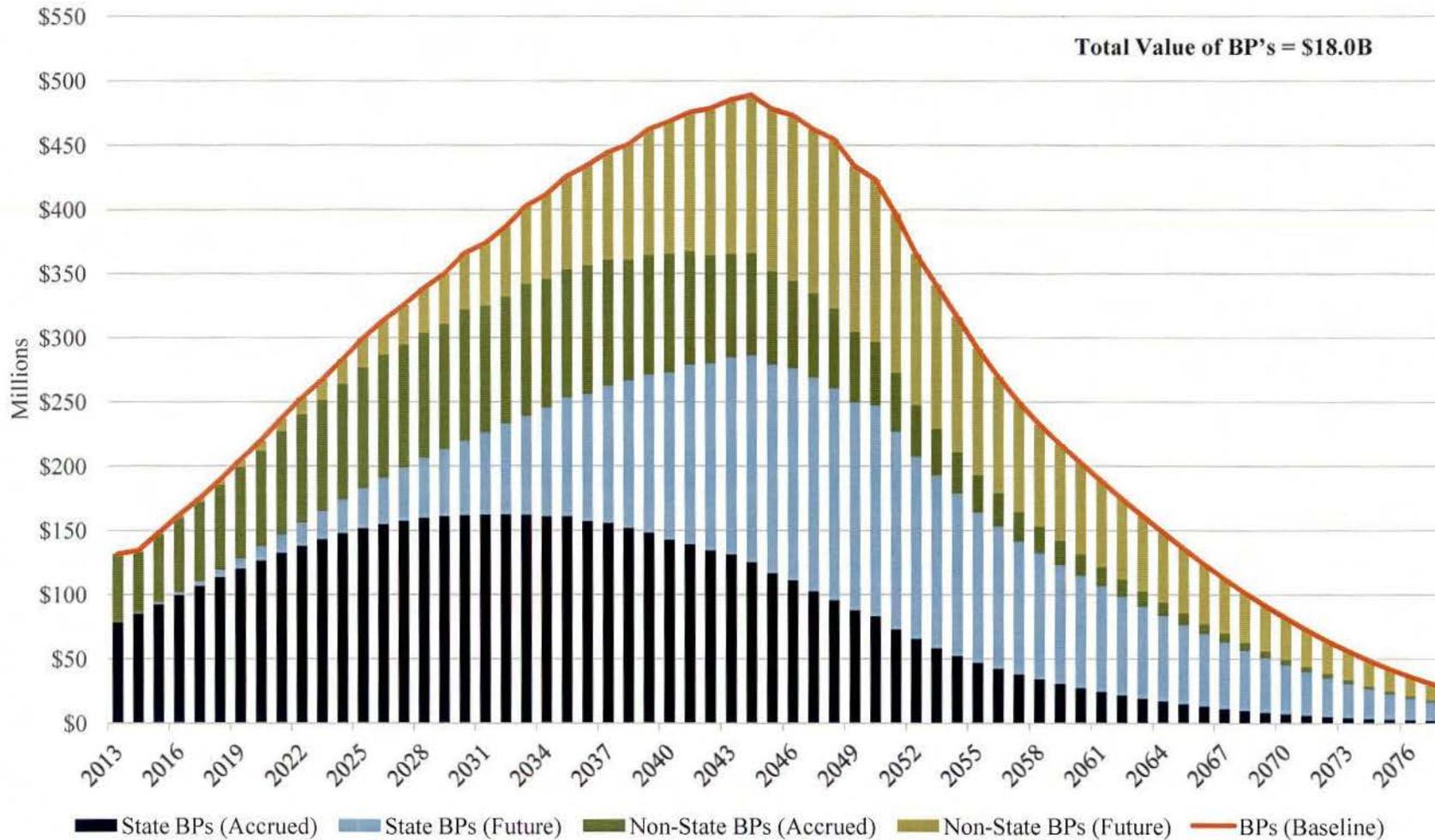
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# Actuarial Audit Results

# Actuarial Valuation Process

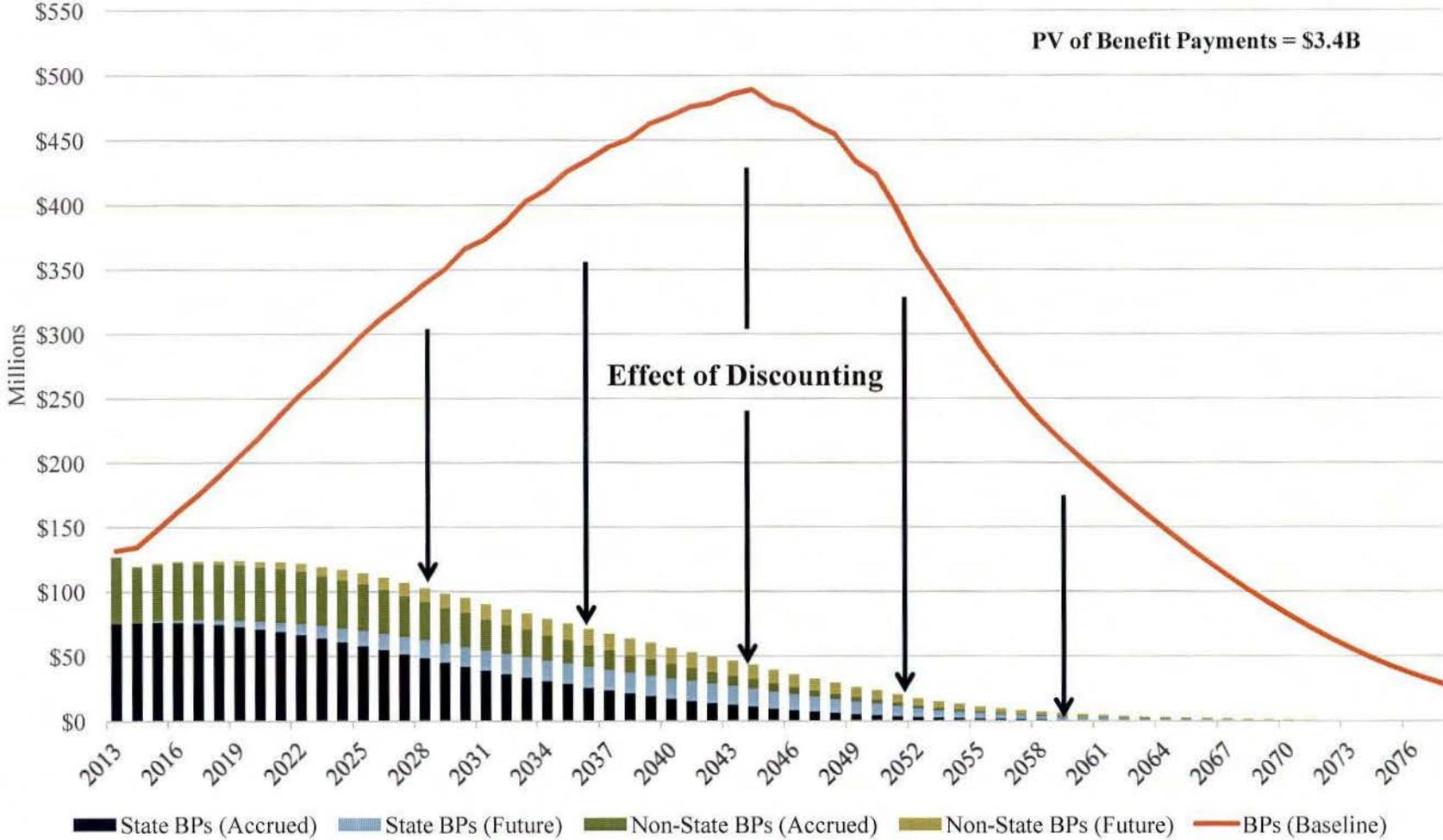


# Projected Benefit Payments



Projected benefit payments are primarily determined by demographic assumptions.

# Discounted Benefit Payments



Discounted values are determined by the investment return assumption.

# Plan Liability Audit Results

	Segal July 1, 2013 Actuarial Valuation	Gallagher Results	Difference
<b>Present Value of Benefits</b>			
Active Members:			
▪ Retirement	\$ 1,976,691,333	\$ 1,975,840,698	0.0%
▪ Disability	51,346,152	49,765,185	(3.1%)
▪ Withdrawal	198,418,550	184,731,918	(6.9%)
▪ Death	<u>59,213,630</u>	<u>58,586,035</u>	(1.1%)
<b>Actives Total:</b>	\$ 2,285,669,665	\$ 2,268,923,836	(0.7%)
Retired Members and Beneficiaries*	943,671,725	940,013,710	(0.4%)
Inactive Non-retired Members	<u>154,900,691</u>	<u>159,939,147</u>	3.3%
Total PVB	\$ 3,384,242,081	\$ 3,368,876,693	(0.5%)
<b>Development of Unfunded Actuarial Accrued Liability</b>			
Actuarial Accrued Liability:			
▪ Active Members	\$ 1,551,952,602	\$ 1,617,869,073	4.2%
▪ Retired Members and Beneficiaries*	943,671,725	940,013,710	(0.4%)
▪ Inactive Non-retired Members	<u>154,900,691</u>	<u>159,939,147</u>	3.3%
▪ Total AAL	\$ 2,650,525,018	\$ 2,717,821,930	2.5%
<b>Actuarial Value of Assets</b>	<u>1,632,915,720</u>	<u>1,632,915,720</u>	0.0%
<b>Unfunded Actuarial Accrued Liability</b>	\$ 1,017,609,298	\$ 1,084,906,210	6.6%

\*Includes Special Prior Service Pensions

# ARC and Amortization Period Audit Results

	Segal July 1, 2013 Actuarial Valuation	Gallagher Results	Difference
<i>Development of Annual Required Contribution (ARC)</i>			
Normal Cost	\$ 89,254,673	\$ 88,160,907	(1.2%)
Member Contributions (6.5%)	<u>(56,281,437)</u>	<u>(56,360,431)</u>	0.1%
Net Employer Normal Cost	\$ 32,973,236	\$ 31,800,476	(3.6%)
Administrative Expense	1,100,000	1,100,000	0.0%
Amortization of UAAL	<u>71,019,268</u>	<u>75,715,897</u>	<u>6.6%</u>
Annual Required Contribution	\$ 105,092,504	\$ 108,616,373	3.4%
Total Payroll	\$ 865,868,265	\$ 867,083,551	0.1%
Total ARC Percentage	12.14%	12.53%	3.2%
<i>Development of Amortization Period</i>			
Annual Required Contribution	12.14%	12.53%	3.2%
Member Contribution Increase	(0.50%)	(0.50%)	0.0%
Total Scheduled Contribution	<u>(7.12%)</u>	<u>(7.12%)</u>	0.0%
Contribution (Surplus)/Deficit	4.52%	4.91%	8.6%
Amortization Period	Infinite	Infinite	

## Result Sensitivity





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# Actuarial Assumption Review

# Actuarial Assumption Review

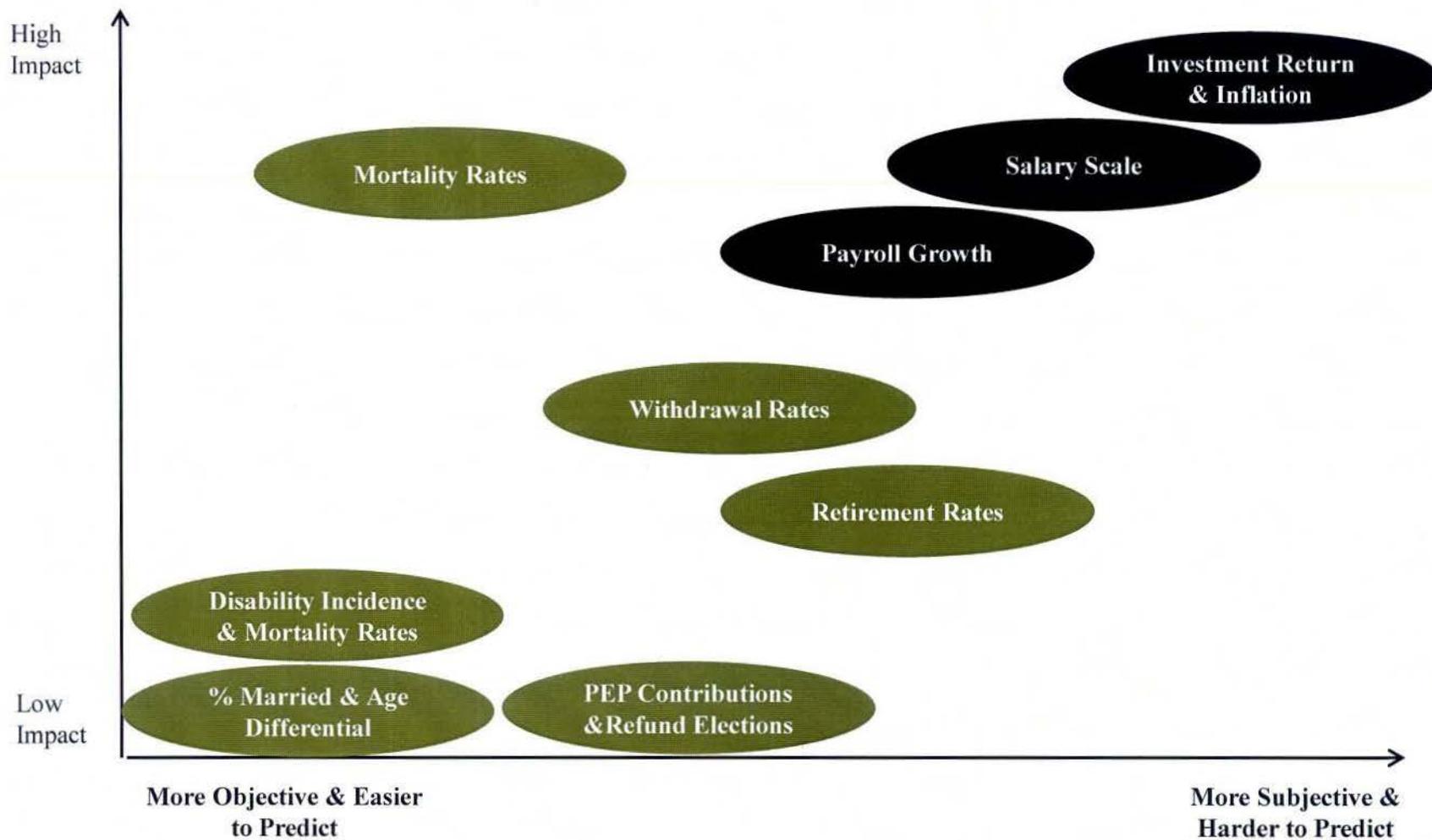
## ■ Overview

- All assumptions are certain to be wrong. They are easier to criticize than to defend.
- Actuaries use past experience to predict future events by performing experience studies at regular intervals.
- The last Experience Study was completed by Segal in early 2010 and resulted in numerous assumption changes reflected in the July 1, 2010 Actuarial Valuation.
- The 2010 assumption changes increased the Annual Required Contribution from 7.74% to 9.42%.

## ■ Gallagher's Review Process

- Review the content and recommendations from the 2010 Experience Study.
- Review the statistical analysis for reasonableness.
- Evaluate whether each assumption recommendation is consistent with the data.
- Evaluate subjective adjustments.
- Identify whether recommendations have an aggressive or conservative bias.

# Assumptions by Impact & Predictability



# Economic Assumptions – Investment & Inflation

<b>Inflation</b>	<b>Current Assumption</b>	<ul style="list-style-type: none"> <li>• 3.5% per year</li> </ul>
	<b>Comments</b>	<ul style="list-style-type: none"> <li>• Segal relied primarily on historical data and the NASRA survey for their recommendation</li> <li>• Segal discounted NDPERS investment consultant (SEI) 2.3% forecast due to short-term outlook</li> </ul>
	<b>Recommendation</b>	<ul style="list-style-type: none"> <li>• 3.0% and 3.5% are common assumptions</li> <li>• Inflation is embedded in other assumptions and does not individually need to be evaluated</li> </ul>
<b>Investment Return</b>	<b>Current Assumption</b>	<ul style="list-style-type: none"> <li>• 8.0% per year after investment expenses</li> </ul>
	<b>Comments</b>	<ul style="list-style-type: none"> <li>• Assumption should be based on future expectations for current asset allocation</li> <li>• SEI's forecast was discounted in favor of a survey from 11 California Counties</li> <li>• Segal stated this allows for "... a broader range of capital market information..."</li> <li>• The recommended assumption is consistent with NASRA survey results</li> <li>• Investment return expectations are very subjective and reasonable arguments can be made to support a range of assumptions</li> <li>• The asset allocation has changed since 2009</li> </ul>
	<b>Recommendation</b>	<ul style="list-style-type: none"> <li>• 8.0% per year is a reasonable assumption for baseline results</li> <li>• Closed plan scenarios imply shorter investment horizons and more conservative approach</li> <li>• The Study should consider results based on both 7.5% and 8.0%</li> <li>• The Study should also demonstrate results for a wider range of possible actual investment returns that are different than the assumed rates of return</li> </ul>

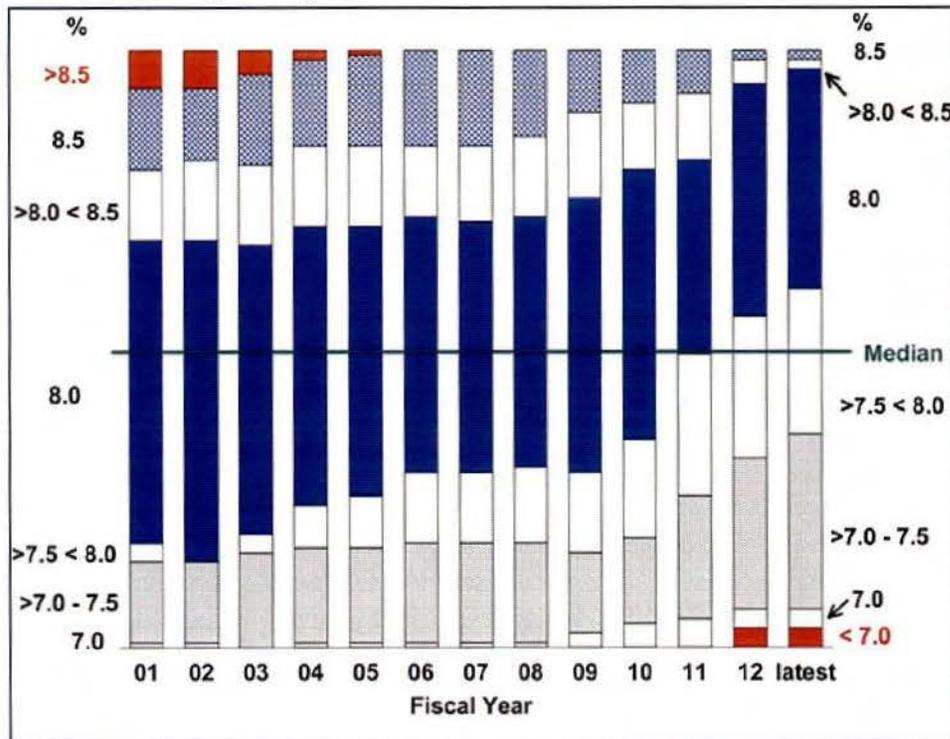
# Economic Assumptions – Investment Return

The chart below shows the basis for the Segal 2010 Experience Study recommended investment return assumption.

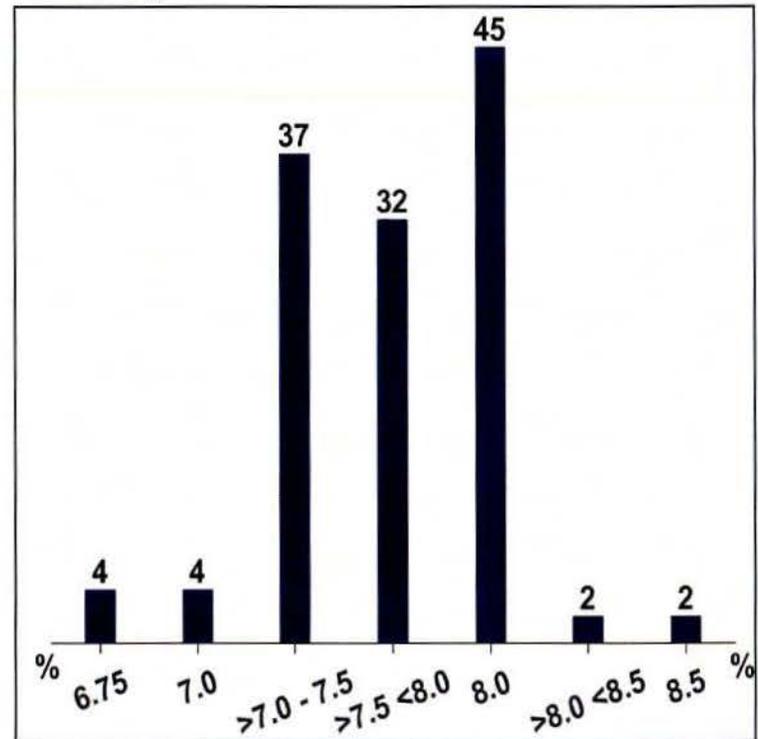
Asset Class	2009 Asset Allocation	SEI's Assumed ROR	Segal Sample ROR	Observations	June 30, 2013 Allocation
Domestic Large Cap Equity	30%	8.40%	7.19%	<ol style="list-style-type: none"> <li>Investment consultant forecasts can vary significantly.</li> <li>Investment allocations change over time</li> <li>Real rates of return are arithmetic calculations and do not reflect the impact of volatility.</li> <li>Segal's Risk Adjustment attempts to account for volatility. They place a 61% likelihood that the 8% assumption will be met over a 15 year period.</li> <li>Since 2009, the equity allocation has decreased from 55% to 52%; Fixed Income has decreased from 34% to 22%; Real Estate has increased from 5% to 10%, and Infrastructure and Commodities have both increased from 0% to 5%.</li> </ol>	16.6%
Domestic Small Cap Equity	10%	10.30%	7.89%		4.8%
Developed International Equity	10%	9.20%	7.63%		11.1%
Global Equity	0%	--%	--%		16.0%
Emerging Market Equity	5%	13.60%	10.49%		3.5%
Domestic Fixed Income	24%	3.90%	2.74%		12.0%
High Yield Fixed Income	5%	6.20%	5.62%		5.0%
International Fixed Income	5%	2.80%	2.50%		5.0%
Real Estate	5%	5.10%	4.80%		10.0%
Private Equity	5%	10.40%	10.40%		5.0%
Infrastructure	0%	--%	--%		5.0%
Commodities (Timber)	0%	--%	--%		5.0%
Cash and Equivalents	1%	0.10%	0.66%		1.0%
Total Portfolio	100%	7.31%	6.06%		100%
Inflation		2.30%	3.50%		
Expenses		(0.60%)	(0.60%)		
Total Portfolio		9.01%	8.96%		
Risk Adjustment			(0.96%)		
Recommended Assumption			8.00%		

# Economic Assumptions - Investment Return

Investment return assumptions for Public Sector Plans have been trending down over the past 12 years.



Investment return assumptions for most Public Sector Plans range from 7.5% to 8.0%.



Source: NASRA Issue Brief: Public Pension Plan investment Return Assumption, Updated April 2014

# Economic Assumptions – Salaries & Payroll Growth

Salary Increases	Current Assumption	<ul style="list-style-type: none"> <li>• Various rates based on service and age, ranging from 8.25% at hire down to 4.86%</li> </ul>
	Comments	<ul style="list-style-type: none"> <li>• Based on inflation (3.5%) plus productivity (1.0%), plus merit (various)</li> <li>• Merit based on 5-year historical data over and above inflation and productivity</li> <li>• Segal subjectively recommended assumptions up to almost 1% lower than observed rates</li> </ul>
	Recommendation	<ul style="list-style-type: none"> <li>• Use current assumption for baseline results</li> <li>• Higher rates are possible in the short term due to regional workforce influences, but remain difficult to predict for the long term</li> <li>• Consider results based on rates both 10% higher and 10% lower than current assumption</li> </ul>
Total Payroll Growth Assumption	Current Assumption	<ul style="list-style-type: none"> <li>• 4.5% per year</li> </ul>
	Comments	<ul style="list-style-type: none"> <li>• Does not affect liability calculation, but does influence Annual Required Contribution (ARC) and expected future contributions to the Fund</li> <li>• Based on 3.5% inflation plus 1.0% productivity</li> <li>• Other Segal reports do not necessarily use inflation plus productivity as the assumption</li> <li>• The assumption doesn't reflect possible shifts in demographics</li> <li>• The assumption will not be appropriate for closed group analysis</li> </ul>
	Recommendation	<ul style="list-style-type: none"> <li>• Use 4.5% for baseline open group results</li> <li>• Consider effect of 3.5% on open group results</li> <li>• No assumption needed for closed group results as these will be directly calculated and dictated by salary scale and other demographic assumptions</li> </ul>

# Demographic Assumptions – Mortality & Disability

Mortality Rates	<b>Current Assumption</b>	<ul style="list-style-type: none"> <li>• RP-2000 Combined Healthy Mortality Table setback 3 years for both males and females</li> </ul>
	<b>Comments</b>	<ul style="list-style-type: none"> <li>• Likely significant cause of large 2010 cost increases</li> <li>• The table has a 10% margin for future mortality improvement (i.e. lower mortality rates are used than past results would seem to indicate)</li> <li>• Segal indicated that the past 5 years showed the table without margin was close to observed rates for females</li> <li>• The 3-year setbacks were applied to both males and females equally based on exposure lives and were selected to achieve the 10% mortality improvement margin</li> <li>• Given that the average male liability is higher than the average female liability, the current table may be more conservative than anticipated (i.e. male liabilities are valued more conservatively than female liabilities and make up a larger portion of the total)</li> </ul>
	<b>Recommendation</b>	<ul style="list-style-type: none"> <li>• Use current assumption for baseline results</li> <li>• Consider results including the current table without the 10% margin for mortality improvement (current table with no set-backs) and RP-2000 with Scale BB, that includes projected future mortality improvements</li> </ul>
Disability Incidence & Mortality	<b>Current Assumption</b>	<ul style="list-style-type: none"> <li>• 33% (males) and 20% (females) of OASDI disability incidence rates</li> <li>• RP-2000 Disabled Retiree Mortality Table set back one year for males</li> </ul>
	<b>Comments</b>	<ul style="list-style-type: none"> <li>• Disability rates were lowered at all ages as a result of 2010 Experience Study</li> <li>• New assumption still higher than observed actual rates</li> <li>• The assumption may be conservative, but the low rates of incidence minimize the impact of this assumption. Disability benefits comprise less than 2% of total plan costs</li> </ul>
	<b>Recommendation</b>	<ul style="list-style-type: none"> <li>• Use current assumptions</li> <li>• Do not consider alternative assumptions during the study as resulting changes are not significant</li> </ul>

# Demographic Assumptions – Withdrawal & Refunds

Withdrawal Rates	Current Assumption	<ul style="list-style-type: none"> <li>• Current rates are as high as 22% in the first year of employment, dropping to 14% in the fourth year. Thereafter rates are based on age, decreasing from about 9% down to about 3% at age 55, and very small after age 55. Rates are the same for males and females</li> </ul>
	Comments	<ul style="list-style-type: none"> <li>• Segal raised the rates at each year of service under 5 years, but not as high as the observed rates</li> <li>• When service exceeds 5 years, recommended rates were close to the observed rates</li> <li>• Our experience within the State indicates withdrawal rates in the past five years have been increasing</li> </ul>
	Recommendation	<ul style="list-style-type: none"> <li>• Use the current assumption for baseline results</li> <li>• Consider rates 10% higher and 10% lower at each age (currently 5.0%, would be evaluated at 4.5% and 5.5%)</li> </ul>
PEP Election Rates and Refund Election Rates	Current Assumption	<ul style="list-style-type: none"> <li>• Members that contributed to PEP last year are assumed to continue each year prospectively</li> <li>• Members that contribute to PEP are assumed to contribute the maximum amount</li> <li>• Terminated members are assumed to elect the more valuable benefit between a Refund of contributions (including the PEP balance) and a deferred annuity</li> </ul>
	Comments	<ul style="list-style-type: none"> <li>• The form of benefit assumption is the most conservative approach that is possible</li> <li>• Segal indicates that few new participants start making elections</li> </ul>
	Recommendation	<ul style="list-style-type: none"> <li>• Use current assumptions for baseline</li> <li>• Alternatives are difficult to assess without more data</li> </ul>

# Demographic Assumptions – Retirement & Marriage

Retirement Rates	Current Assumption	<ul style="list-style-type: none"> <li>Rates vary from age 55 to 75 and depend on eligibility for early retirement and unreduced retirement (age 65 and Rule of 85)</li> </ul>
	Comments	<ul style="list-style-type: none"> <li>The 2010 Experience Study changed the assumption to shift to earlier retirements</li> <li>Recommended rates are consistent with observed data for unreduced benefit retirements</li> <li>Recommended rates are generally higher than observed data for reduced benefit retirements</li> <li>Periods of low rates are often followed by periods of higher rates and vice versa</li> <li>Economic conditions are in flux and trends are difficult to predict</li> </ul>
	Recommendation	<ul style="list-style-type: none"> <li>Use current assumption for baseline results</li> <li>Consider results if rates from age 55 to 59 are either increased or decreased by <math>\pm 5\%</math> (i.e. from 10% per year to either 5% or 15% per year)</li> </ul>
% Married and Spouse Age Differences	Current Assumption	<ul style="list-style-type: none"> <li>80% males and 65% females assumed married at retirement</li> <li>Male spouses are assumed 3 years older than female spouses</li> </ul>
	Comments	<ul style="list-style-type: none"> <li>Segal stated that actual data indicated 84% of recently retired males were married and 70% of recently retired females were married</li> <li>No explanation was given for why the assumption was not changed to be closer to the observed data</li> <li>No data was included in the Experience Study for spouse age differences</li> <li>Age difference was changed from 4 to 3 years based on studies done for other systems</li> <li>2013 participant data indicates 85% of recently retired males and 75% of females are married</li> </ul>
	Recommendation	<ul style="list-style-type: none"> <li>Use current assumptions.</li> <li>Do not consider alternatives due to negligible impact</li> </ul>

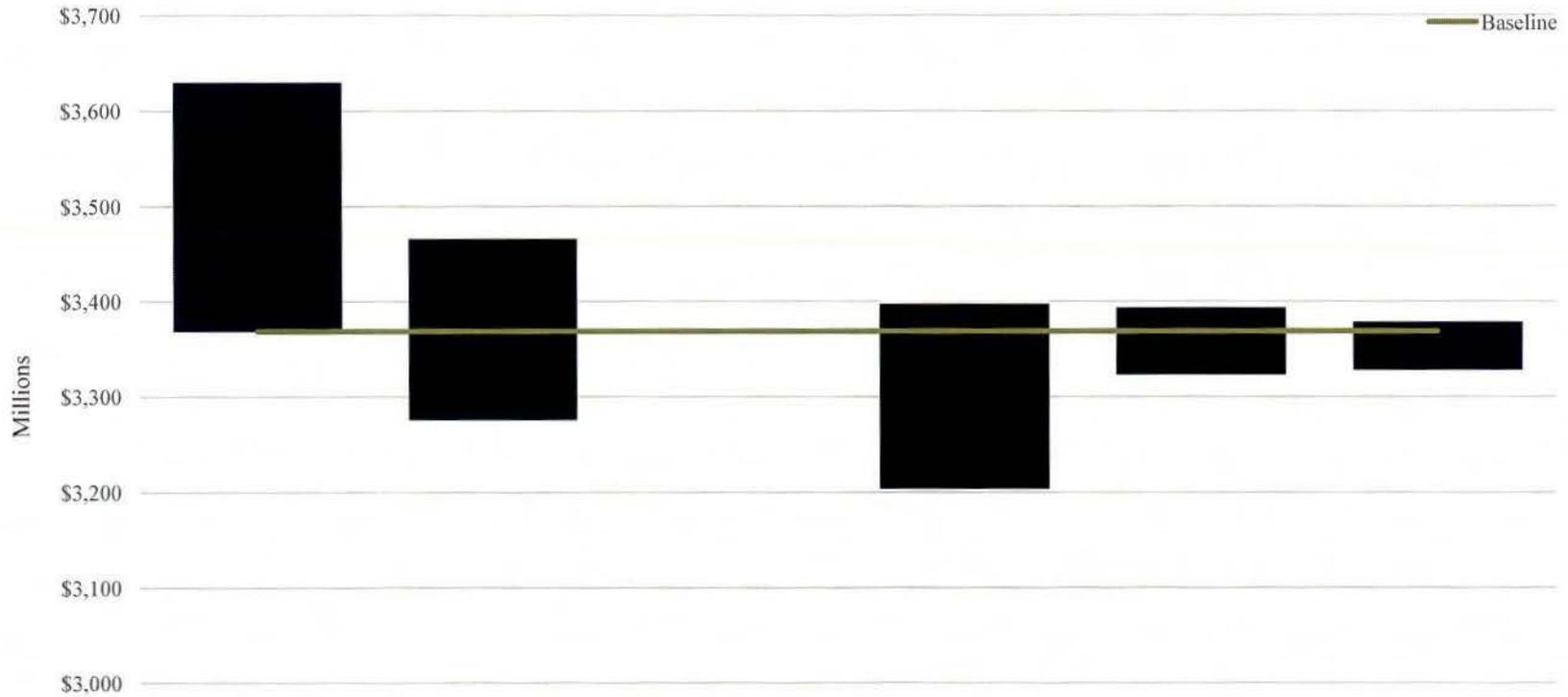


# Sensitivity Analysis

# Recommended Alternative Assumptions to Consider

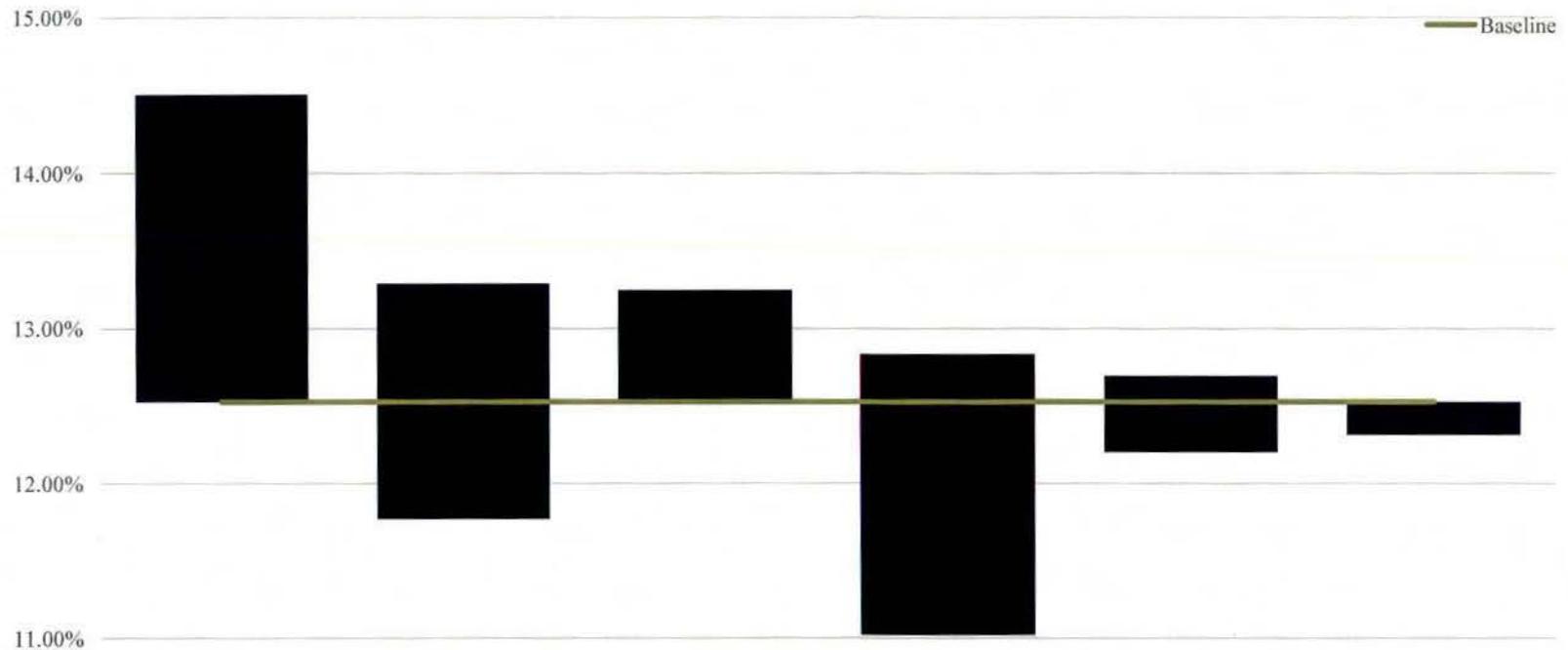
Economic Assumptions	Investment Return	Consider both 8% and 7.5% as the investment return assumption, but also demonstrate results under various actual investment returns
	Salary Scale	Consider current rates plus or minus 10% at each age (ex. a 5% rate would become either 5.5% or 4.5%)
	Total Payroll Growth	Consider both 4.5% and 3.0% for total payroll growth for open group assumptions. Closed plans will be based on projections reflecting salary scale and demographic rates.
Demographic Assumptions	Mortality	Consider current mortality table without 10% margin (no improved mortality) and RP-2000 with Scale BB that includes projected future mortality improvements
	Withdrawal	Consider rates 10% higher and 10% lower at each age (currently 5.0%, would be evaluated at 4.5% and 5.5%)
	Retirement	Consider rates $\pm$ 5% from ages 55 to 59 to estimate accelerated retirements or deferred retirements (i.e. from 10% per year to either 5% or 15% per year)

# Effect of Individual Assumptions on PVB



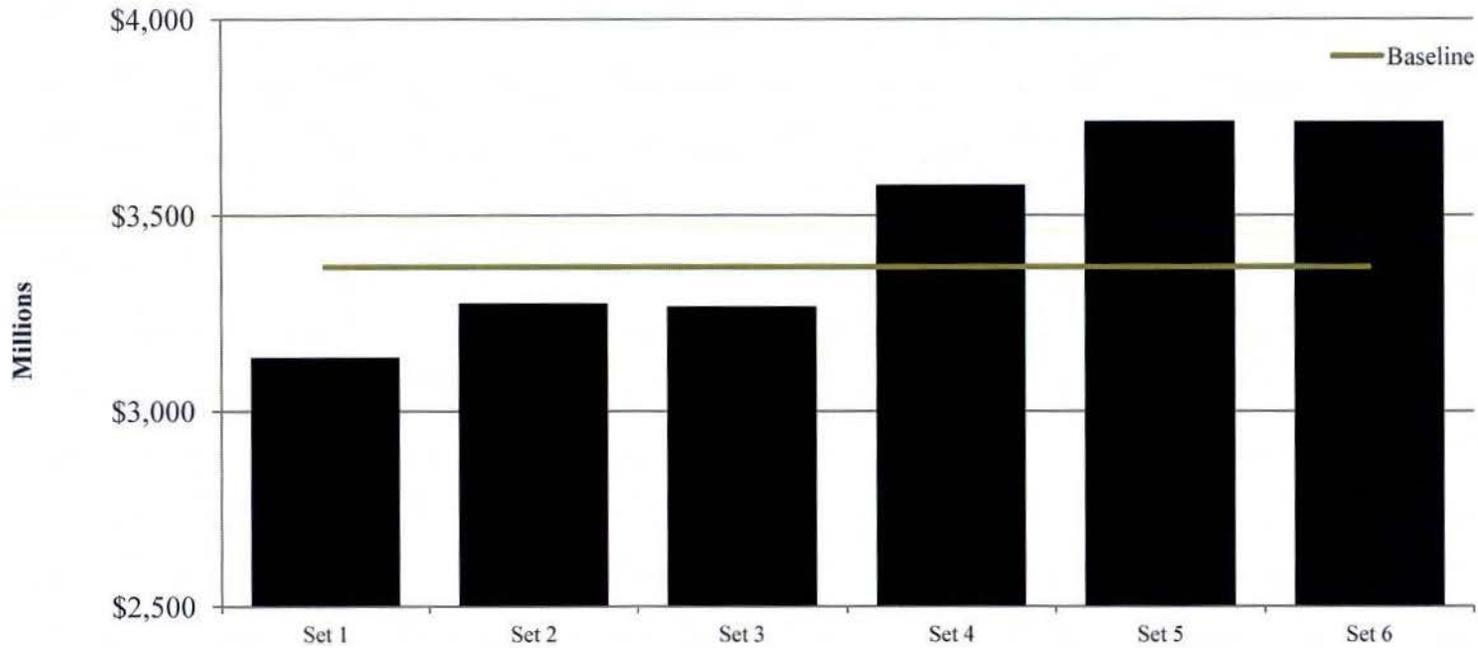
	Interest	Salary Scale	Payroll Growth	Mortality	Termination	Retirement
Range	\$261	\$190	\$0	\$193	\$70	\$50
Low	3,369	3,276	3,369	3,204	3,324	3,328
Baseline	3,369	3,369	3,369	3,369	3,369	3,369
High	3,630	3,466	3,369	3,397	3,394	3,378

# Effect of Individual Assumptions on ARC



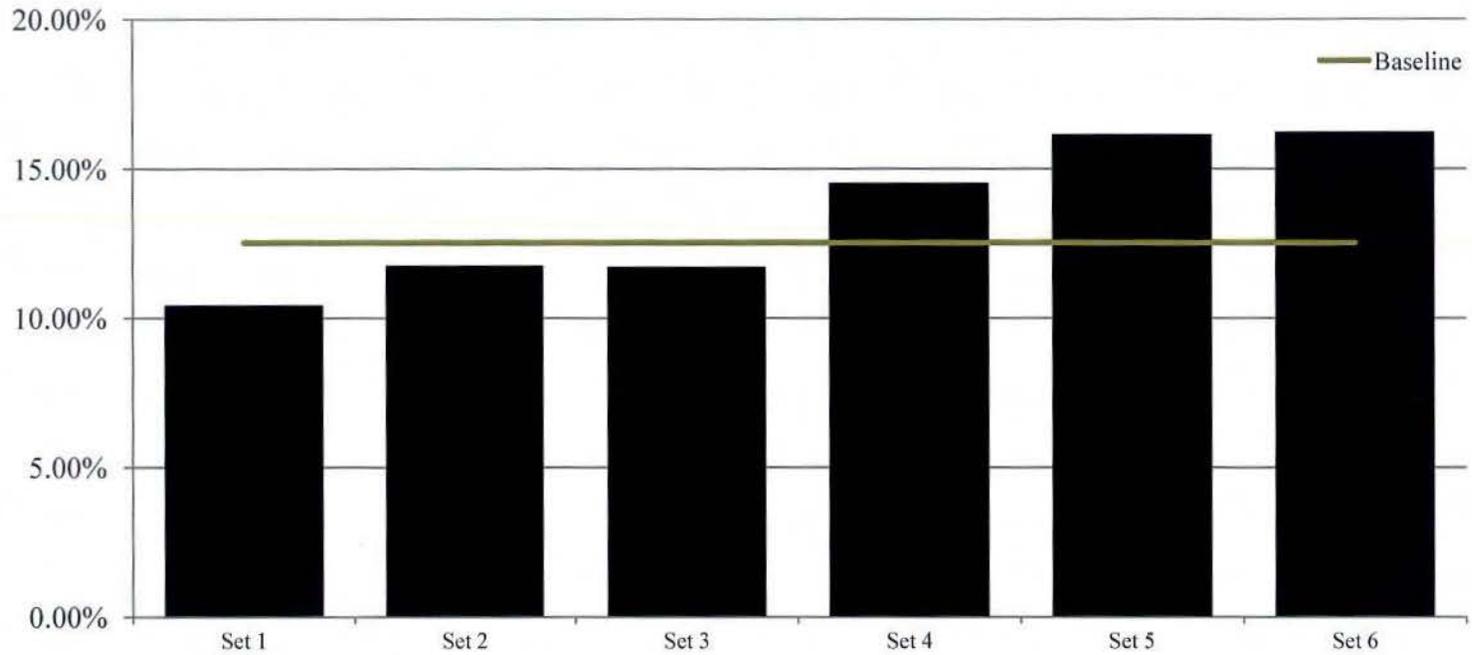
	Interest	Salary Scale	Payroll Growth	Mortality	Termination	Retirement
Range	1.98%	1.52%	0.72%	1.81%	0.49%	0.21%
Low	12.53%	11.77%	12.53%	11.02%	12.20%	12.32%
Baseline	12.53%	12.53%	12.53%	12.53%	12.53%	12.53%
High	14.51%	13.29%	13.25%	12.83%	12.69%	12.50%

# Effect of Grouped Assumptions on PVB



Investment	8.0%	8.0%	8.0%	7.5%	7.5%	7.5%
Salary Scale	Current -10%	Current -10%	Current -10%	Current +10%	Current +10%	Current +10%
Total Payroll Growth	4.5%	4.5%	4.5%	3.0%	3.0%	3.0%
Mortality	High	Neutral	Low	High	Neutral	Low
Withdrawal	Low	Neutral	High	Low	Neutral	High
Retirement	Low	Neutral	High	Low	Neutral	High

# Effect of Grouped Assumptions on ARC



Investment	8.0%	8.0%	8.0%	7.5%	7.5%	7.5%
Salary Scale	Current -10%	Current -10%	Current -10%	Current +10%	Current +10%	Current +10%
Total Payroll Growth	4.5%	4.5%	4.5%	3.0%	3.0%	3.0%
Mortality	High	Neutral	Low	High	Neutral	Low
Withdrawal	Low	Neutral	High	Low	Neutral	High
Retirement	Low	Neutral	High	Low	Neutral	High



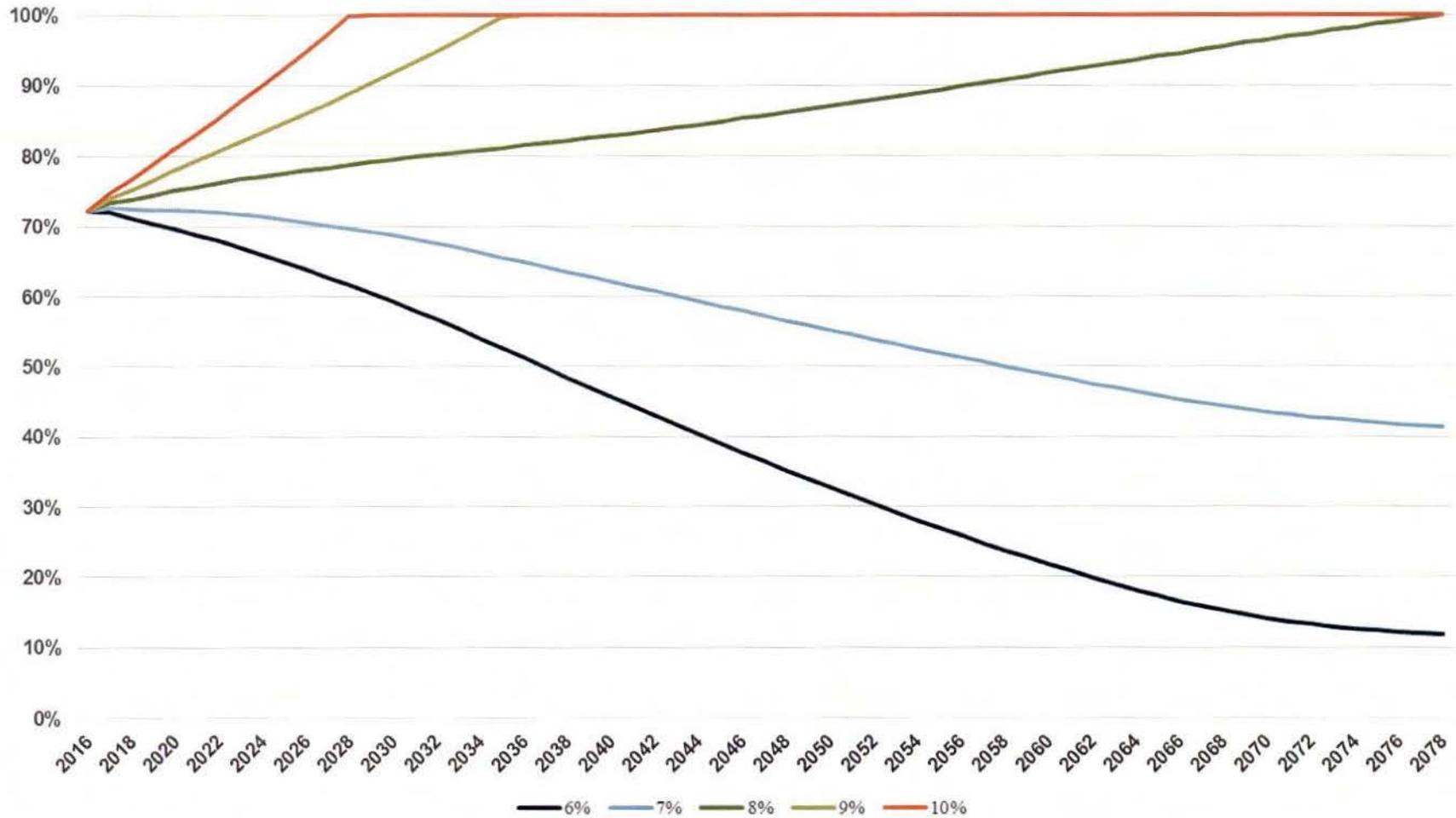
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# Plan Change Study Results

# Plan Options Evaluation Summary

## Main Systems – Existing Plan No Change (entire group)

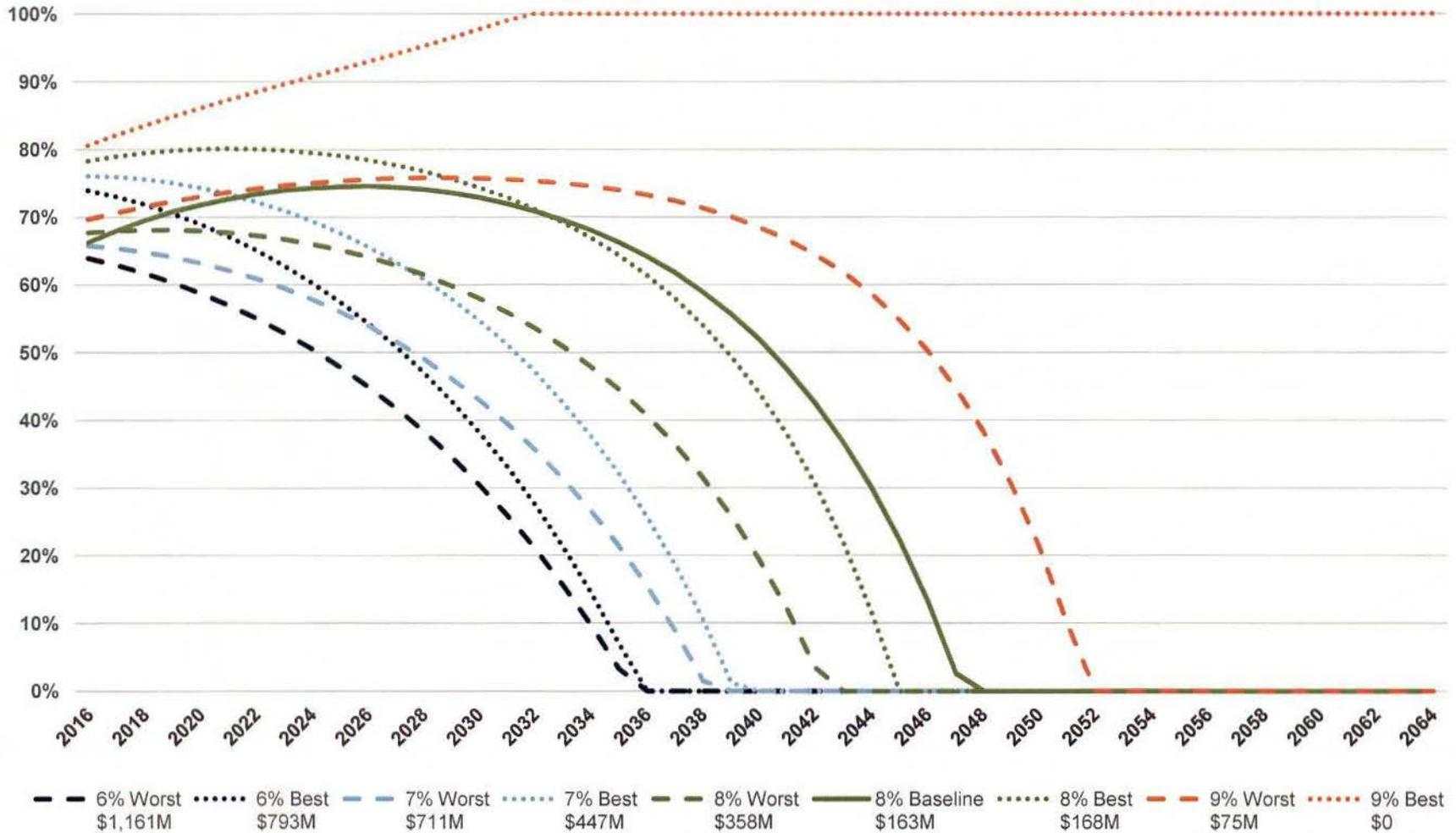
Funded Status



# Plan Options Evaluation Summary

## Main Systems – State Plan Closed (separated from Poli Sub)

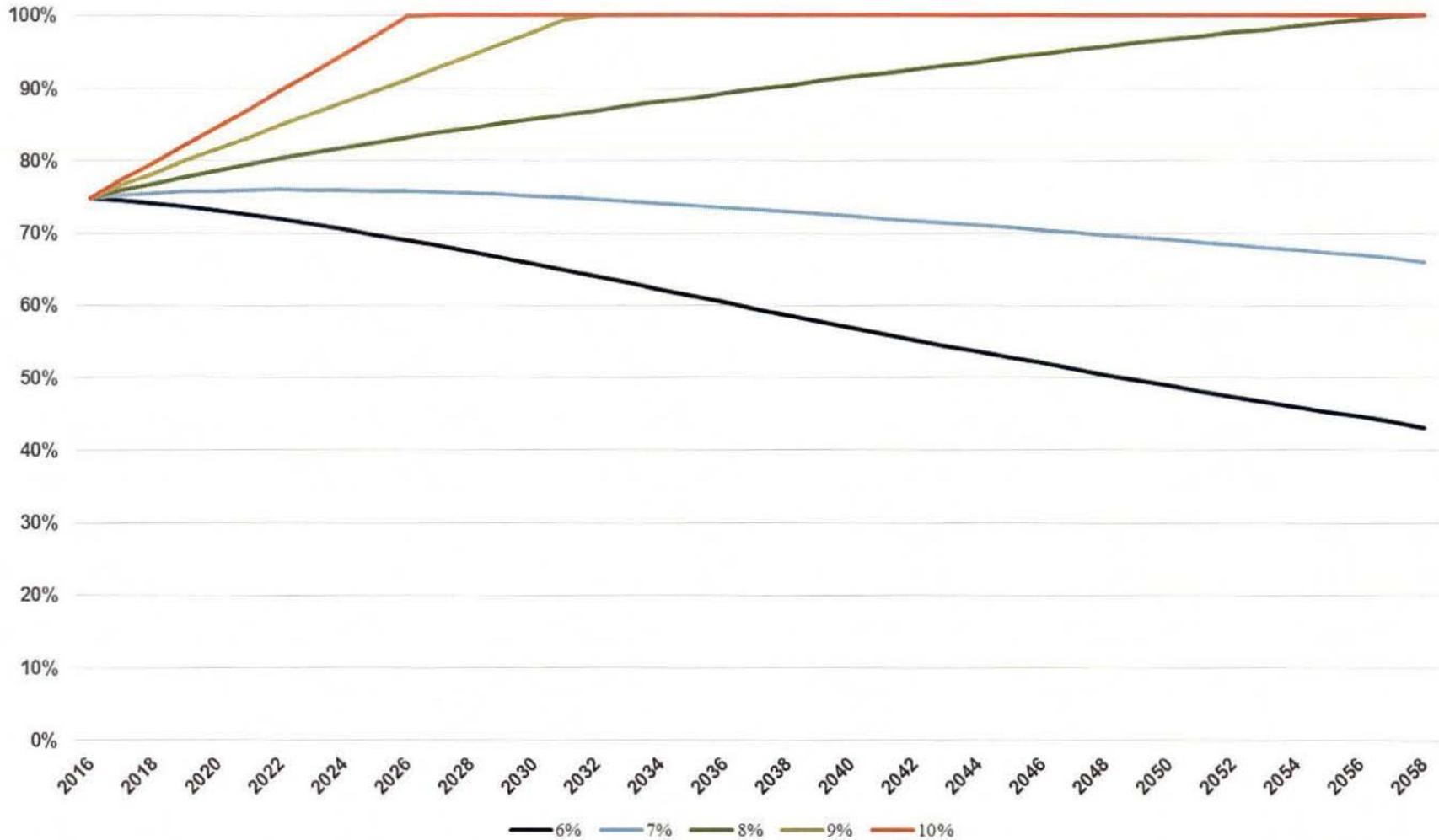
### Funded Status



# Plan Options Evaluation Summary

## Main Systems – Political Sub Plan (without state members)

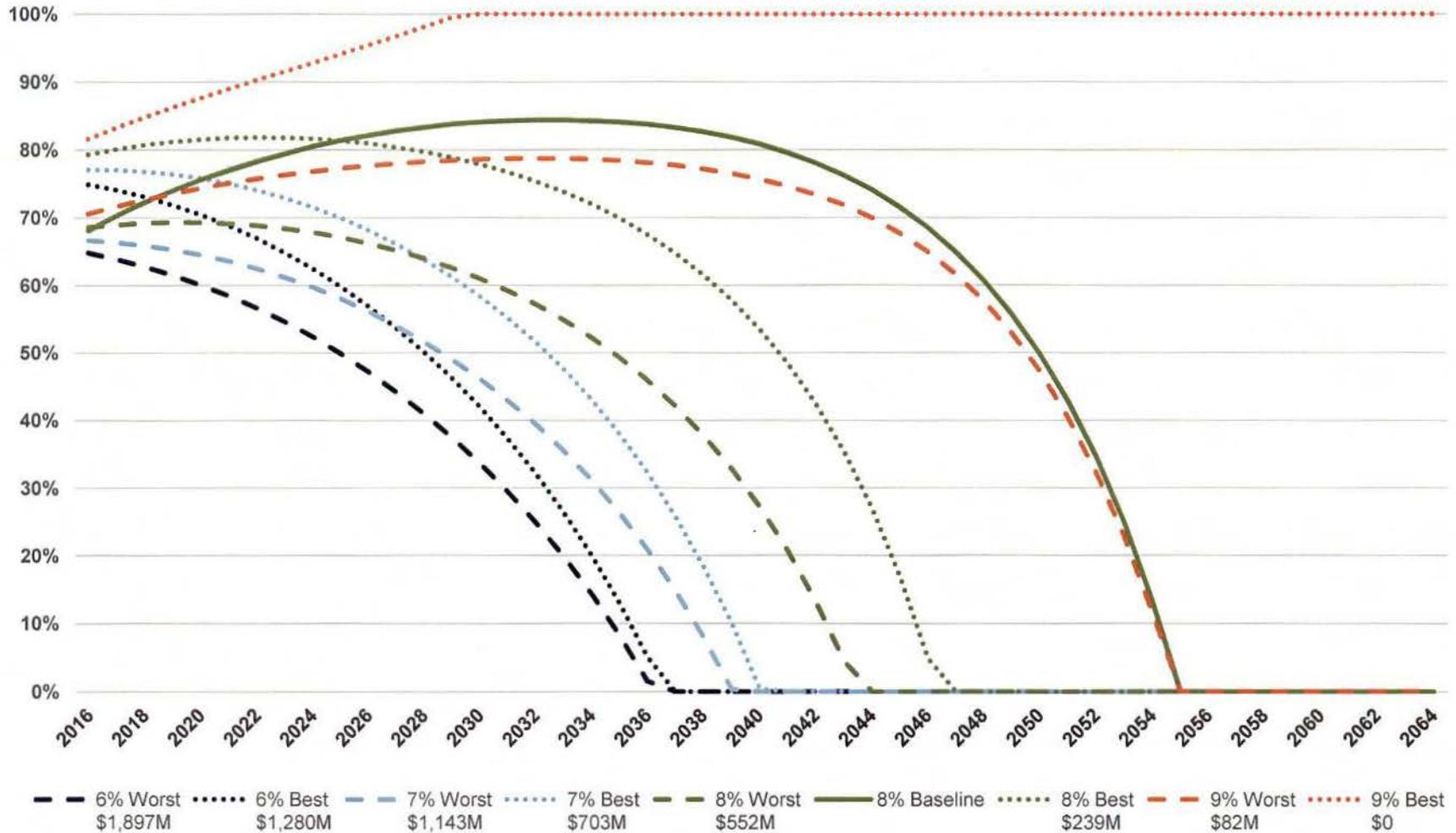
Funded Status



# Plan Options Evaluation Summary

Main Systems – Existing Plan with No New Entrants as of 1/1/2016

## Funded Status



## Next Steps

1. Reconcile minor data differences
2. Reconcile remaining program differences
3. Update projection module
4. Other assumptions and scenarios?
5. Prepare benefit impact information



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# Thank You

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