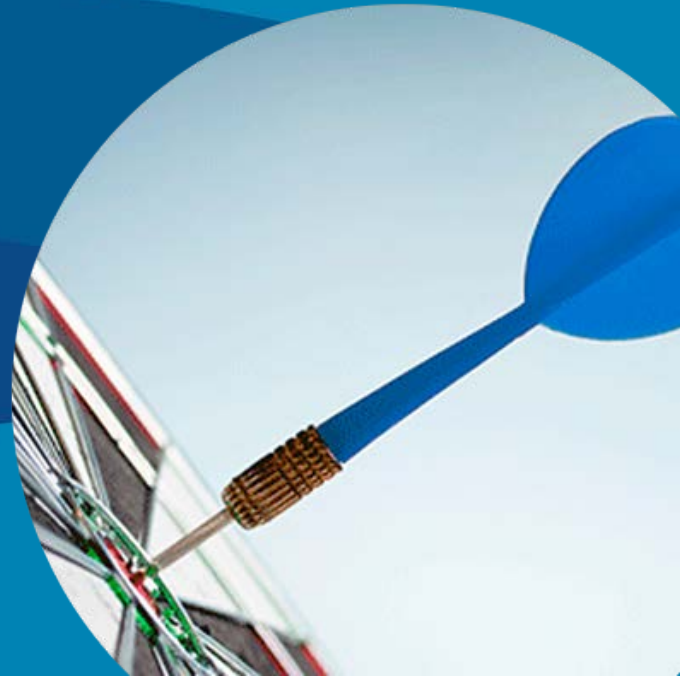


Wisconsin Retirement System

36th Annual Actuarial Valuation as of
December 31, 2016 and Gain/Loss
Analysis

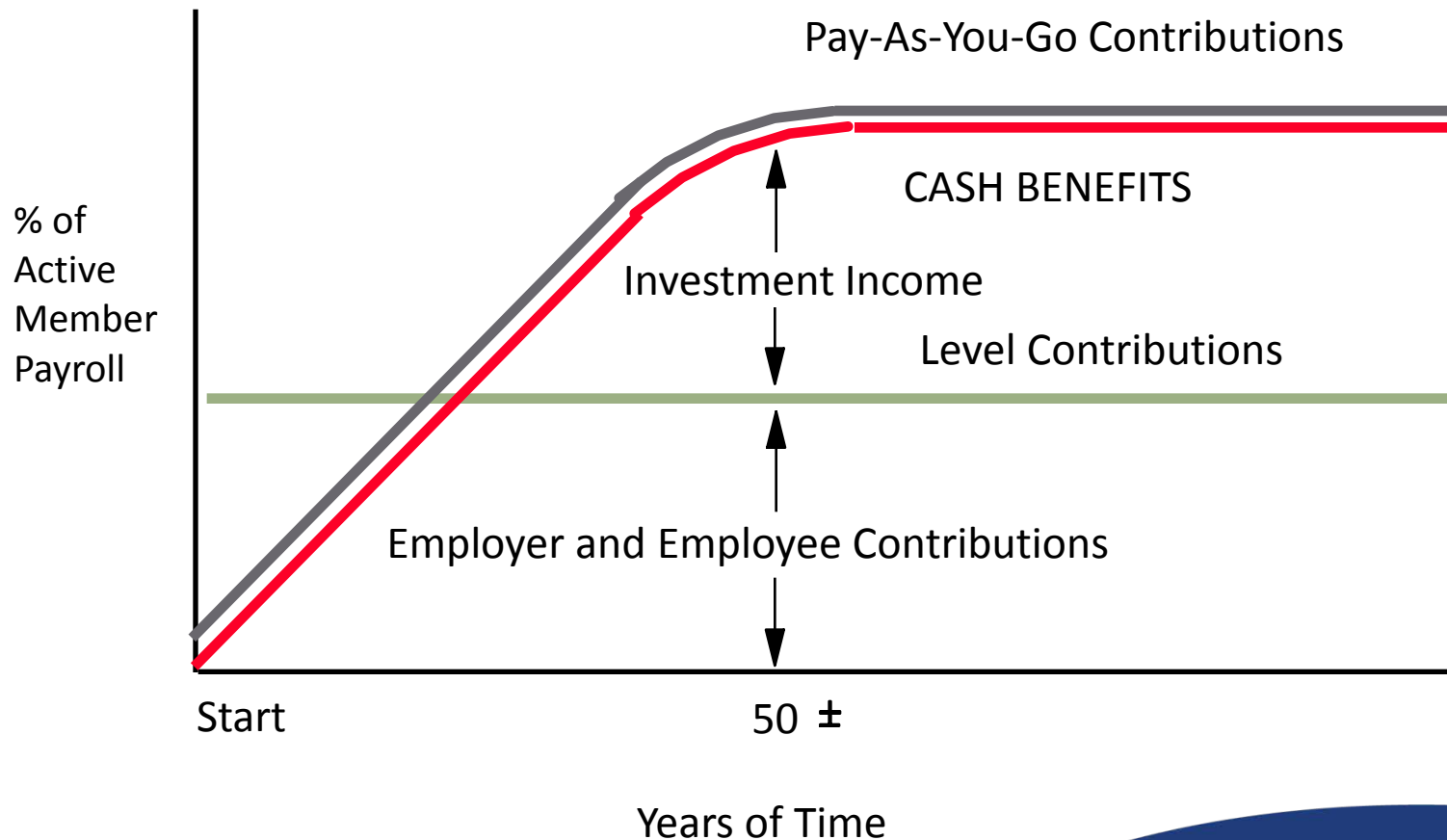
June 2017



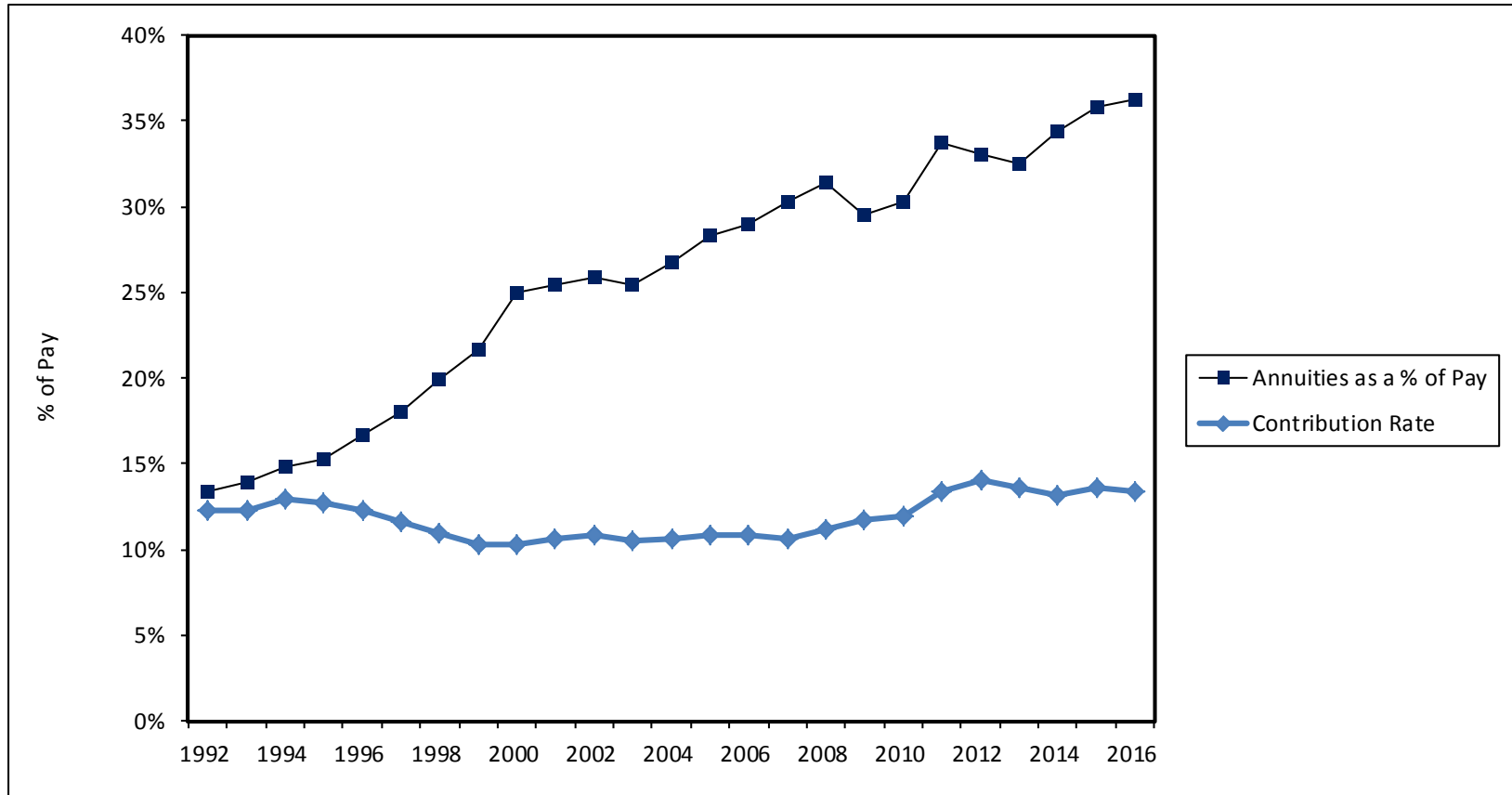
Funding Objectives

- Intergenerational equity with respect to plan costs
- Stable or increasing ratio of assets to liabilities
- Stable pattern of contribution rates

Financing Diagram



Annuities as a % of Payroll and WRS Average Total Contribution Rate*



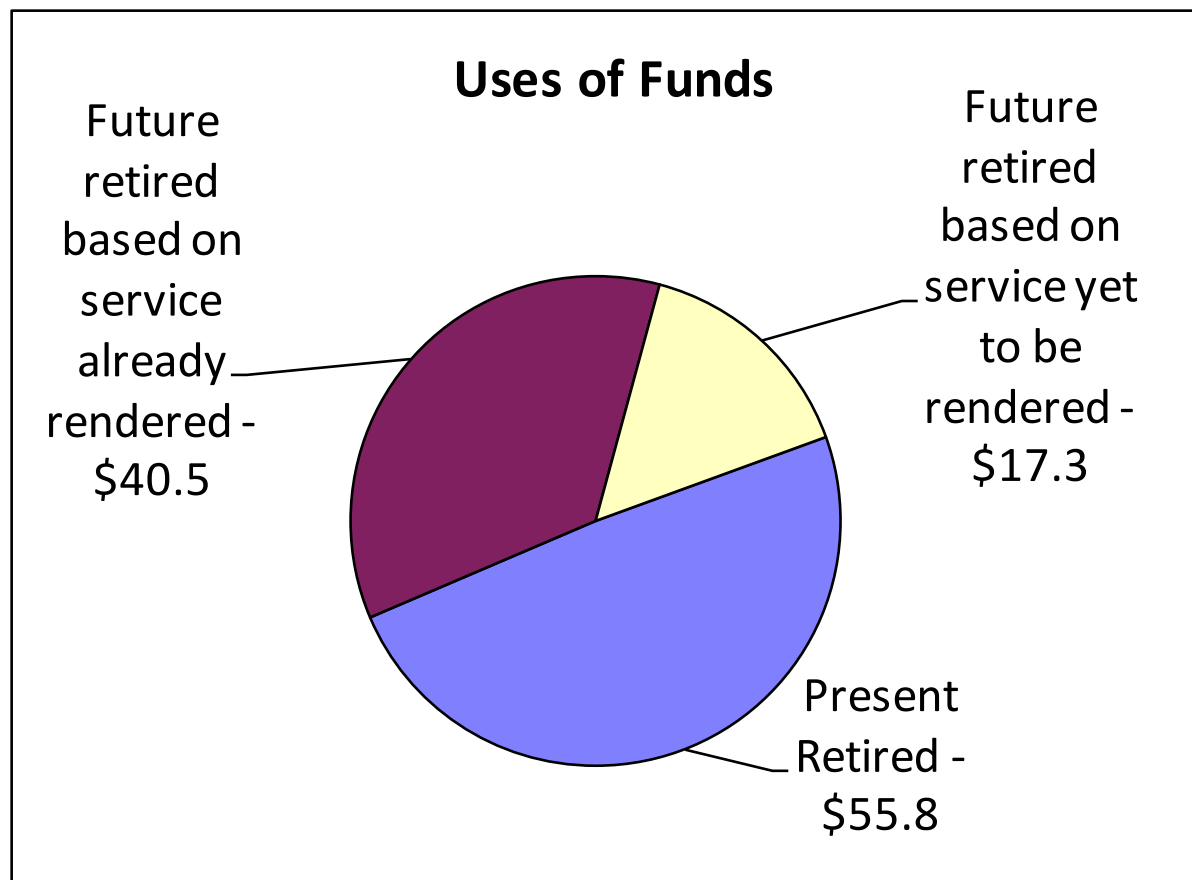
Annuities are expected to continue to increase as a percent of payroll for several more decades.

**Average total rate shown is for General Participants.*

Active Participants

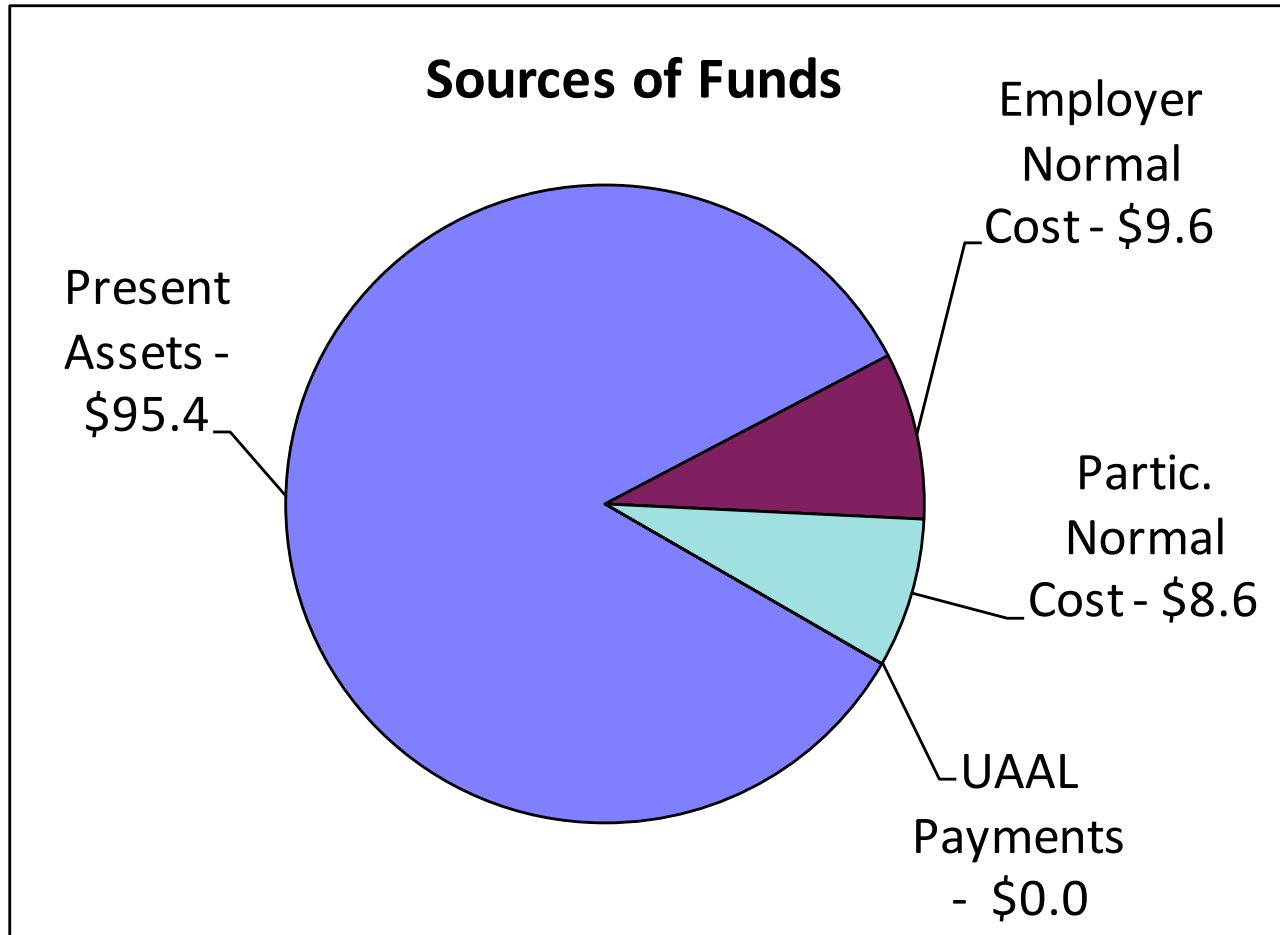
Valuation Group	Number	Annual Earnings (\$Millions)	Group Averages			
			Earnings	Age	Years of Service	Contribs.
General	232,684	\$11,963.8	\$51,417	45.6	11.4	\$55,167
Executive Group & Elected Officials	1,347	106.0	78,667	55.4	13.1	102,601
Protective Occupation with Social Security	19,431	1,203.2	61,924	40.4	12.6	64,918
Protective Occupation without Social Security	2,746	213.0	77,553	41.1	14.1	80,375
Total Active Participants	256,208	\$13,486.0	\$52,637	45.2	11.5	\$56,427
Prior Year	255,014	\$13,273.1	\$52,048	45.3	11.7	\$54,906

\$113.6 Billion* of Benefit Promises to Present Active and Retired Members



* Present value of future benefits; all divisions combined.

Sources of Funds for Financing \$113.6 Billion of Benefit Promises



Summary of December 31, 2016 Valuation Results

	General, Executive & Elected		Protective Occupation			
			With Soc. Sec.		Without Soc. Sec.	
	2018	2017	2018	2017	2018	2017
Employer Normal Cost	6.70%	6.80%	10.70%	10.60%	14.90%	14.90%
Participant Normal Cost	6.70%	6.80%	6.70%	6.80%	6.70%	6.80%
Total Normal Cost	13.4%	13.6%	17.4%	17.4%	21.6%	21.7%
Unfunded Actuarial Accrued Liability (UAL)	0.03%	0.07%	0.03%	0.08%	0.05%	0.14%
WRS Average Total	13.4%	13.7%	17.4%	17.5%	21.7%	21.8%

Comparative Statement of Total Average Contribution Rates

Valuation 12/31	General	Executive & Elected	Protective with Soc. Sec.	Protective without Soc. Sec.
1996	12.3%	15.9%	14.8%	20.4%
2001	10.6%	11.7%	11.7%	13.7%
2006	10.8%	11.6%	13.4%	14.6%
2011	13.4%	14.0%	16.4%	19.3%
2012	14.0%	15.5%	17.1%	21.0%
2013	13.6%	15.4%	16.3%	20.2%
2014	13.2%	15.6%	16.0%	20.0%
2015	13.7%	13.7%	17.5%	21.8%
2016	13.4%	13.4%	17.4%	21.7%

Executive and Elected employee and employer rates for CY 2016 and beyond are made in accordance with the combined General/Exec & Elected results.

Reasons for Contribution Changes

	General, Executive & Elected	Protective with Soc. Sec.	Protective without Soc. Sec.
2017 Normal Cost Rate	13.60%	17.40%	21.70%
Effect of Asset Performance	(0.05)%	(0.11)%	(0.19)%
Effect of Assumption Change	0.00%	0.00%	0.00%
Effect of Salary Experience	(0.15)%	(0.05)%	(0.26)%
Demographic and Other Experience	0.05%	0.18%	0.37%
Effect of Money Purchase Benefit	(0.05)%	(0.02)%	(0.02)%
2018 Normal Cost Rate	13.40%	17.40%	21.60%

The effect of Asset Performance is different for each group because the ratio of assets to payroll is different for each group.

Impact of Asset Gains/Losses

- Asset gains and losses above or below the assumed rate of return are smoothed in over the current year, and four future years
- Four years after a valuation date, all asset gains or losses known at valuation date are fully recognized
- Statutory smoothing method in WRS is referred to as the Market Recognition Account (MRA)

Operation of Market Recognition Account (MRA) - \$ Millions

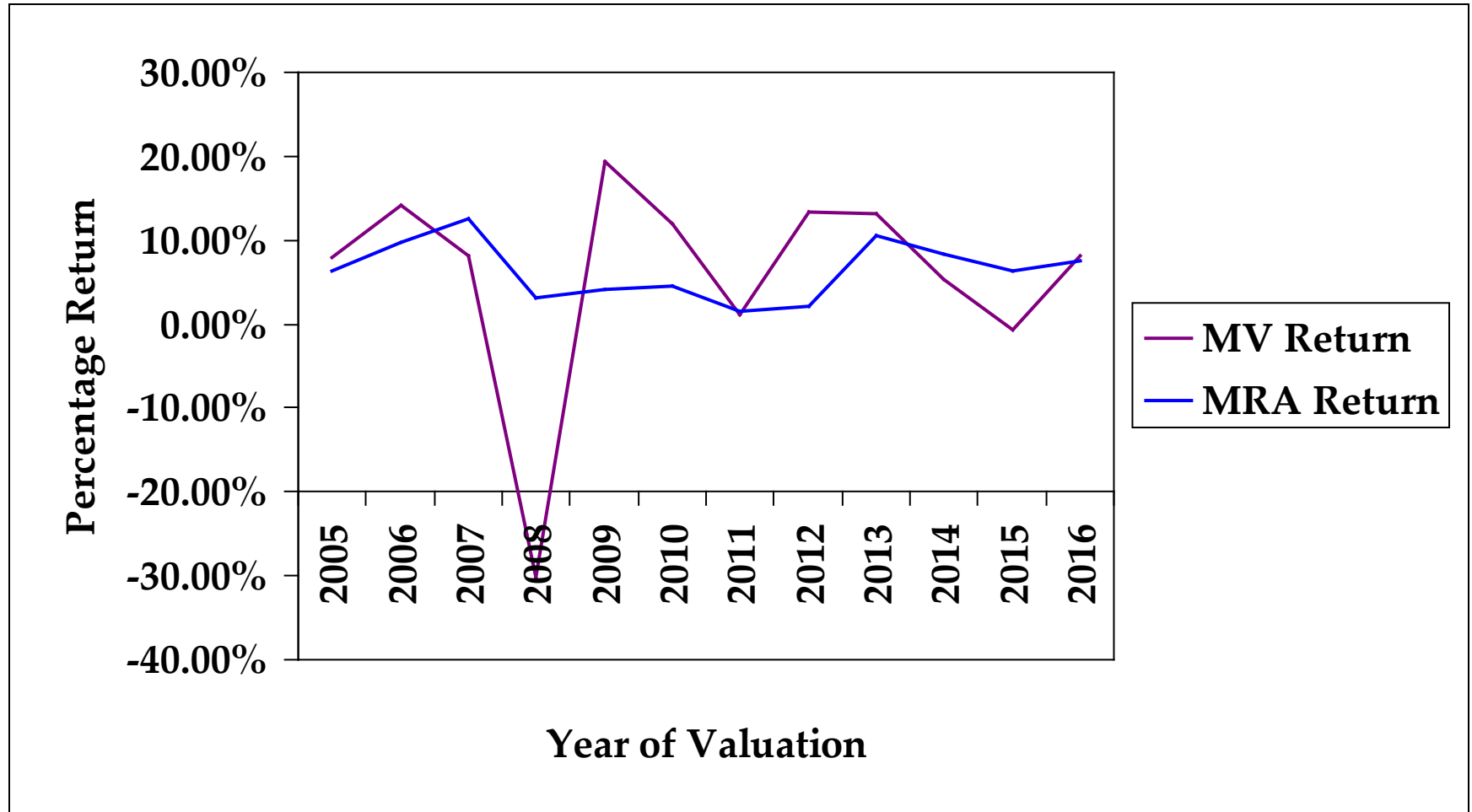
	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
Actual Investment Return	\$ 6,876				
Assumed Investment Return	6,273				
Gain/(Loss) to be phased-in	603				
Phased-in recognition					
• Current year	\$ 121	?	?	?	?
• First prior year	(1,344)	\$ 121	?	?	?
• Second prior year	(243)	(1,344)	\$ 121	?	?
• Third prior year	953	(243)	(1,344)	\$ 121	?
• Fourth prior year	<u>793</u>	<u>953</u>	<u>(243)</u>	<u>(1,344)</u>	<u>\$ 121</u>
Total recognized gain (loss)	\$ 280	\$ (513)	\$ (1,466)	\$ (1,223)	\$ 121

Reconciliation of Market Recognition Account (MRA)

	<u>\$ Millions</u>
MRA at Beginning of Year	\$88,695.4
Non-Investment Cash Flow	(3,136.6)
Assumed Return (at 7.2%)	6,273.2
Phase-in of Gains/(losses)	280.5
MRA at End of Year	\$92,112.5

Assets in MRA include non WRS programs such as Sick Leave, LTDI, Duty Disability, etc.

Market Value Return vs. Market Recognition (Actuarial) Return



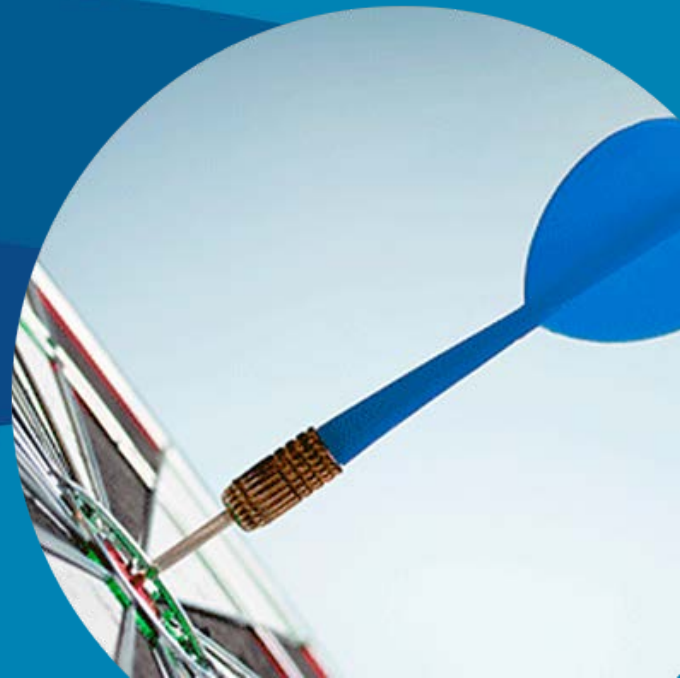
WRS Funded Status

	Frozen Initial	Entry Age
2014	100.0%	99.5%
2015	100.0%	98.7%
2016	100.0%	99.0%

Concluding Remarks

- There are \$3.1 billion of unrecognized losses in the MRA
- Due to the cost sharing nature of WRS, asset losses have been traditionally shared by:
 - Employees (through reduced money purchase benefits)
 - Employers (through increases in contributions)
 - Retirees (through reduced dividends)

Gain/Loss Analysis



2016 Gain/Loss Analysis

A Gain/Loss Analysis measures differences between actual and assumed experience in each Risk Area.

WRS Assumption Risk Areas

Primary Risks

Demographic

Normal retirement

Early retirement

Death-in-service

Disability

Other separations

Economic

Salary increases

Investment return

Why Have a Gain/Loss Analysis?

- To gain an understanding of reasons for contribution rate changes
- It is a year-by-year measure of the operation of assumptions
- To determine when assumption changes are needed
- To understand the nature of risk

Population Development During 2016

	<u>Actual</u>	<u>Expected</u>
Beginning Census	255,014	
(-) Normal Retirement	4,194	4,135
(-) Early Retirement	3,635	4,179
(-) Death	136	253
(-) Disability Retirement		
- Total Approved	103	193
- Less Pending	25	
- Net New	78	
(-) Other Separations	14,016	12,090
(-) Transfers Out	1,926	
(+) Transfers In	1,926	
(+) New Entrants	23,253	
Ending Census	256,208	

Population Development During 2016

Normal Retirements: Varied by group and gender. Overall, slightly higher than expected, but net result on liabilities is a small loss.

Early Retirements: Lower than expected, overall producing a small loss.

Deaths: Among active participants were lower than expected. The net result for the past year was a small loss.

Disabilities: Lower than expected, producing a gain.

Other Separations: Varied by group, gender and service. The net result was a small gain.

Components of Total Gain/(Loss)

	Gain/(Loss) in Millions	
	2015	2016
Economic Risk Areas	\$(141)	\$436
Decrement Risk Areas	(15)	(15)
Other Activity	(19)	(19)
Total Gain/(Loss)	\$(175)	\$402

Investment Earnings in 2016 (Active Participants)

\$ Millions

A. Average balance on Participant and Employer Accumulation Reserves	\$37,524
B. Expected earnings: 7.2%	2,702
C. Earnings credited to Participant and Employer Accumulation Reserves	2,941
D. Gain (loss) from earnings: C - B	\$ 239

Investment Earnings in 2016 (Active Participants)

- \$239 million is the total recognized asset gain for the year for active participants
- However, part of the total gain/loss is allocated to Variable Excess accounts
- Some of the loss flows through to members via the operation of Money Purchase minimum benefits
- Must net these out to determine remaining core fund gain or loss
- Remaining portion affects contribution rates

Investment Earnings in 2016 (Active Participants)

	<u>\$ Millions</u>
Gross Gain/(Loss) for the Year (for Actives)	\$239
Less Estimated Gain/(Loss) due to Money Purchase	48
Less Estimated Gain/(Loss) due to Variable Excess	<u>53</u>
Net Core Fund Asset Gain/(Loss)	\$138

Comparative Schedule of Experience Gains/Losses by Decrement

Divisions Combined (Millions)

	<u>2015</u>	<u>2016</u>
Normal Retirement	\$ (22.0)	\$ (33.1)
Early Retirement	(26.8)	(18.5)
Disability Retirement	14.4	17.2
Death with Benefit	(2.6)	(0.2)
Other Separations	22.2	20.0
Total	\$ (14.8)	\$ (14.6)
As % of Liabilities	<0.05%	<0.05%

Salary Related Gain/Loss

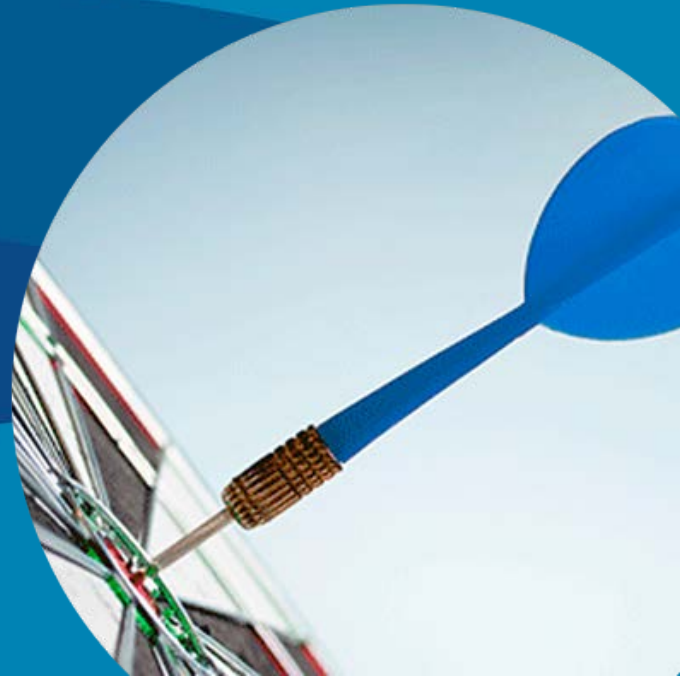
- Pay increases were overall less than expected, resulting in a gain

	Gain/Loss	% of Group
	\$ Millions	Liabilities
General	\$268.1	0.8 %
Executive & Elected	14.0	6.3 %
Protective w/Soc. Sec.	8.5	0.2 %
Protective w/o Soc. Sec.	7.6	0.8 %
	\$298.2	0.7 %

Concluding Remarks

- Recognition of remaining prior asset losses are expected over the next few years
- This Gain/Loss Analysis is the second in a regular 3-year experience cycle
- This study, together with the 2015 and 2017 results, will form the basis for the next experience study
- GRS will also be reviewing the investment return assumption of 7.2% with SWIB this Fall

Current Events



Current Events

- SLGE/AARP Release Guide for Elected Officials on Understanding Public Pensions
- Public Plans — Quick Facts¹
 - **Cover** 14.7 million active (working) members
 - **Distribute** \$277.1 billion annually in benefits to 9.9 million retirees
 - **Hold** \$3.86 trillion in assets

¹Sources: Public Plans Data (PPD) and Federal Reserve Flow of Funds

Current Events

- NCPERS Report

Economic Loss: The Hidden Cost of Prevailing Pension Reforms

– Impact of reforms on

- Total personal income
- Future economic growth
- Income inequality

Current Events

- Center for Retirement Research (CRR) at Boston College issue brief:

How Will More Retirees Affect Investment Returns?

- U.S. demographic transition to an older society → long-term effect on investment returns.

Current Events

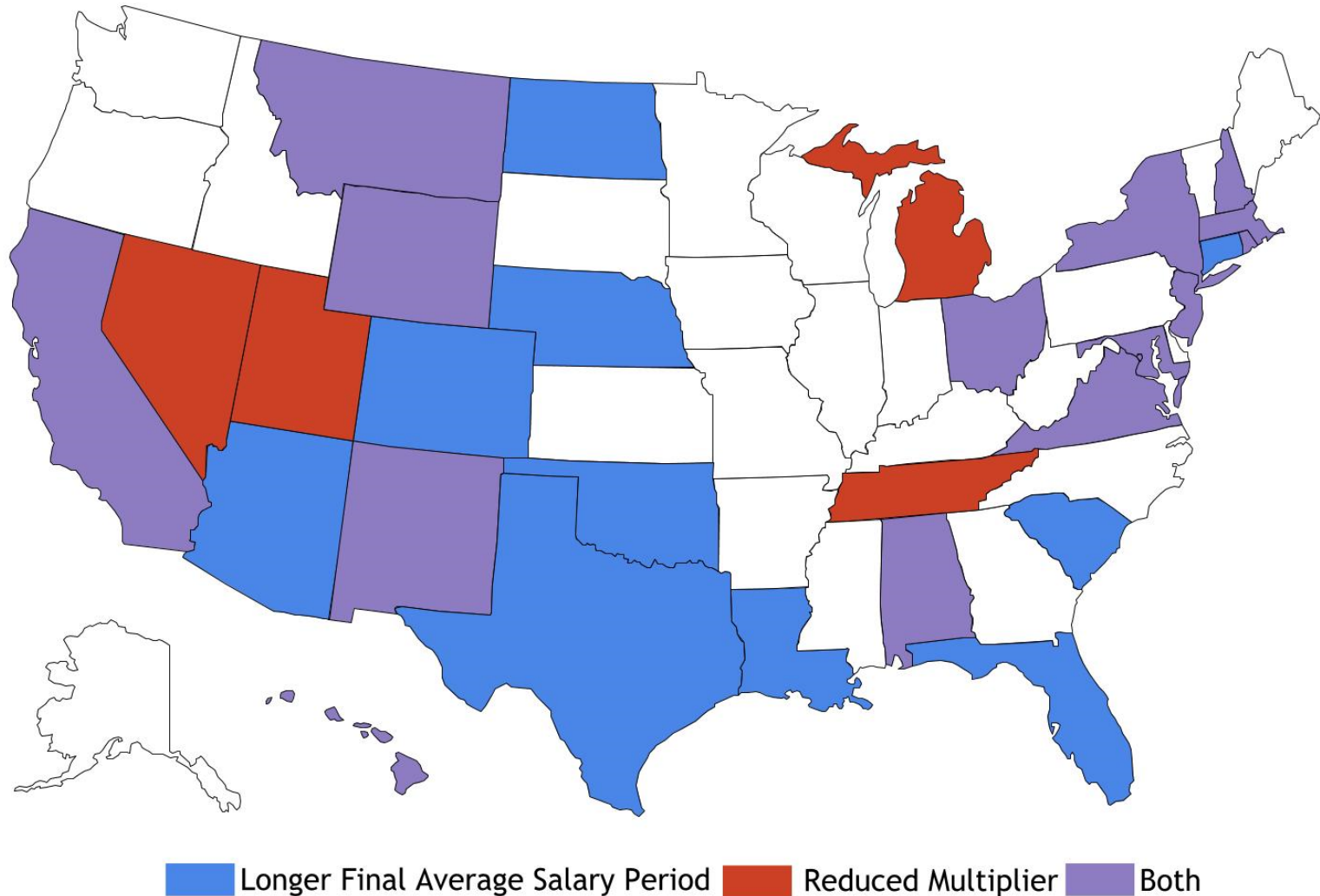
- State happenings
 - Kentucky lessons for other sponsors
 - Michigan – pressure to convert Public School Employee Retirement System to Defined Contribution

Nearly Every State Modified Public Pension Benefits, Raised Employee Contributions, or Both, Since 2009

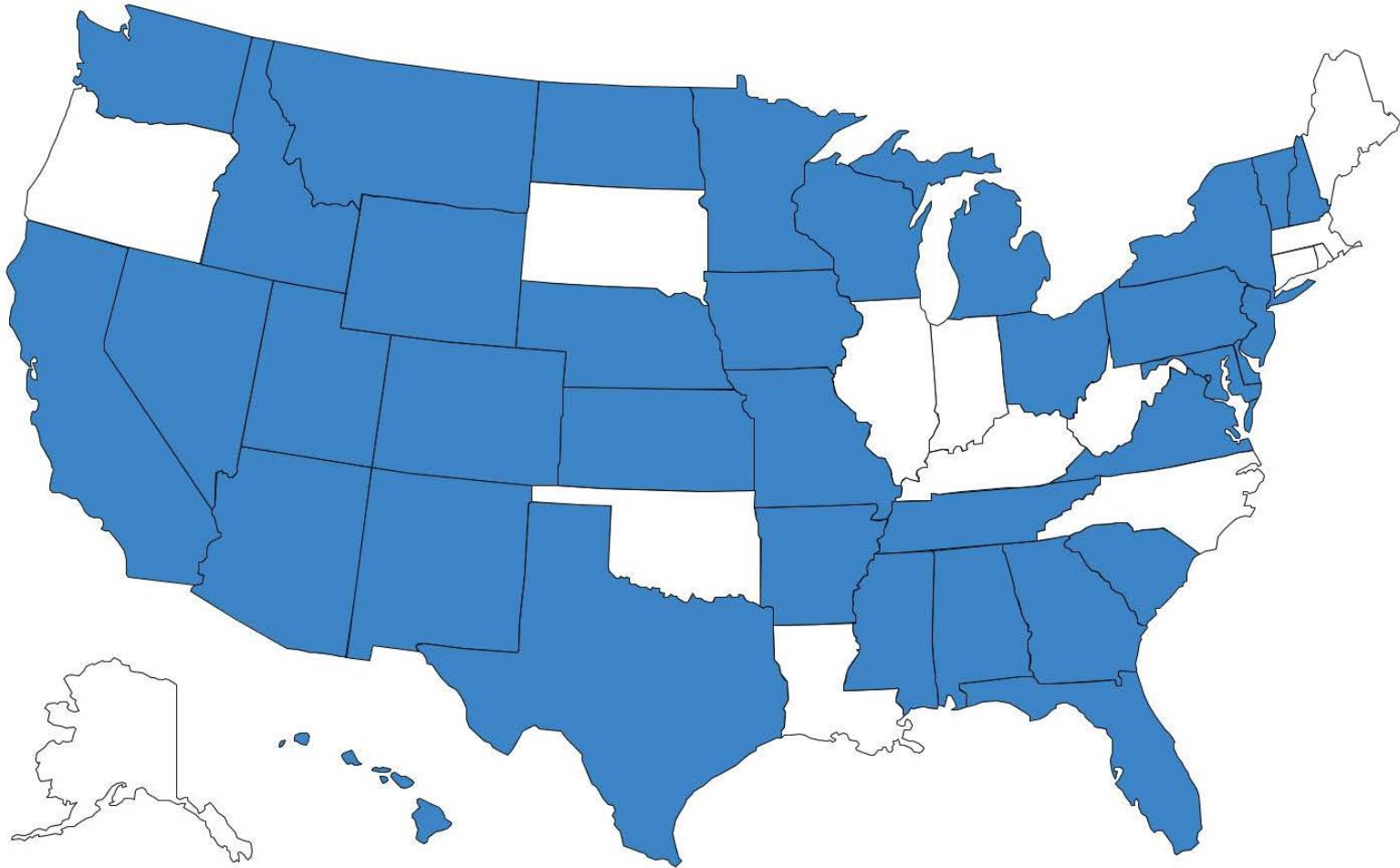
- Lower benefits:
 - Higher retirement age
 - More required years of service
 - Lower multiplier
 - Longer vesting period
 - Reduced, suspended or eliminated COLAs
- Increased use of hybrid retirement plans
- Two new defined contribution plans:
 - Oklahoma new state hires as of 11/1/15
 - Elected officials in Arizona since 2013

Excerpted with permission from "Significant Reforms to State Retirement Systems," NASRA 2016

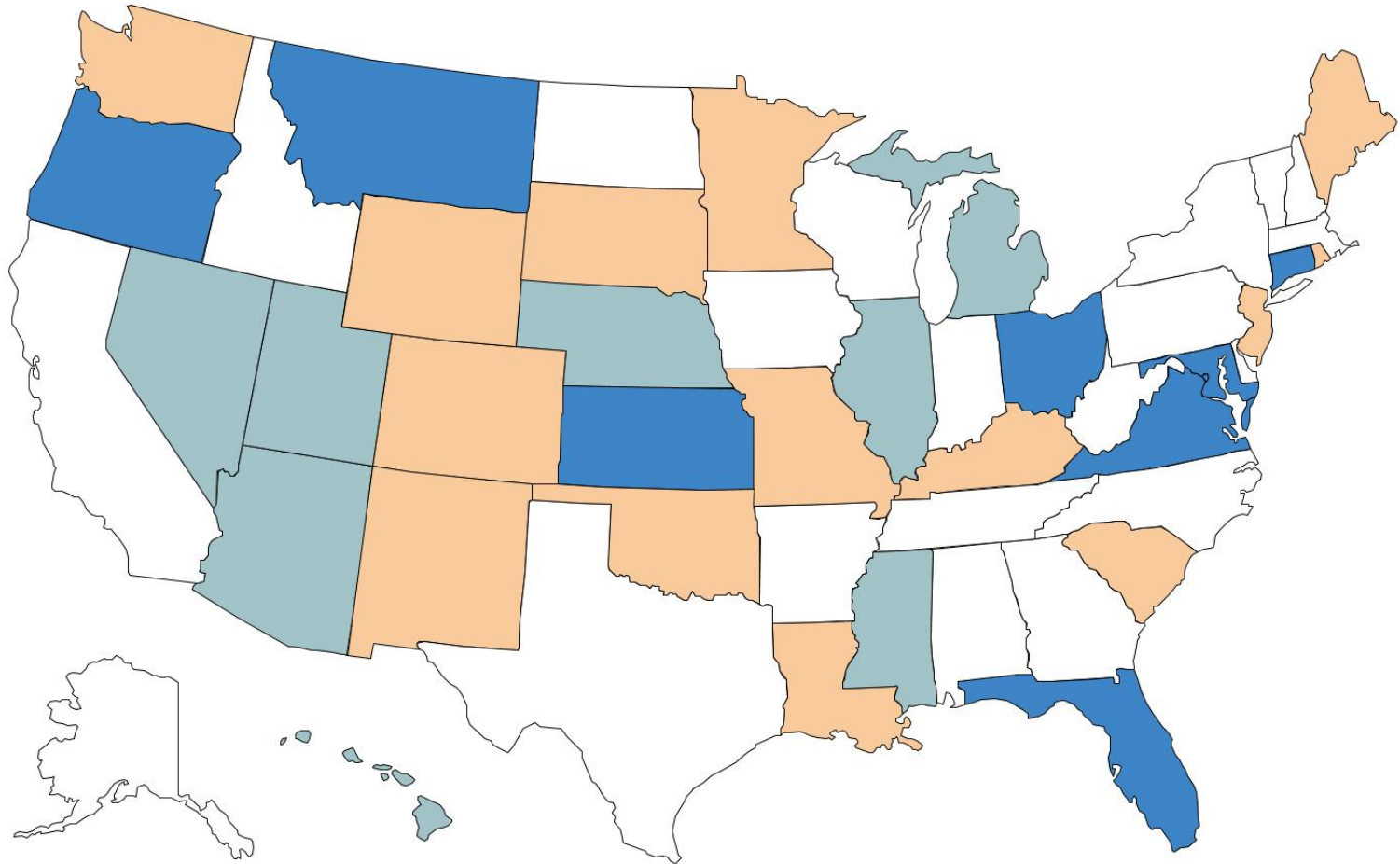
States that Reduced Employee Pension Benefits 2009-2014



States that Increased Employee Pension Contribution Rates 2009-2014

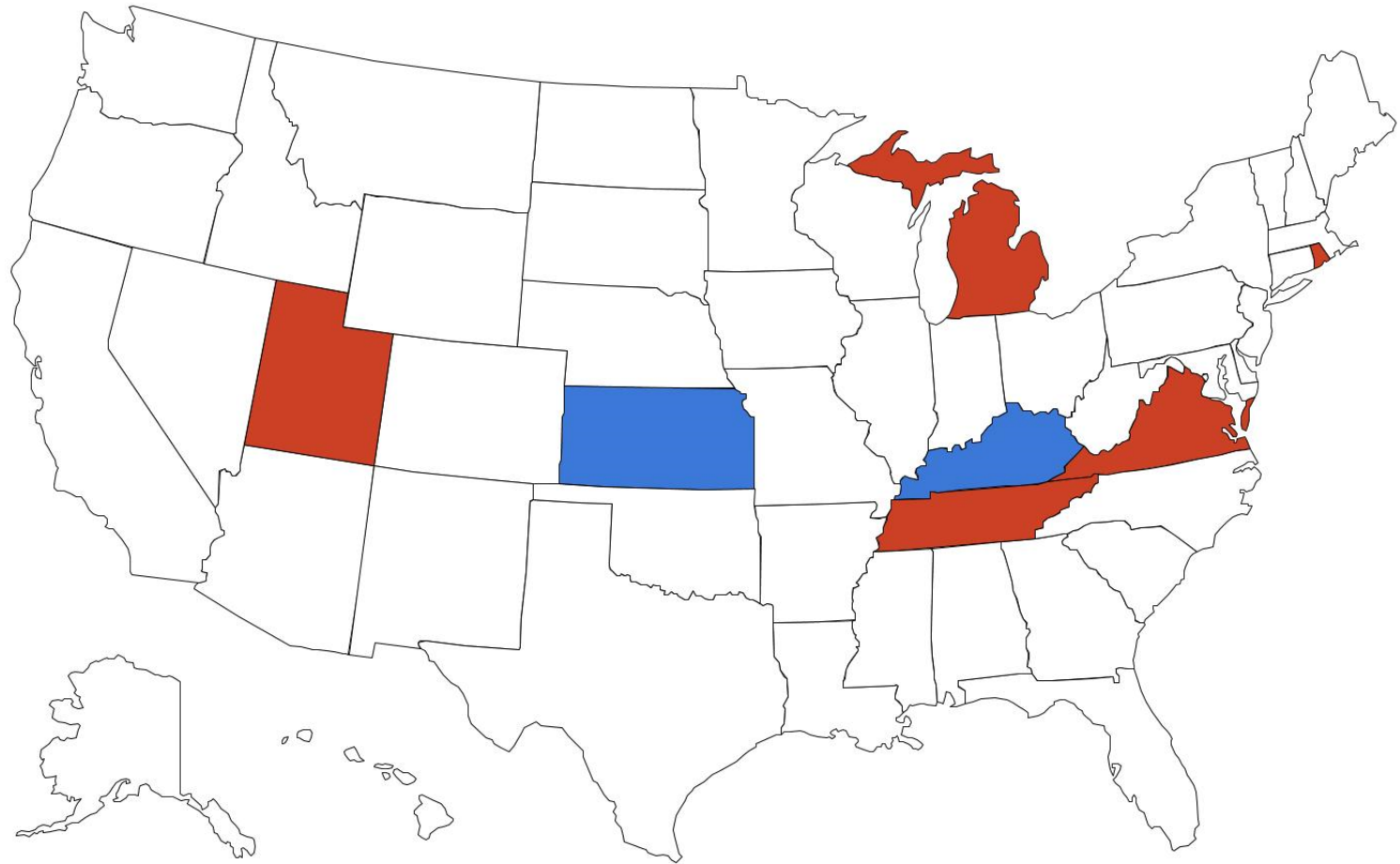


States that Reduced Automatic COLAs 2009-2015



Affecting New Hires Only Affecting Current Employees & New Hires Affecting Retirees

States that Established New Hybrid Plans 2009-2014



Plan Type ■ Combination hybrid ■ Cash balance

Drivers of Redesign

- Financial Crisis of 2008
- Actuarial Issues
- Retirement of Baby Boomers
- Expectations of Millennials
- GASB 68 and 75

-
- QUESTIONS?

Disclaimers

- This presentation shall not be construed to provide tax advice, legal advice or investment advice.
- Brian Murphy, Mark Buis and James Anderson are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.
- This is one of multiple documents comprising the actuarial report. Additional information regarding actuarial assumptions and methods, and important additional disclosures are provided in the full report entitled “Thirty-Sixth Annual Actuarial Valuation and Gain Loss Analysis.”
- If you need additional information to make an informed decision about the contents of this presentation or the contents of the full report, or if anything appears to be missing or incomplete, please contact us before making use of the information.