



Board of Trustees Brown Bag Lunch Meeting
VRS, 1111 E. Main St., 3rd Floor Board Room
Thursday, 9/21/2023
11:30 AM - 12:30 PM ET

1. Actuarial Valuations, Liquidity and Cash Management

GRS - Actuarial Principles Presentation - Page 2

Cash Management Review - Page 48



Brown Bag Session: Actuarial Principles & Key Board Considerations

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Jim Anderson, FSA, EA, MAAA, FCA**



September 21, 2023

Agenda

- Big Picture – VRS & Actuarial Principles
- VRS Risk Mitigation Actions
- Warning Signs
- Looking Ahead



A man in a dark suit and light blue shirt is pointing his right index finger towards the camera. The background is a blurred cityscape at night. Overlaid on the image are several white, glowing digital icons: a group of three people, a money bag with a dollar sign, and a lightbulb inside a magnifying glass. The text 'BIG PICTURE' is written in large, white, bold letters across the middle of the image.

BIG PICTURE

VRS & Actuarial Principles



Pension Actuarial Valuations – Statewide and Political Subdivisions (2022 numbers)

Member Data



888,871 Members

Financial Data



**\$ 97.4 Billion
Market Value**

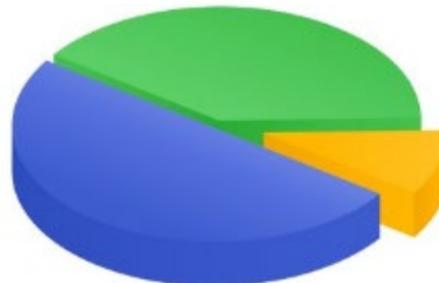
Plan Provisions



Actuarial Assumptions



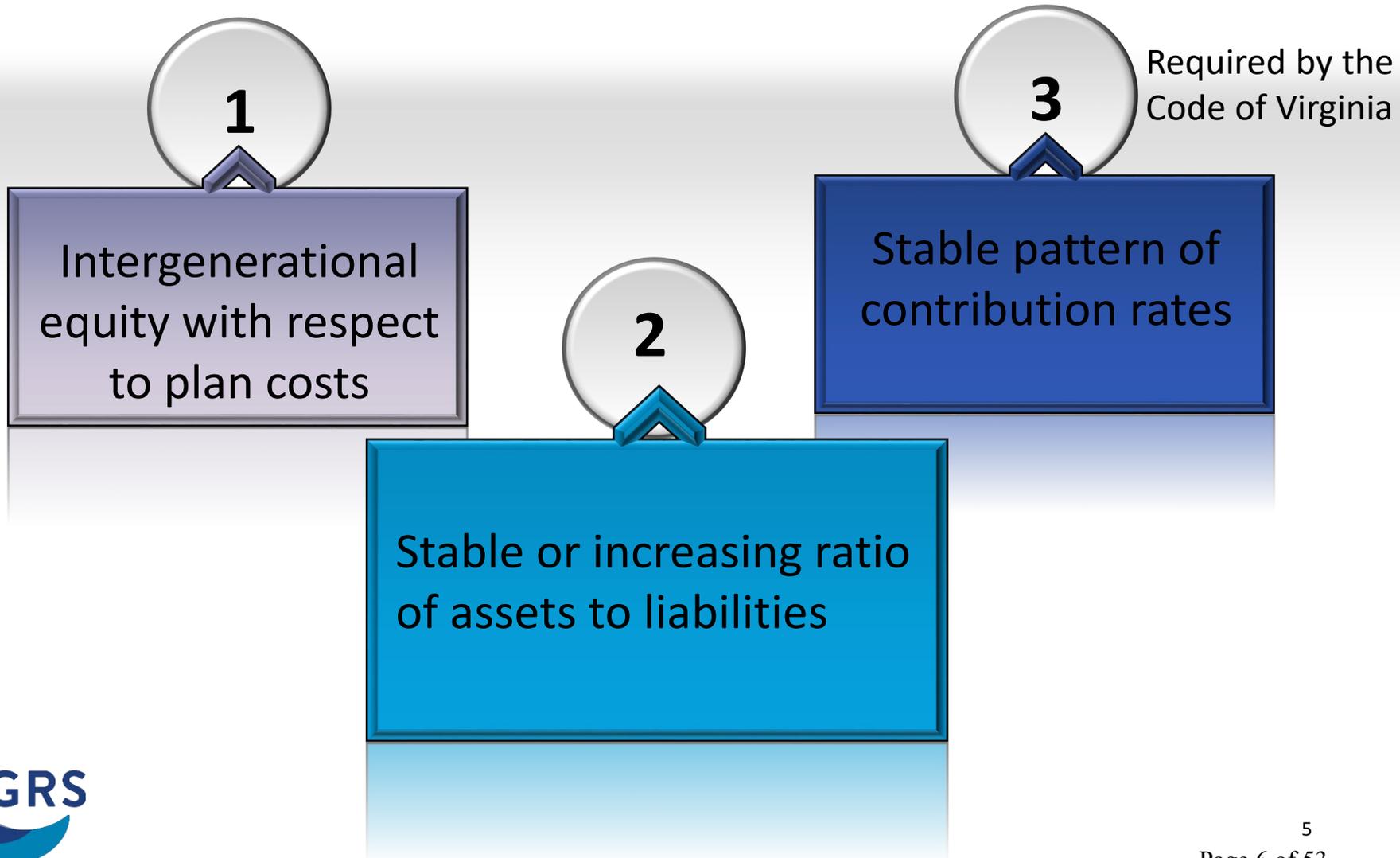
Actuarial Cost Method



**Actuarial
Valuation**

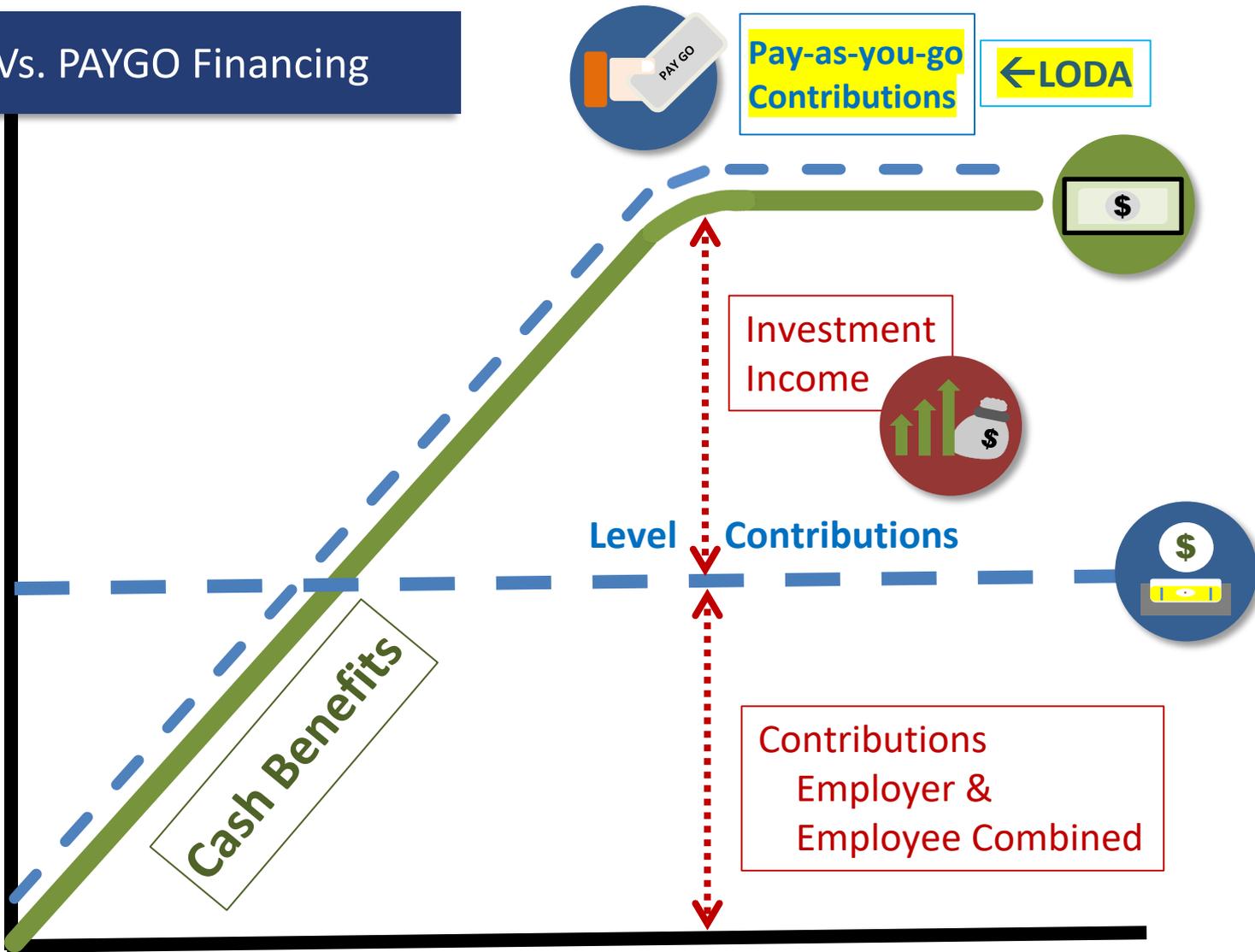


Big Picture: General Funding Objectives



Pre-funding Vs. PAYGO Financing

% of Active Employee Pays

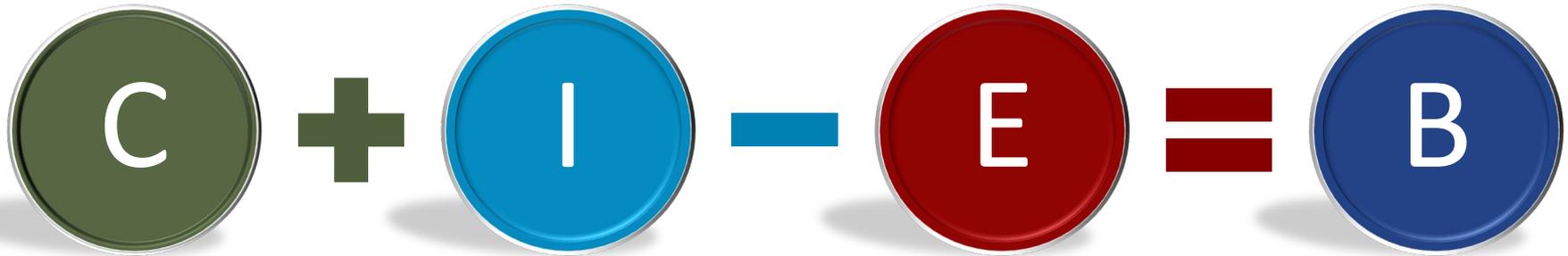


Start

50 Years of Time



Basic Retirement Funding Equation*



Contributions

- Funding Policy



Investment Income

- Investment Strategy



Expenses

- Administrative Policy



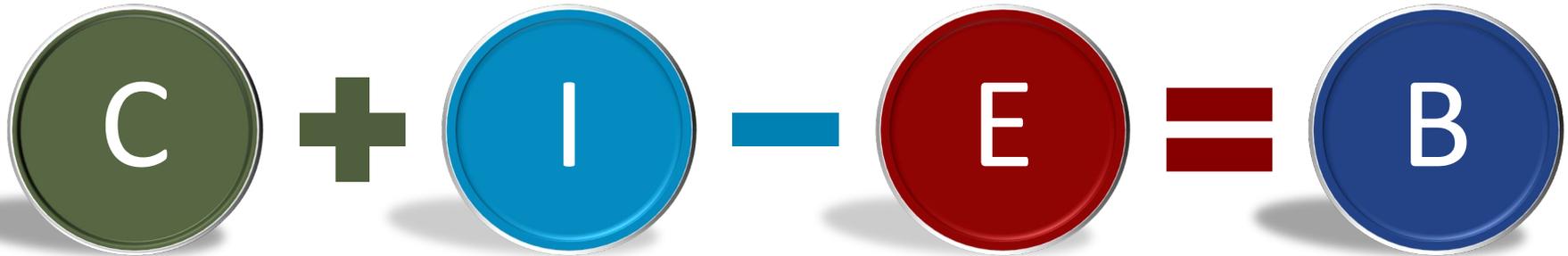
Benefits

- Plan Design



*“Net Money In = Money Out”

Basic Retirement Funding Equation



A diagram illustrating the Basic Retirement Funding Equation. It consists of five circular icons arranged horizontally. From left to right: a green circle with the letter 'C', a plus sign (+), a blue circle with the letter 'I', a minus sign (-), a red circle with the letter 'E', an equals sign (=), and a dark blue circle with the letter 'B'. The circles have a slight 3D effect with shadows.

$$C + I - E = B$$



Depends on:

- **Short Term**
 - Actuarial Assumptions
 - Actuarial Cost Method
- **Long Term**
 - I, B, E



Depends on:

- **Plan Provisions**
- **Experience**



VRS RISK MITIGATION ACTIONS



Actions Firming Up the VRS – Pension Reform Benefit Tiers

Example: High level State Employee provisions

Provision	Plan 1	Plan 2	Hybrid*
Effective	Membership before July 1, 2010, vested by 2013	Membership before July 1, 2010 and not vested by 2013, or Membership between July 1, 2010 - December 31, 2013	Membership after January 1, 2014
Retirement Eligibility	Normal: Age 65 w/5 YOS Early: Age 50/10, 55/5	Normal: SSNRA w/5 YOS Early: Age 60/5	Normal: SSNRA w/5 YOS Early: 60/5
Benefit Multiplier	1.70%	1.70%, 1.65% post-2012 service	1.00%
Final Average Salary (FAS)	Highest 36 highest consecutive months	Highest 60 highest consecutive months	Highest 60 highest consecutive months
Maximum COLA	5% compounded	3% compounded	3% compounded
Member Contribution	5% of creditable compensation	5% of creditable compensation	4% of creditable compensation



*Hybrid has DB & DC components- Chart covers only the DB component



Actions Firming Up the VRS – Pension Reform Benefit Tiers

- Number of active members under benefit tiers (counts at June 30, 2022, ~1/3 Plan 1)

System	Plan 1	Plan 2	Hybrid	Total 2022	Total 2021	Percent Change
State	26,621	13,083	34,344	74,048	73,686	0.5%
Teachers	58,598	27,974	66,784	153,356	149,793	2.4%
SPORS	969	916	-	1,885	1,947	-3.2%
VaLORS	2,123	5,166	-	7,289	7,823	-6.8%
JRS	154	45	262	461	453	1.8%
Pol. Sub.	34,446	30,856	44,604	109,906	108,613	1.2%
Total	122,911	78,040	145,994	346,945	342,315	1.4%



Hybrid has highest active count



Actions Firming Up the VRS – Pension Reform Benefit Tiers

- Number of retired members under benefit tiers (counts at June 30, 2022 **~97% Plan 1**)

System	Plan 1	Plan 2	Hybrid	Total 2022	Total 2021	Percent Change
State	69,430	1,672	272	71,374	70,231	1.6%
Teachers	106,348	1,992	239	108,579	106,011	2.4%
SPORS	1,762	12	-	1,774	1,755	1.1%
VaLORS	6,363	180	2	6,545	6,234	5.0%
JRS	570	3	7	580	577	0.5%
Pol. Sub.	79,777	3,465	425	83,667	80,790	3.6%
Total	264,250	7,324	945	272,519	265,598	2.6%

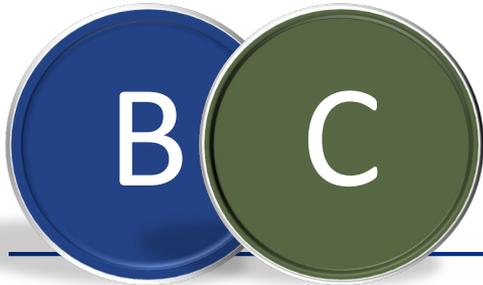




B

Actions Firming Up the VRS – Pension Reform Benefit Tiers

- Pension reform for new hires
 - 2013 changed benefit accrual, 2010 changed retirement ages for ~67% of the current active population headcount
 - Impacts Normal cost component of contribution
 - Has impacted 3% of the retiree population headcount
 - Meaningful cost savings related to COLA changes will increase over time as larger percentage of retirees are in new benefit tiers
- Significant legacy unfunded liabilities remain due to initially amortizing over 30 years



Actions Firming Up the VRS

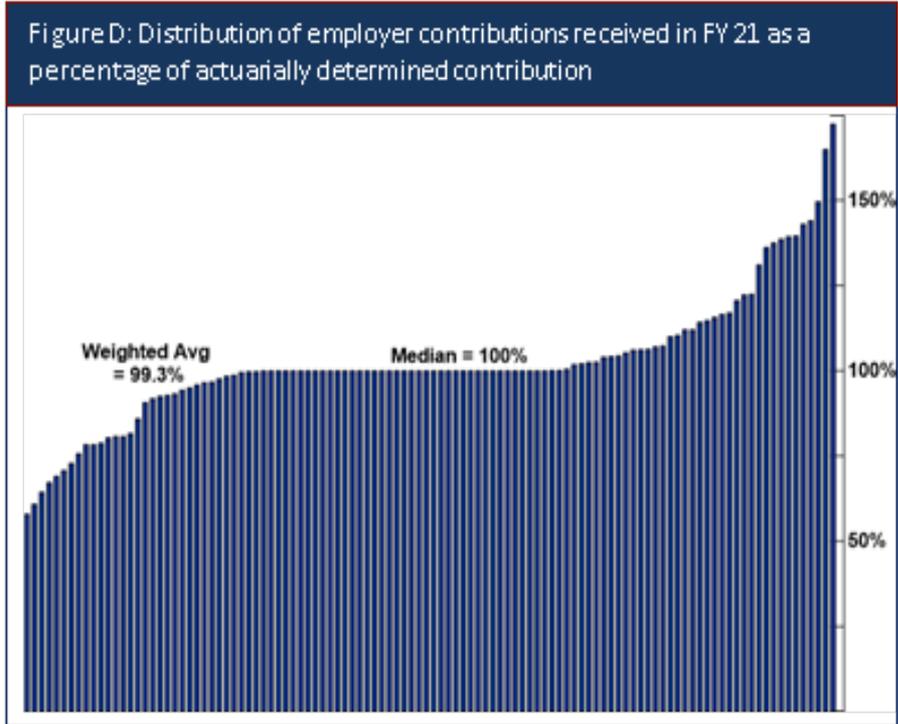
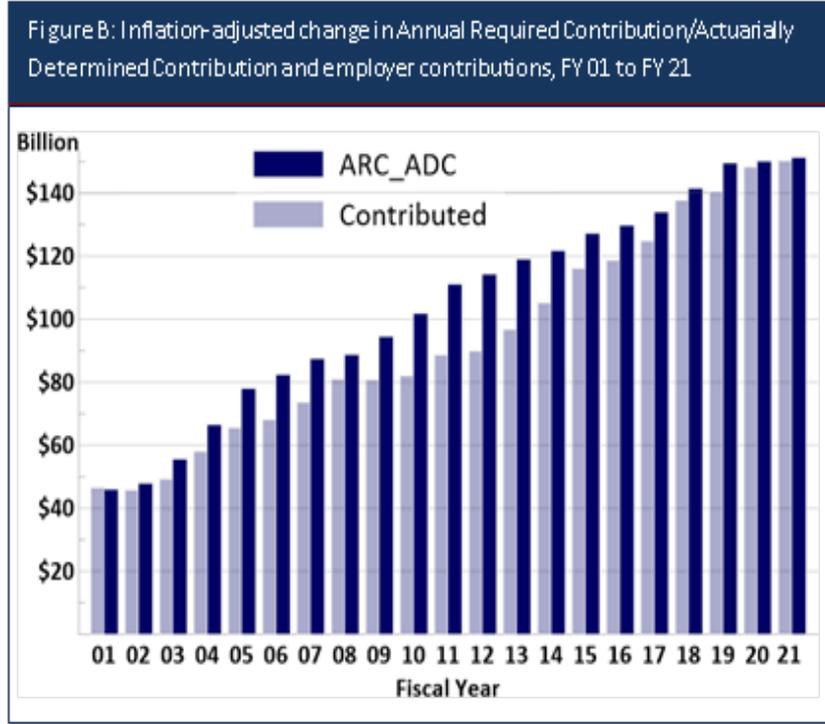
Future liability due to Political Subdivision benefit changes

- VRS funding policy includes “Limitation on Benefit Enhancements Increasing Liability”
 - Requires additional lump sum contribution to ensure 75% funding after benefit enhancement
 - In addition to any increase in annual funding due to plan enhancements
 - Requires 10-year amortization of any accrued liability generated by the plan amendment that is not covered by the lump sum contribution



Actions Firming Up the VRS

Recently, Retirement Systems have addressed Contribution Risk (Dec. 2022, NASRA Issue Brief)





Actions Firming Up the VRS

- VRS received additional contributions in each of June 2022 and 2023
 - Additional dollar amounts set by Governor and Legislature
- Maintaining VRS contribution rates at 2019 valuation level after outstanding 2021 returns provided additional funding for select plans
 - Calculated ADC would otherwise have decreased
- Crucial to get money into the System



VRS Add'l Funding Provisions - Pension

- Additional \$931+ million contributed from the general fund to the trust in June of 2022, 2023

Retirement System	Add'l Contribution 2022	Add'l Contribution 2023	Total Additional 2022-2023
State	\$219,156,316	\$73,052,105	\$292,208,421
Teachers	\$442,371,087	\$147,457,029	\$589,828,116
SPORS	\$10,957,816	\$3,652,605	\$14,610,421
VaLORS	\$19,886,407	\$6,628,802	\$26,515,209
JRS	\$6,250,014	\$2,083,338	\$8,333,352
TOTAL	\$698,621,640	\$232,873,879	\$931,495,519

2022 additional contributions increased funded status by 0.80%-0.86% and decreased contribution rates by 0.32%-0.56%





VRS Add'l Funding Provisions - OPEB

- Additional \$93+ million contributed from the general fund to the trust in June of 2022, 2023

OPEB Group	Add'l Contribution 2022	Add'l Contribution 2023	Total Additional 2022-2023
HIC - State	\$8,522,746	\$27,159,085	\$35,681,831
HIC - Teachers	\$12,013,013	\$4,004,338	\$16,017,351
GLI	\$30,438,378	\$10,146,126	\$40,584,504
HIC - Constit. Off.	\$275,975	\$91,992	\$367,967
HIC - Soc. Svcs.	\$121,754	\$1,031,416	\$1,153,170
HIC – Registrars	\$6,494	\$2,165	\$8,659
TOTAL	\$51,378,360	\$42,435,122	\$93,813,482

2022 additional contributions increased funded status by 0.8%-1.2% and decreased contribution rates by 0.00%-0.01%





VRS Maintains Pension Contr. Rates

	FY 2021/2022	FY 2023/2024	Informational
	2019 Valuation	2021 Valuation	2022 Valuation
State	14.46%	14.46%*	13.19%
Teachers	16.62%	16.62%*	14.13%
SPORS	26.26%	29.98%	28.88%
VaLORS	21.90%	24.60%	21.92%
JRS	29.84%	30.67%	29.10%
Political Subdivisions (Avg)	8.33%	8.79%	8.19%

* State and Teachers contribution rates set at 2019 valuation level, increased from 14.13% and 14.76% respectively, and include DC rate for Hybrid members.

Note: weighted average for Political Subdivisions = 11.89%





VRS Maintains OPEB Contrib. Rates

	FY 2021/2022	FY 2023/2024	Informational
	2019 Valuation	2021 Valuation	2022 Valuation
Group Life Insurance	1.34%	1.34%*	1.21%
Health Insurance Credit (HIC)			
-- State	1.12%	1.12%*	0.90%
-- Teachers	1.21%	1.21%	1.08%

* GLI and HIC-State contribution rates held at 2019 valuation level, increased from 1.19% and 1.04% respectively





Actions Firming Up the VRS

- VRS actuarial staff regularly performs stress testing
 - Simulation measuring the effect on the plans of various projected, generally adverse, investment and actuarial events
 - Also considers risk measures discussed in next section – “Warning Signs”



WARNING SIGNS

The Nature of Defined Benefit Plan Risk

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.



The Nature of Defined Benefit Plan Risk

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.



VRS Assumption Risk Areas

Primary Risks

Demographic	Economic
Normal retirement	Salary increases
Early retirement	Payroll growth
Death-in-service, Death after retirement	Investment return
Disability	Price Inflation
Other separations	

Actuarial Standards require actuarial attestation to reasonability of assumptions, individually and in the aggregate



GRS Performs Gain/Loss Analysis Each Year



1 | To gain an understanding of reasons for contribution rate changes



2 | To measure year-by-year operation of actuarial assumptions



3 | To determine when assumption changes are needed

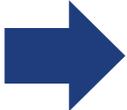
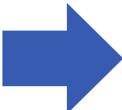


4 | To understand the nature of risk



Impact When Experience Differs from Assumptions

Effect on Liabilities and Contributions

	Assumption	Experience	Plan Cost Impact
	Interest Rate	Decrease	Increase
	Wage Inflation	Increase	Increase
	Spread (Interest – wage)	Increase	Decrease
	Salary Increases	Increase	Increase
	Retirement	Retire Younger	Increase
	Turnover	More Quits	Decrease
	Mortality	Live Longer	Increase

- 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 the valuation date are fully recognized
- Asset smoothing is a crucial element toward meeting the level contributions objective

Actuarial Value Assets 2022: 0.6% MVA Return

State Employees Pension – (\$MM)

Investment Risk

	2022	2023	2024	2025	2026
Actual Investment Return	-22				
Assumed Investment Return	1,543				
Gain/(Loss) to be Phased-in	-1,564				
Phased-in Recognition					
-Current year	-313	?	?	?	?
-1 st prior year	762	-313	?	?	?
-2 nd prior year	-181	762	-313	?	?
-3 rd prior year	-13	-181	762	-313	?
-4 th prior year	15	-13	-181	762	-313
Total Recognized Gain/(Loss)	270	255	268	449	-313

2023-2027: Expect \$0.66 billion in deferred asset GAINS
Other VRS Plans had similar asset experience



See previous page, also: VRS Code Section 51.1-145:

- *The total annual defined benefit employer contribution for each employer, expressed as a percentage of the annual membership payroll, shall be determined in a manner so as to remain relatively level from year to year.*

Impact of Salary/Payroll

- Nationally, for many years pension plans had gains as salaries increased at rates < expected – reversed in 2022 for VRS & the nation

Actives: Changes in Average Salary			
System	2021	2022	Percent Change
State	\$ 62,350	\$ 66,799	7.1%
Teachers	57,125	60,405	5.7%
SPORS	73,341	84,463	15.2%
VaLORS	44,879	51,103	13.9%
JRS	174,669	175,152	0.3%

Resulting Change in Liability Gain/(Loss) (\$ millions)
\$344
\$896
\$58
\$60
(\$7)



- Beyond individual salary changes
 - If total covered payroll grows more slowly than assumed
 - Then actual contributions may fall short of expected contributions

Risk/Maturity Measures

- Issue Recognition Keys
 - From page 20 of the June 30, 2022 Pension valuation report relating to State Employees
- The risk/maturity measures are an additional tool
 - Used to monitor risks that the plan may face or to
 - Signal a source of potential contribution rate volatility
- The following pages provide a sample of State plan risk measures shown in the annual valuation reports



Risk/Maturity Measures – Asset Return

- Investment return → the largest single risk that most systems face
- Year by year return indicates performance of the portfolio versus the system's assumed return of 6.75%

Val. Date	Asset Return
2018	7.5%
2019	6.7%
2020	1.4%
2021	27.5%
2022	0.6%
2023	6.1%

Risk/Maturity Measures – Asset/Liability Ratio

- Funded ratio: most widely known measure of a plan's financial strength
- **Trend in funded ratio much more important than the absolute ratio**
 - Given all assumptions are met, funded ratio should trend to 100% over VRS' 20-year amortization period

Val. Date	MVA/AAL
2018	76.8%
2019	75.2%
2020	72.9%
2021	86.5%
2022	81.3%

- As the ratio approaches 100%, important to re-evaluate level of investment risk in the portfolio



Risk/Maturity Measures – Active/Retiree Ratio

- In the 1970s-1980s, common for 3:1, 4:1 ratio of actives to retirees
- As plans mature, this ratio can drop significantly
 - Today, see Ratios below 2:1 and nearing 1:1
 - A ratio significantly below 1 usually indicates a closed plan, a shrinking workforce or other special situation

Val. Date	Act/Ret
2018	1.1
2019	1.1
2020	1.1
2021	1.0
2022	1.0



Risk/Maturity Measures – Net External Cash Flow

- The ratio of Net External Cash Flow (NECF) to assets, an important sustainability measure
- **Negative ratios are common and expected for a maturing system**
- Longer term, this ratio should be on the order of ~ -4%
 - A ratio significantly more negative than that for an extended period could be a leading indicator of potential exhaustion of assets

Val. Date	NECF \$000	NECF/ Assets
2018	\$(589,592)	-3.2%
2019	(653,801)	-3.4%
2020	(681,103)	-3.6%
2021	(712,813)	-3.1%
2022	(511,512)	-2.3%



The image features a blue background with a stage-like setting. Three spotlights are positioned at the top, casting beams of light onto a central rectangular platform. The text "LOOKING AHEAD" is prominently displayed in the center of the stage area.

LOOKING AHEAD

Something for October...

Managing unfunded accrued liabilities =
Actuarial Value of Assets – Accrued Liability

- VRS uses “Layered amortization”
 - Amortized initial June 30, 2013 unfunded liability over a 30-year closed amortization period, but
 - 2014-2022 annual gains and losses, assumption changes amortized over separate closed 20-year periods
 - This methodology maintains steady progress toward eliminating the unfunded liability

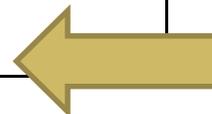


Something for October...

State Pension Amortization Bases (2022)

Description		Original Amount	Outstanding Balance as of June 30, 2022	Years Remaining June 30, 2022
2013	Original Unfunded	\$ 7,117,727,223	\$ 7,489,568,164	21 years
2014	Experience (Gain)/Loss	(414,716,278)	(360,439,976)	12 years
2015	Experience (Gain)/Loss	(637,505,432)	(572,650,763)	13 years
2016	Experience (Gain)/Loss	(87,589,562)	(80,845,675)	14 years
2017	Assumption Change	62,300,692	58,793,059	15 years
2017	Experience (Gain)/Loss	(570,456,389)	(538,338,736)	15 years
2018	Experience (Gain)/Loss	(104,169,714)	(100,073,827)	16 years
2019	Experience (Gain)/Loss	15,231,288	14,839,293	17 years
2019	Assumption Change	671,335,725	654,058,129	17 years
2020	Experience (Gain)/Loss	(90,660,484)	(89,355,305)	18 years
2021	Experience (Gain)/Loss	(740,623,129)	(736,254,839)	19 years
2021	Assumption Change	401,835,129	399,465,053	19 years
2022	Experience (Gain)/Loss	(277,443,138)	(277,443,138)	20 years
Total			\$ 5,861,321,439	

What if
VRS
“Resets”
all bases to
20 years?



Something for October...

- If all assumptions are met
 - Projected contribution rates increase
 - But remain below current rates
 - Remain level, and well below out years projected rates
 - Projected contribution dollar savings of ~\$450 million over 20 years



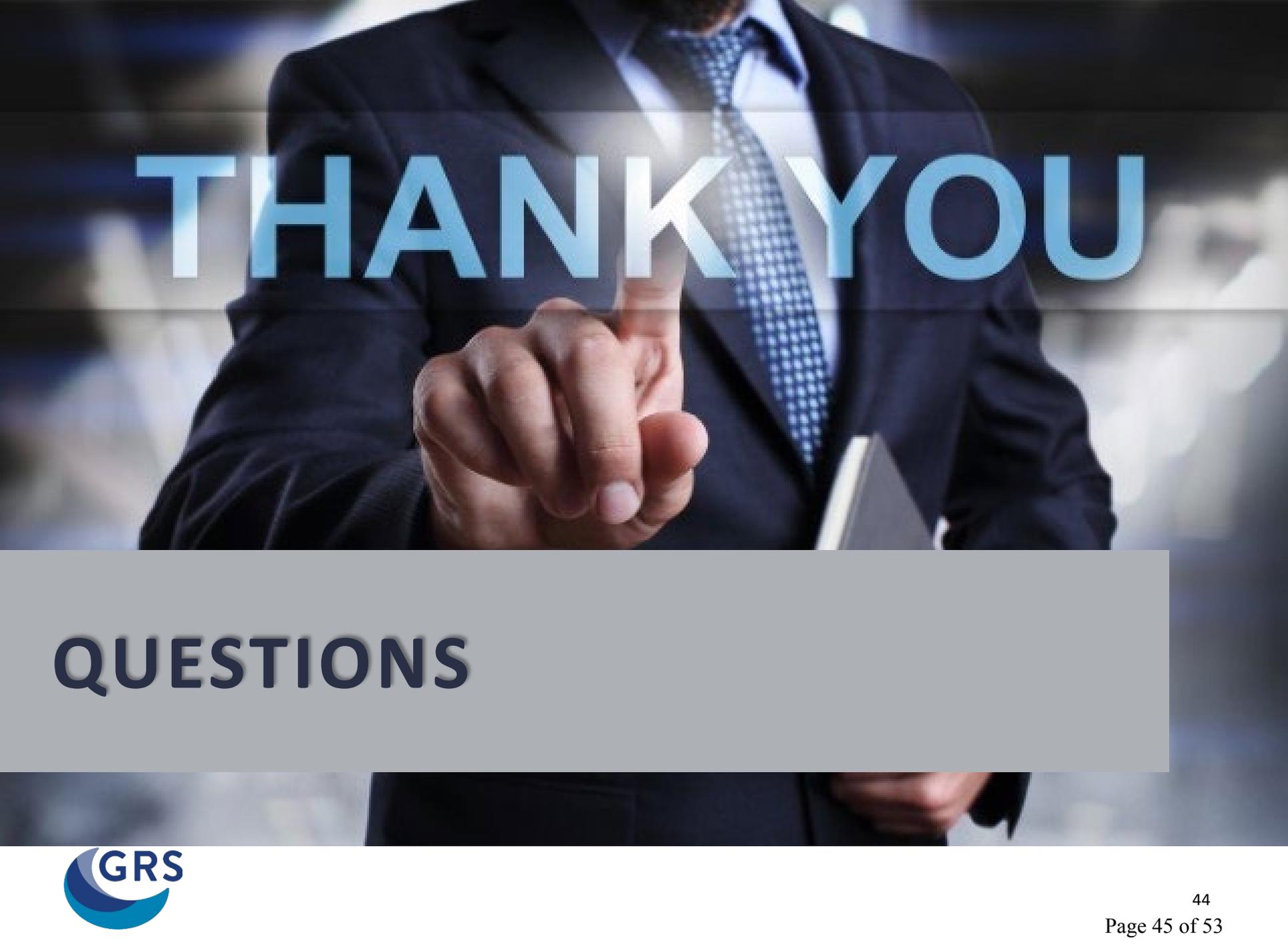
In Summary

- Overall System-wide “health” continues to improve
 - Median funded level continues to improve
 - Contribution rates have remained relatively stable
- The expectation is for a slowly increasing funded ratio over the next few valuations and continued stability in the contribution rates, System-wide

In Summary

- Each valuation GRS will highlight changes relative to expectations
 - Main drivers of funded status and contribution changes
- Solid governance with respect to the following areas leads to success
 - Investment policy
 - Funding policy
 - Benefit policy





THANK YOU

QUESTIONS

Disclaimers

- This presentation expresses the views of the authors and does not necessarily express the views of Gabriel, Roeder, Smith & Company.
- Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.



Disclaimers

- This presentation is intended to be used in conjunction with the forthcoming actuarial valuation reports. This presentation should not be relied on for any purpose other than the purposes described in the valuation reports.
- This presentation shall not be construed to provide tax advice, legal advice or investment advice.
- Jim Anderson and Becky Stouffer are independent of the plan sponsor, are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.





Virginia
Retirement
System

Cash Management and Rebalance Review



Short-term Cash Management (Operational)

- Risk team's primary focus is on ensuring cash positions sustainable over short horizons (i.e. weeks to months)
- This process facilitates cash flows in and around the fund to ease asset class team's burdens

Long-term Cash Management (Strategic)

- ALM process and Board of Trustees choose long term cash targets based on a variety of factors

Cash Management Objectives

Monitor

Cash level and forecast future changes

Ensure

Compliance with policy limits

Track

Cash and margin position at brokers

Communicate

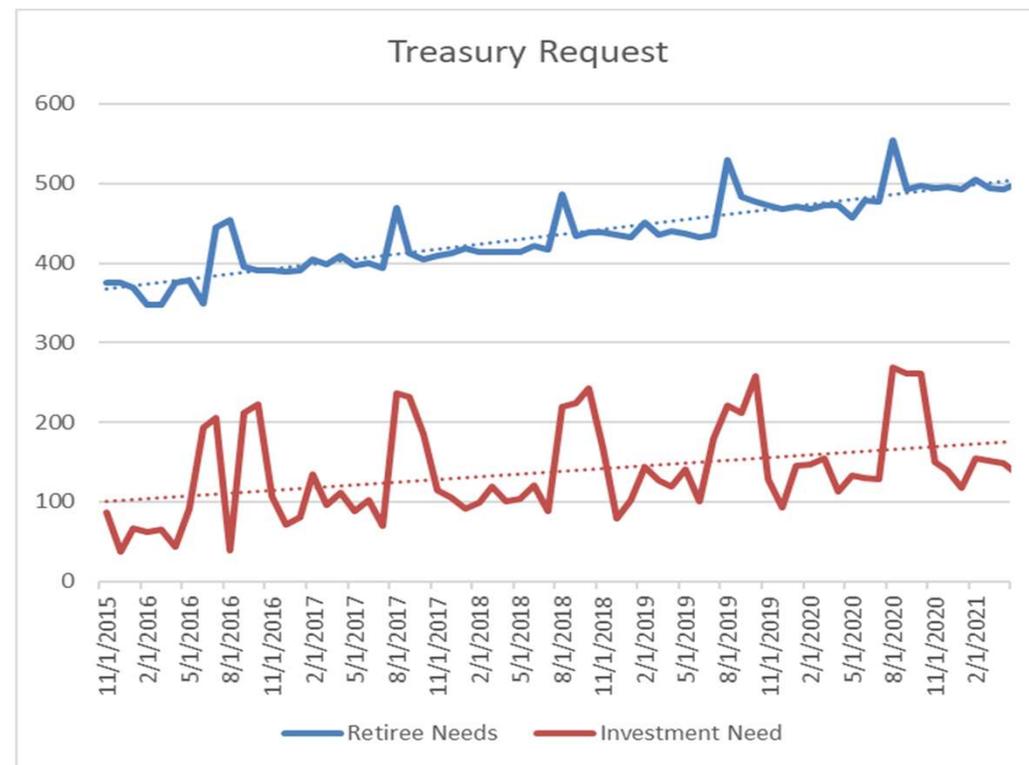
Pertinent changes to Executive Committee and Investment Team

Coordinate and communicate across programs to provide a timely, holistic view of cash balances and positioning across the Fund

Cash Needs Projections

Types of cash flows

- **Smaller Cash Flows ~ < 100MM**
 - Known ~2 weeks in advance
 - Frequent
 - Largest source of variation
 - Examples:
 - Routine calls and distributions
- **Larger Cash Flows ~ > 100MM**
 - Known well in advance
 - Infrequent
 - Historical references ex. Retiree contributions
 - Examples:
 - Program rebalances
 - Funding mandates
 - Retiree payroll
 - Special budget items



Provide best estimate of expected cash flows using most recent data

Cash Management Workflow and Tools

- 1. Cash Request Team (Asset Teams)** – email distribution for upcoming cash flows
 - 2. Cash Management Database (Operations)** – record of all transactions, pending and historical
 - 3. Daily cash flows (Operations)** – reporting of cash flows occurring on a given day
 - 4. Rebalance spreadsheet (Risk Team)** – central hub. Combines expected cash flows with program data to forecast changes
- *Asset and Accrual Detail** – detailed breakout of securities with cash and balances accounts
- *Treasury (LGIP) website** - Daily reporting of cash balances within Treasurer's account



Collaborative effort across asset class teams, operations, and risk team

Cash Management Workflow Example

Asset Class Teams

Teams receive notice of incoming cash flows and relay that information to cash request email distribution.

Operations Team

Records upcoming cash flow into database which feeds daily reporting.

Risk Team

Risk team uses upcoming cash flow data, large cash flow notices, and historical analogues to create best estimate of future draws using rebalance spreadsheet.

Coordinate and communicate across programs to provide a holistic view of cash balances and positioning across the Fund