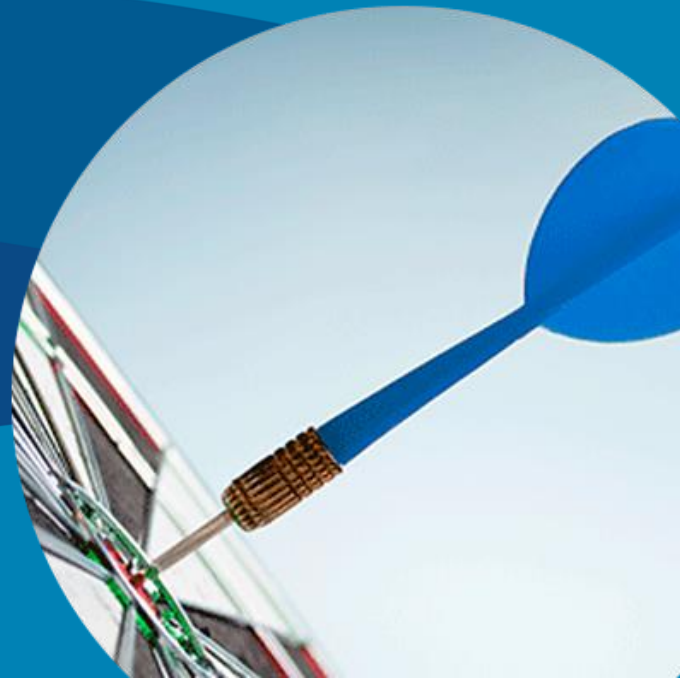


Wisconsin Retirement System

38th Annual Actuarial Valuation as of
December 31, 2018 and Gain/Loss
Analysis

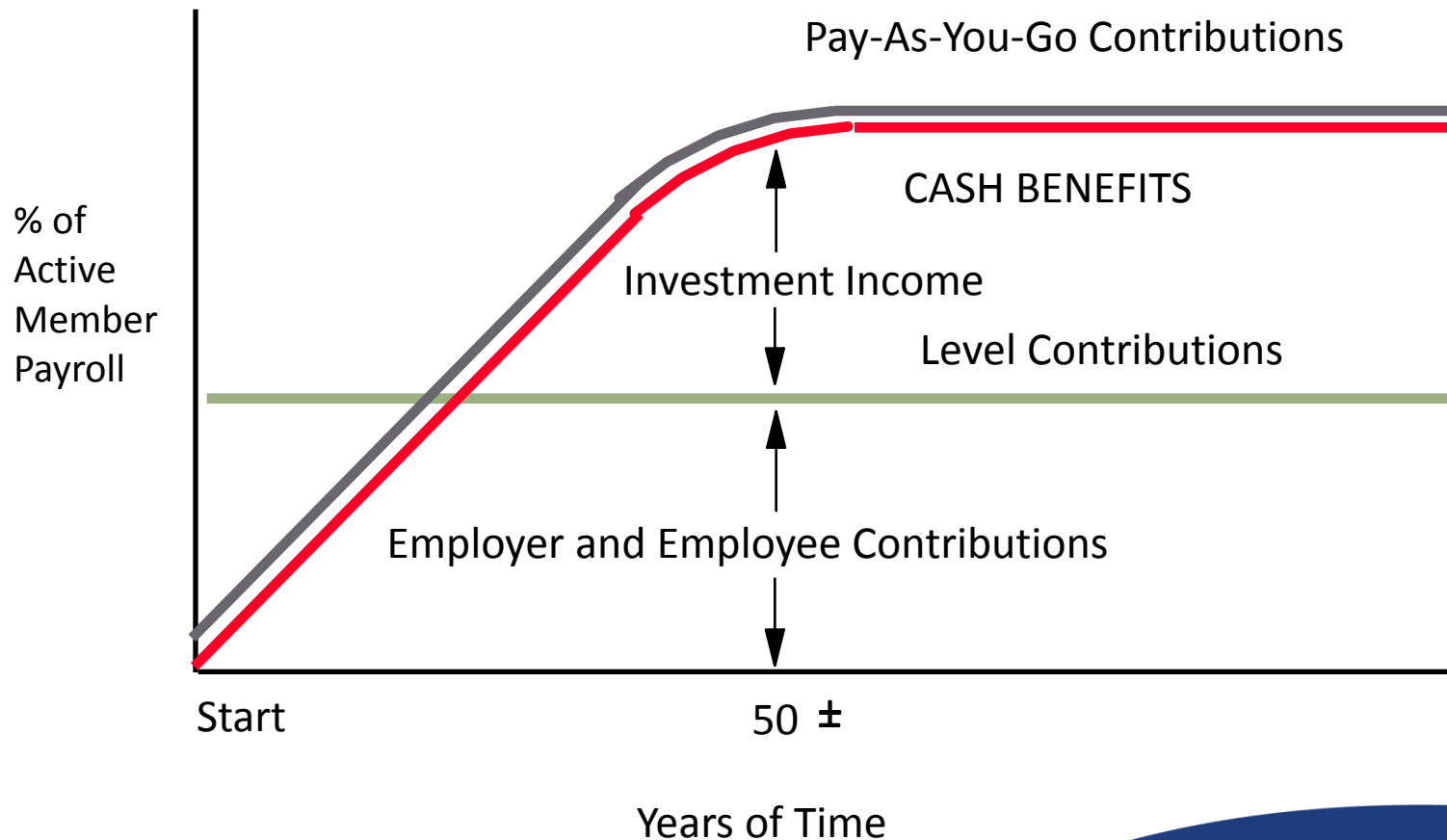
June 2019



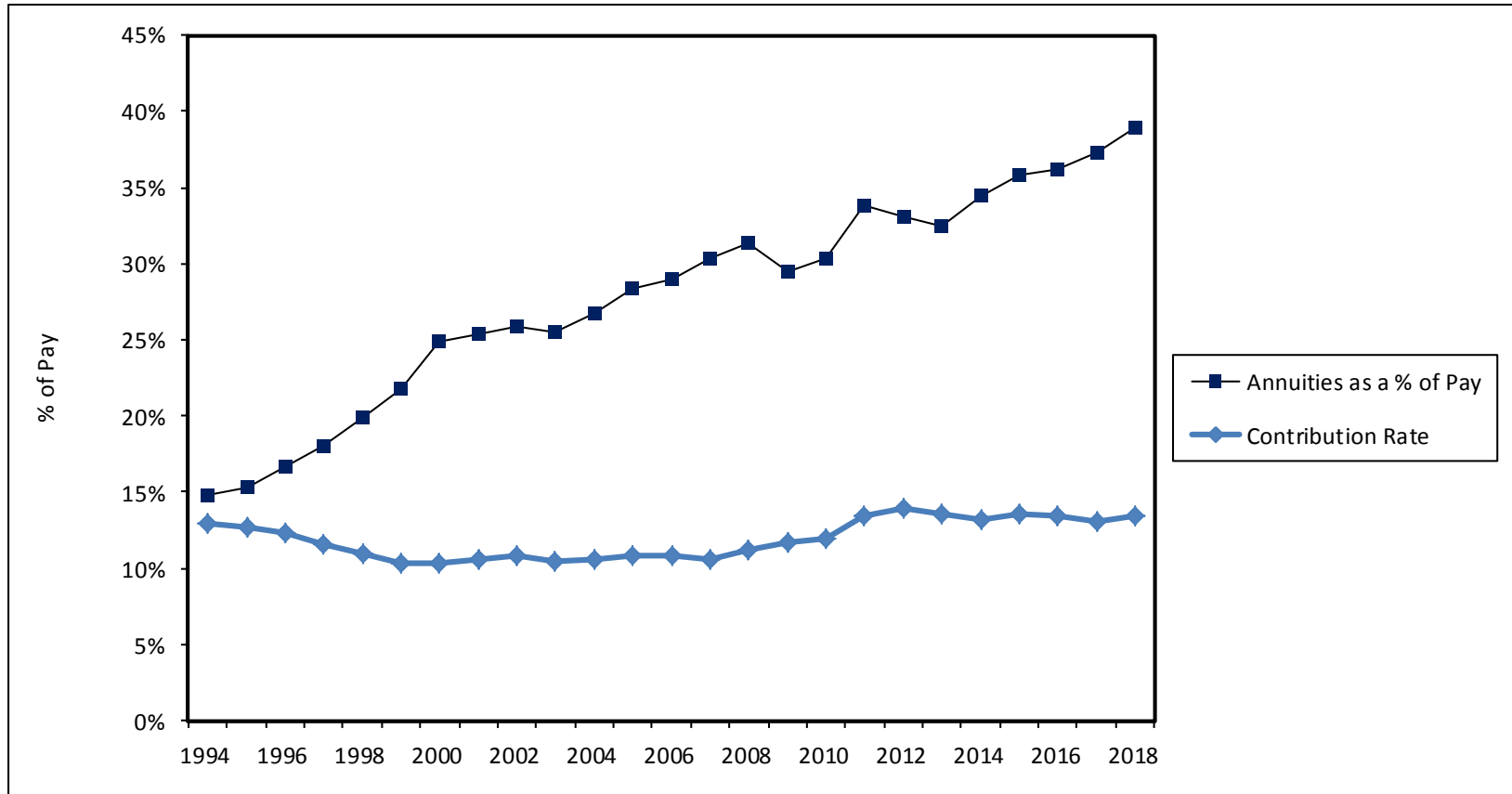
Funding Objectives

- 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

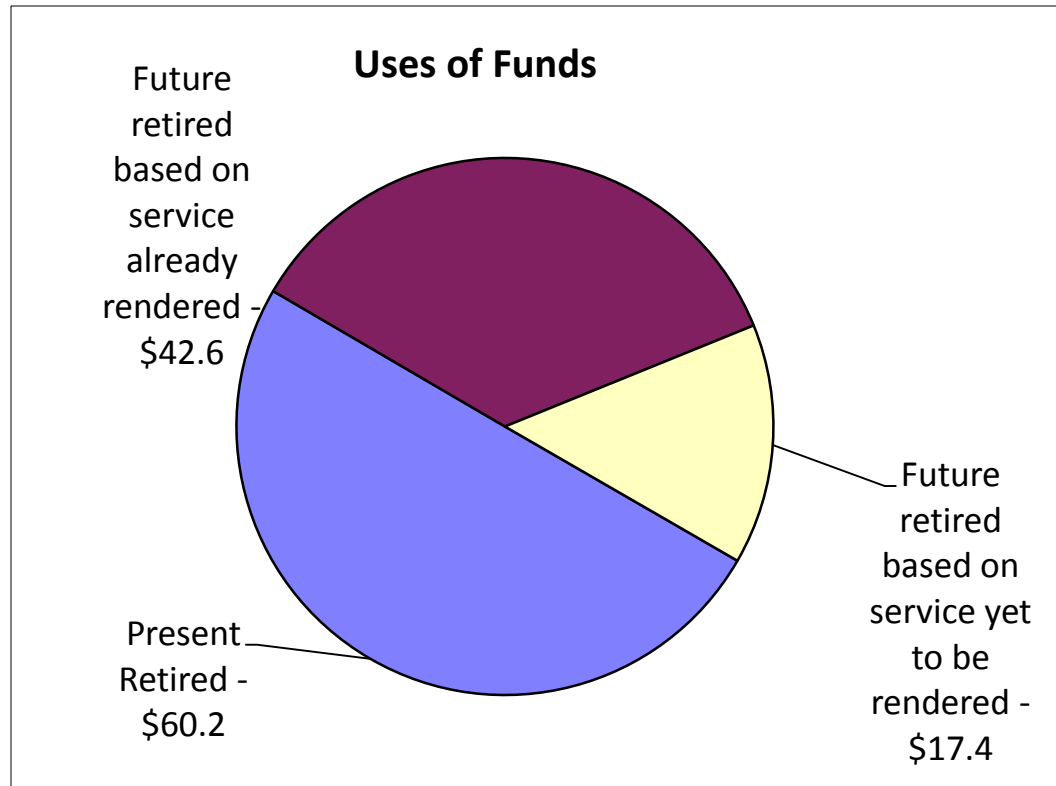
Valuation Group	Number	Annual Earnings (\$Millions)	Group Averages			
			Earnings	Age	Years of Service	Contribs.
General	233,462	\$12,445.3	\$53,307	45.4	11.3	\$57,865
Executive Group & Elected Officials	1,302	108.0	82,986	55.4	13.9	107,053
Protective Occupation with Social Security	19,399	1,263.1	65,113	40.1	12.3	68,238
Protective Occupation without Social Security	2,770	224.9	81,206	40.9	14.0	84,702
Total Active Participants	256,933	\$14,041.3	\$54,650	45.0	11.4	\$59,186
Prior Year	256,383	\$13,720.5	\$53,515	45.1	11.5	\$58,815

All Participants

Valuation Group	Number	Average Annual Earnings/Benefits*
Actives	256,933	\$54,650
Inactives	167,778	\$16,180
Retirees & Beneficiaries	211,126	\$25,893
Total Participants	635,837	

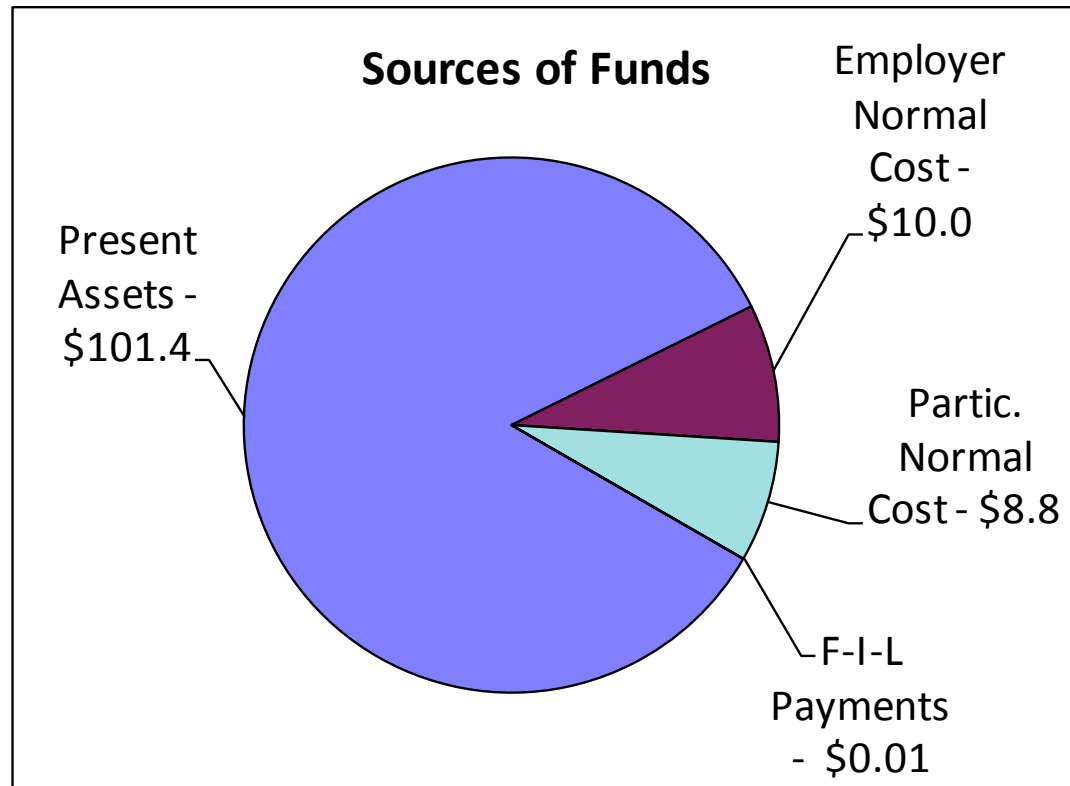
* For inactives, average money purchase balance.

\$120.2 Billion* of Benefit Promises to Present Active and Retired Members

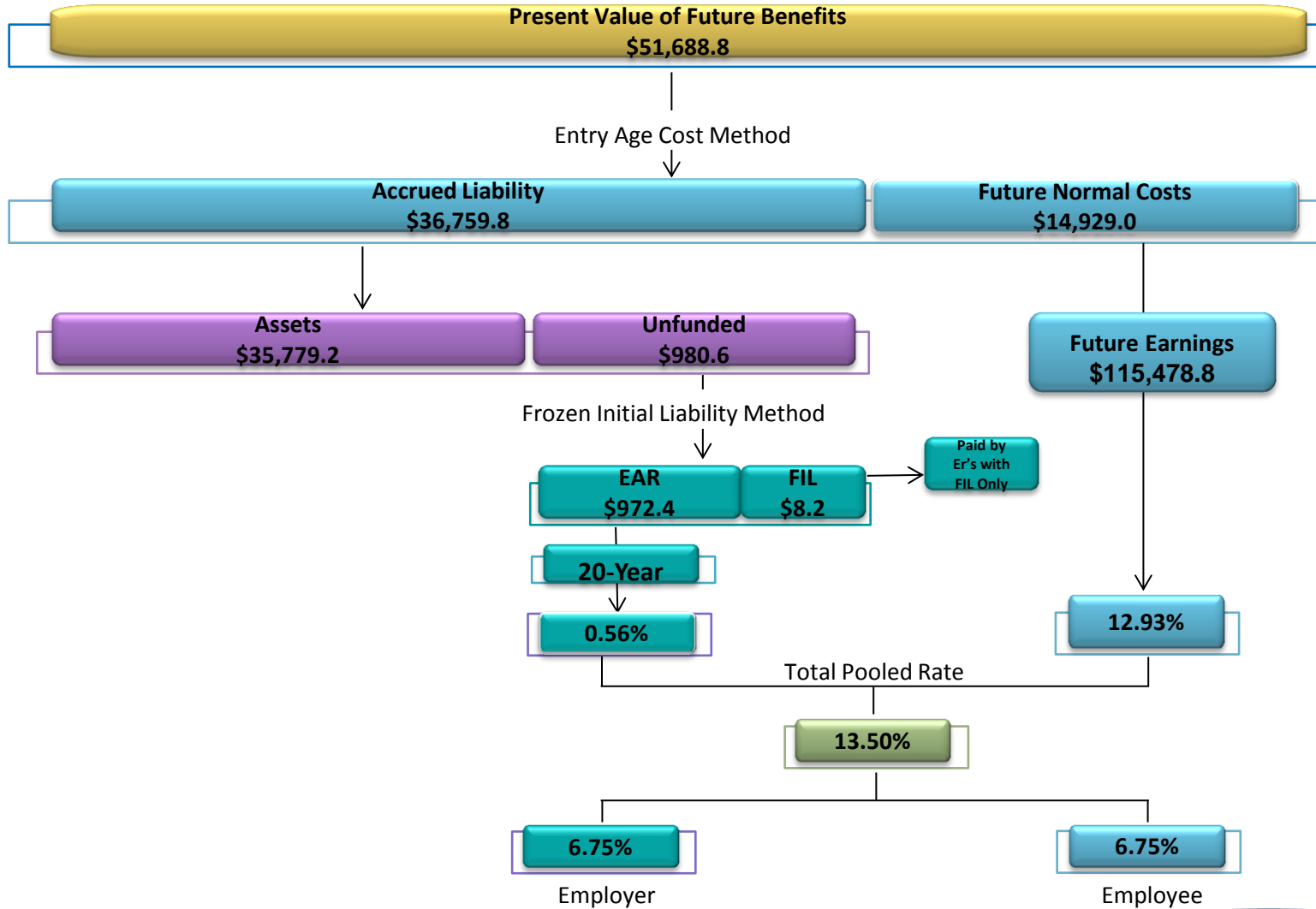


* Present value of future benefits; all divisions combined.

Sources of Funds for Financing \$120.2 Billion of Benefit Promises



Actuarial Valuation Process Illustration for General/Elected Group (\$ Millions)



Summary of December 31, 2018 Valuation Results

	General, Executive & Elected Officials		Protective Occupation				Average 2020
			With Soc. Sec.		Without Soc. Sec.		
	2020	2019	2020	2019	2020	2019	
Employer Normal Cost	6.75%	6.55%	11.65%	10.55%	16.25%	14.95%	7.35%
Participant Normal Cost	6.75%	6.55%	6.75%	6.55%	6.75%	6.55%	6.75%
Total Normal Cost	13.5%	13.1%	18.4%	17.1%	23.0%	21.5%	14.1%
Estimated Total NC (\$ millions)*	\$1,797.9	\$1,712.5	\$246.6	\$223.5	\$54.9	\$50.1	

* Based on payroll projected from valuation date to fiscal year using the payroll growth assumption.

Comparative Statement of Total Average Contribution Rates

Valuation 12/31	General	Executive & Elected	Protective with Soc. Sec.	Protective without Soc. Sec.
1998	11.00%	14.70%	12.10%	17.70%
2003	10.50%	11.20%	13.00%	14.60%
2008	11.15%	11.95%	14.14%	15.46%
2013	13.60%	15.40%	16.30%	20.20%
2014	13.20%	15.60%	16.00%	20.00%
2015	13.67%	13.67%	17.50%	21.80%
2016	13.43%	13.43%	17.43%	21.65%
2017	13.12%	13.12%	17.10%	21.59%
2018	13.54%	13.54%	18.41%	23.02%

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

Protective Contribution Rate Levels

- Higher contribution rates compared to General Employees
 - Higher benefit multipliers
 - Protective = 2% or 2.5% (with or without Soc. Security)
 - General & Executive/Elected = 1.6%
 - Earlier Normal Retirement Eligibility
 - Protective at Age 54 or Age 53 with 25 years of service
 - General & Executive/Elected at Age 65/62 or Age 57 with 30 years of service

Protective Contribution Rate Levels

- More volatile contribution rates compared to General Employees
 - Asset/Payroll ratios¹
 - Protective = 333% - 436% (with - without Soc. Security)
 - General & Executive/Elected = 285%
 - Liability/Payroll ratios¹
 - Protective = 362% - 464% (with - without Soc. Security)
 - General & Executive/Elected = 293%

¹ From active lives valuation

Reasons for Contribution Changes

	General, Executive & Elected	Protective with Soc. Sec.	Protective without Soc. Sec.
2019 Normal Cost Rate	13.10%	17.10%	21.50%
Effect of Benefit Change	0.00%	0.00%	0.00%
Effect of Assumption Change	0.07%	0.65%	0.62%
Effect of Asset Performance	0.36%	0.55%	0.78%
Effect of Salary Experience	(0.18)%	0.03%	0.06%
Effect of Money Purchase Benefit	0.10%	0.03%	0.02%
Demographic and Other Experience	0.05%	0.05%	0.02%
2020 Normal Cost Rate	13.50%	18.40%	23.00%

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

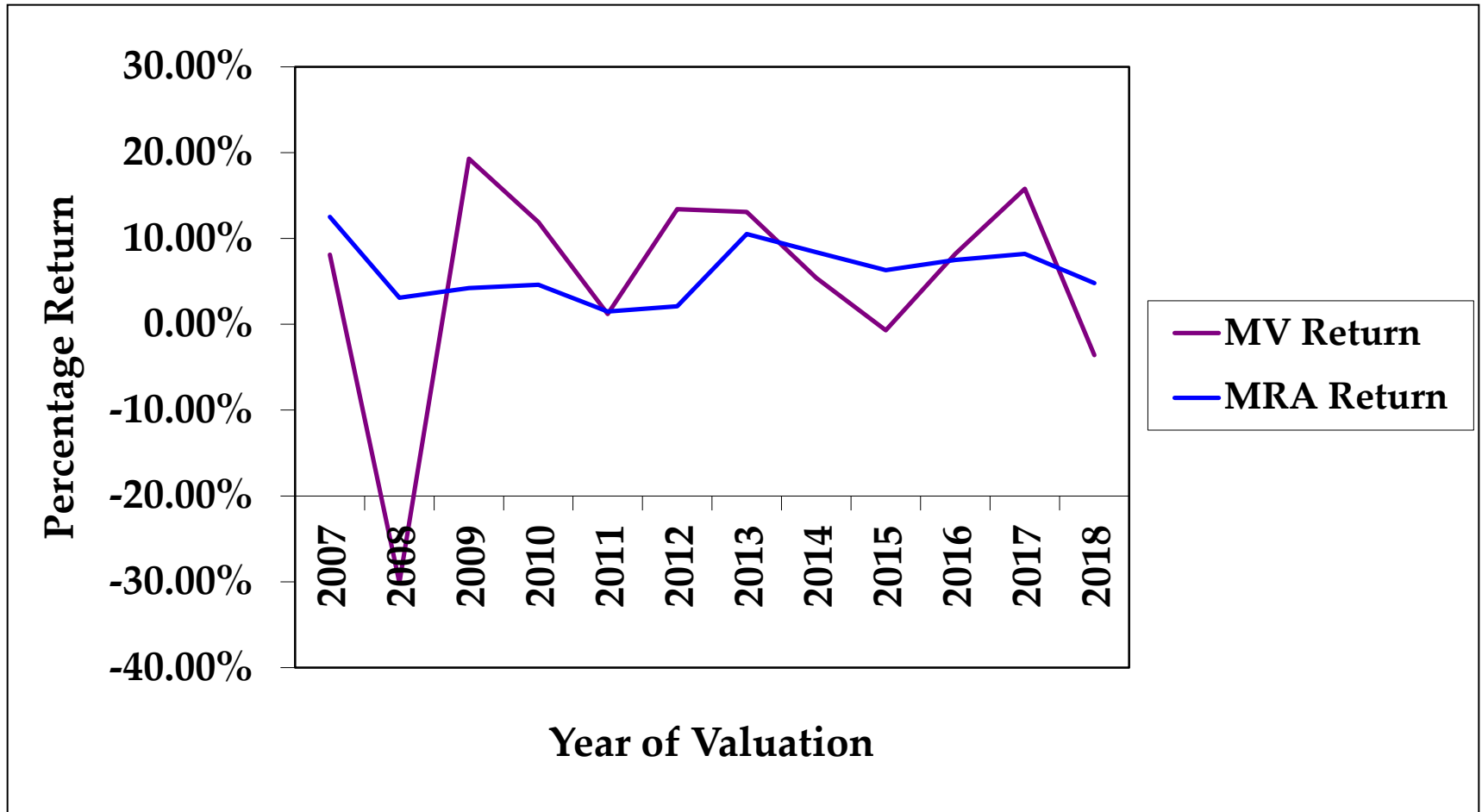
	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>
Actual Investment Return	\$ (3,585)				
Assumed Investment Return	6,659				
Gain/(Loss) to be phased-in	(10,244)				
Phased-in recognition					
• Current year	\$(2,049)	?	?	?	?
• First prior year	1,461	\$(2,049)	?	?	?
• Second prior year	120	1,461	\$(2,049)	?	?
• Third prior year	(1,344)	120	1,461	\$(2,049)	?
• Fourth prior year	<u>(243)</u>	<u>(1,344)</u>	<u>120</u>	<u>1,461</u>	<u>\$ (2,049)</u>
Total recognized gain (loss)	\$ (2,055)	\$ (1,812)	\$ (468)	\$ (588)	\$ (2,049)

Reconciliation of Market Recognition Account (MRA)

	<u>\$ Millions</u>
MRA at Beginning of Year	\$96,763.5
Non-Investment Cash Flow	(3,282.2)
Assumed Return (at 7.0%)	6,658.6
Phase-in of Gains/(losses)	(2,054.7)
MRA at End of Year	\$98,085.2

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

Market Value Return vs. Market Recognition (Actuarial) Return



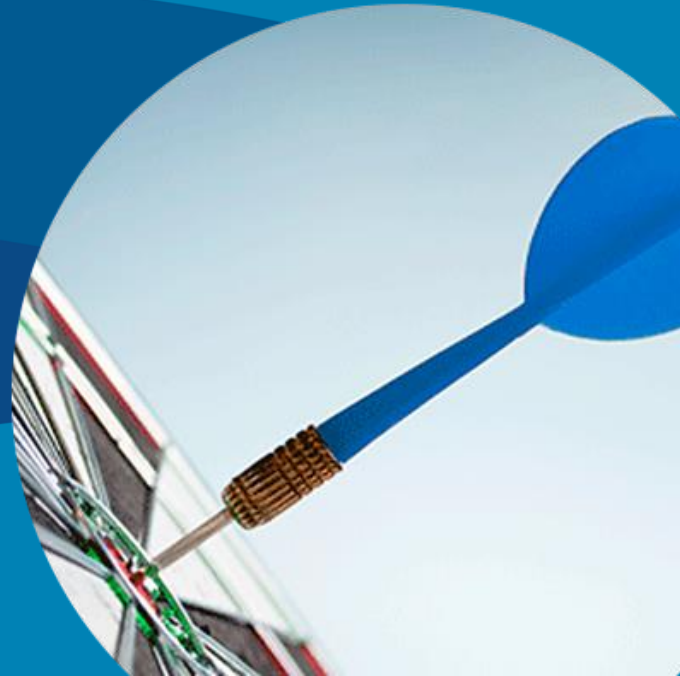
WRS Funded Status

	Frozen Initial	Entry Age
2016	100.0%	99.0%
2017	100.0%	99.5%
2018	100.0%	98.6%

Concluding Remarks

- There are \$4.9 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 and increases in contributions)
 - Employers (through increases in contributions)
 - Retirees (through reduced dividends)

Gain/Loss Analysis



2018 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 2018

	<u>Actual</u>	<u>Expected</u>
Beginning Census	256,383	
(-) Normal Retirement	4,142	4,488
(-) Early Retirement	3,534	4,255
(-) Death	97	240
(-) Disability Retirement		
- Total Approved	245	121
- Less Pending	64	
- Net New	181	
(-) Other Separations	14,525	13,333
(-) Transfers Out	2,019	
(+) Transfers In	2,019	
(+) New Entrants	23,029	
Ending Census	256,933	

Population Development During 2018

Normal Retirements: Varied by group and gender. Overall, slightly lower 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: Greater than expected, producing a loss.

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

Components of Total Gain/(Loss)

	Gain/(Loss) in Millions	
	2017	2018
Economic Risk Areas	\$ 450	\$(379)
Decrement Risk Areas	10	(57)
Other Activity	<u>(122)</u>	<u>(89)</u>
Total Gain/(Loss)	\$ 338	\$(525)

Investment Earnings in 2018 (Active Participants)

\$ Millions

A. Average balance on Participant and Employer Accumulation Reserves	\$40,374
B. Expected earnings: 7.0%	2,826
C. Earnings credited to Participant and Employer Accumulation Reserves	1,554
D. Gain (loss) from earnings: C - B	\$ (1,272)

Investment Earnings in 2018 (Active Participants)

- \$1,272 million is the total recognized asset loss 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 2018 (Active Participants)

	<u>\$ Millions</u>
Gross Gain/(Loss) for the Year (for Actives)	\$(1,272)
Less Estimated Gain/(Loss) due to Money Purchase	(148)
Less Estimated Gain/(Loss) due to Variable Excess	<u>(427)</u>
Net Core Fund Asset Gain/(Loss)	\$(697)

Comparative Schedule of Experience Gains/Losses by Decrement

Divisions Combined (Millions)

	<u>2017</u>	<u>2018</u>
Normal Retirement	\$(27.0)	\$(14.5)
Early Retirement	(13.4)	(18.3)
Disability Retirement	15.9	(7.7)
Death with Benefit	(2.4)	(2.9)
Other Separations	37.4	(13.8)
Total	\$ 10.5	\$(57.2)
As % of Liabilities	<0.05%	-0.15%

Salary Related Gain/Loss

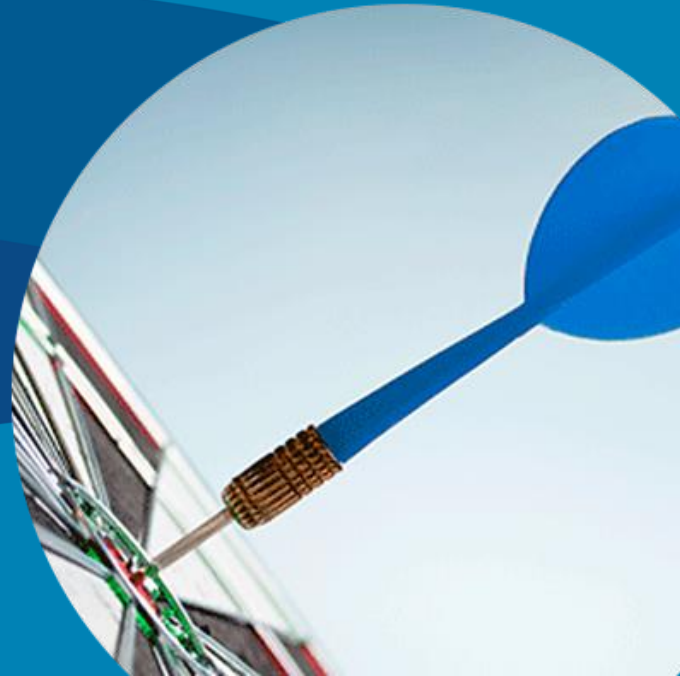
- Pay increases were overall less than expected, resulting in a gain

	Gain/Loss	% of Group
	\$ Millions	Liabilities
General, Executive & Elected	\$323.7	0.9 %
Protective w/Soc. Sec.	(5.4)	(0.1)%
Protective w/o Soc. Sec.	(0.7)	(0.1)%
	\$317.6	0.8 %

Concluding Remarks

- Recognition of remaining prior asset gains and losses are expected over the next few years
- This Gain/Loss Analysis is the first in a regular 3-year experience cycle
- This study, together with the 2019 and 2020 results, will form the basis for the next experience study – to be performed after the December 31, 2020 valuation cycle

Current Events



Pension Actuarial Standards

- ASOPs 4, 27, 35 are being changed
 - Still in “Exposure Draft Form”
 - Might affect WRS December 31, 2019 valuation
- ASOP 51 requires an assessment of risk
 - Reflected in the December 31, 2018 valuation

RISK MANAGEMENT



IDENTIFY



ASSESS



CONTROL



MONITOR & REVIEW



Overview of Risk Areas

Investment Risk

- The risk that actual returns will differ from assumed returns.

Asset/Liability Mismatch

- The potential that changes in assets are not offset by changes in liabilities. Because of the way assets are invested in most public plans this is almost synonymous with investment risk.

Contribution Risk

- The risk that actual contributions will differ from expected contributions. This could occur, for example, if the plan's funding policy is not followed, or if there are changes in the covered population.

Overview of Risk Areas

Salary and Payroll Risk

- Individual pays and/or total covered payroll may not grow at the assumed rate. If covered payroll grows more slowly than assumed, or shrinks, actual contributions may fall short of expected contributions.

Longevity Risk

- Members may live for more or fewer years than expected, affecting the amount of pension income they will receive from the plan.

Other Demographic Risks

- Members may terminate, retire, or become disabled at rates other than expected, affecting both contribution rates and funded status.

Structure of Liabilities

- Over half of WRS Liabilities are for retirees.
- Benefit payments exceed contribution income by almost \$3.3 Billion per year.
- Assets are over 6 times total payroll.
- Liabilities exceed 7 times total payroll.
- Unexpected changes in assets or liabilities can have significant effects on contribution rates and funded status measurements.

Newly Effective Actuarial Standard

ASOP 51

- Requires an Assessment of Risk
 - **Qualitative** – Identify risks and their potential effects in general terms.
 - **Quantitative** based on numerical calculations or projections.
 - **Choice** depends on specifics.

Newly Effective Actuarial Standard

ASOP 51

- Examples of quantitative assessments
 - Scenario tests
 - Sensitivity tests
 - Stochastic modelling
 - Stress tests

- 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-Seventh 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.