

# **Pennsylvania Municipal Retirement System**

## **Actuarial Valuation as of January 1, 2021**

**Produced by Cheiron**

**February 2023**

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February 16, 2023

Pennsylvania Municipal Retirement Board of the  
Pennsylvania Municipal Retirement System  
c/o Timothy A. Reese  
Chief Executive Officer  
1721 North Front Street  
Harrisburg, Pennsylvania 17102-2315

***Re: PMRS 2021 Actuarial Valuation Report***

Dear Members of the Board:

At your request, we have conducted the annual actuarial valuation of the Pennsylvania Municipal Retirement System (System) as of January 1, 2021. The purpose of this report is to provide the aggregate valuation results of the participating employers for the System and analyze the System-wide asset and liability performance with projections. The report provides statistics on the employer contribution levels for all plans participating in the system as of the valuation date, incorporating the individual Governmental Accounting Statement Nos. 67 and 68 (GASB 67/68) results for each plan.

This report reflects the actuarial liabilities for the municipal and authority employers' traditional defined benefit plans (i.e. non-county defined benefit plans), which are calculated as of January 1, 2021. The liabilities for the cash balance plans are based on the member and municipal account balances as of December 31, 2020, as provided by PMRS, as well as the explicit liabilities associated with retirees for these plans. The liabilities for the county plans are explicitly valued every even calendar year and are based on the January 1, 2020 actuarial liabilities. These liabilities were redetermined using the actuarial assumption changes that went into effect January 1, 2021, rolled-forward by plan in total, the retiree liabilities are determined as of January 1, 2021, and the active and terminated vested liabilities are adjusted accordingly. Any material changes to the plan provisions are also reflected.

This report was prepared for the Board for the purposes described herein and for use by the System auditor in completing an audit related to the matters herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to such other users.

This report analyzes system-wide asset and liability performance and projections. PMRS is an agent multiple-employer retirement system (as defined under Governmental Accounting Standards Board Statement Nos. 67 and 68) for participating municipalities and counties. Assets and liabilities are separately accounted for and reported to the Auditor General of the Commonwealth of Pennsylvania. We refer you to the Foreword and Board Summary which present the general approach used in the preparation of this report with a focus on key metrics of the System, historical trends, and stress testing of the System. The report also includes descriptions of the sources and reliability of the data and the actuarial assumptions upon which our findings are based.

Pennsylvania Municipal Retirement Board of the  
Pennsylvania Municipal Retirement System  
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This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice (ASOPs) set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.

Sincerely,  
Cheiron



Anthony Bucci, FCA, MAAA, EA  
Consulting Actuary



Karen M. Zangara, FSA, MAAA, EA  
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Jonathan B. Chipko, Cheiron

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**FOREWORD**

Cheiron performed the actuarial valuation of the Pennsylvania Municipal Retirement System (System) as of January 1, 2021. The purpose of this report is to:

- 1) **Measure and disclose**, as of the valuation date, the financial condition of the System;
- 2) **Indicate trends** in the financial progress of the System;
- 3) **Provide specific information** and documentation required by the Governmental Accounting Standards Board (GASB).

An actuarial valuation establishes and analyzes System assets and liabilities on a consistent basis and traces the progress from one year to the next. It includes measurement of the System's investment performance as well as an analysis of actuarial liability gains and losses.

**Section I** presents a summary of our findings, disclosing important trends experienced by the System in recent years, and risks for consideration.

**Section II** contains details on various asset measures, together with pertinent performance measurements.

**Section III** shows similar information on System liabilities, measured for funding, accounting, and government reporting purposes.

**Section IV** shows the distribution of the traditional defined benefit plans' contribution rates by component for non-county plans.

**Section V** includes the required disclosures under GASB as well as additional information provided in the System's Annual Comprehensive Financial Report (ACFR) based on the Government Finance Officers Association (GFOA) guidance.

The appendices to this report contain a summary of the System's membership at the valuation date and the actuarial methods and assumptions used in the valuations.

As this System is an agent multiple-employer retirement system in which each of the participating municipalities are entitled to define and submit to the Board the benefit provisions for their respective employees, the actual plan provisions are not included in this report. In preparing this valuation, we relied on the plan provisions defined and submitted to the State under the 2020 Act 293 filings including any subsequent county plan changes (if applicable) and 2021 Act 205 filings as provided by the System.

We have rolled forward the total liabilities for all county plans from January 1, 2020 to January 1, 2021. These liabilities reflect material changes at the individual plan level (such as plan and assumption changes) if applicable. These liabilities are incorporated into all of the 2021 liability calculations to provide a reasonable estimate for the aggregate System's obligations. Further information on these techniques can be found in Appendix B under "Method to Roll Forward Liabilities".

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**FOREWORD**

Liabilities for cash balance plans and non-county defined benefit plans were determined using the demographic and financial data as of January 1, 2021 that was provided to us by the System for all participants.

Liabilities for participants in pay status for all plans were determined based on the January 1, 2021 data sets.

In preparing our report, we relied on information (some oral and some written) supplied by the System's staff. This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data by plan for all the traditional defined benefit plans and in aggregate for the cash balance plans for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23 (Data Quality).

The actuarial assumptions reflect the Board's understanding of the likely future experience of the System, as well as adopted formal procedures by the Board in the reviewing and setting of the interest rate assumption. The assumptions both individually and in aggregate represent the best estimate for the future experience of the System as of January 1, 2021. They reflect the experience study analysis completed in September 2020 as approved by the Board. This experience study analysis was completed in accordance with the Actuarial Standards of Practice No. 27 (Selection of Economic Assumptions for Measuring Pension Obligations) and No. 35 (Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations) in performing actuarial valuations of retirement systems. To the extent the laws of the Commonwealth of Pennsylvania and/or the administrative practices of the System differ from Actuarial Standards of Practice, we have identified such deviations within the Actuarial Assumptions and Methods Appendix of this report.

The results of this report are dependent on future experience conforming to these assumptions. Future valuation reports may differ significantly from the current results presented in this document due to such factors as: plan experience differing from that anticipated by the assumptions, changes in assumptions, and changes in plan provisions or applicable law.

This report and its contents have been prepared in accordance with generally accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION I – BOARD SUMMARY**

**General Comments**

The primary purpose of the actuarial valuation and this report is to disclose the following as of the valuation date:

- The overall financial condition of the Pennsylvania Municipal Retirement System,
- Biennial valuation of the non-county defined benefit plans participating in the System and the full valuation of the cash balance plans,
- Roll-forward of the county defined benefit plans,
- Past trends and expected future trends in the System’s financial condition,
- Potential risks to the System and individual plans, and
- Information required by the Governmental Accounting Standards Board (GASB) and the System’s Financial Statements.

In this Section, we present the principal valuation results. This includes the basis upon which the January 1, 2021 valuation was completed and an examination of the current financial condition of the System. In addition, we present a review of the key historical trends followed by the System’s projected financial outlook.

Throughout our report, our discussion will address changes from January 1, 2019, the last time the non-county defined benefit plans were explicitly valued, to January 1, 2021. We also address the overall status of the System comparing results from January 1, 2020 to January 1, 2021. The January 1, 2020 valuation results reflect the explicit valuation of the cash balance and county pension plans, and a roll-forward of the non-county defined benefit plan liabilities based upon the January 1, 2019 results.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION I – BOARD SUMMARY**

**A. Valuation Basis**

The January 1, 2021 valuation results are based on the actuarial assumptions approved by the Board effective January 1, 2021 and a 5.25% interest rate assumption, as adopted by the Board in November 2016, effective January 1, 2017. There were changes to the demographic and economic assumptions, excluding the interest rate assumption, effective with the January 1, 2021 valuation as a result of the experience study completed in September 2020 and the Board's selection and adoption of the new assumptions. Refer to Appendix B for a complete listing of the actuarial assumptions and changes.

Below we identify key results of this valuation.

- *Transfer of Funds to the Retired Members' Reserve Account (Retiree Reserve):* As a result of the Asset Surplus (described below) as of December 31, 2020 and because the retiree liabilities exceeded the Retiree Reserve as of December 31, 2020 by \$67.8 million, the System transferred \$67.8 million from the Undistributed Earnings as outlined in the December 31, 2020 ACFR to the Retiree Reserve.
  - Consistent with past practice, this transfer amount is determined after the December 31, 2020 ACFR is published. The transfer will be reflected in the Retiree Reserve and Undistributed Earnings retroactive to January 1, 2021 in the December 31, 2021 ACFR.
  - The Retiree Reserve throughout this report reflects this transfer of funds unless explicitly stated otherwise.
- *Actuarial Value of Assets:* The Actuarial Value of Assets (AVA) of \$2.827 billion equals the sum of the reserve information provided in the System's December 31, 2020 ACFR plus expenses in excess of the \$20 per plan member administrative charge (\$6.1 million) as outlined in Board Policy 05-2 and includes the transfer of \$67.8 million to the Retiree Reserve as described above. The return of the reserves for the past year was 5.25% based on the Regular Interest Rate determined by PMRS for the year. This transfer has no impact on the System's Market Value of Assets (MVA) nor each individual plan's AVA but does result in a larger System AVA. The AVA increased from \$2.632 billion as of January 1, 2020 to \$2.827 billion as of January 1, 2021.
- *Market Value of Assets:* The Market Value of Assets (MVA) is \$3.167 billion as of December 31, 2020 and the money-weighted rate of return net of investment expense for the past year was 13.8% as published in the ACFR. The investment return for the year is the primary reason the results associated with the MVA as provided in this report improved over the prior year's results. The MVA increased from \$2.792 billion as of January 1, 2020 to \$3.167 billion as of January 1, 2021.
- *Asset Surplus:* The System's MVA exceeded the AVA by \$339 million. This created a Trial Excess Interest as defined in the Board Policy 05-2. The Board has elected to not award Excess Interest to the System's plans based on the Trial Excess Interest as of December 31, 2020.



**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION I – BOARD SUMMARY**

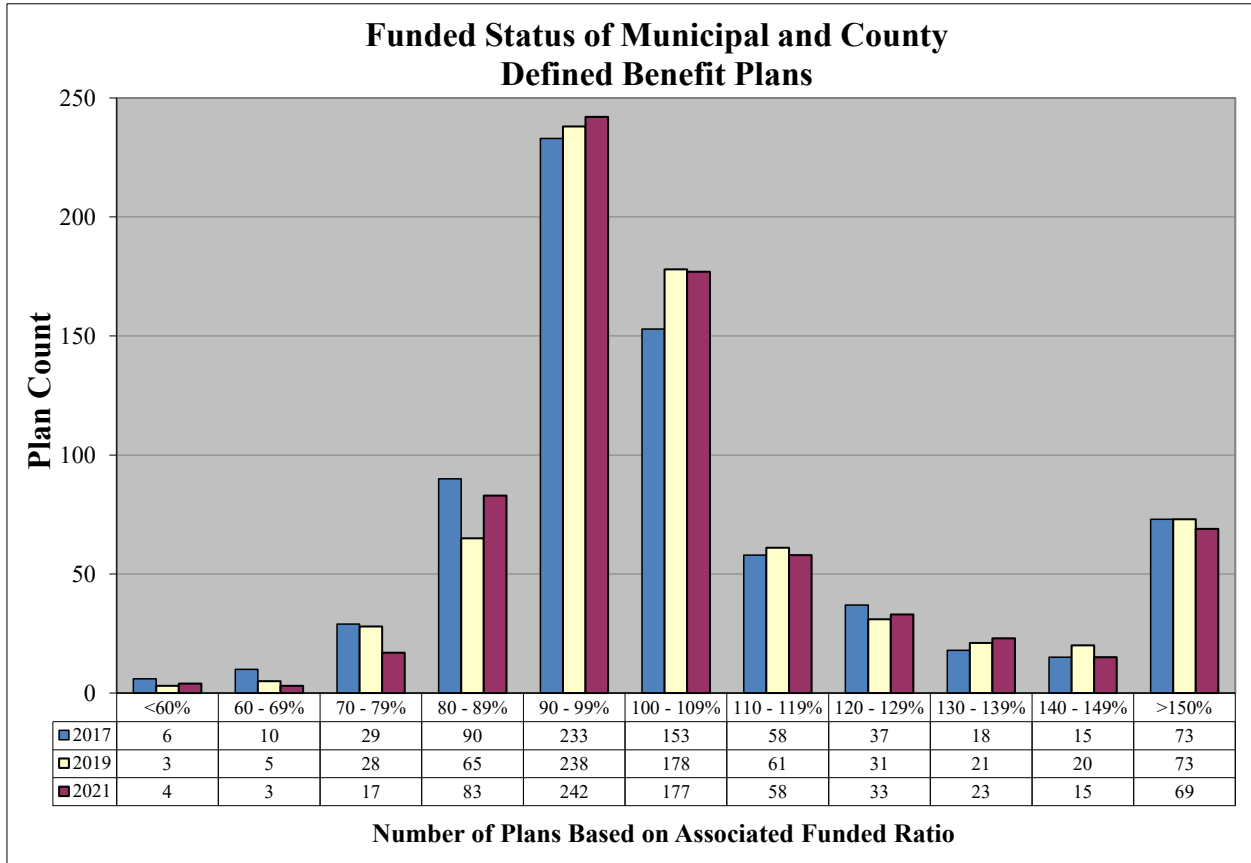
- *Actuarial Liabilities:* The January 1, 2021 Actuarial Liabilities (AL) represent the explicit valuation of the cash balance and non-county defined benefit plans, and a roll-forward of the liabilities for county plans based on the January 1, 2020 results. The System's AL increased by \$230 million, from \$2.601 billion to \$2.831 billion. Additional accruals during the year with interest offset by benefit payments paid to retirees accounted for \$86.5 million of the increase. Plan changes and transfers accounted for \$47.8 million of the increase. The assumption changes increased the actuarial liability by \$87.0 million, or 0.62% of the AL. There was a net actuarial loss of \$8.6 million, which is 0.30% of the AL, due to experience deviating from the assumptions.
- *Unfunded Actuarial Liability (UAL)/Surplus Assets (SA):* The System is made up of many different retirement plans. Some plans have UAL (AL exceeds the AVA), other plans have SA (AVA is greater than AL). In aggregate, the System's surplus of \$30.4 million as of January 1, 2020 changed to a UAL of \$3.9 million as of January 1, 2021, primarily due to the changes in the actuarial assumptions.
- *Funded Ratio using Actuarial Value of Assets:* This is the ratio of the System's AVA to AL. The funded ratio decreased from 101.2% as of January 1, 2020 to 99.9% as of January 1, 2021 primarily due to the changes in the actuarial assumptions.
- *Funded Ratio using Market Value of Assets:* This is the ratio of the System's MVA to AL. The funded ratio increased from 107.3% as of January 1, 2020 to 111.9% as of January 1, 2021. This change was primarily due to the market gains during the year offset by the impact of the changes in the actuarial assumptions.

The numerical values provided above may not add due to rounding. Please refer to the detailed sections in this report for more information.

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**SECTION I – BOARD SUMMARY**

The following chart shows a distribution of each individual plan’s funded status for the defined benefit plans (both municipal and county plans) using AVA of the plans covered by the System in 2017, 2019 and 2021. Overall these bars are very similar although this year the funded ratio decreased slightly due to the new actuarial assumptions which increased the liabilities.



Under Act 205 as amended by Act 44, plans may be considered distressed if they are less than 90% funded. As of January 1, 2021, **about 15% of the defined benefit plans were less than 90% funded. This is better than the 19% of plans as of January 1, 2017 that were less than 90% funded, but slightly worse when compared to the 14% of plans under 90% as of January 1, 2019.**

**As of January 1, 2021, 52% of the defined benefit plans were at least 100% funded which is slightly less than 53% as of January 1, 2019 and greater than 49% as of January 1, 2017.** These overfunded plans can apply 10% of the excess assets (assets that exceed the liabilities) to reduce their Minimum Municipal Obligation (MMO). On this basis, it is common for the number of plans that have a funded status above 100% to decline as this surplus is used to offset contributions.

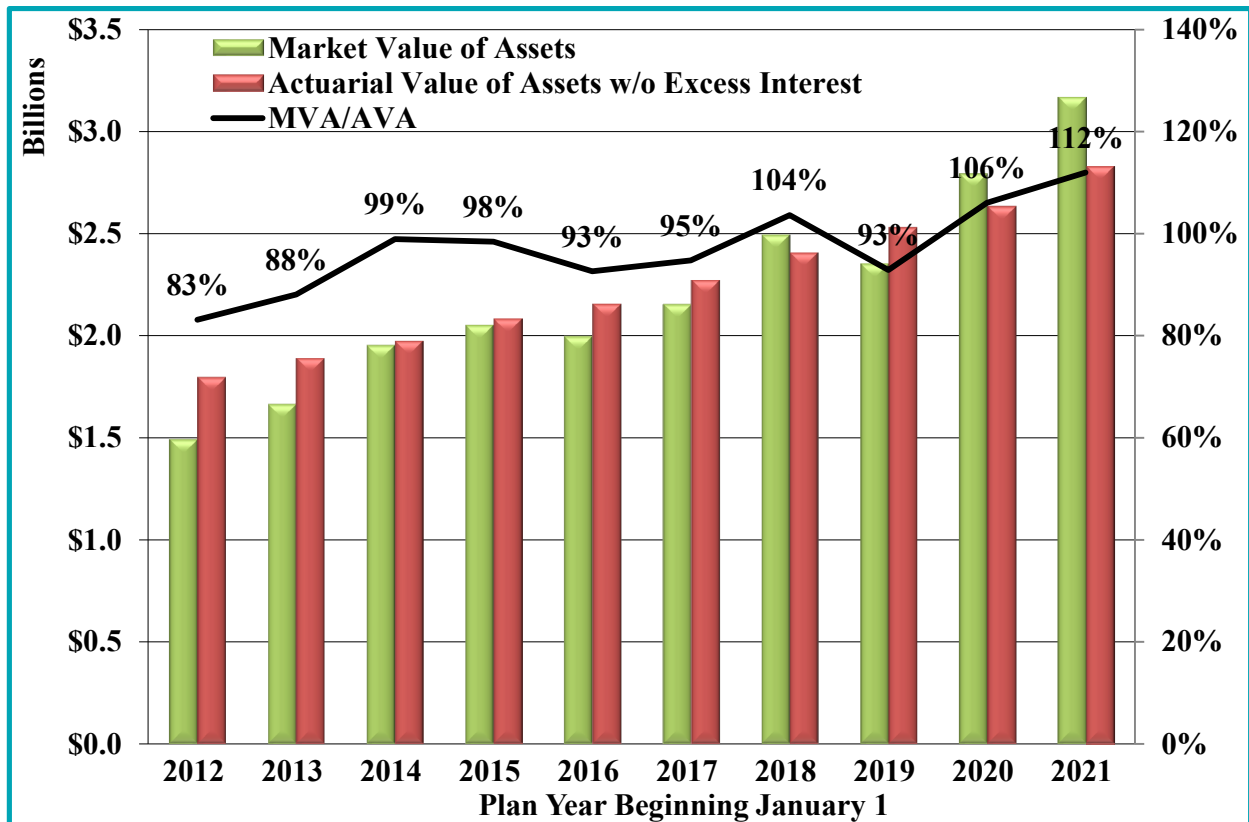
In addition to the historical funded status ranges, another important relationship to review is that of the Actuarial Value of Assets and Market Value of Assets. The Actuarial Value of Assets is defined as the reserves being held for all benefits of the participating employers and reflects the crediting of the Regular Interest Rate and actual cash flows without regard to the actual investment return of the System.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION I – BOARD SUMMARY**

The Market Value of Assets is the actual amount of money the system has as reported on the ACFR. The money-weighted returns net of investment expenses for the plan years ended 2019 and 2020 were 20.9% and 13.8%, respectively. Comparing the MVA to the AVA provides a representation of the actual System assets to the System reserve accounts, which are used to determine the AVA. As of January 1, 2020, the MVA was \$160 million greater than the AVA, and as of January 1, 2021, the MVA exceeded the AVA by \$339 million.

The following table shows the historical relationship between the MVA (green bars) and the AVA (red bars) along with the ratio of the MVA to the AVA (the ratios provided for the black line and oriented with the right vertical axis) demonstrating the underlying risk of the System as addressed later in this report. The MVA has exceeded the AVA in only three Plan Years shown in the time period below, all of which occurred since 2018.



When the ratio of the MVA to the AVA is less than 100%, any shortfall between the AVA and MVA must come from future investment earnings in excess of the Regular Interest Rate. When the MVA exceeds the AVA, there is a potential for excess interest distributions to be awarded by the Board.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION I – BOARD SUMMARY**

**B. Current Financial Condition**

On the following pages, we summarize the key results of the January 1, 2021 valuation and how they compare to the results from the January 1, 2020 valuation.

Table I-1 shows that the total System membership increased by 1.5% from 2020 to 2021. The active participant counts reported for the Traditional Defined Benefit Plans decreased by 1.4% while the active cash balance plan participation decreased by 1.1%.

<b>Table I-1 Membership Total</b>			
	January 1, 2021	January 1, 2020	% Change
Traditional Defined Benefit Actives	7,860	7,970	-1.4%
Cash Balance Benefit Actives	1,486	1,502	-1.1%
Terminated Vesteds	1,284	1,205	6.6%
Participants Receiving Benefit Payments	6,050	5,781	4.7%
Inactive Nonvested Participants with accounts	47	47	0.0%
Beneficiaries	694	654	6.1%
Total System Members	17,421	17,159	1.5%
Annual Salaries*	\$ 548,523,430	\$535,040,390	2.5%
Average Salary per Active Member	\$58,691	\$56,487	3.9%

\* Annualized salary paid during the prior plan year for Traditional Defined Benefit plan participants and actual salary for active cash balance participants

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION I – BOARD SUMMARY**

Table I-2 summarizes the demographic make-up of the traditional defined benefit and cash balance plans in the System.

Table I-2 Demographic Make-up of the System			
Category	Valuation as of		Percent
	January 1, 2021	January 1, 2020	Change
<b>Number of plans:</b>			
Traditional Defined Benefit Plans	724	728	-0.55%
Cash Balance Plans	328	328	0.00%
<b>Total</b>	<b>1,052</b>	<b>1,056</b>	<b>-0.38%</b>
<b>Active Employees in Traditional Defined Benefit Plans:</b>			
Count	7,860	7,970	-1.38%
Average Age	47.6	47.8	-0.39%
Average Service	11.6	11.7	-0.53%
Total Payroll*	\$ 476,970,336	\$ 465,906,342	2.37%
Average Pay	\$ 60,683	\$ 58,458	3.81%
<b>Active Employees in Cash Balance Plans:</b>			
Count	1,486	1,502	-1.07%
Average Age	49.2	49.3	-0.21%
Average Service	10.6	10.6	-0.77%
Total Payroll*	\$ 71,553,094	\$ 69,134,048	3.50%
Average Pay*	\$ 48,151	\$ 46,028	4.61%
<b>Total Active PMRS Participants</b>	<b>9,346</b>	<b>9,472</b>	<b>-1.33%</b>
Inactive Nonvested Participants with account balances:	47	47	0.00%
<b>Deferred Vested Participants:</b>			
Traditional Defined Benefit Plans	933	882	5.78%
Cash Balance Plans	351	323	8.67%
<b>Pensioners:</b>			
Count	6,050	5,781	4.65%
Average Age	70.5	70.3	0.28%
Average Monthly Benefit	\$ 1,473	\$ 1,434	2.70%
Number of New Awards	429	381	12.60%
Average New Monthly Benefit	\$ 1,631	\$ 1,638	-0.43%
Number Receiving Legislated COLA	312	293	6.48%
<b>Survivor Beneficiaries:</b>			
Count	694	654	6.12%
Average Age	74.5	74.6	-0.06%
Average Monthly Benefit	\$ 1,053	\$ 1,022	3.07%
<b>Total Inactive Participants Count</b>	<b>8,075</b>	<b>7,687</b>	<b>5.05%</b>

\* Annualized salary paid during the prior plan year for Traditional Defined Benefit plan participants and actual salary for active cash balance participants.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION I – BOARD SUMMARY**

Table I-3 presents a comparison between the January 1, 2020 and January 1, 2021 System assets, liabilities, and unfunded actuarial liability for the non-county defined benefit plans, county defined benefit plans and the cash balance plans.

<b>Table I-3 Total Plan Assets and Liabilities (\$ thousands)</b>			
	<b>January 1, 2021</b>	<b>January 1, 2020</b>	<b>Percent Change</b>
<b>Traditional Defined Benefit (Non-county) Plans:</b>			
Actives	\$ 1,166,045	\$ 1,119,823	4.1%
Terminated Vested	109,230	87,519	24.8%
In Pay Status	1,242,793	1,103,197	12.7%
Total Actuarial Liability	\$ 2,518,068	\$ 2,310,539	9.0%
Actuarial Value of Assets	2,504,190	2,331,222	7.4%
Unfunded/(Surplus) of Actuarial Liability	\$ 13,878	\$ (20,683)	
<b>Traditional Defined Benefit (County) Plans:</b>			
Actives	\$ 72,427	\$ 72,399	0.0%
Terminated Vested	14,278	13,432	6.3%
In Pay Status	60,434	52,593	14.9%
Total Actuarial Liability	\$ 147,139	\$ 138,424	6.3%
Actuarial Value of Assets	148,634	139,730	6.4%
Unfunded/(Surplus) of Actuarial Liability	\$ (1,495)	\$ (1,306)	
<b>Cash Balance Plans:</b>			
Actives	\$ 97,767	\$ 93,400	4.7%
Terminated Vested	20,101	18,354	9.5%
In Pay Status	48,213	40,764	18.3%
Total Actuarial Liability	\$ 166,081	\$ 152,518	8.9%
Actuarial Value of Assets	167,814	153,843	9.1%
Unfunded/(Surplus) of Actuarial Liability	\$ (1,733)	\$ (1,325)	30.8%
<b>Total of All Plans:</b>			
Actives	\$ 1,336,239	\$ 1,285,622	3.9%
Terminated Vested	143,609	119,305	20.4%
In Pay Status	1,351,440	1,196,554	12.9%
Total Actuarial Liability	\$ 2,831,288	\$ 2,601,481	8.8%
Market Value of Assets	\$ 3,166,700	\$ 2,792,069	13.4%
Aggregate Actuarial Value of Assets (summation of above)	\$ 2,820,638	\$ 2,624,795	7.5%
Expenses in Excess of \$20 per Plan Member Fee	6,053	4,511	34.2%
Actuarial Value of Asset Adjustment <sup>1</sup>	712	2,543	-72.0%
Actuarial Value of Assets <sup>2</sup>	2,827,403	2,631,849	
Excess Interest Distribution	-	-	
Actuarial Value of Assets Reflecting Excess Interest	\$ 2,827,403	\$ 2,631,849	7.4%
<b>Unfunded/(Surplus) using Actuarial Value of Assets</b>	<b>\$ 3,885</b>	<b>\$ (30,368)</b>	<b>-112.8%</b>
<b>Funded Ratio on Actuarial Value of Assets</b>	<b>99.9%</b>	<b>101.2%</b>	<b>-1.3%</b>
<b>Unfunded/(Surplus) using Market Value of Assets</b>	<b>\$ (335,412)</b>	<b>\$ (190,588)</b>	<b>76.0%</b>
<b>Funded Ratio on Market Value of Assets</b>	<b>111.9%</b>	<b>107.3%</b>	<b>4.5%</b>

<sup>1</sup> The Actuarial Value of Asset Adjustment reflects the net difference between the retiree reserve and the retiree liabilities as well as differences from plans entering and exiting the System as of plan year end and the disability reserve, which is not included in the AVA at the plan level.

<sup>2</sup> The Actuarial Value of Assets is based on member, municipal, retiree, disability & DROP reserve accounts as approved by the Board including the \$67.8 million transfer to the Retiree Reserve effective December 31, 2020. This transfer will first be reflected retroactively as of December 31, 2020 in the System's Retiree Reserve in the December 31, 2021 ACFR.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION I – BOARD SUMMARY**

Table I-4 summarizes the January 1, 2021 municipal defined benefit plans that are in a surplus or underfunded position compared to the last full valuation for these plans.

<b>Table I-4</b>		
<b>Funded Status of Municipalities</b>		
	<b>January 1, 2021</b>	<b>January 1, 2019</b>
<b>A. Municipal Plans in a surplus position</b>		
Number of plans with a surplus	373	382
1. Actuarial Value of Assets in plans with a surplus	\$929,013,745	\$841,035,536
2. Actuarial Liability in plans with a surplus	<u>819,835,662</u>	<u>723,667,659</u>
3. Amount of surplus (1. - 2.)	\$109,178,083	\$117,367,877
<b>B. Municipal Plans in an underfunded position</b>		
Number of underfunded plans	347	337
1. Actuarial Value of Assets in underfunded plans	\$1,575,176,566	\$1,412,871,761
2. Actuarial Liability in underfunded plans	<u>1,698,232,056</u>	<u>1,520,905,003</u>
3. Amount of (unfunded) liability (1. - 2.)	(\$123,055,490)	(\$108,033,242)

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION I – BOARD SUMMARY**

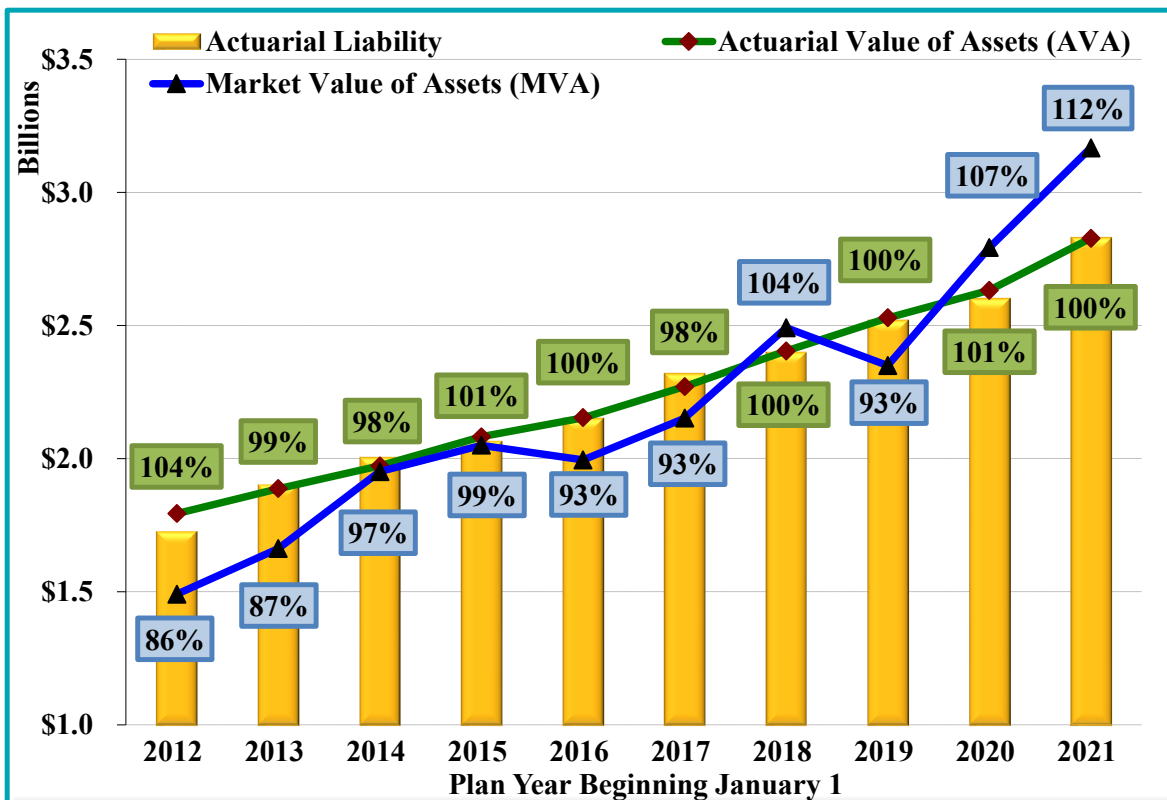
**C. Historical Trends**

Even though the attention given to the valuation reflects the most recently computed actuarial liability and funded ratio, it is important to remember that each valuation is merely a snapshot of the long-term progress of the System. It is equally important to judge a current year’s valuation results relative to historical trends as well as trends expected into the future.

In the chart below, we present the historical trends for the total System’s MVA and AVA (blue and green lines) compared to the total System actuarial liabilities (yellow bars). We have included the AVA funded ratio (AVA divided by AL) across the top of each bar in green boxes to show the recent progress of the System. For 2021, this funded ratio is 100%. The Actuarial Value of Assets are based on the reserve accounts for the System. Due to the growth of the reserves as outlined with the Pennsylvania Municipal Retirement Law, the Actuarial Value of Assets is expected to grow linearly as seen by the green line, although when undistributed earnings are transferred to the Retiree Reserve to fully fund the retiree liabilities, then this line increases more. Overall, there is little variability in the historical AVA funded ratio.

The funded ratio on a Market Value of Assets basis illustrates the underlying System’s risks addressed later in this report. The market value funded ratios (MVA divided by the AL) are provided across the top of each bar in blue boxes. The 2021 Market Value of Assets is greater than the Actuarial Liability with a funded ratio of 112%. Due to the volatility of the Market Value of Assets, this ratio ranges from 86% up to 112% compared to the funded ratio based on the Actuarial Value of Assets, which ranges from 98% to 104%.

**Pennsylvania Municipal Retirement System Assets and Liabilities**





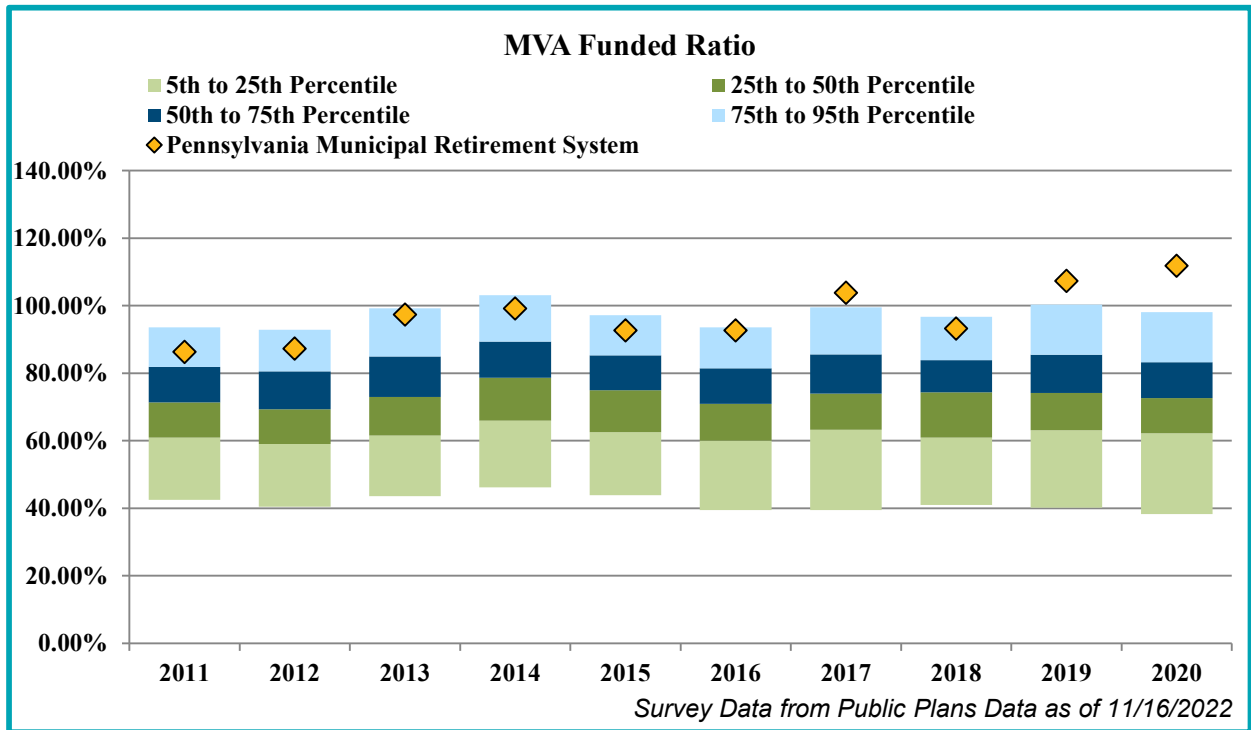
**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION I – BOARD SUMMARY**

The following chart compares PMRS to the distribution of plans from the Public Plans Database, which is maintained by the Boston College’s Center for Retirement Research, the Center for State and Local Government Excellence, and the National Association of State Retirement Administrators. The number of plans in any given year range from about 150 up to just over 200.

The years in these types of charts represent plans with fiscal years ending during the year. Therefore, the results of PMRS as of this valuation are aligned to 2020 (December 31, 2020). The gold diamonds represent PMRS and the bars represent the 5th to 95th percentile of the plans in the database

The funded ratio on an MVA basis shown in the blue boxes in the prior chart are now represented by the yellow diamonds. Relative to this universe of plans, PMRS has always been in the top quartile.



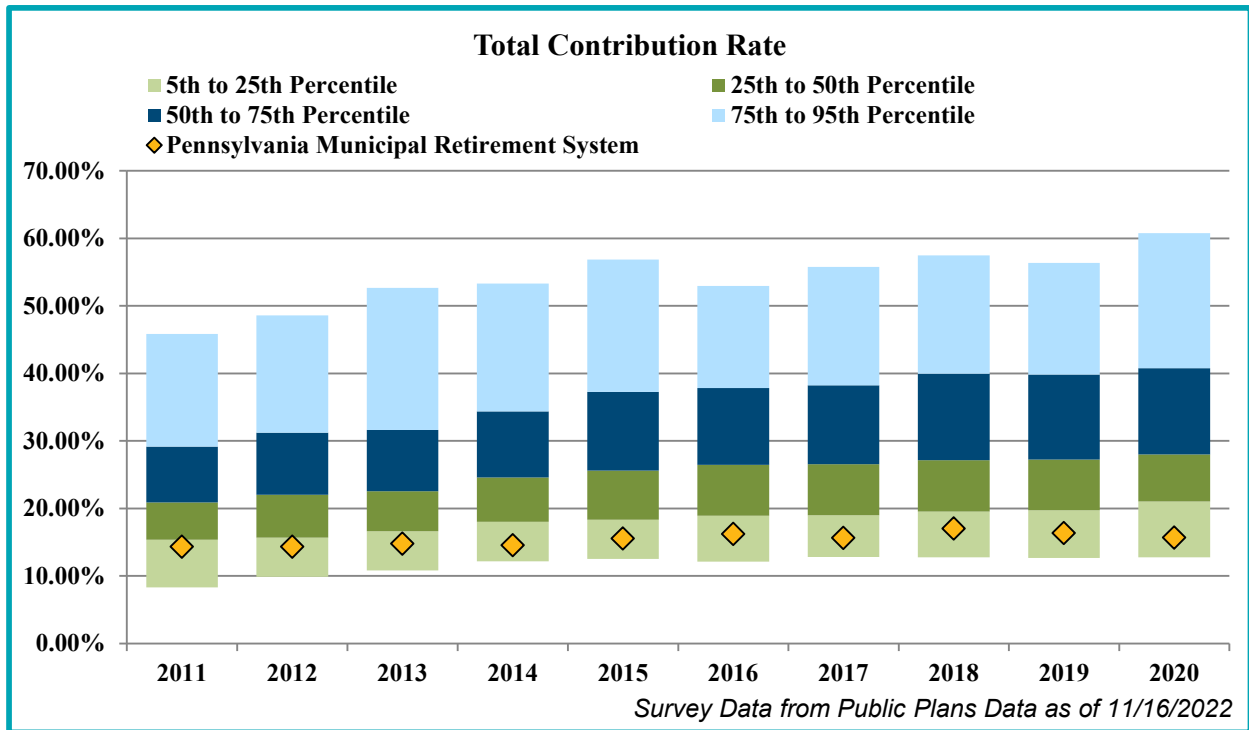
**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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The Total Contribution Rate of pension plans is generally the sum of the following divided by the active payroll:

1. **Normal Cost**, the value of benefits accrued during the year for active participants
2. An **Amortization Payment** of the unfunded liability based on the funding method
3. **Annual Expenses** equal to \$20 per participant to assist in maintenance of the plan

The Total Contribution Rate for the System, shown by the yellow diamonds below, is substantially driven by the Normal Cost. The majority of plans are fully funded with no required Amortization Payment. Therefore, although many PMRS plans are not fully funded in aggregate, the System remains in the lower quartile when compared to the distribution of contribution rates for the plans in the Public Plan Database.

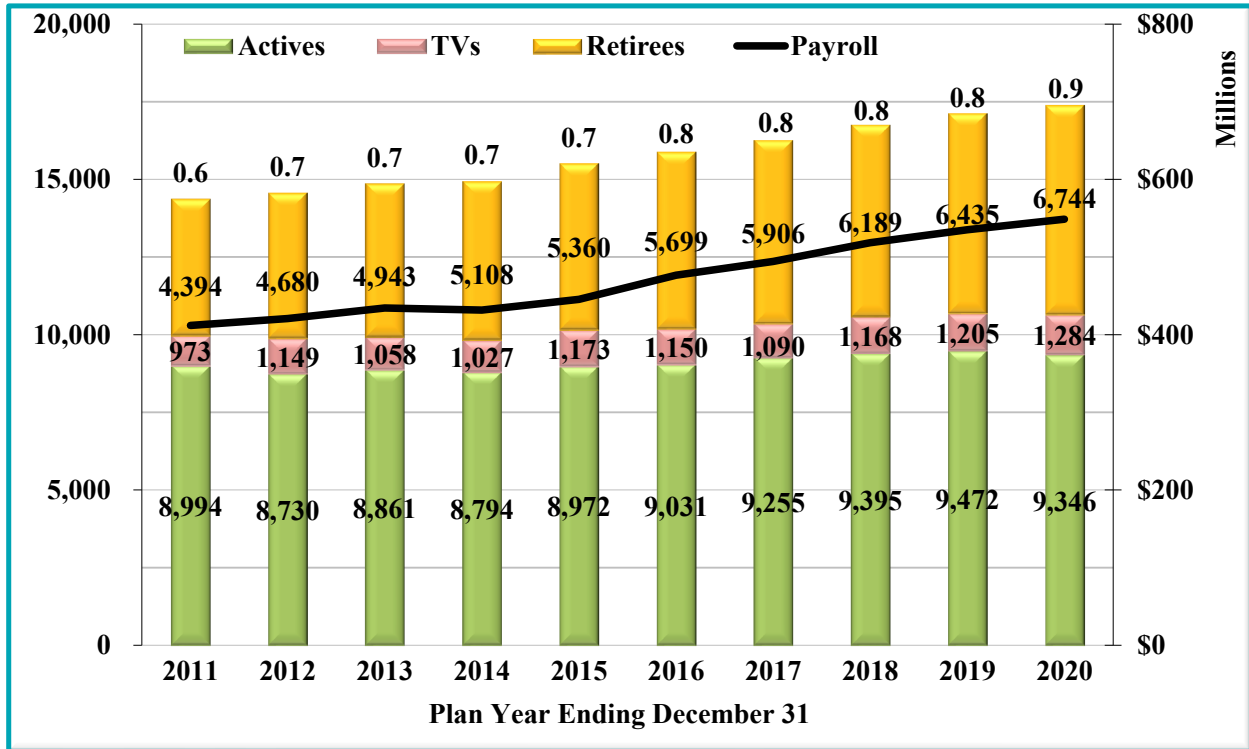


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**Pennsylvania Municipal Retirement System Participant Counts – end of year**

This chart shows a comparison of the demographic makeup of the System over the last ten years. The black line represents the active payroll and is oriented to the right-hand axis. The numbers above the bars represent the support ratio of retirees and terminated vested participants to active participants at each date, which has been slowly increasing but remains under 1.



A retirement system has a life cycle, reaching maturity when there are more covered inactive participants (retirees and terminated vested participants) than those who are actively employed. When this occurs, the support ratio of inactive to active participants is above 1.0. The System is maturing as indicated by the steadily increasing ratio of inactive to active participants, currently at 0.9. A mature system is more sensitive to risk factors such as investment risk, such that investment recovery takes more time and can be difficult to achieve without additional actions such as increased contributions. Prolonged investment recovery is impacted by the net negative cash flows occurring when benefit payments and expenses exceed contributions. This measure is correlated with the support ratio. This is discussed in more detail in the risk section of this report.

## SECTION I – BOARD SUMMARY

### D. Projected Financial Trends

Our analysis of the Pennsylvania Municipal Retirement System’s projected financial trends is an important part of this valuation. In this section, we present our assessment of the implications of the January 1, 2021 valuation results on the future outlook in terms of benefit security (assets sufficient to cover liabilities) and the System’s expected funding progression.

In the charts that follow, we project the Retirement System’s resources and obligations. We assume the Act 205 contributions are made each year. The projections in this section only consider what was known as of January 1, 2021 based on the assumptions listed in Appendix B of this report. The projections are provided under four different investment return assumption scenarios:

- 1) Projection 1: Assuming 5.25% investment returns each and every year,
- 2) Projection 2: Assuming a 7.00% (net of investment fees) for each and every year. Based on the current asset allocation for the System, the investment consultant has indicated that the long-term return on assets is expected to exceed 5.25%,
- 3) Projection 3: Assuming average investment returns over 20 years equal 5.25% but vary annually based on the returns provided in Table I-5. We do this to demonstrate a more realistic projection with varying returns because the System’s return will never be the same every year,
- 4) Projection 4: Assuming 20 years of varied returns equal to an overall average 7.00% investment return based on the returns provided in Table I-6.

In the graphs that follow, the area under the purple line represents the *Present Value of Benefits*. This amount takes into account the value of all benefits earned up to that point in time (Actuarial Liability) plus benefits assumed to be earned into the future for the participants covered at each point in time. This amount represents the System’s total obligation. This is an open group projection which means when an active participant is expected to change status, they are assumed to be replaced.

To meet these obligations, the System has resources which include the Market Value of Assets (in blue) and the present value of future contributions (in gold).

- If these two sources are insufficient to meet the obligations today or in the future, the result will display as a deficit (in red).
- If these two resources exceed the obligations, the result will display as a surplus (green).

For the System, given that the investment Regular Interest Rate for all municipalities is currently 5.25%, the key resource initially to cover a deficit or create a surplus is through average future investment returns at a System level that exceed the 5.25% rate. The Board can reduce the Regular Interest Rate at future valuation dates which in turn should increase the likelihood that returns will exceed this rate. This would also result in increased future contributions.

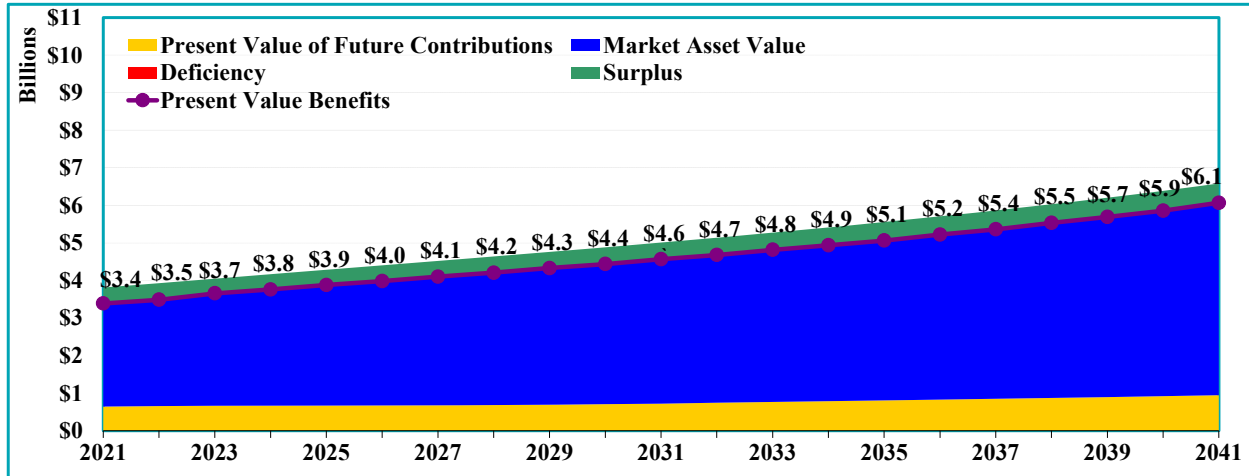
Excess interest can be distributed to pay down unfunded liabilities for plans less than 95% funded or provide benefit improvements for plans that are at least 95% funded. About 63% of the AL is associated with plans that are at least 95% funded. We assumed 63% of excess interest distributions provide benefit improvements. This percentage is increased linearly to 100% over a ten-year period.

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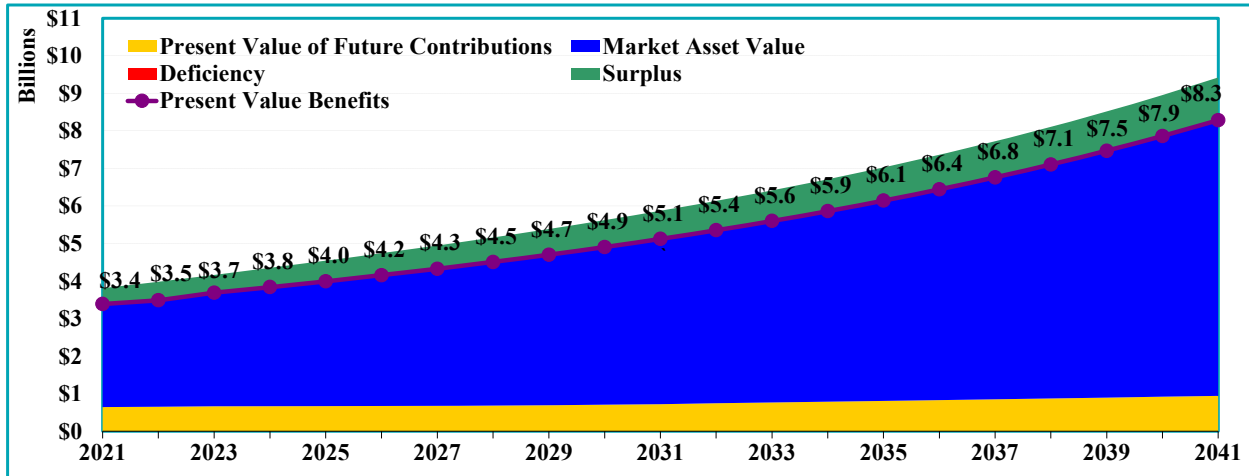
**Projection 1:**

In this scenario, the gap between the assets and the System’s obligations gradually increases throughout the projection period. This occurs primarily because the MVA is originally greater than the obligation and the AVA, and contributions are based on the AVA funded status, not the MVA. Therefore, even without earning in excess of the Regular Interest Rate, the surplus between the MVA and the obligations will grow.



**Projection 2:**

This scenario shows the projection if the assets grow at a rate of 7.00% throughout the projection period.



The surplus in this scenario grows much faster as the assets outpace the obligations over the 20-year projection because of the assumption that the annual investment return will be 175 basis points higher (7.0% compared to 5.25%). In addition, the projected present value of benefits increases even more under this scenario because excess interest is assumed to be awarded, which increases the benefits offered for most individual pension plans.

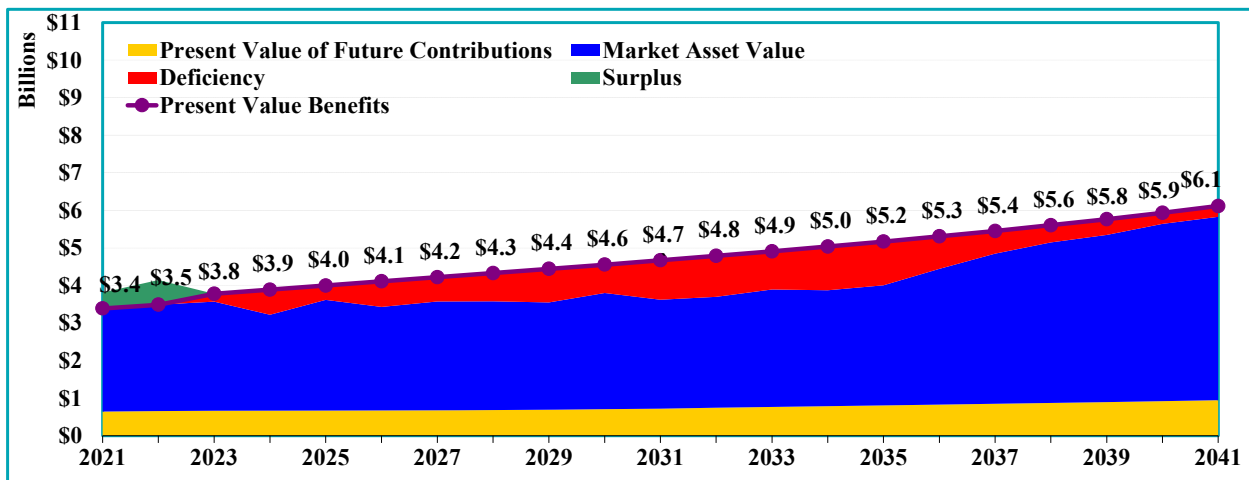
**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**Projection 3:**

The System’s return on assets each year is assumed to be the Regular Interest Rate of 5.25% but will, over time, be volatile with returns above and below the assumption. Based on the hypothetical future return rates in Table I-5, which yield an average 5.25% rate of return over the projection period, the projected funded status will fluctuate based on the market value of assets.

Table I-5 Projected Returns Equal to the Valuation Rate										
Fiscal Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Return	12.00%	-15.00%	-10.00%	18.00%	-4.00%	8.00%	3.00%	2.00%	12.00%	-3.00%
Fiscal Year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Return	6.00%	10.00%	2.60%	7.50%	17.00%	14.00%	10.00%	7.00%	8.70%	6.00%



In this scenario, the negative net cash flow in conjunction with these volatile returns results in a worse funded position over time than the flat 5.25% projection. This is due in part to the projected distribution of excess interest prior to 2024 where the early returns are higher than the assumption, which results in an increase in liabilities for plans that are at least 95% funded.

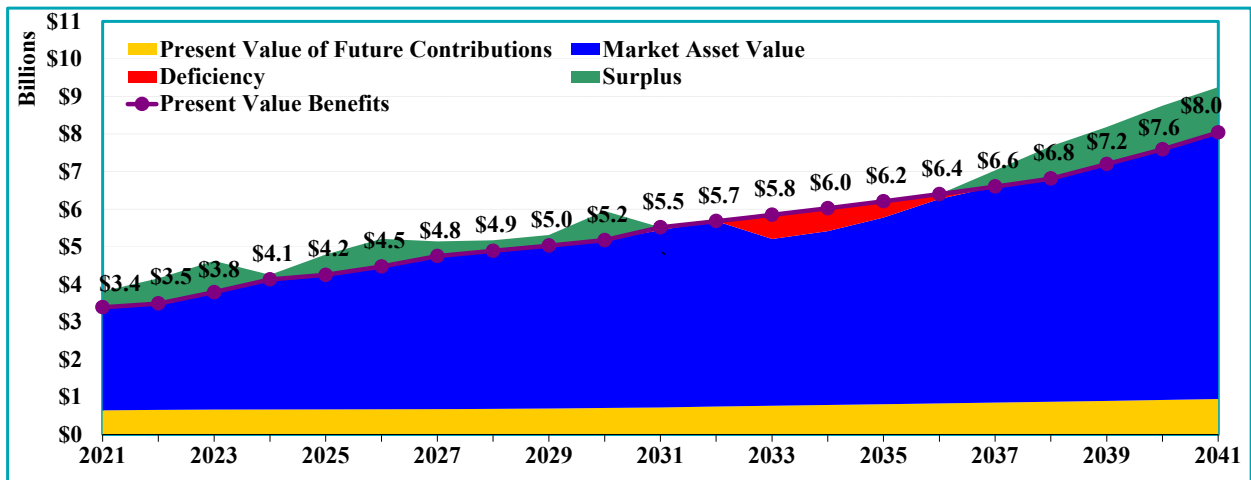
**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION I – BOARD SUMMARY**

**Projection 4:**

The volatility is equally apparent when the projected investment returns vary but are expected to produce an average return over time of 7.00% as summarized in Table I-6.

Table I-6 Projected Returns Equal to 7.00%										
Fiscal Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Return	12.50%	15.00%	-8.00%	17.00%	12.00%	0.00%	2.50%	5.00%	16.00%	-8.00%
Fiscal Year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Return	7.25%	-8.00%	7.00%	10.00%	12.00%	16.00%	12.00%	9.00%	9.00%	7.50%



## SECTION I – BOARD SUMMARY

### E. Actuary’s Assessment of Risk

Actuarial valuations are based on a set of assumptions regarding future economic and demographic experience. These assumptions represent a reasonable estimate of long-term future experience, but actual future experience will undoubtedly be different. The purpose of this section of the actuarial report is to identify, in the actuaries’ professional judgment, the primary risks to the System, provide some background information about those risks, and provide an assessment of those risks in accordance with ASOP No. 51. According to the ASOP, the actuary should identify risks that, in the actuary’s professional judgment, may reasonably be anticipated to significantly affect the plan’s future financial condition.

The identification of risks for PMRS can be viewed in aggregate at a System level or at the individual plan level (Plan Risk). The individual plan level risks can vary greatly from plan to plan. The fundamental risk to the System is that the market value of assets could become insufficient to meet the benefit obligations of the individual plans, which could require increased contributions making the plans unaffordable. This section will attempt to address this fundamental risk by reviewing the Plan and System level risks for the following:

- 1) Investment Risk
- 2) Longevity and Other Demographic Risks
- 3) Withdrawal Risk

1) ***Investment Risk*** represents the risk associated with asset volatility (particularly losses) and exists for nearly all pension plans. Because the Pennsylvania Municipal Retirement Law defines the Regular Interest used in the funding valuation, the risk associated with the investment return for PMRS is unique, as outlined below.

#### **Plan Level:**

Participating plans within PMRS are not exposed to the same investment risk as typical pension plans. PMRS credits the municipal and member accounts at the Regular Interest Rate each year, regardless of the actual investment return on the market value of assets. Thus, the aggregation of the plans’ reserve accounts represents the AVA and is used to determine the required plan contributions also known as the Minimum Municipal Obligation (MMO). If the System’s MVA exceeds the combined plans’ AVAs, then individual plans may receive a distribution of the surplus called Excess Interest. Therefore, plans participating in PMRS are not generally subject to the down-side risk of asset volatility, but they do have the opportunity to share in the up-side potential.



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**System Level:**

When the actual investment returns are less than the Regular Interest Rate (currently 5.25%), the MVA may drop below the system-wide reserve accounts. The System's asset allocation is selected such that the long-term return on assets is expected to exceed the Regular Interest Rate, which helps to mitigate this inherent System risk. This gap would be expected to be closed by the accumulation of returns in excess of the Regular Interest Rate in the future. This scenario occurred during 2019. For the January 1, 2020 valuation, the MVA exceeded the AVA because the excess asset returns exceeded the Regular Interest Rate and also were sufficient to fill the shortfall that existed at January 1, 2019. Based on information provided by the investment consultant and reviewed by the Board, the current long-term expected return is above 7.00% (net of investment expenses).

If the actual investment returns are greater than the Regular Interest Rate and the system-wide reserve accounts are less than the market value of assets, then there is a surplus as defined in PMRS Policy Statement 05-2. This surplus allows for a portion of the undistributed earnings to transfer to the Retired Member Reserve Account to ensure that the System level retiree liabilities are fully funded. This transfer amount was \$67.8 million as of January 1, 2021 and is discussed in more detail later in this report.

The current funded status for the System after this transfer of surplus results in the MVA exceeding the AVA by \$339 million. The Board discussed the excess interest calculation based on this surplus that could be distributed per Board Policy 05-2 and decided not to distribute excess interest as of January 1, 2021.

The System level's sensitivity to investment risk can be explored in more detail by reviewing the Net Cash Flow and the Maturity Level.

*Net Cash Flow:* Net cash flow (NCF) during a year equals the contributions into the System (inflows) minus the benefit payments and expenses (outflows) coming out of the System. If the level of outflows exceeds the inflows, the system has negative NCF. Mature plans generally have a negative NCF as the number of retirees increase. Additional cash from investment returns and existing assets are then needed to pay the pension benefits if a system has negative NCF.

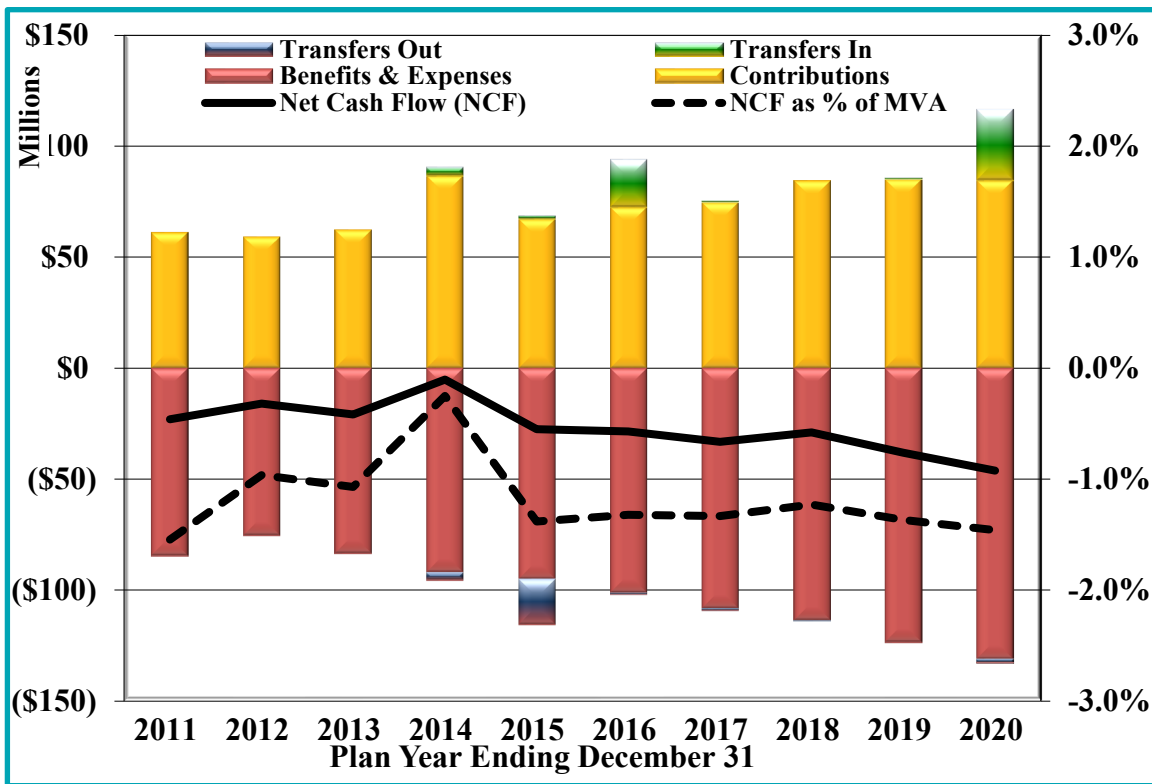
**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION I – BOARD SUMMARY**

The System’s NCF over the recent ten-year span is displayed in the next graph. The NCF is represented by the black line. The dashed black line (which is oriented to the right-hand axis) provides the NCF as a percentage of the beginning of year MVA. As of December 31, 2020, the system had a \$46 million negative NCF, excluding transfers into and out of the System. This represents about -1.5% of the beginning of year MVA. The negative NCF has been between -0.1% to -2.0% of total assets over the last 10 years. This implies that in addition to contributions, current plan assets must be used to pay benefits. Another way to say this is that for the total value of assets to remain level or grow, the fund needs a minimum investment return at least equal to the negative NCF. Negative NCF can become less negative or even positive by decreasing the Regular Interest Rate (which results in an increase in contributions).

The volatility of the NCF is largely a function of contributions and benefit payments. Beginning in 2014, the transfer of funds into and out of the System from new participating municipalities and exiting municipalities is excluded from the calculation of the NCF due to changes in the information provided on the ACFR. The incorporation of transfers into and out of the System can be found in Table II-2 for the past year. During 2020, a \$32 million transfer into PMRS for York Area Regional Police represents the largest transfer in recent history. In this chart, the transfers are included starting in 2014, the first year this information became available.

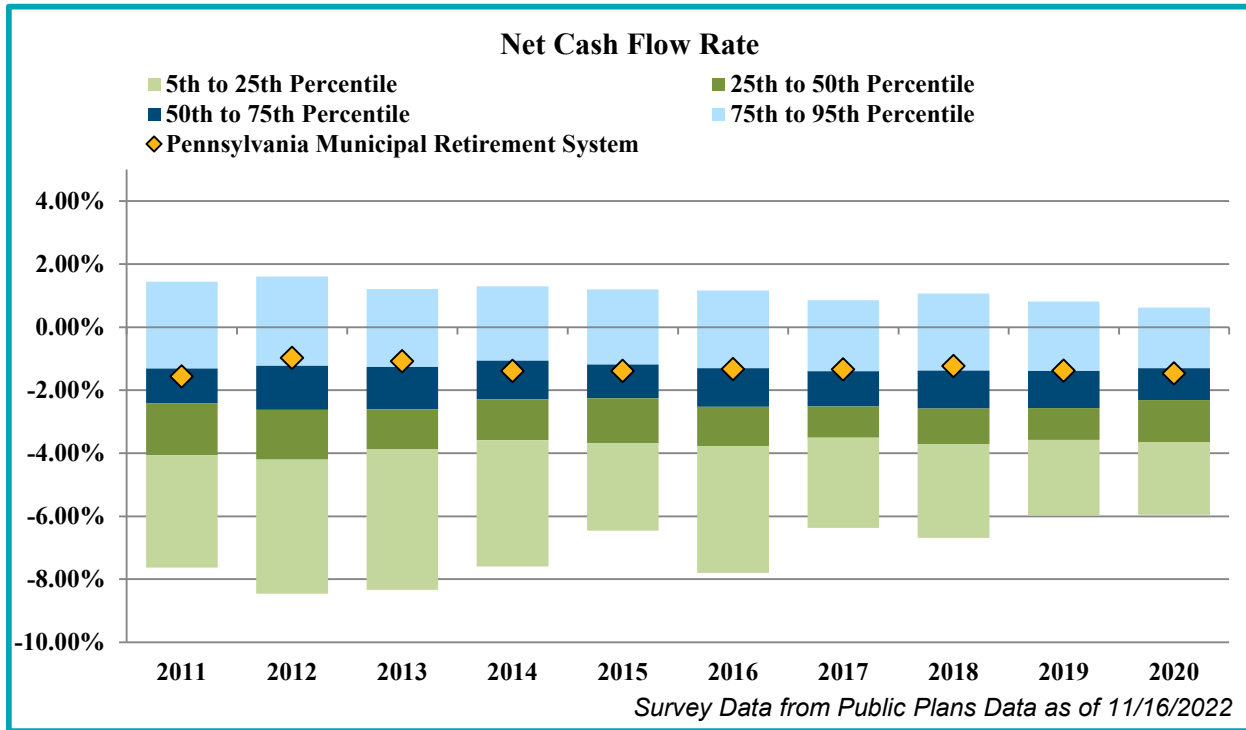
**Pennsylvania Municipal Retirement System Cash Flows**



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The following chart shows the distribution from the 5<sup>th</sup> to 95<sup>th</sup> percentile of NCF for the plans in the Public Plans Database. Similar to the prior charts like this, data is grouped by the year containing the fiscal year end. The gold diamonds represent PMRS. Relative to the universe of plans, PMRS is a less mature plan, found in the top quartile of this group in recent years.

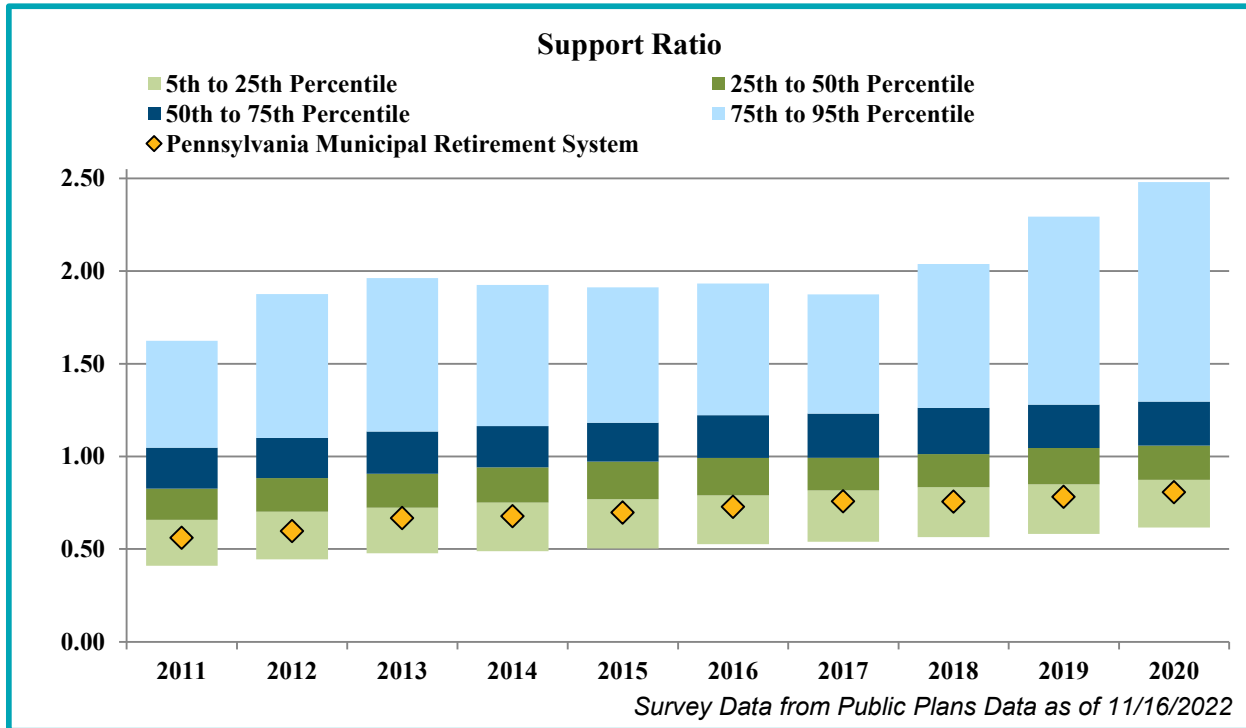


*Maturity Level:* Mature pension plans usually have more inactive participants than active participants. These plans tend to have negative NCF and are more sensitive to investment risks. Plan maturity can be measured in a variety of ways, but one simple measure of plan maturity is the ratio of the number of inactive participants (those receiving benefits or entitled to a deferred benefit) to the number of active participants. We refer to this as the support ratio. The revenue base supporting the plan is usually proportional to the number of active participants. A relatively high number of inactive participants compared to active participants may indicate a larger plan relative to its revenue base.

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The chart below shows the distribution from the 5<sup>th</sup> to 95<sup>th</sup> percentile of support ratios for the plans in the Public Plans Database. The lower the support ratio, the lower the maturity and the lower the sensitivity of the plan to risk. The gold diamonds represent PMRS. This shows that while the System is maturing, it is doing so at a very similar rate to the universe of plans and still remains in the lowest quartile.



For additional review of the risk of the System associated with the investment returns, please refer to the prior section to review the deterministic projections.

- 2) **Longevity and Other Demographic Risk** is the potential for retirees to live longer than expected or other demographic experience to differ from the assumptions. This has the potential to result in more benefits being paid than anticipated from the assets. This creates a financial risk that the plan will cost more than originally anticipated.

**Plan Level:**

PMRS is designed to transfer the longevity risk from individual plans to the System when participants retire. This is managed via a transfer of the present value of expected benefit payments from the member and municipal accounts to the Retiree Reserve. Once this transfer occurs, the individual plan no longer has risk associated with the retiree outliving their reserve as long as the plan remains in the System.

Plans in PMRS range in number of participants from 1 to nearly 1,000. Actual demographic experience will vary from the assumptions. This reality is magnified in plans with fewer participants, where the plan experience in one year can deviate materially from the assumptions. This deviation can cause volatility in the liabilities and the associated MMO. The demographic experience of the System is reviewed every 5 years to ensure that assumptions reflect the experience of the plans of the System in aggregate.

## SECTION I – BOARD SUMMARY

### System Level:

All retirees are paid from the Retiree Reserve Account which is funded through transfers of member and municipal reserve accounts from the individual plans. In this way, mortality risk is pooled among all individual plans, reducing an individual plan's overall risk associated with mortality. Provided plans do not withdraw from PMRS, this retiree longevity risk stays within the System. Assumption changes that occur after the transfer to the Retiree Reserve Account that increase the retiree liabilities (such as mortality assumption changes or reductions in the discount rate) can create a gap between the Retiree Reserve Account and the System's retiree liabilities. If retirees live longer than originally expected, more benefit payments will be paid out of the Retiree Reserve Account than expected, further increasing this gap. If the retiree liabilities are not fully funded by the Retiree Reserve Account and there are surplus assets available under PMRS Policy Statement 05-2, then according to general counsel's interpretation of PMRL, there will be a transfer of undistributed excess earnings to the Retiree Reserve Account to ensure these liabilities are fully funded.

- 3) **Withdrawal Risk** is the risk that plans withdraw from the System.

### Plan Level:

If an individual plan withdraws from the System, all future risks associated with longevity and market fluctuations will be passed onto the withdrawing plan. The assets that are distributed to the plan on withdrawal are based on the System's Market Value of Assets at the time of the withdrawal application up to the plan's Actuarial Value of Assets.

### System Level:

If a significant number of plans or plans representing a large percentage of assets withdraw from the System, this could increase the risk to the System due to smaller pools within which risks are diversified. Further, the depletion in assets may greatly change the System's exposure to investment risk, longevity risk, and expense management. There have been relatively few plans that have withdrawn from PMRS in the past 10 years. In fact, the number of pension plans in total has increased from 697 defined benefit plans and 203 cash balance plans as of January 1, 2010 to 730 defined benefit plans and 328 cash balance plans as of January 1, 2021. The active participant count over that same time period has slightly decreased from 9,351 to 9,346 participants while participants receiving a benefit have increased from 3,909 to 6,744. When plans withdraw from PMRS, the Pennsylvania Municipal Retirement Law states that the assets distributed to the withdrawing plan cannot exceed the Plan's pro rata portion of the market value of assets "as of the date of receipt of the application for permission to withdraw to prevent plans from leaving with higher reserve accounts". This protects the System and other participating plans from anti-selection risk when a participating employer requests a withdrawal.

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**SECTION II – ASSETS**

The System’s assets play a key role in the financial operation and in the decisions the Board may make with respect to future deployments. The level of assets, the allocation of assets among asset classes, and the methodology used to measure assets can impact funded status, municipal and county contributions, and the ultimate security of participants’ benefits.

In this section, we present detailed information on total System assets including:

- **Disclosure** of System assets at December 31, 2020 and December 31, 2019;
- Statement of the **changes** in market values during the year;
- Development of the **actuarial value of assets**; and
- Allocation of **excess interest**.

**Disclosure**

The market value of assets represents a “snapshot” or “cash-out” value, which provides the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the marketplace.

The actuarial values are a reflection of the market values and the aggregate reserves being credited to each participating employer. They are used for evaluating the System’s ongoing liability to meet its obligations to pay benefits when due.

Table II-1 summarizes the market value of assets by asset class as provided in the December 31, 2020 PMRS ACFR.

<b>Table II-1</b>		
<b>Statement of Assets at Market Value December 31 (\$ Thousands)</b>		
	<b>2020</b>	<b>2019</b>
<b>Assets</b>		
Equity Investments	\$ 2,201,705	\$ 1,856,004
Accounts Receivable	6,678	6,946
Fixed Income Investments	481,021	446,610
Real Estate Investments	496,100	500,027
Fixed Assets	323	388
Accounts Payable	(8,205)	(5,299)
Net Pension Liability	(4,501)	(4,781)
Net OPEB Obligation Liability	(4,055)	(3,332)
Investment Purchases Payable	(1,206)	(2,409)
Net Deferred Outflow of Resources	(1,160)	(2,085)
<b>Total Market Value of Assets</b>	<b>\$ 3,166,700</b>	<b>\$ 2,792,069</b>

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION II – ASSETS**

Table II-2 summarizes the transaction of the assets during the year leading up to our valuation.

<b>Table II-2 Changes in Market Value in (\$ Thousands)</b>		
<b>Market Value of Assets – January 1, 2020</b>		<b>\$ 2,792,069</b>
<b><u>Additions</u></b>		
Contributions:		
Municipal Employers	\$ 59,259	
Plan Members	25,200	
Transfers from other plan administrators	31,925	
Assessments	249	
<b>Total Contributions</b>		<b>\$ 116,633</b>
Investment Income:		
Net Appreciation In Fair Value Of Investments	\$ 368,975	
Short-Term And Other Investments	316	
Common And Preferred Stock	11,441	
Real Estate Equity	18,780	
International Equities	2,860	
Less Investment Expenses	(11,726)	
<b>Net Investment Income</b>		<b>\$ 390,646</b>
Miscellaneous Income:		\$ (4)
<b>Total Additions</b>		<b>\$ 507,275</b>
<b><u>Deductions</u></b>		
Annuity Benefits	\$ (124,613)	
Transfers to other plan administrators	(1,730)	
Administrative Expenses	(6,302)	
<b>Total Deductions</b>		<b>\$ (132,645)</b>
<b>Market Value of Assets – January 1, 2021</b>		<b>\$ 3,166,700</b>

The deductions of \$133 million (including transfers out of PMRS) exceed total contributions of \$117 million (including transfers into PMRS) for a net negative cash flow of \$16 million, which is approximately negative 0.6% of the beginning of year Market Value of Assets.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION II – ASSETS**

**Funding of Retiree Reserve Account**

All retirees are paid from the Retiree Reserve Account which is funded through transfers of Members' and Municipal Reserve Accounts from the individual plans as participants retire. If the preliminary retiree liabilities are not fully funded by the Retiree Reserve Account and there are surplus assets available under PMRS Policy Statement 05-2, then according to general counsel's interpretation of PMRL, there will be a transfer of undistributed excess earnings to the Retiree Reserve Account to ensure these liabilities are fully funded. The following table compares the preliminary retiree liabilities to the Retiree Reserve Account as published in the December 31, 2020 ACFR and determines the amount of money, if any, that needs to be transferred from the Undistributed Earnings to the Retiree Reserve. The updated resulting Retiree Reserve (line item 6 below) will be reflected retroactively to December 31, 2020 in the December 31, 2021 ACFR.

<b>Table II-3</b>	
<b>Retired Member Reserve Account as of January 1, 2021 (\$ Thousand)</b>	
1. Preliminary Retiree Liabilities January 1, 2021	\$ 1,351,439
2. December 31, 2020 Total In-Pay Reserve Accounts	
a. Retired Members' Reserve Account <sup>1</sup>	\$ 1,282,887
b. DROP Participant Reserve Account	729
c. Total (a. + b.)	\$ 1,283,616
3. Unfunded Preliminary Retiree Actuarial Liabilities [(1. - 2c.), not less than \$0]	\$ 67,823
4. Undistributed Earnings as of December 31, 2020 [Not less than zero]	\$ 413,173
5. If 4. is greater than 3., then the transfer amount to the Retiree Reserves is 3., else 4.	\$ 67,823
6. Retired Members' Reserve Account with transfer	\$ 1,350,710
7. Undistributed Earnings after transfer [4. - 5.]	\$ 345,350

<sup>1</sup> Published in the December 31 2020 ACFR.



**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION II – ASSETS**

**Preliminary Actuarial Value of Assets**

The Preliminary Actuarial Value of Assets is based on the individual municipal account balances maintained by PMRS, also referred to as reserves, after reflecting the \$67.8 million assets transferred to the Retiree Reserve as outlined in Table II-3.

<b>Table II-4</b>	
<b>Preliminary Actuarial Value of Assets January 1, 2021 (\$ Thousand)</b>	
1. Members' Reserve Account	\$ 494,275
2. Municipal Accounts	974,897
3. Disability Reserve Account	739
4. DROP Participant Reserve Account	729
5. Retired Members' Reserve Account	<u>1,350,710</u>
6. Total of System's Accounts	\$ 2,821,350
7. Total Expenses	\$ 6,302
8. Municipal Expenses of \$20 per Plan Member	<u>249</u>
9. Expenses not covered by Municipalities: (7. – 8.)	\$ 6,053
10. Preliminary Actuarial Value of Assets: (9. + 6.)	\$ 2,827,403

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION II – ASSETS**

**Available Excess Interest**

Each year the System’s funded status is evaluated in accordance with Board Policy 05-2 to determine if cumulative investment monies earned above the regular interest rate are available for the Board to consider awarding to plans. This “excess interest” award is derived as a portion of “new surplus” created during the year. “Surplus” refers to the excess of Market Value of Assets over the Actuarial Value of Assets. Once the Preliminary Actuarial Value of Assets has been determined, a formula is used to determine the new surplus. Depending on the relative size of surplus to market value “margin,” between 10% and 90% of new surplus will be designated as “excess interest”, which the Board may decide to distribute. For the year ended December 31, 2020, the excess interest available to distribute was \$118 million.

<b>Table II-5 Determination of Available Excess Interest (\$ Thousands)</b>	
1. Assets as of January 1, 2021	
a. Market Value	\$ 3,166,700
b. Preliminary Actuarial Value	<u>2,827,403</u>
c. Available Surplus (1a. - 1b.)	\$ 339,297
d. Ratio of Available Surplus to MVA (1c. / 1a.)	10.71%
2. Assets as of January 1, 2020	
a. Market value	\$ 2,792,069
b. Actuarial Value	2,631,849
c. Available Surplus (2a. - 2b.)	\$ 160,220
3. New surplus {Lesser of (1c. - 2c.) and 1c.}	\$ 179,077
4. Ratio of New Surplus to MVA (3. / 1a.)	5.66%
5. Percentage of New Surplus Available to be Credited as Excess Interest: (10% + 800% x 1d.) / (100% + 800% x 4.)	65.902%
6. Maximum Excess Interest Award Available {(3. x 5.), not less than zero}	\$ 118,016

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION II – ASSETS**

**Final Actuarial Value of Assets**

The Final Actuarial Value of Assets is based on Preliminary Actuarial Value of Assets plus any Excess Interest that was awarded by the Board during the year. As allowed by Policy Statement 05-2, the Board decided not to make this excess interest distribution as of January 1, 2021. Therefore, the Final Actuarial Value of Assets equals the Preliminary Actuarial Value of Assets.

<b>Table II-6</b>	
<b>Final Actuarial Value of Assets (\$ Thousands)</b>	
1. Preliminary Actuarial Value of Assets	\$ 2,827,403
2. Maximum Excess Interest Award available	118,016
3. Excess Interest Awarded	0
<b>4. Final Actuarial Value of Assets (1. + 3.)</b>	<b>\$ 2,827,403</b>

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION III – LIABILITIES**

**Disclosure**

The present value of all benefits is the measure of the total expected obligations of the System reflecting the expected future benefit accruals of active participants and the payout stream of all benefits. When compared to the Market Value of Assets and present value of future contributions the balance (surplus)/deficit is a measure of the System’s risk in providing for these obligations.

The Actuarial Liability is used for funding calculations. The Actuarial Liability is calculated taking the present value of benefits less the present value of future normal costs under the **Entry Age Normal** funding method.

The following table presents the different liability measurements reflecting actual non-county liabilities (both cash balance and defined benefit plans) and a roll-forward of county plan liabilities for the 2021 valuation. The Present Value of Future Contributions is based on the Present Value of Future Normal Cost and future amortization of unfunded/(surplus) as of the January 1, 2021 valuation for the non-county defined benefit plans. This information for the county plans is based on the prior year valuation results rolled forward one year. For the analysis of the deficit/surplus of the Present Value of Benefits (PVB) outlined below, the PVB of the cash balance plans equals the AL because for funding purposes these plans are by definition currently set to be fully funded due to their plan design.

<b>Table III-1</b>		
<b>Obligation Deficit/(Surplus) Analysis of All PMRS Plans*</b>		
	<b>January 1, 2021</b>	<b>January 1, 2020</b>
<b><u>Present Value of All Benefits - Total Obligation</u></b>		
Active Participant Benefits	\$ 1,891,749,386	\$ 1,771,387,356
Retiree and Inactive Benefits	<u>1,495,048,974</u>	<u>1,315,859,327</u>
<b>Present Value of Benefits (PVB)</b>	<b>\$ 3,386,798,360</b>	<b>\$ 3,087,246,683</b>
Present Value of Future Contributions (PVFC)	632,085,555	544,164,959
Municipal Market Value of Assets (MVA)	3,166,699,719	2,792,069,139
<b>Net (Surplus)/Deficit of Resources to Obligation (PVB - PVFC - MVA)</b>	<b>\$ (411,986,914)</b>	<b>\$ (248,987,415)</b>
<b><u>Actuarial Liability</u></b>		
Present Value of Benefits (PVB)	\$ 3,386,798,360	\$ 3,087,246,683
Present Value of Future Normal Cost Contributions (PVFNC)	555,510,176	485,765,469
<b>Actuarial Liability (AL = PVB - PVFNC)</b>	<b>\$ 2,831,288,184</b>	<b>\$ 2,601,481,214</b>
Municipal Actuarial Value of Assets (AVA)	2,827,402,985	2,631,849,434
<b>Net Unfunded/(Surplus) (AL - AVA)</b>	<b>\$ 3,885,199</b>	<b>\$ (30,368,220)</b>

\*Unrounded values may differ from the rounded values in other sections of report.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION III – LIABILITIES**

**Changes in Liabilities**

The Actuarial Liabilities shown in the following table change with each valuation based on the experience of the Plan. As liabilities for the non-county plans are valued every other year, gains/losses shown below reflect a two-year period. The liability may change for any of several reasons, including:

- New hires since the last full valuation
- Benefits accrued (normal cost) since the last valuation
- Plan amendments (benefit changes) including excess interest benefit improvements
- Interest on Actuarial Liability
- Benefits paid (benefit payments) to retirees and beneficiaries
- Participants leaving employment and dying at rates different than expected (gain/losses)
- Participants transferring to other Plans within the System
- Plans transferring into and out of the System
- Changes in actuarial assumptions
- Changes in actuarial methods

The following table shows the sources of the Actuarial Liability changes since the last valuation based on the GASB results determined for the individual plans and updated liabilities for the cash balance plans. The total benefit payments below represent the sum of those reported in the individual plans' GASB reports.

<b>Table III-2 Actuarial Liability Reconciliation</b>	
Actuarial Liability as of 1/1/2020	\$ 2,601,481,214
Actuarial Liability as of 1/1/2021	2,831,288,184
Liability Increase/(Decrease)	229,806,970
Changes due to	
Normal Cost	\$ 72,554,618
Interest	138,518,657
Benefit Changes	17,645,632
Assumption Changes	86,889,847
(Gains)/Losses	8,617,001
Benefit Payments	(124,613,259)
Net Transfers	30,194,474
<b>Total</b>	<b>\$ 229,806,970</b>

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION IV – CONTRIBUTIONS**

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine the contributions needed based upon the funding policy established for the plan. Typically, the actuarial process will use a funding technique that will result in a pattern of contributions that are both stable and predictable.

For each of the plans covered by the System, the funding cost method as stipulated by law to be applied in the determination of the liability is the **Entry Age Normal Actuarial Cost Method**. This method is also relevant for accounting standards, as it is the cost method required under GASB 67/68. Incorporating this cost method results in four components used to determine the total contribution: the **normal cost**, the amortization of **initial unfunded actuarial liability**, any subsequent amortizations of **increases/decreases in the unfunded actuarial liability/or adjustment for surplus**, and **expenses** applied at the rate of \$20 per participant.

The statutory funding method requires that increases/decreases resulting from experience gains or losses by each plan are amortized over the lesser of 20 years or the future working life of the active participants in the plan. Increases/decreases from assumption changes by the System are amortized over the lesser of 15 years or the future working life of the active participants. Changes in liabilities as a result of changes in benefits by plan are amortized over 20 years if state mandated, otherwise over 10 years for active employees and 1 year for inactive employees. There are exceptions to some of these rules for plans in differing levels of “distress” as defined by Act 205.

In years where there are benefit improvements related to excess interest distributions, the impacted plans receive funds through their excess interest distribution to fully fund the excess interest benefit improvement. Therefore, there is no impact on the unfunded liabilities as a result of the excess interest benefit improvements.

For plans with a surplus, the contribution rate is the normal cost offset by 10% of the surplus. This report provides an analysis of the aggregate assets and liabilities but not the aggregation of the Minimum Municipal Obligations (MMO) required for each participating municipality covered by the 2021 Act 205 forms for 2023 and 2024 MMO contributions and 2020 Act 293 forms for 2022 and 2023 employer contributions. The combination of underfunded and surplus plans would not necessarily be informative in reviewing the overall funded status of the System.

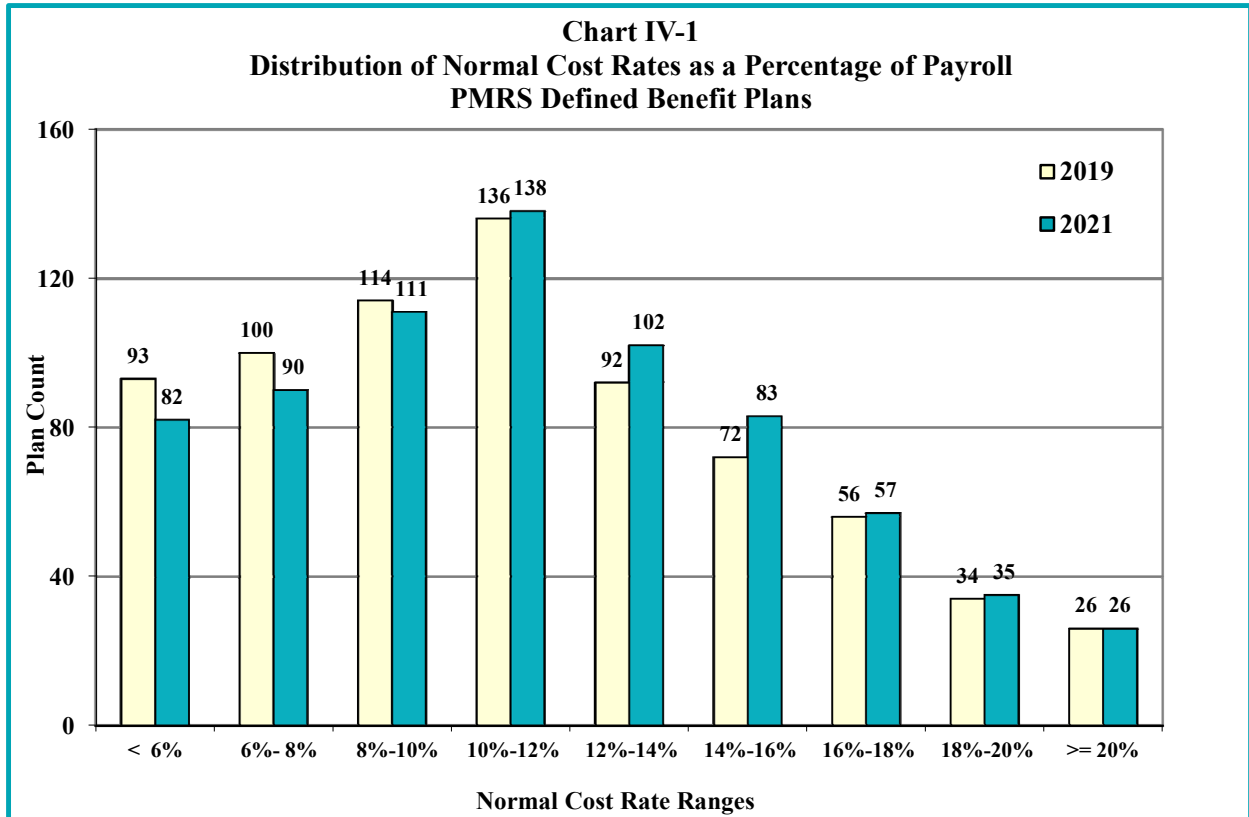
On the following pages, we describe the cost components and graphically provide the distribution of costs among the participating non-county plans.

The normal cost rate (i.e., normal cost as a percentage of payroll) is determined in the following steps. For a typical new entrant, an individual normal cost rate is determined by taking the present value of future normal costs as of entry age into the plan divided by that member’s present value of expected future salary during their working lifetime. The total normal cost rate is reduced by the member contribution rate to produce the net employer normal cost rate. If a plan provides for a Separate Member Annuity through required member contributions, this contribution rate is then added to the total normal cost rate to determine the final total normal cost rate.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION IV – CONTRIBUTIONS**

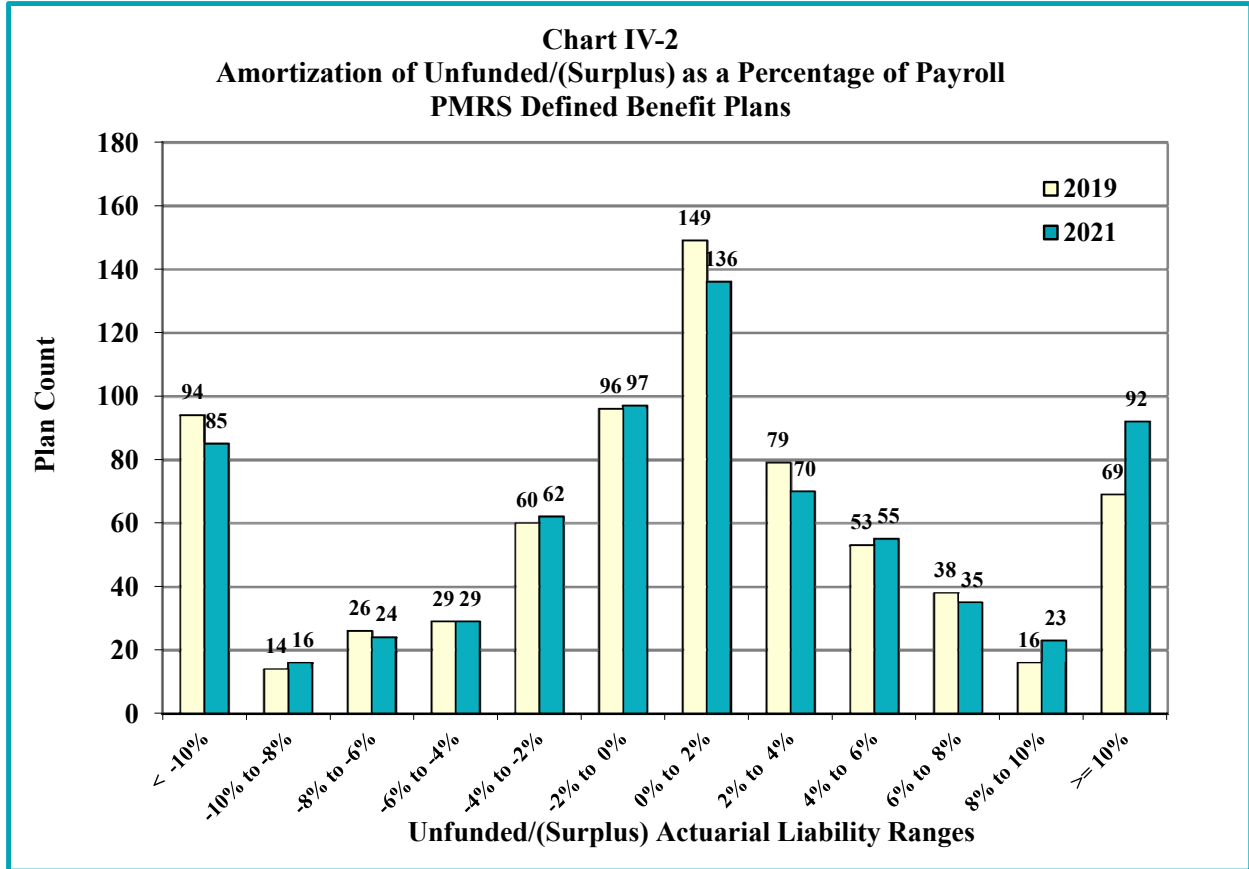
The following chart is a summary of the normal cost rates, which is the normal cost as a percentage of payroll, determined for the traditional defined benefit plans as of January 1, 2019 and January 1, 2021.



**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION IV – CONTRIBUTIONS**

Chart IV-2 below is a summary of the unfunded/(surplus) actuarial liability amortization costs defined as a percentage of covered payroll of each plan’s active members, determined for the traditional defined benefit plans as of January 1, 2019 and January 1, 2021.

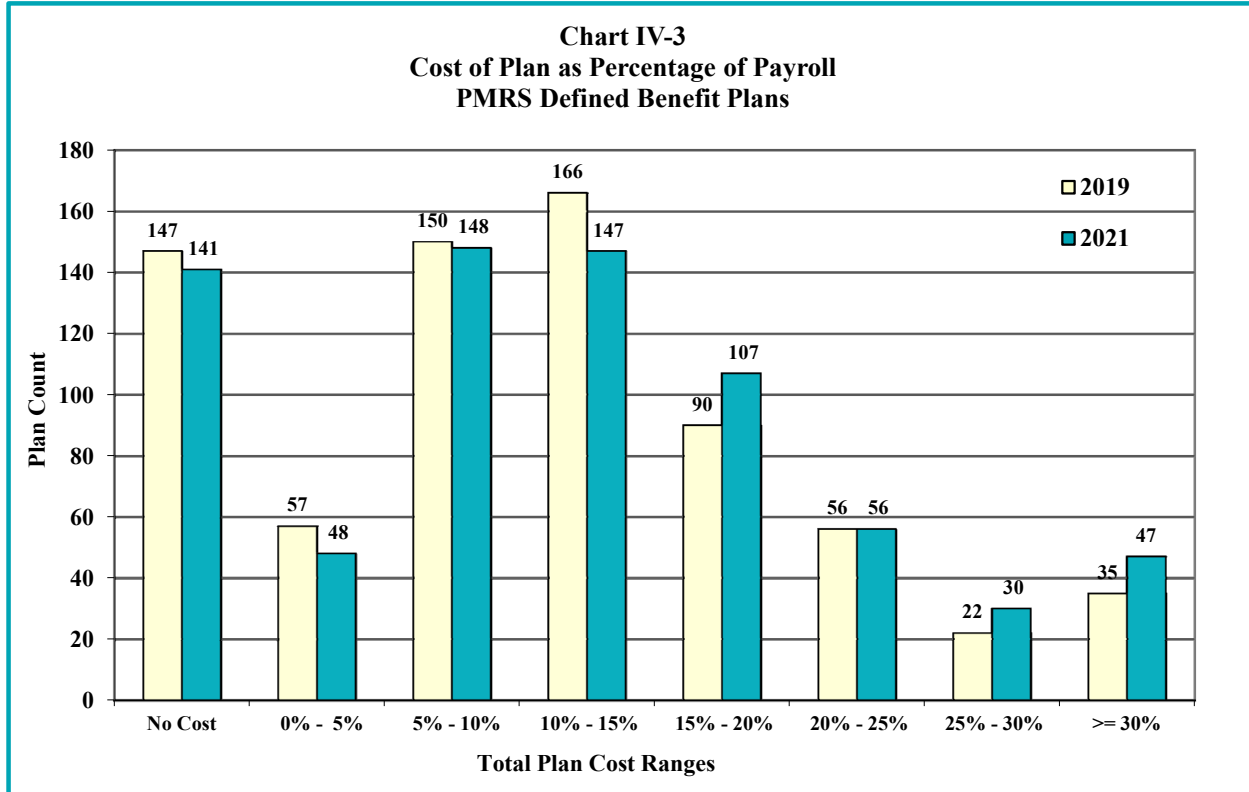




**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION IV – CONTRIBUTIONS**

Chart IV-3 below is a summary of the total costs as a percentage of covered payroll, representing the sum of the normal cost and amortization of unfunded/(surplus) offset determined for the traditional defined benefit plans as of January 1, 2019 and January 1, 2021.



**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION V – ACCOUNTING AND FINANCIAL STATEMENT INFORMATION**

GASB Statement Nos. 67 (GASB 67) and No. 68 (GASB 68) established standards for disclosure of pension information by public employee retirement systems and governmental employers in notes to financial statements and supplementary information. The System is defined as an agent multiple-employer plan system under GASB 67. The assets of an agent multiple-employer plan system are pooled for investment purposes but separate accounts are maintained for each individual participating employer. As a result, each participating employer's share of the pooled assets is legally available to pay the pensions of only its retirees.

The actuarial liability is determined assuming that the System is on-going and participants continue to terminate employment, retire, etc., in accordance with the actuarial assumptions. Liabilities are discounted at the assumed valuation interest rate of 5.25% per annum.

Tables V-1 through V-6 provide the exhibits to be used with the System's ACFR based upon review of GASB 67 and input from PMRS:

- Table V-1 is the Note to Required Supplementary Information;
- Table V-2 is the Solvency Test which shows the portion of Actuarial Liability covered by Assets;
- Table V-3 is the Funded Status of Actuarial Liabilities;
- Table V-4 is the Schedule of Retirees and Beneficiaries;
- Table V-5 is the Schedule of Total Membership by Status; and
- Table V-6 is the Schedule of Total Membership and Salary.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION V – ACCOUNTING AND FINANCIAL STATEMENT INFORMATION**

**Table V-1  
NOTE TO REQUIRED SUPPLEMENTARY INFORMATION**

The information presented in the required supplementary schedules was determined as part of the actuarial valuation at the date indicated. Additional information as of the latest actuarial valuation follows.

Valuation date	January 1, 2020 – County Plans and Cash Balance (CB) Plans January 1, 2021 – Plans that are neither County nor CB plans
Measurement date	January 1, 2021
Actuarial cost method	Entry Age Normal
Amortization method	Level dollar for Plan Bases and an average for Aggregate Gain/Loss, 10% of surplus is credited against aggregate cost where applicable
Actuarial assumptions:	
Investment rate of return*	5.25%
Projected salary increases*	2.2%-6.22%
*Includes inflation of 2.2%	
Cost-of-living adjustments (COLA)	2.2% per year up to plan maximum

The actuarial assumptions used have been adopted by the System’s Board based on the most recent review of the System’s experience for the period January 1, 2014 through December 31, 2018 and completed in 2020.

The rate of employer contributions to the System is composed of the normal cost, amortization of the unfunded actuarial liability and an allowance for administrative expenses. The normal cost is a level percentage of payroll which, along with member contributions, will pay for projected benefits at retirement for the average plan participant. The actuarial liability is that portion of the present value of projected benefits that will not be paid by future employer normal costs or future member contributions. The difference between this liability and the Actuarial Value of Asset as of the same date is the unfunded actuarial liability (or surplus if funds exceed the liabilities). The allowance for administrative expenses is based on the System’s actual administrative expenses.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION V – ACCOUNTING AND FINANCIAL STATEMENT INFORMATION**

**Table V-2  
SOLVENCY TEST  
Aggregate Accrued Liabilities for**

Valuation Date January 1,	Active Member Contributions (1)*	Retirees, Beneficiaries & Vested Terminated (2)	Active Member Employer Financed Contributions (3)	Actuarial Value of Reported Assets	Portion of Accrued Covered by Reported		
					(1)	(2)	(3)
2021	\$494,275,157	\$1,495,048,974	\$841,964,053	\$2,827,402,985	100%	100%	100%
2020	485,374,472	1,315,859,327	800,247,415	2,631,849,434	100%	100%	104%
2019	474,930,885	1,258,545,895	786,667,534	2,528,939,742	100%	100%	101%
2018	460,805,568	1,175,715,217	764,391,135	2,404,498,404	100%	100%	100%
2017	451,613,188	1,114,835,472	754,316,724	2,270,278,691	100%	100%	93%
2016	435,834,498	999,866,637	715,640,331	2,153,625,821	100%	100%	100%

\*Includes the sum of the active member employee contribution balances, the member separate annuity account balances, the municipal for member separate annuity account balances, and the excess interest allocations

**Table V-3  
Funded Status of Actuarial Liabilities**

Valuation Date January 1,	Actuarial Value of Assets (A)	Actuarial Liability (AL) Entry Age (B)	Unfunded AL (Surplus) (B-A)	Funded Ratio (A/B)	Discount Rate
2021	\$2,827,402,985	\$2,831,288,184	\$3,885,199	99.9%	5.25%
2020	2,631,849,434	2,601,481,214	(30,368,220)	101.2%	5.25%
2019	2,528,939,742	2,520,144,314	(8,795,428)	100.4%	5.25%
2018	2,404,498,404	2,400,911,920	(3,586,484)	100.1%	5.25%
2017	2,270,278,691	2,320,765,384	50,486,693	97.8%	5.25%
2016	2,153,625,821	2,151,341,466	(2,284,355)	100.1%	5.50%

The actuarial assumptions as of January 1, 2021 are shown in the assumptions and methods section which are used, along with the participant data and plan provisions provided by PMRS, to determine the liabilities above. The following table shows the number of pension plans valued each year, and the number of plans have liabilities rolled-forward from the prior year. The counts from this table may not match the counts of the pension plans on Table I-2 which is based on the number of plans listed on the asset statement from PMRS.

**Valuation of Defined Benefit Liabilities**

Valuation Date	Complete Valuation	Roll-Forward	Cash Balance Plans
January 1, 2021	720	4	328
January 1, 2020	4	724	328
January 1, 2019	719	4	323
January 1, 2018	4	726	314
January 1, 2017	718	4	311
January 1, 2016	4	718	294

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**SECTION V – ACCOUNTING AND FINANCIAL STATEMENT INFORMATION**

The table below is a schedule of the changes to the retiree and beneficiary rolls over the last six years.

Valuation Date	Added to roll	Average Annual Annuities Added	Average Annual Benefit Increase	Deleted from roll	Average Annual Annuities Removed	Number on roll	Annual Annuities	Percentage Increase in Annuities	Average Annual Annuities	Percent Increase in Average Annuities
2021	434	\$ 21,588	\$ 375	125	\$ 10,350	6,744	\$ 115,697,265	7.6%	\$ 17,156	2.7%
2020	381	19,656	528	135	11,392	6,435	107,504,808	6.0%	16,706	2.0%
2019	429	19,572	419	146	8,147	6,189	101,399,088	7.8%	16,384	2.9%
2018	383	18,912	575	176	9,325	5,906	94,073,168	6.5%	15,928	2.7%
2017	447	18,744	490	108	8,174	5,699	88,360,677	9.5%	15,505	2.9%
2016	339	18,888	161	87	18,915	5,360	80,729,221	6.3%	15,061	1.3%

The table below is a summary of the total membership over the last six years.

Valuation Date	Active Defined Benefit	Active Cash Balance	Deferred Pensions	Inactive Members*	Total		
2021	7,860	1,486	6,050	694	1,284	47	17,421
2020	7,970	1,502	5,781	654	1,205	47	17,159
2019	7,949	1,446	5,550	639	1,168	40	16,792
2018	7,868	1,387	5,307	599	1,090	35	16,286
2017	7,728	1,303	5,099	600	1,150	28	15,908
2016	7,698	1,274	4,784	576	1,173	7	15,512

\* Inactive members represent inactive non-vested participants with employee contribution account balances.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**SECTION V – ACCOUNTING AND FINANCIAL STATEMENT INFORMATION**

The table below is a schedule of the total membership over the last four years.

<b>Table V-6 Schedule of Total Membership and Salary</b>				
	<b>2021</b>	<b>As of January 1<sup>1</sup></b>		<b>2018</b>
		<b>2020</b>	<b>2019</b>	
a. Retirees currently receiving benefits	6,050	5,781	5,550	5,307
b. Beneficiaries currently receiving benefits	694	654	639	599
c. Terminated vested employees entitled to future benefits from Defined Benefit Plans	933	882	853	797
d. Terminated non-vested employees entitled to contribution refunds from Defined Benefit Plan:	47	47	40	35
e. Active employees in defined benefit plans	7,860	7,970	7,949	7,868
i. Aggregate Salary <sup>2</sup>	\$476,970,336	\$465,906,342	\$455,352,355	\$434,554,380
ii. Vested <sup>3</sup>	4,281	4,388	4,470	4,553
iii. Non-vested	3,579	3,582	3,479	3,315
f. Non-Retired Participants in cash balance plans	1,837	1,825	1,761	1,680
i. Aggregate Salary	\$71,553,094	\$69,134,048	\$63,302,730	\$60,013,152
ii. Active	1,486	1,502	1,446	1,387
iii. Inactive	351	323	315	293

<sup>1</sup> Represents entire System

<sup>2</sup> Annualized salary paid during the prior plan year for Traditional Defined Benefit plan participants and actual salary for active cash balance participants

<sup>3</sup> Count of vested participants estimated based on service as of the valuation date

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**APPENDIX A – MEMBERSHIP INFORMATION**

This appendix provides various member information including age-service distribution tables for active members by count and salary, benefit distribution information for participants in pay status, including a break-down by pension type.

**Distribution of Active Defined Benefit Members  
by Age and Service as of January 1, 2021**

**Counts By Age/Service**

Age	Service										Total	
	1 year or less	1 to 2	2 to 3	3 to 5	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	30 & up		
Under 20	3	4	0	0	0	0	0	0	0	0	0	7
20 to 24	104	65	33	24	3	0	0	0	0	0	0	229
25 to 29	119	119	105	137	84	1	0	0	0	0	0	565
30 to 34	103	109	114	128	227	55	2	0	0	0	0	738
35 to 39	77	76	75	128	233	156	46	4	0	0	0	795
40 to 44	69	87	67	102	170	148	173	55	2	0	0	873
45 to 49	51	57	58	87	166	133	167	129	49	4	4	901
50 to 54	60	67	68	98	177	165	169	164	121	63	63	1,152
55 to 59	39	46	53	94	169	151	176	154	123	202	202	1,207
60 to 64	33	32	37	71	145	142	140	119	76	194	194	989
65 & up	6	14	14	36	45	54	61	61	33	80	80	404
<b>Total</b>	<b>664</b>	<b>676</b>	<b>624</b>	<b>905</b>	<b>1,419</b>	<b>1,005</b>	<b>934</b>	<b>686</b>	<b>404</b>	<b>543</b>	<b>543</b>	<b>7,860</b>

PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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APPENDIX A – MEMBERSHIP INFORMATION

**Distribution of Active Cash Balance Members  
by Age and Service as of January 1, 2021**

Counts By Age/Service

Age	Service										Total	
	1 year or less	1 to 2	2 to 3	3 to 5	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	30 & up		
Under 20	2	0	0	0	0	0	0	0	0	0	0	2
20 to 24	16	15	11	3	2	0	0	0	0	0	0	47
25 to 29	23	24	14	28	20	0	0	0	0	0	0	109
30 to 34	23	17	23	21	19	7	1	0	0	0	0	111
35 to 39	12	23	20	16	21	18	5	0	0	0	0	115
40 to 44	14	19	10	16	28	22	18	0	0	0	0	127
45 to 49	11	20	17	28	36	24	19	15	5	0	0	175
50 to 54	19	14	18	30	40	21	26	22	11	12	0	213
55 to 59	14	17	13	25	50	29	25	30	15	20	0	238
60 to 64	7	7	16	15	42	28	27	30	23	40	0	235
65 & up	4	2	4	7	17	16	23	10	11	20	0	114
Total	145	158	146	189	275	165	144	107	65	92	0	1,486



PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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APPENDIX A – MEMBERSHIP INFORMATION

**Distribution of All Active Members  
by Age and Service as of January 1, 2021**

Average Salary By Age/Service

Age	Service										Total	
	1 year or less	1 to 2	2 to 3	3 to 5	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	30 & up		
Under 20	\$23,293	\$33,270	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$27,727
20 to 24	\$35,541	\$44,254	\$46,717	\$48,784	\$83,464	\$0	\$0	\$0	\$0	\$0	\$0	\$42,012
25 to 29	\$40,982	\$48,563	\$51,592	\$53,246	\$57,668	\$62,140	\$0	\$0	\$0	\$0	\$0	\$50,072
30 to 34	\$41,539	\$49,998	\$51,418	\$57,671	\$62,745	\$59,600	\$52,387	\$0	\$0	\$0	\$0	\$54,721
35 to 39	\$45,758	\$47,679	\$56,452	\$56,090	\$63,505	\$68,935	\$71,350	\$98,681	\$0	\$0	\$0	\$59,770
40 to 44	\$39,565	\$47,952	\$53,294	\$55,376	\$60,172	\$66,762	\$74,015	\$72,262	\$60,016	\$0	\$0	\$60,500
45 to 49	\$43,271	\$48,514	\$54,959	\$56,466	\$59,218	\$65,336	\$71,721	\$78,438	\$74,145	\$78,868	\$0	\$63,391
50 to 54	\$38,288	\$50,114	\$50,746	\$52,580	\$55,898	\$59,105	\$67,310	\$69,374	\$75,313	\$78,888	\$0	\$60,944
55 to 59	\$38,372	\$53,031	\$46,535	\$54,820	\$57,048	\$60,640	\$62,216	\$64,303	\$68,280	\$74,313	\$0	\$61,339
60 to 64	\$35,292	\$47,323	\$51,324	\$56,307	\$58,089	\$54,507	\$58,144	\$63,324	\$65,851	\$65,748	\$0	\$58,822
65 & up	\$36,859	\$42,969	\$54,982	\$52,429	\$57,101	\$55,106	\$59,582	\$52,153	\$60,666	\$64,758	\$0	\$57,048
<b>Total</b>	\$39,941	\$48,429	\$51,913	\$54,983	\$59,553	\$61,873	\$66,437	\$67,513	\$69,672	\$70,221	\$0	\$58,691

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**APPENDIX A – MEMBERSHIP INFORMATION**

**Inactive Benefit Payment Distribution  
as of January 1, 2021**

**Counts By Benefit/Age: Receiving Payments**

Age	Monthly Benefit	Count
x < 30	\$2,339	3
30 <= x < 35	\$4,247	5
35 <= x < 40	\$8,890	11
40 <= x < 45	\$13,979	21
45 <= x < 50	\$33,419	42
50 <= x < 55	\$184,580	120
55 <= x < 60	\$656,389	343
60 <= x < 65	\$1,839,475	1,045
65 <= x < 70	\$2,875,216	1,748
70 <= x < 75	\$2,011,977	1,461
75 <= x < 80	\$1,072,721	918
80 <= x < 85	\$527,326	535
85 <= x	\$410,881	492
<Total>	\$9,641,439	6,744

**Counts By Benefit/Age: Deferred Payments**

Age	Monthly Benefit	Count
x < 30	\$822	10
30 <= x < 35	\$10,214	34
35 <= x < 40	\$43,109	91
40 <= x < 45	\$86,551	120
45 <= x < 50	\$162,829	210
50 <= x < 55	\$234,167	303
55 <= x < 60	\$236,937	321
60 <= x < 65	\$116,116	164
65 <= x < 70	\$14,691	25
70 <= x < 75	\$1,375	6
75 <= x < 80	\$0	0
80 <= x < 85	\$0	0
85 <= x	\$0	0
<Total>	\$906,810	1,284

<sup>1</sup> Deferred payments listed above are attributable to the non-cash balance defined benefit plans only. Deferred payments to the 351 cash balance participants will be determined upon their retirement.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX A – MEMBERSHIP INFORMATION**

<b>Pensions in Payment on January 1, 2021 by Type and Amount</b>						
<b>Monthly Amount</b>	<b>Pension Type</b>					
	<b>Total</b>	<b>Normal</b>	<b>Involuntary early</b>	<b>Voluntary early</b>	<b>Service disability</b>	<b>Non-service disability</b>
Total	6,744	5,729	226	666	54	69
Under \$100	293	253	20	18	1	1
\$100 - \$199	361	297	29	34	1	0
200 - 299	348	285	27	36	0	0
300 - 399	338	275	24	33	4	2
400 - 499	350	291	24	32	1	2
500 - 599	327	274	9	36	2	6
600 - 699	274	221	15	35	3	0
700 - 799	293	239	14	35	1	4
800 - 899	287	233	10	34	1	9
900 - 999	258	206	8	30	5	9
1,000 - 1,199	547	443	16	69	6	13
1,200 - 1,399	404	323	9	60	6	6
1,400 - 1,599	374	316	5	39	9	5
1,600 - 1,799	285	248	5	29	1	2
1,800 - 1,999	277	234	3	33	5	2
2,000 - 2,199	240	213	3	19	2	3
2,200 - 2,399	227	198	4	23	2	0
2,400 - 2,599	174	155	0	17	1	1
2,600 - 2,799	163	146	0	13	2	2
2,800 - 2,999	118	111	0	6	0	1
3,000 - 3,499	297	279	1	15	1	1
3,500 - 3,999	205	195	0	10	0	0
\$4,000 and over	304	294	0	10	0	0

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX A – MEMBERSHIP INFORMATION**

<b>Pensions Awarded in Prior Ten Years, by Type and Monthly Amount</b>										
<b>Year Ended December 31:</b>	<b>Total</b>	<b>Normal</b>		<b>Involuntary Early</b>		<b>Voluntary Early</b>		<b>Disability</b>		
	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	<b>Average Monthly Amount</b>	
<b>Number</b>	<b>Number</b>	<b>Number</b>	<b>Number</b>	<b>Number</b>	<b>Number</b>	<b>Number</b>	<b>Number</b>	<b>Number*</b>	<b>Number</b>	
2011	438	1,367	352	1,496	37	459	40	1,180	9 (3)	888
2012	390	1,370	341	1,421	20	520	22	1,614	7 (2)	709
2013	431	1,706	364	1,800	17	905	34	1,280	16 (2)	1,319
2014	392	1,492	341	1,524	14	825	29	1,575	8 (2)	1,022
2015	339	1,574	309	1,593	4	562	22	1,569	4 (2)	1,113
2016	447	1,562	397	1,600	11	627	28	1,428	11 (3)	1,485
2017	383	1,576	342	1,616	8	822	29	1,350	4 (1)	1,311
2018	429	1,631	382	1,651	9	963	33	1,475	5 (4)	2,277
2019	381	1,638	341	1,644	8	781	27	1,887	5 (5)	1,247
2020	434	1,799	406	1,797	1	2,312	22	1,790	5 (3)	1,931

\*Number of service-related disability pensions are shown in parentheses.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
ACTUARIAL VALUATION AS OF JANUARY 1, 2021**

**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

**Actuarial Assumptions:**

The PMRS demographic actuarial assumptions were most recently updated by the Board effective January 1, 2021, while the Regular Interest Rate (investment return assumption) was most recently updated by the Board effective January 1, 2017:

**A. Mortality:**

**1) Healthy Life Mortality Base Tables:**

**Pre-Retirement**

Males: PUB-2010 General Employees male table

Females: PUB-2010 General Employees female table

Type of Death:

(a) 20% of pre-retirement deaths are assumed to be service related for municipal plans, and

(b) 70% of pre-retirement deaths are assumed to be service related for uniform plans.

**Post-Retirement**

Males: RP-2006 annuitant male table

Females: RP-2006 annuitant female table

**2) Disabled Life Mortality Base Tables:**

Males: RP-2006 disabled annuitant male table

Females: RP-2006 disabled annuitant female table

**3) Mortality Improvement:**

All base mortality tables described above are projected from the applicable table's base year to 2023 using Mortality Improvement Scale MP-2018

The mortality assumption, inclusive of the projected mortality improvements described above, was selected as a reasonable representation of the ultimate projected payout of benefits from the Plan using nationally available mortality tables as well as data provided by PMRS.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

**B. Termination Rates Before Retirement:**

<b>Municipal Participants Number of Active Members in Plan</b>		
<b>Service</b>	<b>&lt;25</b>	<b>25+</b>
<1	11.0%	12.0%
1	11.0%	12.0%
2	10.0%	11.0%
3	9.0%	10.0%
4	8.0%	9.0%
5	7.0%	7.5%
6	8.0%	7.5%
7	6.0%	7.0%
8	5.0%	6.0%
9	4.0%	5.0%
10+	3.0%	3.5%

<b>Participants in Uniformed Plans</b>	
<b>Service</b>	<b>Termination Rates</b>
<4	10.0%
5	5.0%
6	4.0%
7	4.0%
8	4.0%
9	3.0%
10+	3.0%

**C. Disability Incidence Rates:**

50% of the 2017 CalPERS Public Miscellaneous Group disability rates for males. Sample rates are:

<b>Age</b>	<b>Rate</b>
25	0.0085%
35	0.0245%
45	0.0955%
55	0.1105%
65	0.1050%

Type of Disability:

- (a) 20% of disablements are assumed to be service related for municipal plans, and
- (b) 70% of disablements are assumed to be service related for uniform plans.

**D. Workers Compensation:** Service-related disability benefits payable from municipal plans are offset by 25% of final average salary.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

**E. Salary Scale:**

Inflation rate of 2.2% plus merit based increases, as shown below for select ages:

Age	Total Rate <sup>1</sup> (including inflation)
25	6.22%
30	5.16%
35	4.49%
40	4.14%
45	3.82%
50	3.55%
55	3.28%
60	3.11%
65	2.79%

<sup>1</sup>Add 3% for each of the first 2 years of service, 2% for years 3 and 4, and 1% for years 5 and 6

For 2021 and 2022, merit based increases are assumed to be 0%.

**F. Rates of Retirement and Retirement Age:**

**Retirement Age:** The age at which unreduced benefits are available. No early retirement is assumed. Specific assumptions regarding retirement age are:

(a) Municipal Members:

Members are assumed to retire over a range of ages as shown below.

Age	Rate <sup>1</sup>	Age	Rate <sup>1</sup>
<55	33%	63	18%
55	30%	64	15%
56 – 57	12%	65 – 67	25%
58 – 59	14%	68 – 70	20%
60	18%	71 – 73	22%
61	10%	74	20%
62	20%	75	100%

<sup>1</sup> Rates indicated are adjusted by adding 10% for ages 61-63 and 5% for ages 64-70 for the year in which the member is first eligible for normal retirement.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

(b) Uniform Members:

Members are assumed to retire over a range of ages as shown below.

Age	Rate	Age	Rate
<49	0%	62	28%
50	25%	63	22%
51 – 53	10%	64	25%
54 – 55	15%	65	35%
56 – 58	17%	66	30%
59 – 60	15%	67+	100%
61	20%		

For any members participating in a Deferred Retirement Option Program (DROP), the participant’s date of entry into the DROP is considered the retirement date.

**G. DROP (Deferred Retirement Option Plans) or In-Service Distribution Plan:**

For plans with these options, at Participant’s Normal Retirement Age, retirement rate multiplied by the following factors:

- (a) Uniform: 130%
- (b) Non-uniform: 115%

**H. Marital Status and Spouse’s Age (if applicable):**

For plans with the 50% J&S form of payment, 85%/65% of active male/female members are assumed to be married. Male spouses are assumed to be three years older than female spouses.

**I. Social Security Projections (if applicable):**

- a) The Social Security Taxable Wage Base will increase by 2.7% compounded annually;
- b) The Consumer Price Index will increase 2.2% compounded annually; and
- c) The Average Total Wages of All Workers will increase by 2.7% compounded annually.

**J. Post-Retirement Cost of Living Increases (if applicable)/Inflation:**

2.2% per year, subject to plan limitations.

**K. Investment Return Assumption for municipal assets (Regular Interest Rate):**

5.25% compounded annually (net of investment and certain administration expenses) for funding purposes.

**L. Administrative Expenses**

**System-wide Actuarial Value of Assets:** The expense assumption is based on the previous year’s actual expenses.

**Municipalities:** The expense assumption is based on the expected expenses for the current year, as reported on the Act 205 forms.



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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

**M. Rationale for Assumptions:** An experience study is completed every five years for the System. The assumptions outlined above were reviewed and adopted by the Board based on the most recent experience study for the period covering January 1, 2014 – December 31, 2018.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

**Actuarial Methods:**

Contribution requirements are individually determined for each participating municipality, on an actuarial basis as described below in the Funding of the Unfunded Actuarial Liability section, at least biennially. The frequency of the actuarial valuation is determined by applicable Commonwealth statute (Act 205 of 1984 and Act 293 of 1972). The following actuarial methods were adopted effective January 1, 1985, unless indicated otherwise.

**Actuarial Value of Assets (AVA):**

The AVA is the sum of all audited reserve accounts as of the valuation date, including Members', Municipal, Retired Members', Disability, and DROP Participants' Reserves, as provided in the December 31, 2020 ACFR, and a one-year administration expense reserve, plus any additional adjustments as made during the year by the Board of Trustees without reflecting any Excess Interest. In years where an excess interest distribution occurs, the following year's valuation will incorporate the updated information once the type and amount of distribution to each plan has been determined.

The actuarial value can never be less than 90 percent of fair market value.

Each year, municipalities may receive an excess interest allocation derived as a portion of new surplus created during the prior year based on the current financial standing of the System. "Surplus" refers to the excess of fair market value over the AVA. Once the preliminary AVA has been determined, a formula is used to allocate the new surplus. Generally, depending on the relative size of surplus to fair market value, between 10 percent and 90 percent of the new surplus will become available for possible distribution as excess interest pending Board approval.

The AVA is set equal to reserves under the System based on the unique legislative structure of PMRS. These reserves are increased annually at a set rate agreed on by the Board named "Regular Interest" as defined under the Pennsylvania Municipal Retirement Law. These assets do not relate directly or indirectly with the current market value of assets as required under Actuarial Standard of Practice Statement No. 44 which states under Section 3.3:

*"...the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. The qualities of such an asset valuation method include the following:*

- a. The asset valuation method is likely to produce actuarial values of assets that are sometimes greater than and sometimes less than the corresponding market values.*
- b. The asset valuation method is likely to produce actuarial values of assets that, in the actuary's professional judgment, satisfy both of the following:*
  - 1. The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the difference from market value is not greater than the actuary deems reasonable.*

PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

2. *Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, the actuary might use a method where the actuarial value of assets converges toward market value at a pace that the actuary deems reasonable, if the investment return assumption is realized in future periods.*

*In lieu of satisfying both (1) and (2) above, an asset valuation method could satisfy section 3.3(b) if, in the actuary's professional judgment, the asset valuation method either (i) produces values within a sufficiently narrow range around market value or (ii) recognizes differences from market value in a sufficiently short period."*

**The administrative rules adopted by the PMRS Board in conjunction with Pennsylvania Municipal Retirement Law, which are not required to comply with Actuarial Standards of Practice (ASOP) when defining the Actuarial Value of Assets, do not necessarily meet the requirement of ASOP 44 Selection and Use of Asset Valuation Methods for Pension Valuations. The Actuarial Value of Assets provided within this report follow the Pennsylvania Municipal Retirement Law and the PMRS policy statement.**

**Actuarial Cost Method:**

The Entry Age Normal Actuarial Cost Method was used for active employees, whereby the normal cost is computed as the level annual percentage of salary required to fund the retirement benefits between each member's date of hire and assumed retirement. Entry age is defined as attained age less credited service. The normal cost is based on taking the value, as of entry age into the plan, of each member's projected future benefits. This value is then divided by the value, also at entry age, of each member's expected future salary producing a normal cost rate as a percentage of salary. The normal cost rate is multiplied by current salary to determine each member's normal cost. If a plan provides for a Separate Member Annuity through required member contributions, this contribution rate is then added to the total normal cost rate to determine the final total normal cost rate. Within the MMO calculation, the normal cost is reduced by the member contribution to produce the employer normal cost to be paid.

The actuarial liability is the difference between the present value of future benefits and the present value of future normal cost. The unfunded actuarial liability is the difference between the actuarial liability and the actuarial value of assets.

**PENNSYLVANIA MUNICIPAL RETIREMENT SYSTEM  
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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

**Funding of the Unfunded Actuarial Liability:**

Actuarial gains (or losses), including the effect of contributions greater or less than the previously determined actuarial level, are reflected by decreases (or increases) in the unfunded actuarial liability. Under Act 205 of 1984, and updated by Act 44, the unfunded actuarial liability for each plan is amortized as a level dollar amount over the lesser of:

- (a)
  - (i) 30 years, with respect to the initial liability as of 1/1/85 (or first valuation);
  - (ii) 20 years, with respect to actuarial gains and losses;
  - (iii) 15 years, with respect to changes due to actuarial assumptions;
  - (iv) 20 years, with respect to changes due to plan provisions (if state mandated);
  - (v) 10 years, with respect to changes in benefits for currently active members and 1 year for retired members (if local benefit changes); or
- (b) The average assumed working lifetime of active employees as of the date the liability was established. If there are no active employees, the unfunded liability is amortized one year after the liability was established.

With the two exceptions which follow, the funding method is applied individually with respect to each municipality:

- 1) Retired and disabled members are paid monthly benefits from the System's Retired Members' Reserve account, which at the time of retirement receives a transfer from the Municipal and Members' Reserve Accounts in an amount actuarially determined to be sufficient to pay all future benefits for the member (and, if applicable, a surviving beneficiary). Thus, post-retirement experience is pooled with the System.
- 2) A disabled member's pension is met in part from the amount that can be provided by the value of that portion of the member's accrued benefit attributable to municipal contributions, with the balance of the pension being provided by the appropriate transfer from the Disability Reserve Account. The amount of annual transfer from the accumulated municipal contributions to the Disability Reserve Account is determined on a one-year term cost basis, i.e., the expected cost of disabilities in the coming year.

If a plan is in a surplus position, then 10% of the surplus is credited against the aggregate cost of the plan.

**Method to Roll Forward Liabilities:**

The non-county defined benefit pension plans are valued explicitly every odd calendar year. Cash balance plans are valued every year. The county plans are valued explicitly every even calendar year. The liabilities for all participants in pay status are explicitly valued every year.

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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

In the off valuation year, defined benefit plan liabilities are rolled forward using actual benefit payments and reflecting new retirements. These liabilities reflect any material changes that may have occurred since the prior actuarial valuation, such as new actuarial assumptions and material plan provision changes. The rolled forward active and deferred vested liabilities are proportionally adjusted based on the prior year liabilities net of in pay status liabilities.

**Valuation Software:**

Cheiron utilizes ProVal, an actuarial valuation software leased from Winklevoss Technologies (WinTech) to calculate liabilities and project benefit payments. We have relied on WinTech as the developer of ProVal. We have reviewed ProVal and have a basic understanding of it and have used ProVal in accordance with its original intended purpose. We have not identified any material inconsistencies in assumptions or output of ProVal that would affect this actuarial valuation.

**Disclosures Regarding Models Used:**

Cheiron utilizes ProVal, an actuarial valuation software leased from Winklevoss Technologies for the intended purpose of calculating liabilities and projected benefit payments. We have examined the reasonableness of the input data and assumptions, reviewed sample calculations for accuracy, reconciled the actuarial gain loss, and find the aggregate results reasonable and appropriate. We are not aware of any material inconsistencies, unreasonable output resulting from the aggregation of assumptions, material limitations or known weaknesses that would affect this actuarial valuation.

The deterministic projections are based on our propriety model P-Scan developed by our firm that utilize the results shown in this valuation report. The model is also used to stress test the impact of volatile asset returns over the projection period. The projections assume continuation of the plan provisions and actuarial assumptions (other than projected returns on MVA where noted in Section I) in effect as of the valuation date and do not reflect the impact of any changes in benefits or actuarial assumptions that may be adopted after the valuation date. While the assumptions individually are reasonable for the underlying valuation that supports the projections, specifically for projection purposes, they are also considered reasonable in the aggregate. Additional assumptions are disclosed in the Projected Financial Trends of Section I to provide scenarios related to projected returns and distribution of excess interest.

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**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

**Changes in Actuarial Assumptions and Methods:**

The demographic and economic assumptions were reviewed with the Board as required every five years at the July and September 2020 Board Meetings. At the September meeting, the Board approved updated actuarial assumptions including mortality rates, termination rates, retirement rates, and the salary scale effective January 1, 2021, and detailed throughout this appendix. A complete listing of assumption changes effective with this valuation can be located in Cheiron’s report titled “Experience Study Results and Recommendations” dated September 2, 2020.