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Pennsylvania Municipal Retirement System

Actuarial Valuation as of January 1, 2016

Produced by Cheiron

April 2017

TABLE OF CONTENTS

April 27, 2017

Pennsylvania Municipal Retirement Board of the
Pennsylvania Municipal Retirement System
c/o Stephen W. Vaughn, Secretary
P.O. Box 1165
Harrisburg, PA 17108-1165

Re: PMRS 2016 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, 2016. This report includes the valuation of the four county plans, the cash balance plans, and the participants in pay status based on updated data provided by the System as of January 1, 2016. All other liabilities were developed using a roll forward of the other plans administered by the System. The roll forward reflects the GASB 68 results at a plan level, which provides the total actuarial liabilities from the prior year, increased with interest and additional accruals and decreased due to the actual benefits payments. The assumption changes approved by the Pennsylvania Municipal Retirement Board of the Pennsylvania Municipal Retirement System ("Board") in July 2015 and effective January 1, 2016 as well as any material changes, if applicable, that occurred for any participating employer through January 1, 2016 are incorporated into this report. The results of the valuation are contained in this report.

The purpose of this report is to present the annual actuarial valuation of the Pennsylvania Municipal Retirement System which is discussed in more detail in the Foreword section of this report. This report was prepared for the Board for the purposes described herein and for the use by the plan 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 contains analyses which combine asset and liability performance and projections. This is an Agent Multiple Employer retirement system (as defined under Governmental Accounting Standards Board Statements No. 67 and 68 (GASB 67/68)) for participating municipalities and counties. Assets and liabilities are separately accounted for and reported to the Commonwealth of Pennsylvania for review by the Department of the Auditor General. This report reflects aggregate valuation results for the System and certain statistics for the traditional defined benefit portion of the municipal plans participating in the system as of the valuation date, incorporating the updated methods in the GASB 67/68 results and the new assumptions adopted by the Board effective January 1, 2016.

Your attention is called to the Foreword and Board Summary in which we refer to the general approach employed in the preparation of this report, a big picture view of the System, historical trends developed by Cheiron, and future stress testing of the System. We also comment on the sources and reliability of both the data and the actuarial assumptions on which our findings are based. These comments support the information presented throughout our report.

All liabilities reflect the updated actuarial assumptions, as reported and accepted by the Board from the experience study results reported in July 2015. We rely on future System experience conforming to the underlying assumptions. To the extent that actual System experience deviates from the underlying assumptions, the results would vary accordingly.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. 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

Kenneth A. Kent, FSA, FCA	Karen M. Zangara, FSA	Anthony J. Bucci, EA
Principal Consulting Actuary	Principal Consulting Actuary	Associate Actuary

cc: Jonathan Chipko, FSA
Charity D. Rosenberry
Kristine M. Cline

FOREWORD

Cheiron has performed the actuarial valuation of the Pennsylvania Municipal Retirement System (System) as of January 1, 2016. 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 of both 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 containing our findings and disclosing important trends experienced by the System in recent years.

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

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

Section IV shows the distribution of the county plans' contribution rates by component.

Section V includes the required disclosures under GASB as well as additional information provided in the System's Comprehensive Annual Financial Report (CAFR).

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. We based our results on the plan provisions defined and submitted to the State under the 2015 Act 205 filings and 2016 Act 293 filings in preparing this valuation as provided by the System. Because the System is bound by Act 293 to complete a biennial valuation for each county, we incorporated these results as of January 1, 2016 into this report. For municipalities with cash balance plans and all participants in pay status, the liabilities as of January 1, 2016 reflect the data as of this date, as provided by the System.

All other liabilities associated with the municipalities with traditional defined benefit plans most recently valued as of January 1, 2015, under Act 205, have been "rolled forward" to the end of the year with actual benefit payments following the methodology employed for the GASB 68 determination of the Total Pension Liabilities. These liabilities reflect the assumption changes,

FOREWORD

material changes (such as plan changes), and for some plans, updated data as of January 1, 2015 for vested terminated participants. These liabilities are incorporated into all of the 2016 liability calculations for the municipalities with defined benefit plans to provide a reasonable estimate of the aggregate System results.

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 for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

The updated actuarial assumptions individually and in the aggregate represent the Board's best estimate for the future experience of the System based on the trends and results of periodic experience analysis performed as required under Act 205. The results of this report are dependent on future experience conforming to these assumptions. To the extent that future experience deviates from the actuarial assumptions, the true cost of the System could vary from our results.

Future valuation reports may differ significantly from the current report presented in this document due to such factors as the following: plan experience differing from that anticipated by the assumptions; changes in assumptions; and changes in plan provisions or applicable law.

Finally, in preparing this report, we have conformed to generally accepted actuarial principles and practices which are consistent with the Code of Professional Conduct, and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board.

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 assumption section of this report.

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 county plans participating in the System,
- Past trends and expected future trends in the System's financial condition, and
- Information required by the Governmental Accounting Standards Board (GASB).

In this Section, we present a summary of the principal valuation results. This includes the basis on which the January 1, 2016 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.

The county plans are valued every other year. Throughout our report, our discussion will address changes from January 1, 2014, the last time the county plans were valued, to January 1, 2016. In other parts of the discussion, we address the overall status of the System. In this case, we compare results from January 1, 2015 to January 1, 2016 to identify the changes in the overall System's funded status.

A. Valuation Basis

The January 1, 2016 valuation results are based on updated actuarial assumptions. Demographic and economic assumptions were reviewed with the Board as required every four years at the July 2015 Board Meeting. At that meeting, the Board approved multiple assumption changes including updating mortality rates, termination rates, retirement rates, and the salary scale in response to changes in the Systems experience effective with this valuation and detailed throughout Appendix B. These assumption changes resulted in an overall increase in the System's Actuarial Liability by $3.3 million, primarily due to an increase in the retiree liabilities.

Below we identify a number of key results of this valuation.

- *Unfunded Actuarial Liability (UAL):* The UAL is the excess of the System's Actuarial Liability (AL) over the Actuarial Value of Assets (AVA). Because the System is made up of many plans, some with UAL and others with surplus (when the AVA is greater than the AL), the aggregate changes for each of these values combined provides the net funded level of the System. In aggregate, the System surplus of $14.2 million as of January 1, 2015 has been reduced to a $2.3 million surplus as of January 1, 2016. This occurred, in part, due to the incorporation of the new demographic assumptions from the 2015 experience study.

- On a snap shot basis comparing the Market Value of Assets (MVA) to AL provides information of the progress of the System's funding status. As of January 1, 2016 the AL exceeded the MVA resulting in an unfunded liability of $156.9 million. This represents an increase in the unfunded liability on a MVA basis compared to the unfunded liability of $17.7 million as of January 1, 2015, or a net $139.2 million dollar increase compared to last year due primarily to less than expected investment return on assets.

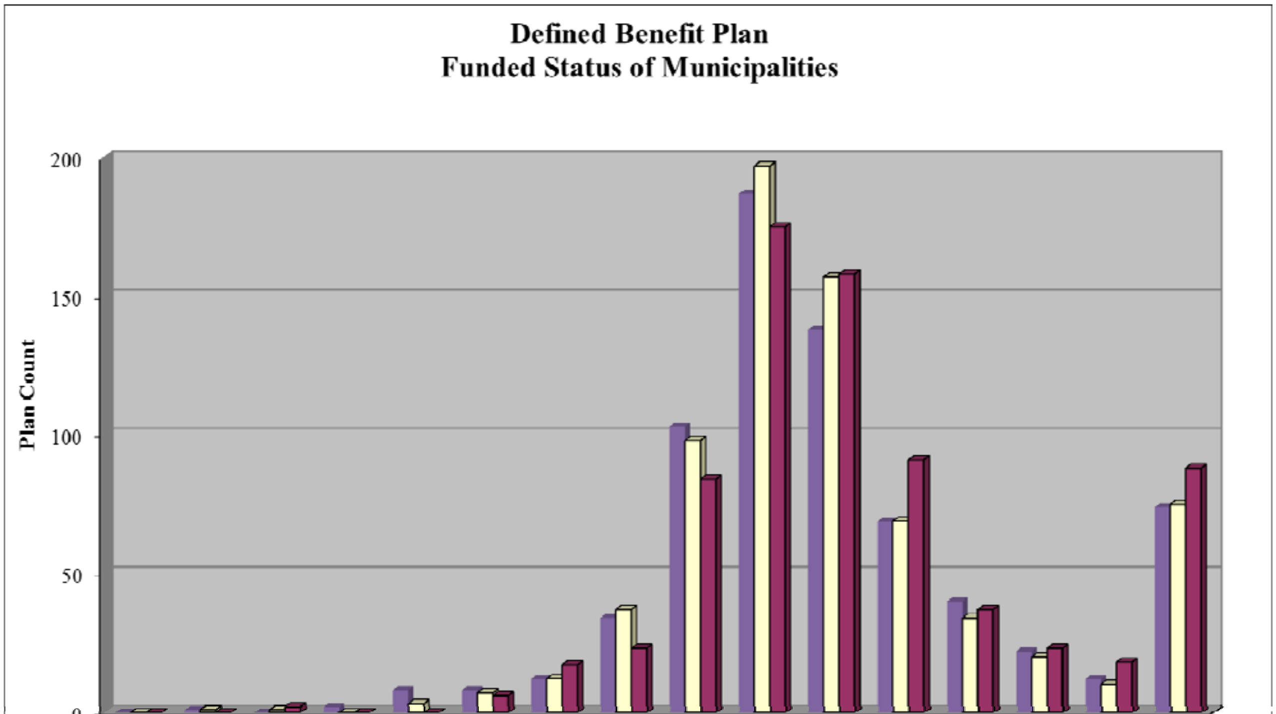
SECTION I
BOARD SUMMARY

- *Funding Ratio:* This is the ratio of the System's AVA to AL. The funding ratio decreased from 100.7% as of January 1, 2015 to 100.1% as of January 1, 2016. The decrease reflects the two-year contribution delay and incorporation of new assumptions.

- *System Experience:* On an Actuarial Value of Assets basis, the rate of return is 5.50% based on the regular interest rate determined by the Board. However on a market value of assets basis the dollar-weighted net investment return for the year ending December 31, 2015 was -0.2% compared to 5.2% for the ending December 31, 2014.

- The actuarial assets provided in this report reflect the reserve information provided in the System's December 31, 2015 CAFR and any adjustments provided to us subsequent to the publishing of this document as detailed in Section II of this report.

The following chart shows a distribution of the funded status using the actuarial value of assets of the plans covered by the System as filed with the state as of January 1, 2013 and 2015, and an estimate as of January 1, 2016. This comparison displays an anticipated improvement in the individual funding ratios of the member municipalities, as determined under Act 205 based on the individual actuarial value of assets for each plan, due primarily to the new demographic assumptions.



	0% - 9%	10 - 19%	20 - 29%	30 - 39%	40 - 49%	50 - 59%	60 - 69%	70 - 79%	80 - 89%	90 - 99%	100- 109%	110 - 119%	120 - 129%	130 - 139%	140 - 149%	Over 150%
2013	0	1	0	2	8	8	12	34	103	187	138	69	40	22	12	74
2015	0	1	1	0	3	7	12	37	98	197	157	69	34	20	10	75
2016	0	0	2	0	0	6	17	23	84	175	158	91	37	23	18	88

Number of Plans Based on Associated Funding Ratio

SECTION I
BOARD SUMMARY

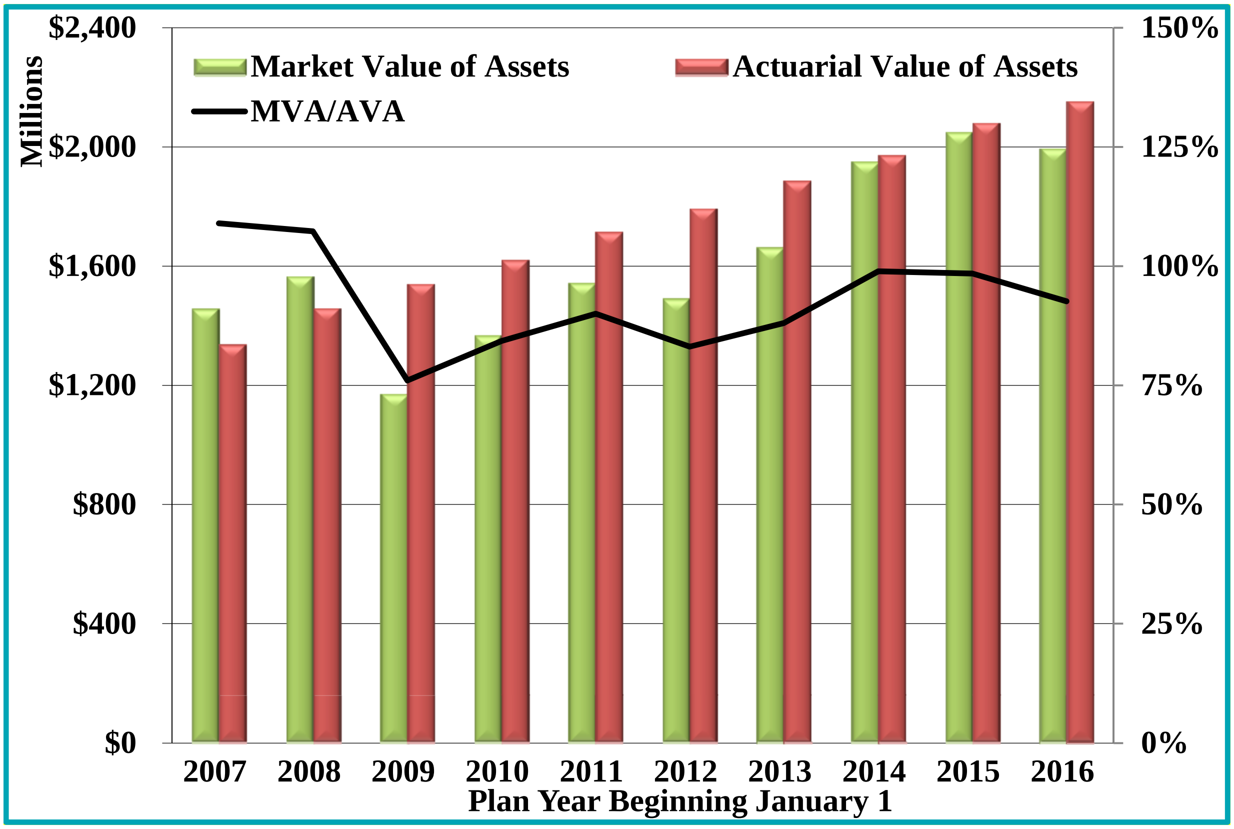
For the county plans administered by the System, the aggregate funded status increased from 97.9% as of January 1, 2014 to a funding ratio of 98.3% as of January 1, 2016.

In addition to the historical funded status ranges, another important relationship to review is 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, as reported in the System's CAFR. This amount changes annually by the actual cash flows and the regular interest rate (as defined under the Pennsylvania Municipal Retirement Law) for the year when compared to the Market Value of Assets, any shortfall must be resolved from future investment earnings in excess of the regular interest rate assumption. As a response to the recession and slow recovery as well as a review of the System liabilities, annuity purchase rates, and the long term expected rate of return for the Market Value of Assets, the regular interest rate was reduced by the Pennsylvania Municipal Retirement Board effective January 1, 2017 in response to continued low rates, which is not reflected in this valuation. In part, this reduction was intended to help return the System to the pre-recession levels when the Market Value of Assets exceeded Actuarial Value of Assets. Based on analysis provided to the Board, this regular interest rate is supported by the trend that liabilities associated with retirees continue to grow as a percentage of the entire system-wide liabilities. Rates published by the Pension Benefit Guaranty Corporation were used as a proxy for the estimated cost if annuities were purchased for retirees. The regular interest rate was selected for funding purposes. The liabilities presented within this report are not intended to represent the cost of settling plan liabilities through either the purchase of annuities or lump sum payments.

On a Market Value of Assets basis, the dollar-weighted net portfolio returns for 2014 and 2015 were 5.2% and -0.24%, respectively. The Market Value of Assets is less than the Actuarial Value of Assets by $159.1 million. Until this difference is made up, there will be no potential for excess interest distribution.

SECTION I
BOARD SUMMARY

The following table shows the historic relationship between the Market Value of Assets (MVA; green bars) and the Actuarial Value of Assets (AVA; red bars) along with the ratio of the MVA to the AVA (represented by the line associated with the right vertical axis) demonstrating the underlying risk of the System. The difference between the market and actuarial value of assets represent a major source of risk to the System. This difference needs to be made up from investment returns exceeding the crediting rate.



SECTION I
BOARD SUMMARY

B. Current Financial Condition

On the following pages, we summarize the key results of the January 1, 2016 valuation and how they compare to the results from the January 1, 2015 valuation.

1. <u>System Membership:</u>

As shown in Table I-1 below, total membership in the Retirement System increased by 3.8% from 2015 to 2016. The active participant counts reported for the Traditional Defined Benefit Plans increased by 1.6%. The aggregate covered payroll of the System increased by 3.2% and the average salary increased by 1.2%.

Table I-1
Membership Total

	January 1, 2016	January 1, 2015	% Change
Traditional Defined Benefit Actives	7,698	7,580	1.6%
Cash Balance Benefit Actives	1,274	1,214	4.9%
Terminated Vesteds	1,173	1,027	14.2%
Inactive Nonvested Participants with Balances	7	8	-12.5%
Participants Receiving Benefit Payments	4,784	4,566	4.8%
Beneficiaries	576	542	6.3%
Total System Members	15,512	14,937	3.8%
Annual Salaries*	$445,775,169	$431,808,006	3.2%
Average Salary per Active Member	$49,685	$49,103	1.2%

** Annualized salary for traditional defined benefit plan participants and actual salary for cash balance participants*

SECTION I
BOARD SUMMARY

Table I-2 is a summary of 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 January 1, 2016	January 1, 2015	Percent Change
Number of plans:			
Traditional Defined Benefit Plans	722	721	0.14%
Cash Balance Plans	294	286	2.80%
Total	1,016	1,007	0.89%
Active Employees in Traditional Defined Benefit Plans:			
Count	7,698	7,580	1.56%
Average Age	48.1	48.3	-0.22%
Average Service	12.6	12.8	-1.28%
Total Payroll*	$ 394,133,120	$ 384,270,155	2.57%
Average Pay	$ 51,199	$ 50,695	0.99%
Active Employees in Cash Balance Plans:			
Count	1,274	1,214	4.94%
Average Age	50.7	51.0	-0.68%
Average Service	12.4	12.6	-1.89%
Total Payroll*	$ 51,642,049	$ 47,537,851	8.63%
Average Pay*	$ 40,535	$ 39,158	3.52%
Total Active PMRS Participants	8,972	8,794	
Inactive Nonvested Participants with account balances:	7	8	
Deferred Vested Participants:			
Traditional Defined Benefit Plans	872	779	11.94%
Cash Balance Plans	301	248	21.37%
Pensioners:			
Count	4,784	4,566	4.77%
Average Age	69.6	69.6	0.06%
Average Monthly Benefit	$ 1,298	$ 1,279	1.54%
Number of New Awards	339	392	-13.52%
Average New Monthly Benefit	$ 1,574	$ 1,492	5.50%
Number Receiving Legislated COLA	220	220	0.00%
Survivor Beneficiaries:			
Count	576	542	6.27%
Average Age	74.2	74.8	-0.83%
Average Monthly Benefit	$ 895	$ 902	-0.79%
Total Inactive PMRS Participants	6,540	6,143	6.46%

**Annualized salaries paid during the prior Plan year.*

SECTION I
BOARD SUMMARY

2. System Assets and Liabilities:

Table I-3 presents a comparison between the January 1, 2015 and January 1, 2016 System assets, liabilities, unfunded actuarial liability, and funding ratios for traditional defined benefit non-county, traditional defined benefit county, and non-county cash balance plans. While this valuation was prepared to support the county plans, the non-county traditional defined benefit liabilities were *rolled forward* from the 2015 valuation. This method is consistent with the preparation of the GASB 68 reports, reflecting assumption changes and any material changes to each plan, if applicable. Liabilities for participants in pay status were explicitly valued based on updated data and assumption changes as of January 1, 2016.

Based on the Actuarial Value of Assets, reflecting the reserves published in the System's CAFR as of December 31, 2015 with subsequent adjustments as detailed in Section II, the System's funding ratio decreased from 100.7% as of January 1, 2015 to 100.1% as of January 1, 2016. Based on the Market Value of Asset, the System's funding ratio decreased due to the investment returns for the year ending December 31, 2015 of -0.24%. This return did not meet the actuarial assumption of 5.50% and as a result the AVA funding ratio decreased from 99.2% to 92.7%.

SECTION I
BOARD SUMMARY

Table I-3
Total Plan Assets and Liabilities ($ thousands)

	January 1, 2016	January 1, 2015	% Change to Baseline
Traditional Defined Benefit (Non-county) Plans:			
Actives	$ 1,008,220	$ 992,752	1.6%
Terminated Vesteds	73,850	72,718	1.6%
In Pay Status	843,753	790,439	6.7%
Total Actuarial Liability[2]	$ 1,925,823	$ 1,855,909	3.8%
Actuarial Value of Assets[1]	1,949,912	1,870,425	4.2%
Unfunded/(Surplus) of Actuarial Liability	$ (24,089)	$ (14,516)	65.9%
Traditional Defined Benefit (County) Plans:			
Actives	$ 66,498	$ 64,394	3.3%
Terminated Vesteds	10,079	9,240	9.1%
In Pay Status	39,192	36,145	8.4%
Total Actuarial Liability	$ 115,769	$ 109,779	5.5%
Actuarial Value of Assets[1]	113,785	107,677	5.7%
Unfunded/(Surplus) of Actuarial Liability	$ 1,984	$ 2,102	-5.6%
Cash Balance Plans:			
Actives	$ 76,757	$ 71,738	7.0%
Terminated Vesteds	11,440	11,549	-0.9%
In Pay Status	21,552	18,290	17.8%
Total Actuarial Liability	$ 109,749	$ 101,577	8.0%
Actuarial Value of Assets[1]	109,749	101,577	8.0%
Unfunded/(Surplus) of Actuarial Liability	$ 0	$ 0	0.0%
Total of All Plans			
Actives	$ 1,151,475	$ 1,128,884	2.0%
Terminated Vesteds	95,369	93,507	2.0%
In Pay Status	904,497	844,874	7.1%
Total Actuarial Liability	$ 2,151,341	$ 2,067,265	4.1%
Market Value of Assets (MVA)	$ 1,994,491	$ 2,049,615	-2.7%
Actuarial Value of Assets (summation of above)[1]	$ 2,173,446	$ 2,079,679	4.5%
Expenses in Excess of Assessment	4,668	4,102	13.8%
Actuarial Value of Asset Adjustment[3]	(24,488)	(2,341)	946.0%
Final Actuarial Value of Assets[4]	$ 2,153,626	$ 2,081,440	3.5%
Unfunded/(Surplus) using Actuarial Value	**$ (2,285)**	**$ (14,175)**	**-83.9%**
Funding Ratio on Actuarial Asset Value	**100.1%**	**100.7%**	**-0.6%**
Unfunded/(Surplus) using Market Asset Value	**$ 156,850**	**$ 17,650**	**788.7%**
Funding Ratio on Market Asset Value	**92.7%**	**99.2%**	**-6.5%**

1 The assets shown above are attributable to the traditional defined benefit, cash balance, non-county and county plans based on updated data and information provided and are consistent with the asset method used for reporting purposes in the Act 205 filings.

2 Municipal liabilities for traditional defined benefit plans are estimated in even years based on a roll forward of the prior year's liabilities, incorporating updated retiree data and assumptions.

3 The excess/(shortfall) of the sum of individual plan assets compared to the System Actuarial Value of Assets.

4 The final Actuarial Value of Assets reflect the asset value based on member, municipal, retiree, disability, and DROP reserve accounts with expense adjustment, as approved by the Board and provided by PMRS.

SECTION I
BOARD SUMMARY

Table I-4 presents a summary of the most recent County defined benefit plan valuations over the past two years that are in a surplus or underfunded position.

Table I-4
Funded Status of County Plans

	January 1, 2016	January 1, 2014
A. County Plans in a surplus position		
1. Number of plans with a surplus	1	1
2. Actuarial Value of Assets in plans with a surplus	$26,963,368	$24,319,632
3. Actuarial Liability in plans with a surplus	26,707,991	24,018,801
4. Amount of surplus (2. – 3.)	$255,377	$300,831
B. County Plans in an underfunded position		
1. Number of underfunded plans	3	3
2. Actuarial Value of Assets in underfunded plans	$86,821,476	$78,044,252
3. Actuarial Liability in underfunded plans	89,061,211	80,569,728
4. Amount of (unfunded) liability (2. – 3.)	($2,239,735)	($2,525,476)

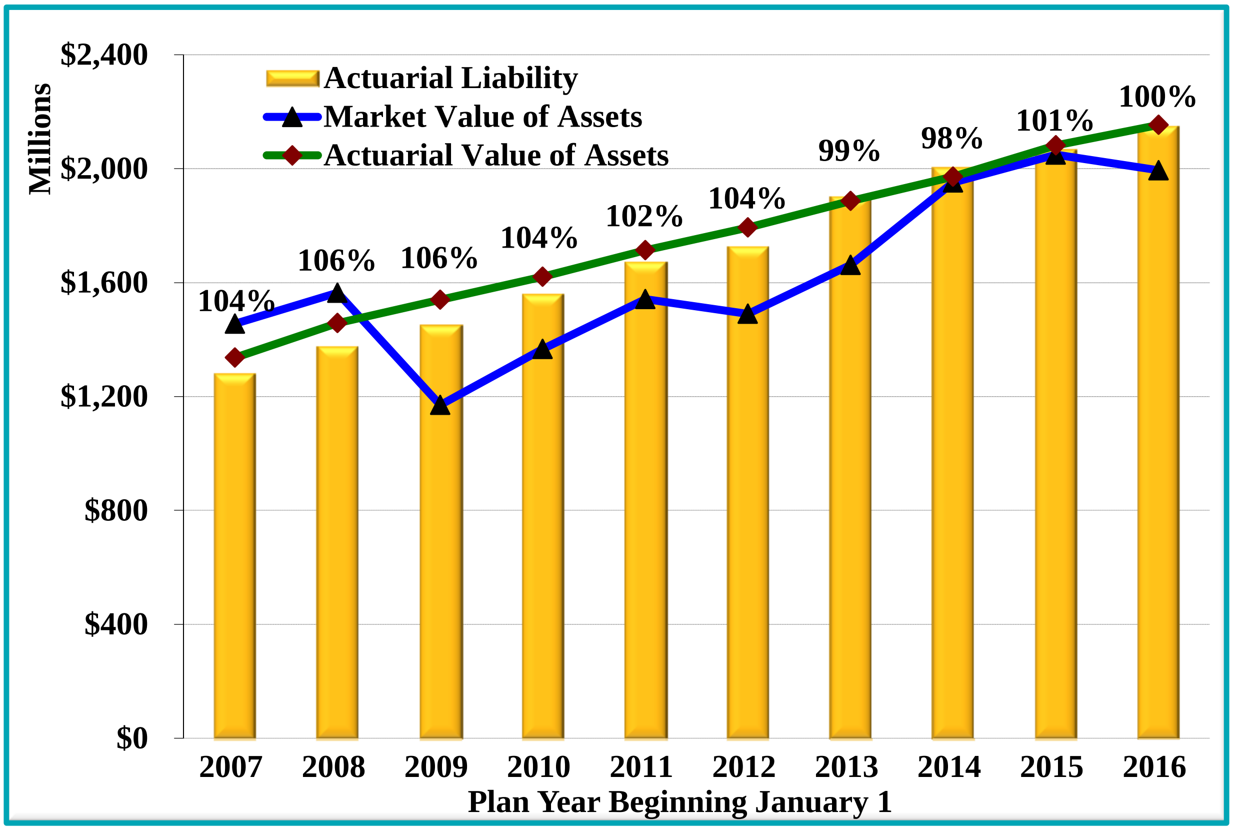
SECTION I
BOARD SUMMARY

C. Historical Trends

Even though the attention given to the valuation reflects the most recently computed actuarial liability and funding 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 result 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 (traditional defined benefit, cash balance, county and non-county) market and actuarial value of assets compared to the total System (traditional defined benefit, cash balance, county and non-county) actuarial liabilities. We have included the funding ratio across the top of each bar to show the funded progress of the Retirement System over the last ten years.

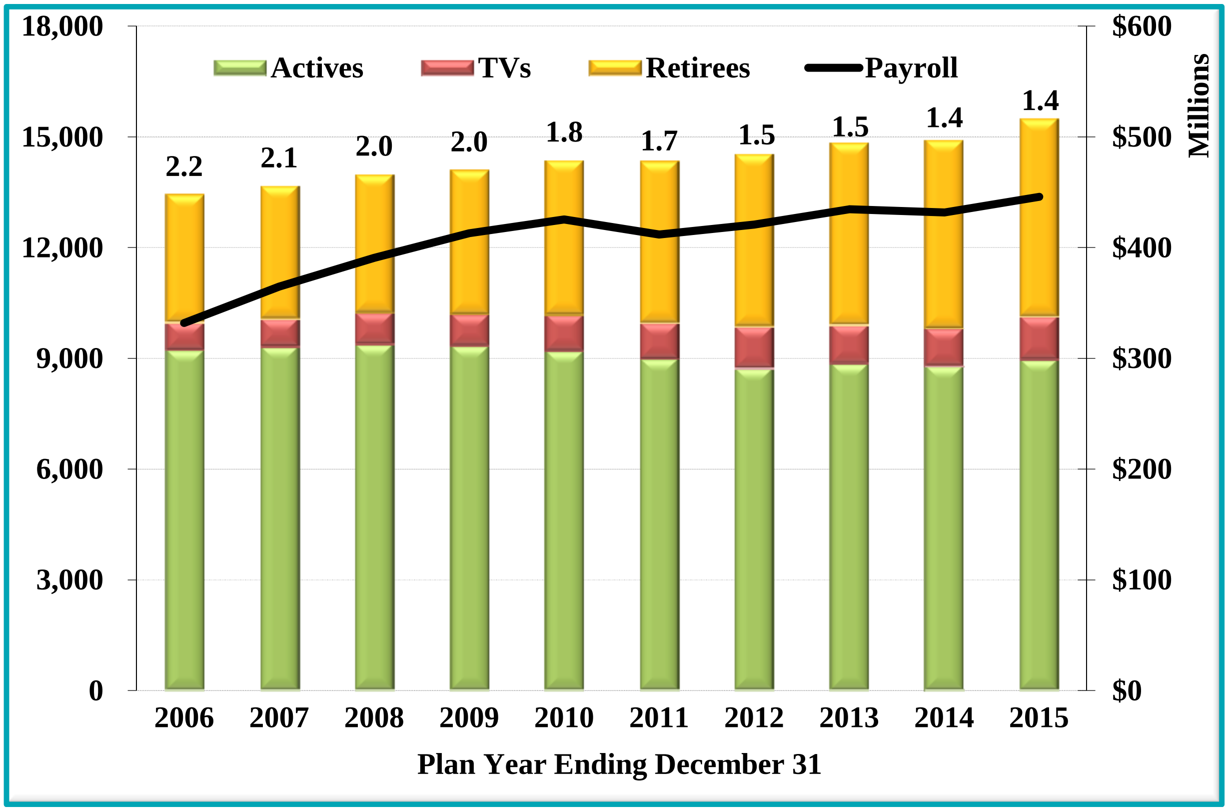
<u>Assets and Liabilities</u>



This graph demonstrates that the System's funding ratio (Actuarial Value of Assets divided by the Actuarial Liability) declined over the given period, primarily in 2013, because the discount rate assumption decreased from 6.00% to 5.50%. However, the funded ratio on a Market Value of Assets basis is more important to understand the underlying System's risks and recovery. The 2016 Market Value of Assets is less than the Actuarial Liability, such that on a market value basis, the funded ratio would be 92.7%.

SECTION I
BOARD SUMMARY

Participant Counts



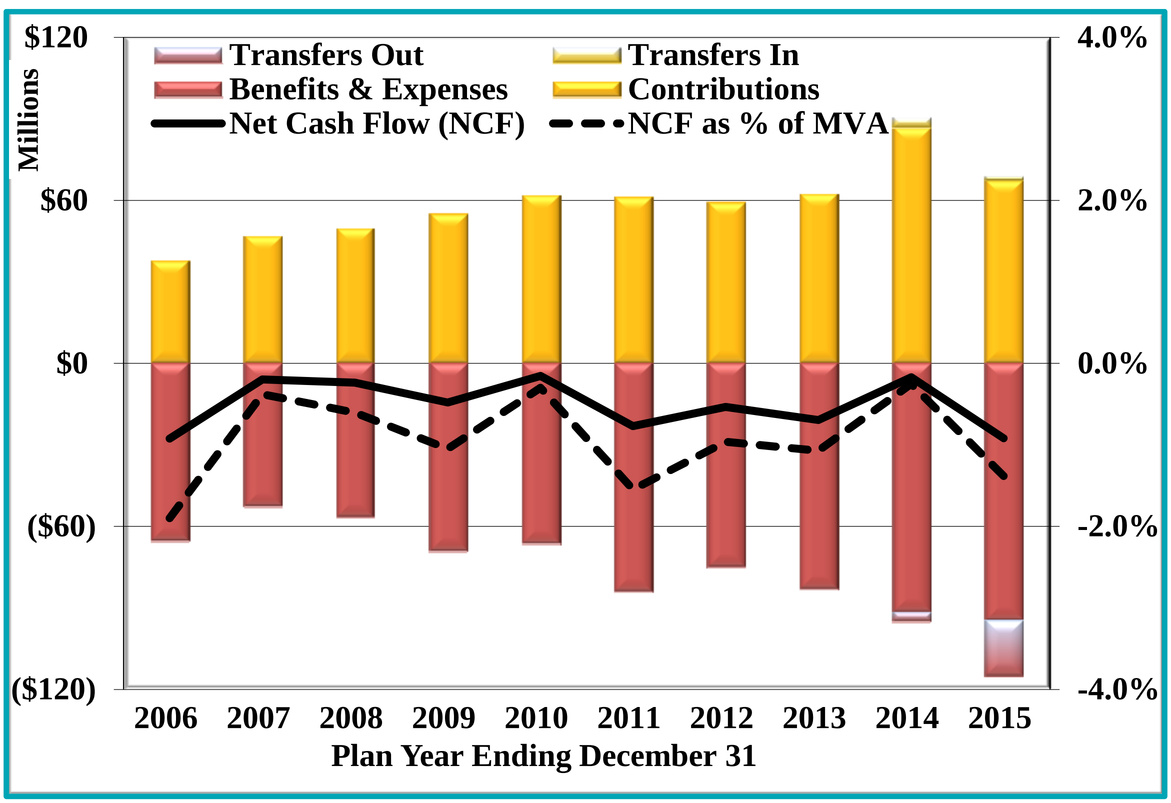
The chart above shows a comparison of the demographic makeup of the System over the last ten years. The number above the bars represents the ratio of active to inactive participants which is decreasing at a steady pace. A retirement system has a life cycle of its own, reaching maturity when as many or more of the covered participants are non-active (retirees and terminated vested {"TV"}) participants. When this occurs, the ratio moves closer to and sometimes below 1.0. For the System, the fact that this ratio is still above 1.0 indicates that contribution income is significant and net negative cash flows based on benefit payments and expenses greater than contribution receipts (excluding plan withdrawals and mergers) are relatively low. There has been a steady decline of this ratio over the past ten years and the maturity of the plans in aggregate should continue to be monitored.

SECTION I
BOARD SUMMARY

This next graph tracks the cash flows over the last ten years. An important risk element of a retirement system is the implication of cash flow and resources for paying benefits. If the level of benefit payments plus expenses exceeds expected contributions, then additional cash from existing assets are needed to make the benefit payments. This is referred to as negative cash flow (NCF) which is typical among retirement systems where the number of retirees increases relative to the active participants. On the right-hand side, we show the net cash flow as a percent of market value of assets (NCF as % of MVA). As the graph below illustrates, the net negative cash flow, without accounting for transfers, falls within the range of 0.1% to 1.9% of total assets. For the year ended December 31, 2015, the negative net cash flow was 1.4% of market value of assets. This implies that along with proceeds from contributions, an additional amount of cash generated from asset investments must be identified to pay benefits. Another way to consider this is that for the total value of assets to grow, the fund needs a minimum return of 1.4%.

The volatility of the net cash flow is not only a function of contributions and benefit payments, but also reflects transfer of funds into the System from new participating municipalities and asset outflows to municipalities that choose to leave the System. Incorporating this net transfer of over $19 million out of the System, results in a negative cash flow of 2.3% of assets, the highest point over the last 10 years. Additionally, in 2014, a municipality made a one-time $27.4 million contribution to reduce their unfunded liability, resulting in the lowest negative NCF in this period.

<u>Cash Flow Analysis</u>



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, 2016 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 are provided using five different assumptions:

1) Assuming 5.50% investment returns each and every year,

2) Assuming 7.50% investment returns each and every year,

3) Assuming average investment returns over the projected period equal to 5.50% but which vary each year based on Table I-5. This method demonstrates a more realistic projection as the System's return will differ annually,

4) Assuming 20 years of varied returns equal to an overall average 7.50% investment return based on Table I-6, and

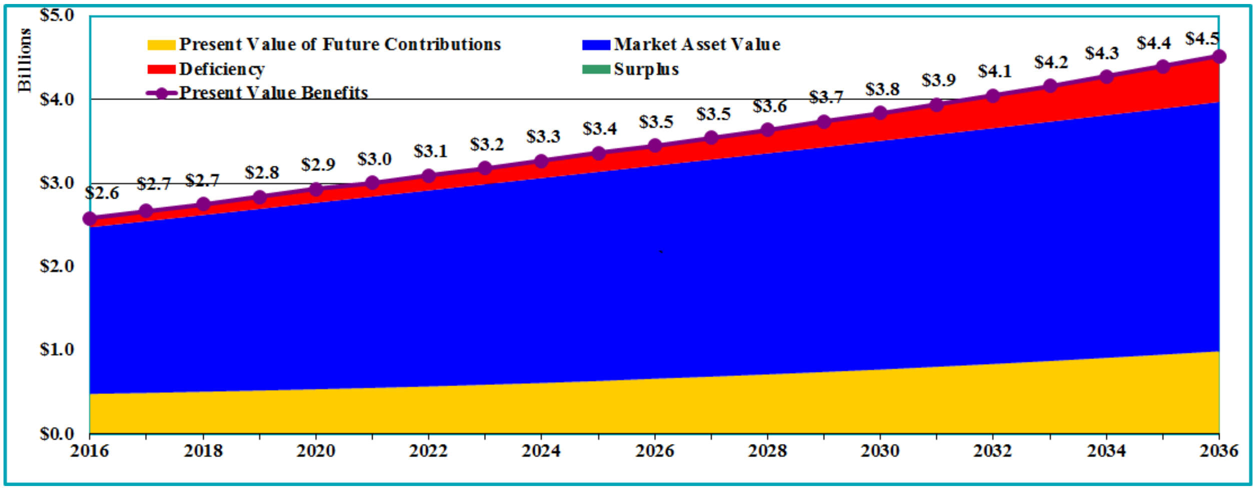
5) Assuming an investment return of 6.50% to reach full funding after ten years and 5.50% thereafter.

The projections that follow show how the total obligations of the System, assuming the current active population remain constant. This is an open group projection with a stationary active population which means when an active participant is expected to change status, they are assumed to be replaced to maintain a constant number of active participants over the projection period. The area under the curve (the purple line) represents the *Present Value of Benefits.* This amount takes into account the value of all benefits earned up to this point of time called the actuarial liability plus benefits assumed to be earned into the future. This represents the total PMRS obligation over time.

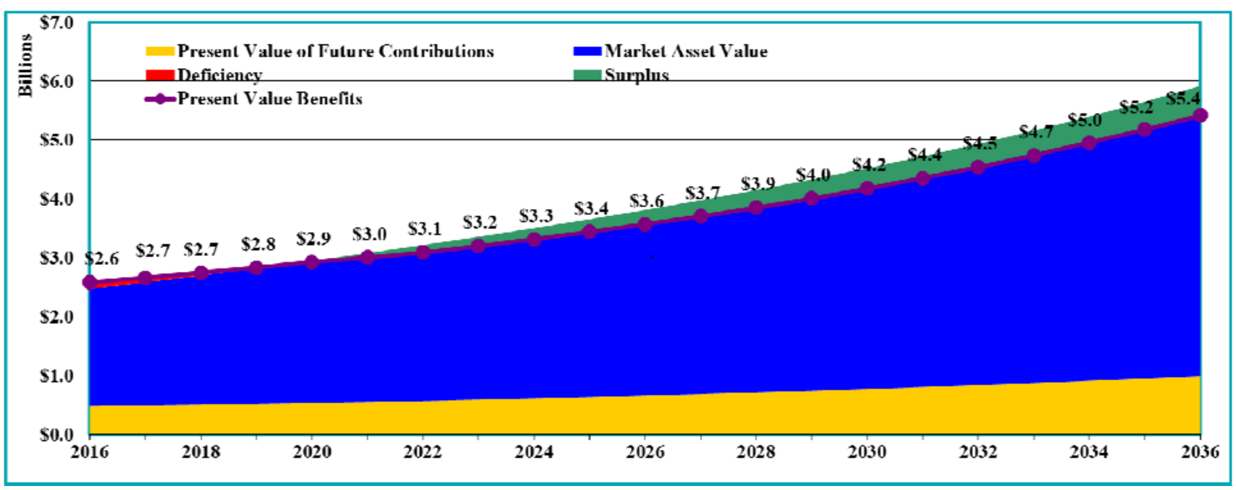
To meet these obligations, the System has resources which include the Market Value of Assets (in blue) and the present value of future contributions (in gold). To the extent these two sources are insufficient to meet the obligations today or in the future, the result will be a deficit (in red). If the resources are more than enough, the result will be a surplus (green). For this System, given that the investment crediting return rate for all municipalities will be 5.50%, the only resource to cover a deficit and create surplus is through average future returns anticipated in excess of the 5.50% rate. Based on historical and expected future returns along with statistical analysis completed by the Investment Consultant, the Board established a Long-Term Expected Rate of Return of 7.50%. The first two projections will focus on the impact of using each of these rates.

SECTION I
BOARD SUMMARY

The following graph shows the implications if the assets are projected to grow at the crediting rate of 5.50%. Because there is a deficiency at the beginning of the period, the deficit grows throughout the projection period.



The following graph shows the implications if the assets are projected to grow at the Long-Term Expected Rate of Return of 7.50%. The surplus, shown by the green area, displays the assets outpacing the obligations over the 20 year projection because the annual investment return is 200 basis points larger. The projected present value of benefits increases under this scenario because excess interest is distributed to the individual member pension plans, increasing benefits. If excess interest is distributed, the use of excess interest may be limited to increased contributions based on Pennsylvania Municipal Retirement Law until an individual municipality's funded status is at least 95% funded.

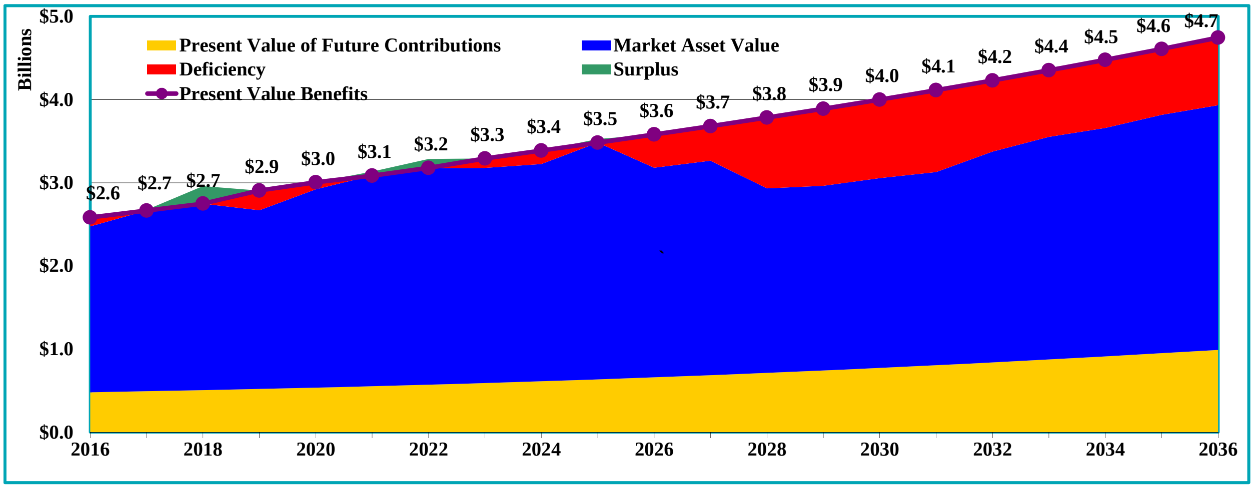


The System's return on assets each year will not consistently be the same rate, but will, over time, have a high likelihood of achieving 5.50%. Based on the hypothetical future return rates in Table I-5, which yield an average 5.50% rate of return over the projection period, the projected funded status will show higher and lower levels of funding based on the market value of assets.

SECTION I
BOARD SUMMARY

Table I-5
Projected Returns Equal to the Valuation Rate

Fiscal Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Return	12.00%	15.00%	-10.00%	14.00%	11.00%	8.00%	-2.00%	4.00%	14.00%	-10.00%
Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Return	6.00%	-10.50%	4.00%	7.50%	6.50%	14.00%	10.00%	7.00%	8.75%	6.90%



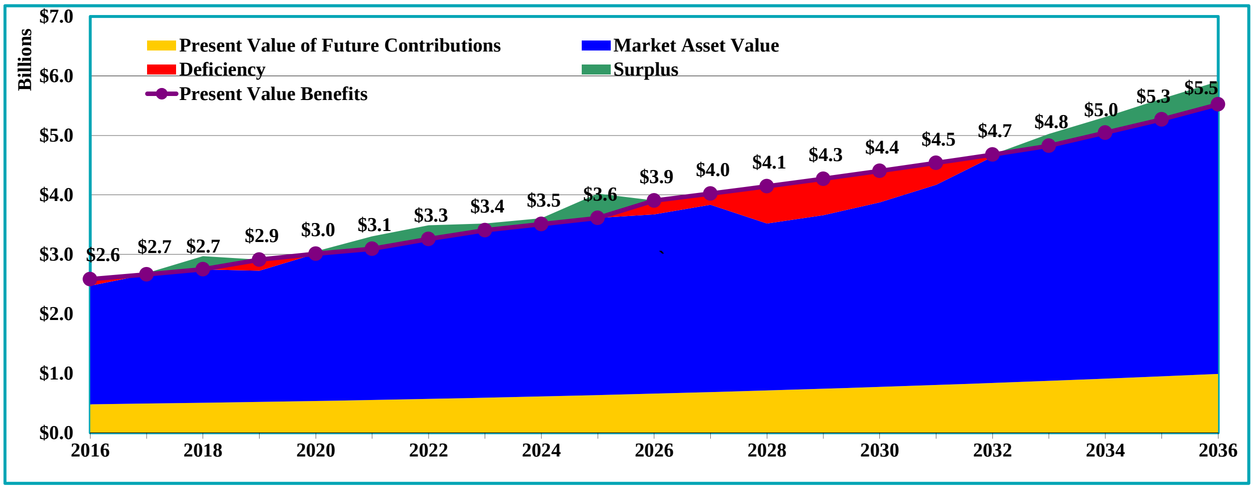
Based on this illustration, there is potential for the System to have funding level improvement which reflects some of the real expectations for future returns. However, without returns averaging in excess of 5.50% the fund can go from surplus to deficit, but will result in a deficit at the end of the projection period.

The potential volatility is even more apparent when we project investment returns that vary but now are expected to produce an average return over time of 7.50% as summarized in Table I-6. The fund could fluctuate from a deficit to a surplus before nearing full funding at the end of the period.

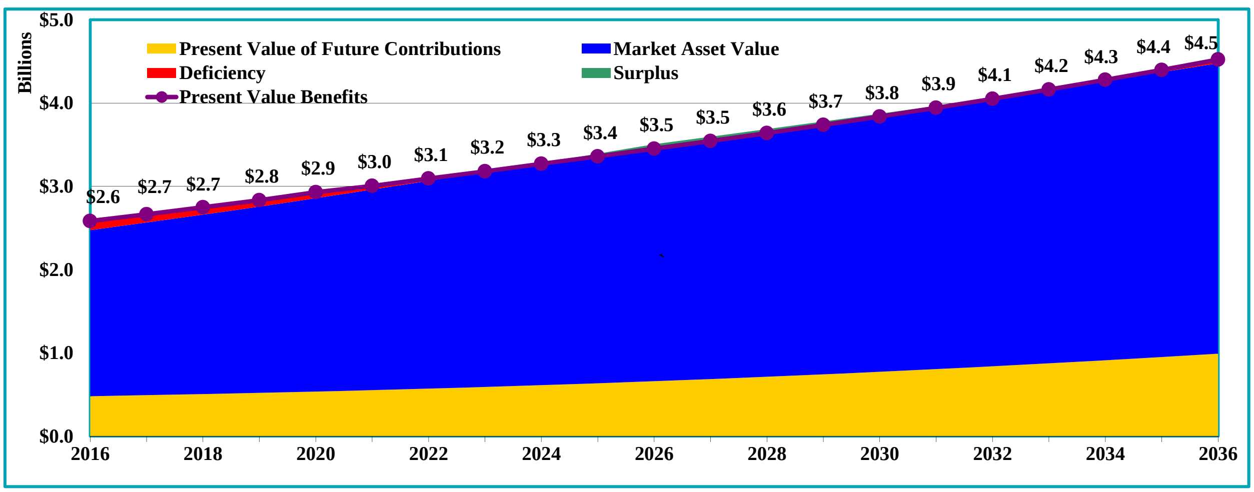
Table I-6
Projected Returns Equal to 7.5%

Fiscal Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Return	12.50%	15.00%	-8.00%	17.00%	12.00%	9.00%	3.00%	5.00%	16.00%	-8.00%
Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Return	7.50%	-8.00%	7.00%	10.00%	12.00%	16.00%	12.00%	9.00%	9.00%	7.50%

SECTION I
BOARD SUMMARY



This final projection provides for a 6.50% investment return for the next ten years, and 5.50% thereafter. In this scenario, the System reaches full-funding in 2024 and then maintains full-funding with 5.50% investment returns. This projection is intended to illustrate the System's required returns to achieve full-funding in the near-term.



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 benefit levels, Municipal and County contributions, and the ultimate security of participants' benefits.

In this section, we present detailed information on total (county & non-county) System assets as provided in the December 31, 2015 System CAFR and reflecting the adjusted reserve accounts as provided by the System including:

- **Disclosure** of System assets at December 31, 2015 and December 31, 2014;
- 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 "snap-shot" 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 at the market value of assets by asset class.

Table II-1
Statement of Assets at Market Value December 31 ($ Thousands)

	2015	2014
Assets		
Equity Investments	$ 1,271,596	$ 1,360,818
Accounts Receivable	16,845	4,648
Fixed Income Investments	367,716	360,287
Real Estate Investments	357,871	328,359
Fixed Assets	121	134
Accounts Payable	(7,857)	(2,749)
Investment Purchases Payable	(12,252)	(1,882)
Net Deferred Outflow of Resources	451	0
Total Market Value of Assets	**$ 1,994,491**	**$ 2,049,615**

SECTION II
ASSETS

Table II-2 summarizes the transaction of the assets during the year leading up to our valuation, as reported in the CAFR.

Table II-2
Changes in Market Value in ($ Thousands)

Market Value of Assets – January 1, 2015			**$**	**2,049,615**
Change in Accounting Principles				**(3,634)**
<u>Additions</u>				
Contributions:				
Municipal Employers	$	47,505		
Plan Members		19,606		
Transfers from other plan administrators		1,424		
Assessments		206		
Total Contributions			$	68,741
Investment Income:				
Net Appreciation (Depreciation) In Fair Value Of Investments	$	(27,307)		
Short-Term And Other Investments		104		
Common And Preferred Stock		11,973		
Real Estate		14,466		
International Equities		4,669		
Less Investment Expenses		(9,103)		
Miscellaneous Income		254		
Net Investment Income			$	(4,944)
Total Additions			**$**	**63,797**
<u>Deductions</u>				
Annuity Benefits and terminations	$	(89,856)		
Transfers to other plan administrators		(20,448)		
Administrative Expenses		(4,983)		
Total Deductions			**$**	**(115,287)**
Market Value of Assets – January 1, 2016			**$**	**1,994,491**

From Table II-2, ignoring transfer of money, the benefit payouts plus expenses of $94.8 million exceeds contribution income of $67.3 million for a net negative cash flow of $27.5 million, which is over 1.4% of the market value of assets. However, due to net transfers, the net negative cash flow in 2015 was $46.5 million representing 2.3% of the market value of assets.

SECTION II
ASSETS

Actuarial Value of Assets

The actuarial value of assets is developed based on the individual municipal account balances maintained by PMRS, also referred to as reserves, as reported on the System's CAFR as of December 31, 2015 and reflecting the reserve adjustments in the December 31, 2016 CAFR

This asset valuation method also takes into account the calculation of *excess interest* which is derived from income in excess of the long-term investment return assumption and when the market value of assets exceed the actuarial value of assets. The steps in the determination of the actuarial value assets as of December 31, 2015 are shown below. The difference between the market value of assets and the actuarial value of assets is considered a surplus when this value is positive. However the market value of assets is less than the reserves by $159.1 million as of December 31, 2015. This deficit represents 8.0% of the Market Value of Assets compared to 1.6% as of December 31, 2014. Based on the funding structure of the System, it is currently anticipated that this difference will be made up by future investment returns in excess of the long-term crediting assumption of 5.50%.

Table II-3
Development of Actuarial Value of Assets ($ Thousands)

1. Prior Year Actuarial Value	$	2,081,440
2. Total Audited Reserve Accounts [a]	$	2,148,958
3. Expected Administrative Expenses Net of Assessment[b]		4,668
4. Preliminary Actuarial Value (2+3)	$	2,153,626
5. Current Year Market Value of Assets		1,994,491
6. Prior Year Market Value of Assets		2,049,615
7. New Surplus {Minimum of [(5-4)&(5-4)-(6-1)]}		(159,135)
8. Percentage of New Surplus Credited as Excess Interest [c]		0.000%
9. Excess Interest (Maximum of 0 and (7x8)) available	$	0
10. Excess Interest awarded	$	0
11. Current Year Actuarial Value of Assets (4+10)	**$**	**2,153,626**

a Restated reserves reflecting reserve adjustment after publication of the December 31, 2015 CAFR
b Assessment includes $206,114 in employer contributions and $109,026 in transfers from the Municipal Reserve Account
c See Table II-4b

SECTION II
ASSETS

Excess Interest Allocation

Each year, municipalities may be eligible to receive a supplemental allocation of investment monies beyond the regular 5.50% interest rate if the market value of assets exceeds the actuarial value of assets. This "excess interest" award is derived as a portion of "new surplus" created during the year. "Surplus" refers to the excess of market value over the actuarial value of assets/reserves. 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."

For the year ended December 31, 2015, there was no surplus because the market value of assets is less than the actuarial value of assets/reserves. The calculation in Table II-4a details the calculation that leads to no excess interest for this year.

Table II-4a
Determination of Excess Interest ($ Thousands)

1. Assets		
a. Market value	$	1,994,491
b. Preliminary Actuarial Value		2,153,626
c. Available Surplus (1a. - 1b.)	**$**	**(159,135)**
2. Reserves [d]		
a. Members' Reserve Account	$	435,835
b. Municipal Accounts		833,971
c. Disability Reserve Account		849
d. Retired Members' Reserve Account		877,490
e. DROP Participant Reserve Account		813
f. Total (2a. + 2b. + 2c. + 2d. + 2e.)	**$**	**2,148,958**
3. Last year's surplus	$	0
4. New surplus (1c. - 3.)	$	(159,135)
5. Excess percent of New Surplus (see Table II-4b)		0.000%
6. Excess Interest Awarded	$	0
7. Percent of reserve {6. / (2f. - 2c.)}		0.00%
8. Trial Surplus/(Deficit) (1c. - 6.)	$	(159,135)
9. Trial margin percent {8. / 1a.}, not less than 0		0.00%

d Restated reserves after publication of the CAFR

SECTION II
ASSETS

Table II-4b
Determination of Excess Percent of New Surplus ($ Thousands)

1. Market Value of Assets	$	1,994,491
2. Available Surplus	$	0
3. Margin (2. / 1.)		0.00%
4. New Surplus	$	0
5. New Margin (4. / 1.)		0.00%
6. Excess Percent (10% + 8*3.) / (100% + 8*5.)		0.00%

Because there is a net deficit, there is no excess interest to award to participating municipalities and counties until the Excess Percent is greater than zero.

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. After reducing these obligations by the Market Value of Assets and present value of future contributions, the remaining (surplus)/deficit provides a measure of the System's risk in providing for these obligations.

The actuarial liabilities are used for funding calculations and to roll-forward for GASB disclosures. This 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 total benefit liabilities reflecting actual County measured liabilities and roll-forward liabilities for the municipalities for the 2016 valuation.

Table III-1
Obligation Deficit/(Surplus) Analysis of All PMRS Plans

		January 1, 2016		January 1, 2015
Present Value of All Benefits - Total Obligation				
Active Participant Benefits	$	1,581,929,109	$	1,622,496,125
Retiree and Inactive Benefits		999,866,637		938,380,471
Present Value of Benefits (PVB)	**$**	**2,581,795,746**	**$**	**2,560,876,596**
Present Value of Future Contributions (PVFC)		(473,633,595)		(542,676,819)
Municipal Market Value of Assets (MVA)		(1,994,491,256)		(2,049,615,132)
Net (Surplus)/Deficit of Resources to Obligation (PVB + PVFC + MVA)	**$**	**113,670,895**	**$**	**(31,415,355)**
Actuarial Liability				
Present Value of Benefits (PVB)	$	2,581,795,746	$	2,560,876,596
Present Value of Future Normal Cost Contributions (PVFNC)		(430,454,280)		(493,611,746)
Actuarial Liability (AL = PVB - PVFNC)	**$**	**2,151,341,466**	**$**	**2,067,264,850**
Actuarial Value of Assets (AVA)		(2,153,625,821)		(2,081,439,591)
Net Unfunded/(Surplus) (AL + AVA)	**$**	**(2,284,355)**	**$**	**(14,174,741)**

SECTION IV
CONTRIBUTIONS

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine what contributions are needed based on 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**. Based on this statutory cost method, there are four components that are used to determine the total contribution: the **normal cost**, the amortization of **initial unfunded actuarial liability**, and any amortizations of **increases/decreases in the unfunded actuarial liability / or adjustment for surplus** expressed as a percent of payroll, and expenses applied at the rate of $20 per participant.

The statutory funding method requires that increases/decreases resulting from experience gains or losses get amortized over the lesser of 20 years or the future working life of the active participants. Increases/decreases from assumption changes 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 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 under Act 205.

For plans with a surplus, the contribution rate is the normal cost offset by 10% of the surplus again expressed as a percent of payroll. This report provides an analysis of the aggregate assets and liabilities but not the aggregation of the Minimum Municipal Obligations required for each participating municipality covered by the 2015 Act 205 forms. The combination of underfunded and surplus plans is not necessarily informative in reviewing the overall funded status of the System. However, results for the 2016 Act 293 County plans are provided.

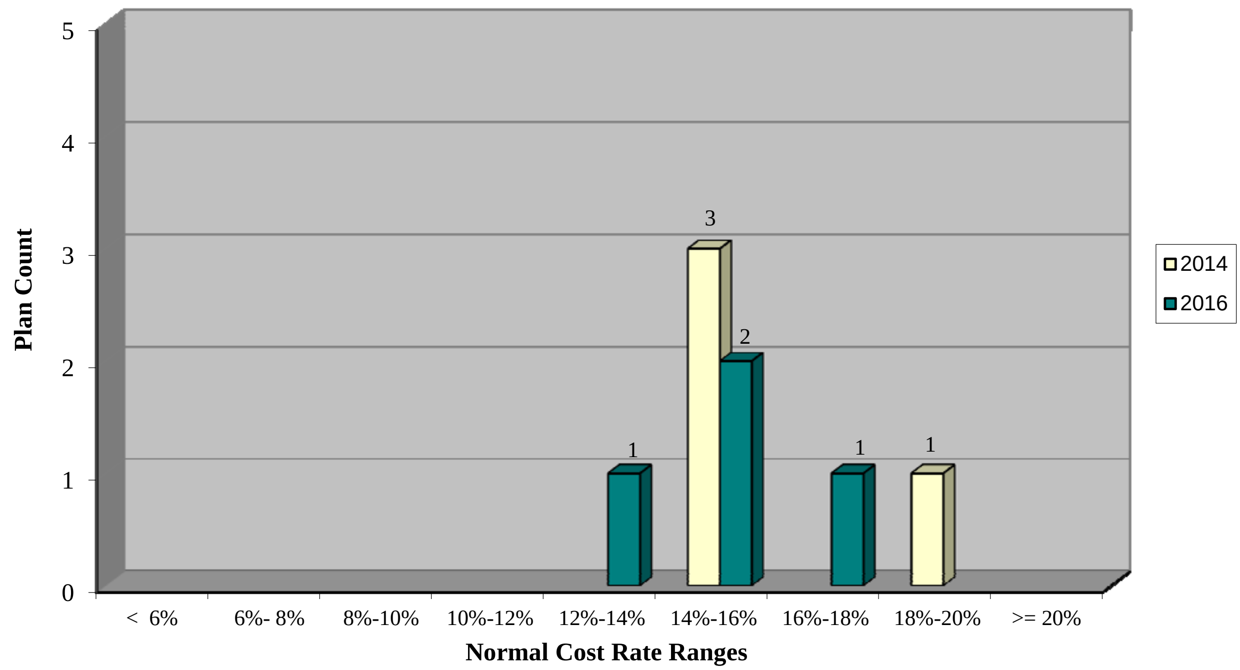
On the following pages, we describe the cost components and provide graphically the distribution of costs among the participating counties.

The normal cost rate (i.e., normal cost as a percent of payroll) is determined in the following steps. First, for a typical new entrant, an individual normal cost rate is determined by taking the present value, as of entry age into the plan, of that member’s projected future benefits. This value is then divided by the present value, also at entry age, of the member’s expected future salary during their working lifetime. Finally, the total normal cost rate is reduced by the member contribution rate to produce the 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.

SECTION IV
CONTRIBUTIONS

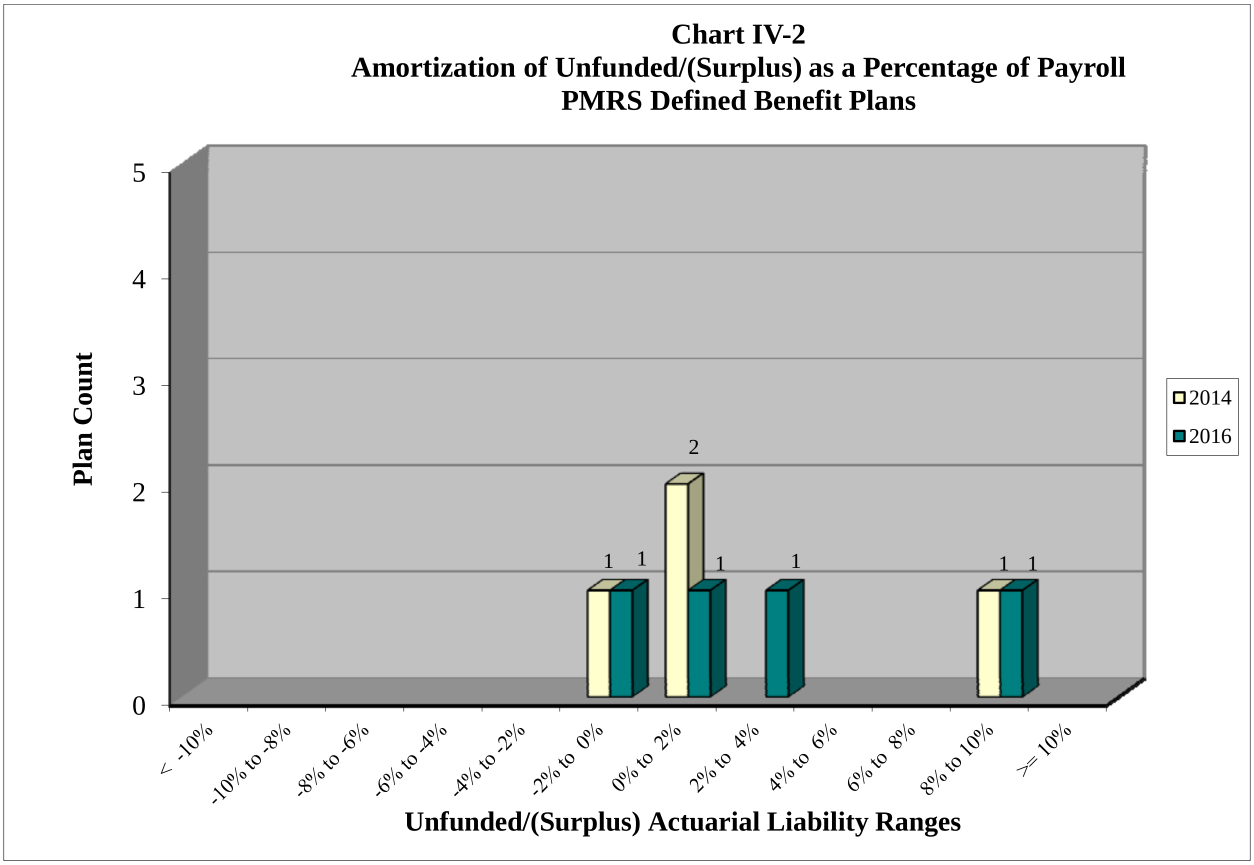
The following chart is a summary of the normal cost rates determined for the traditional defined benefit County plans as of January 1, 2014 and January 1, 2016.

Chart IV-1
Distribution of Normal Cost Rates as a Percentage of Payroll
PMRS Defined Benefit Plans



SECTION IV
CONTRIBUTIONS

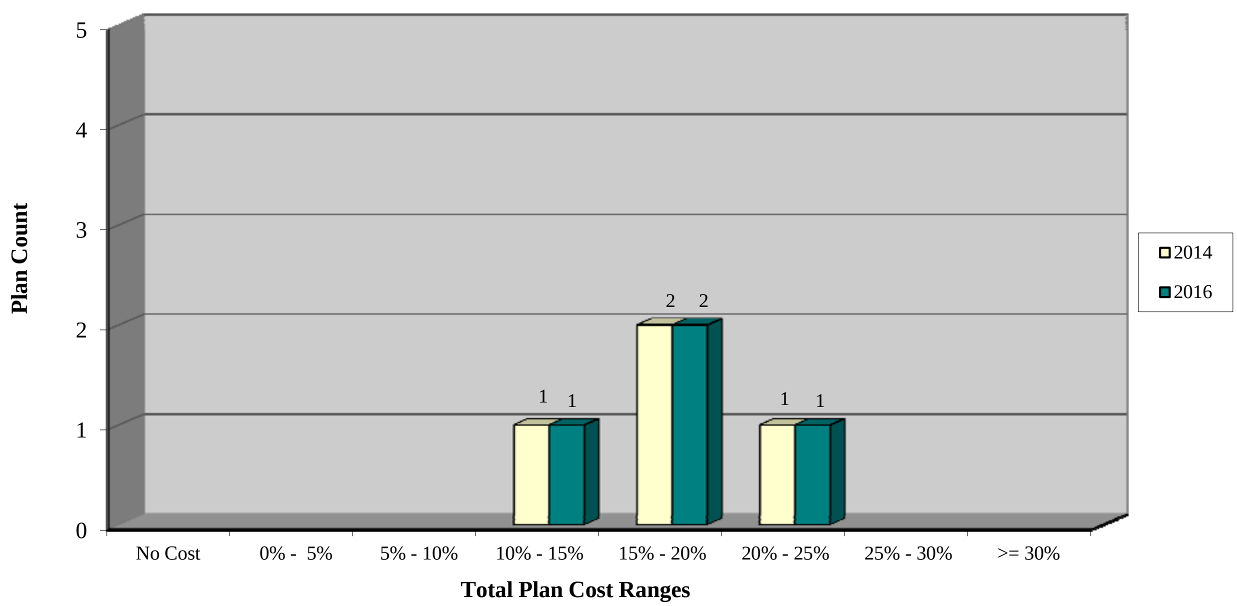
Chart IV-2 below is a summary of the unfunded/(surplus) actuarial liability amortization costs defined as a percent of covered payroll of each plan's active members, determined for the traditional defined benefit County plans as of January 1, 2014 and January 1, 2016.



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) determined for the traditional defined benefit County plans as of January 1, 2014 and January 1, 2016.

Chart IV-3
Cost of Plan as Percentage of Payroll
PMRS Defined Benefit Plans



SECTION V
ACCOUNTING STATEMENT INFORMATION

GASB Statement No. 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 retirement system under GASB 67. The assets of an Agent Multiple Employer retirement 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 5.50% per annum.

Tables V-1 through V-6 provide the information to be used for the System's Comprehensive Annual Financial Report based on 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 with Six Year Trend; and
- Table V-6 is the Schedule of Total Membership and Salary.

SECTION V
ACCOUNTING 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, 2016 - County & Cash Balance (CB) plans January 1, 2015 - Municipal plans that are not CB
Measurement date	January 1, 2016
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*	5.50%
Projected salary increases*	2.8%-7.05%
*Includes inflation at	2.8%
Cost-of-living adjustments	ad hoc

The actuarial assumptions used have been adopted by the System's Board based on the most recent review of the System's experience completed in 2015.

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 percent of payroll cost 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 member contributions. The difference between this liability and the funds accumulated as of the same date is the unfunded actuarial liability. The allowance for administrative expenses is based on the System's actual administrative expenses.

SECTION V
ACCOUNTING STATEMENT INFORMATION

Table V-2
SOLVENCY TEST
Aggregate Accrued Liabilities for

Valuation Date January 1,	Active Member (1)*	Retirees & Beneficiaries (2)	Active Member Employer Financed Contributions (3)	Actuarial Value of Reported Assets	Portion of Accrued Liabilities Covered by Reported Assets (1)	(2)	(3)
2016	$435,834,498	$999,866,637	$715,640,331	$2,153,625,821	100%	100%	100%
2015	427,736,008	938,380,470	701,148,372	2,081,439,591	100%	100%	102%
2014	416,472,872	881,502,593	707,246,642	1,972,273,674	100%	100%	95%
2013	418,163,830	812,688,102	672,720,129	1,886,703,664	100%	100%	97%
2012	407,199,633	639,260,852	680,756,784	1,792,809,433	100%	100%	110%
2011	395,048,320	655,645,661	623,210,164	1,713,751,974	100%	100%	106%

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

Table V-3
Funded Status of Actuarial Liabilities
GASB Statement No. 67 Disclosure

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
2016	$2,153,625,821	$2,151,341,466	$(2,284,355)	100.1%	5.50%
2015	2,081,439,591	2,067,264,850	(14,174,741)	100.7%	5.50%
2014	1,972,273,674	2,005,222,107	32,948,433	98.4%	5.50%
2013	1,886,703,664	1,903,572,061	16,868,397	99.1%	5.50%
2012	1,792,809,433	1,727,217,269	(65,592,164)	103.8%	6.00%
2011	1,713,751,974	1,673,904,145	(39,847,829)	102.4%	6.00%

The actuarial assumptions as of January 1, 2016 are shown in the assumptions and methods section. The above information was derived from the following membership data, as provided by the System, regarding:

Valuation Date	Valuation of Defined Benefit Liabilities: Complete Valuation	Roll-Forward	Cash Balance Plans
January 1, 2016	4	718	294
January 1, 2015	717	4	286
January 1, 2014	4	712	268
January 1, 2013	710	4	251
January 1, 2012	4	705	240
January 1, 2011	702	5	229
January 1, 2010	5	691	202
January 1, 2009	691	5	203

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

SECTION V
ACCOUNTING STATEMENT INFORMATION

Table V-4
Schedule of Retirees and Beneficiaries - Added to and Removed from Rolls in Last Six Years

Valuation Date January 1,	Added to roll	Average Annual Annuities Added	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
2016	339	$18,888	161	87	$18,915	5,360	$80,729,221	6.3%	$15,061	1.3%
2015	392	17,908	185	227	10,494	5,108	75,936,364	6.6%	14,866	3.1%
2014	431	20,472	430	168	16,043	4,943	71,257,797	9.5%	14,416	3.7%
2013	391	16,440	443	105	8,288	4,680	65,046,544	9.5%	13,899	2.8%
2012	438	16,404	885	228	14,252	4,394	59,411,245	7.5%	13,521	2.4%
2011	396	18,624	432	121	8,981	4,184	55,257,189	13.0%	13,207	5.6%

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

Table V-5
Schedule of Total Membership by Status
Six Year Trend

Valuation Date January 1,	Active Members: Defined Benefit	Active Members: Cash Balance	Retirees	Beneficiaries	Deferred Pensions	Inactive Members	Total
2016	7,698	1,274	4,784	576	1,173	7	15,512
2015	7,580	1,214	4,566	542	1,027	8	14,937
2014	7,676	1,185	4,423	520	1,044	14	14,862
2013	7,599	1,131	4,160	520	1,098	51	14,559
2012	7,836	1,158	3,899	495	952	21	14,361
2011	8,091	1,119	3,707	477	945	42	14,381

SECTION V
ACCOUNTING STATEMENT INFORMATION

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

Table V-6
Schedule of Total Membership and Salary

	As of January 1[a] 2016	2015	2014	2013
a. Retirees currently receiving benefits	4,784	4,566	4,423	4,160
b. Beneficiaries currently receiving benefits	576	542	520	520
c. Terminated vested employees entitled to future benefits from Defined Benefit Plans	872	779	753	800
d. Terminated non-vested employees entitled to contribution refunds from Defined Benefit Plans	7	8	14	51
e. Active employees in defined benefit plans	7,698	7,580	7,676	7,599
i. Aggregate Salary[b]	$394,133,120	$384,270,155	$389,410,214	$376,296,674
ii. Vested[c]	4,676	4,726	4,881	4,885
iii. Non-vested	3,022	2,854	2,795	2,715
f. Participants in cash balance plans	1,575	1,462	1,476	1,429
i. Aggregate Salary	$51,642,049	$47,537,851	$45,193,710	$44,490,671
ii. Active	1,274	1,214	1,185	1,131
iii. Inactive	301	248	291	298

a Includes traditional defined benefit non-county plans, traditional defined benefit county plans, and cash balance plans
b Actual salary for preceding valuation date
c Count of vested participants estimated based on service as of the valuation date

APPENDIX A
MEMBERSHIP INFORMATION

Distribution of All Active Members
by Age and Service as of January 1, 2016

COUNTS BY AGE/SERVICE

	Service										
Age	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	Total
Under 20	6	2	0	0	0	0	0	0	0	0	8
20 to 24	104	62	30	13	3	0	0	0	0	0	212
25 to 29	139	108	81	110	85	3	0	0	0	0	526
30 to 34	107	102	84	103	227	67	5	0	0	0	695
35 to 39	87	71	43	78	220	220	60	2	0	0	781
40 to 44	115	55	47	99	201	210	163	61	4	0	955
45 to 49	81	78	66	90	229	255	218	147	89	2	1,255
50 to 54	92	65	72	95	232	254	217	183	192	94	1,496
55 to 59	62	59	63	85	235	246	227	174	176	261	1,588
60 to 64	18	33	45	37	136	152	163	120	125	205	1,034
65 & up	2	10	10	25	63	63	68	57	57	67	422
Total	813	645	541	735	1,631	1,470	1,121	744	643	629	8,972

APPENDIX A
MEMBERSHIP INFORMATION

Distribution of Active Defined Benefit Members by Age and Service as of January 1, 2016

COUNTS BY AGE/SERVICE

	Service										
Age	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	Total
Under 20	5	2	0	0	0	0	0	0	0	0	7
20 to 24	88	58	28	11	3	0	0	0	0	0	188
25 to 29	120	102	77	100	76	2	0	0	0	0	477
30 to 34	96	93	76	91	199	60	5	0	0	0	620
35 to 39	72	63	42	63	193	199	59	2	0	0	693
40 to 44	95	46	42	80	174	184	144	55	4	0	824
45 to 49	68	67	53	67	198	221	192	136	77	2	1,081
50 to 54	73	58	56	70	197	227	180	166	171	88	1,286
55 to 59	47	47	59	63	198	212	183	140	150	236	1,335
60 to 64	15	26	39	30	105	125	134	100	108	178	860
65 & up	2	8	9	19	49	52	54	43	42	49	327
Total	681	570	481	594	1,392	1,282	951	642	552	553	7,698

APPENDIX A
MEMBERSHIP INFORMATION

Distribution of Active Cash Balance Members by Age and Service as of January 1, 2016

COUNTS BY AGE/SERVICE

	Service										
Age	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	Total
Under 20	1	0	0	0	0	0	0	0	0	0	1
20 to 24	16	4	2	2	0	0	0	0	0	0	24
25 to 29	19	6	4	10	9	1	0	0	0	0	49
30 to 34	11	9	8	12	28	7	0	0	0	0	75
35 to 39	15	8	1	15	27	21	1	0	0	0	88
40 to 44	20	9	5	19	27	26	19	6	0	0	131
45 to 49	13	11	13	23	31	34	26	11	12	0	174
50 to 54	19	7	16	25	35	27	37	17	21	6	210
55 to 59	15	12	4	22	37	34	44	34	26	25	253
60 to 64	3	7	6	7	31	27	29	20	17	27	174
65 & up	0	2	1	6	14	11	14	14	15	18	95
Total	132	75	60	141	239	188	170	102	91	76	1,274

APPENDIX A
MEMBERSHIP INFORMATION

Pennsylvania Municipal Retirement System Distribution of Active Members by Age and Service as of January 1, 2016

AVERAGE SALARY BY AGE/SERVICE

	Service										
Age	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	Total
Under 20	$10,736	$34,331	$0	$0	$0	$0	$0	$0	$0	$0	$16,635
20 to 24	$15,841	$39,477	$38,903	$41,294	$50,355	$0	$0	$0	$0	$0	$28,066
25 to 29	$19,377	$43,682	$42,563	$47,822	$48,983	$51,221	$0	$0	$0	$0	$38,852
30 to 34	$20,377	$45,360	$45,017	$46,753	$53,470	$59,366	$71,443	$0	$0	$0	$45,865
35 to 39	$18,763	$41,565	$50,454	$48,597	$51,607	$60,764	$61,399	$52,912	$0	$0	$50,007
40 to 44	$20,771	$45,314	$46,536	$46,091	$53,186	$59,439	$64,293	$63,030	$76,371	$0	$51,763
45 to 49	$23,612	$43,522	$45,429	$43,776	$49,771	$55,943	$57,708	$63,363	$67,251	$62,127	$52,520
50 to 54	$22,229	$45,055	$46,037	$43,808	$49,638	$52,101	$52,766	$58,582	$63,882	$64,290	$51,925
55 to 59	$19,554	$47,531	$46,747	$44,092	$45,864	$49,724	$53,406	$56,816	$56,554	$60,565	$51,316
60 to 64	$17,489	$44,290	$44,831	$46,670	$47,733	$49,333	$49,204	$54,142	$57,294	$60,968	$51,923
65 & up	$67,853	$38,336	$42,693	$45,353	$44,183	$44,501	$44,284	$48,824	$51,568	$55,525	$47,679
Total	$19,959	$43,840	$45,204	$45,818	$49,947	$54,432	$55,046	$57,999	$60,048	$60,721	$49,685

APPENDIX A
MEMBERSHIP INFORMATION

Inactive Benefit Payment Distribution
as of January 1, 2016

COUNTS BY BENEFIT/AGE: RECEIVING PAYMENTS

Age	Monthly Benefit	Count
x < 30	$3,709	4
30 <= x < 35	$3,028	5
35 <= x < 40	$4,975	12
40 <= x < 45	$9,409	24
45 <= x < 50	$40,028	52
50 <= x < 55	$208,395	133
55 <= x < 60	$692,229	398
60 <= x < 65	$1,600,796	989
65 <= x < 70	$1,708,976	1,266
70 <= x < 75	$1,132,526	978
75 <= x < 80	$632,759	646
80 <= x < 85	$405,255	447
85 <= x	$285,350	406
<Total>	$6,727,435	5,360

DEFINED BENEFIT PLANS

COUNTS BY BENEFIT/AGE: DEFERRED PAYMENTS

Age	Monthly Benefit	Count
x < 30	$1,828	19
30 <= x < 35	$15,003	34
35 <= x < 40	$31,287	58
40 <= x < 45	$67,401	89
45 <= x < 50	$133,743	153
50 <= x < 55	$201,111	202
55 <= x < 60	$167,653	222
60 <= x < 65	$55,949	85
65 <= x < 70	$2,754	8
70 <= x < 75	$333	1
75 <= x < 80	$301	1
80 <= x < 85	$0	0
85 <= x	$0	0
<Total>	$677,364	872

APPENDIX A
MEMBERSHIP INFORMATION

Pensions in Payment on January 1, 2016 by Type and Amount

		Pension Type				
Monthly Amount	Total	Normal	Involuntary early	Voluntary early	Service disability	Non-service disability
Total	5,360	4,436	203	607	49	65
Under $100	259	223	18	16	1	1
$ 100 - $199	316	256	25	34	1	0
200 - 299	307	238	27	41	1	0
300 - 399	311	250	24	36	0	1
400 - 499	296	242	19	31	2	2
500 - 599	315	254	11	41	3	6
600 - 699	266	213	13	35	3	2
700 - 799	260	201	12	41	2	4
800 - 899	237	185	9	29	3	11
900 - 999	225	169	7	33	7	9
1,000 - 1,199	431	339	15	60	7	10
1,200 - 1,399	331	256	5	59	6	5
1,400 - 1,599	288	238	3	35	6	6
1,600 - 1,799	214	185	6	22	0	1
1,800 - 1,999	211	179	4	25	2	1
2,000 - 2,199	172	151	2	17	1	1
2,200 - 2,399	154	140	2	11	1	0
2,400 - 2,599	132	119	0	11	1	1
2,600 - 2,799	101	90	0	8	1	2
2,800 - 2,999	86	83	0	2	0	1
3,000 - 3,499	188	176	1	10	1	0
3,500 - 3,999	117	110	0	6	0	1
4,000 and over	143	139	0	4	0	0

APPENDIX A
MEMBERSHIP INFORMATION

Pensions Awarded in Prior Ten Years, by Type and Monthly Amount

	Total		Normal		Involuntary early		Voluntary early		Disability		
Year Ended December 31:	Number	Average Monthly Amount	Number	Average Monthly Amount	Number	Average Monthly Amount	Number	Average Monthly Amount	Number*		Average Monthly Amount
2006	252	1,069	192	1,082	19	572	32	1,196	9	(2)	1,373
2007	236	1,065	227	1,056	6	1,259	-	-	3	(0)	1,350
2008	271	1,157	223	1,150	7	843	36	1,259	5	(3)	1,162
2009	296	1,336	249	1,412	17	339	26	1,300	4	(0)	1,067
2010	396	1,552	341	1,632	13	364	37	1,250	5	(0)	1,407
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

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

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

Actuarial Assumptions:

The PMRS actuarial assumptions were approved by the Board effective January 1, 2016:

A. Healthy Life Mortality:

Rates of Pre-Retirement Mortality
Males: RP 2000 Non-Annuitant Male table projected 15 years with Scale AA
Females: RP 2000 Non-Annuitant Female table projected 15 years with Scale AA, setback five years

Rates of Post-Retirement Mortality
Males: RP2000 Annuitant Male table projected 5 years with Scale AA
Females: RP2000 Annuitant Female table projected 10 years with Scale AA

Based on the information provided by PMRS and review of the actual mortality experience over a five-year period, these mortality tables provide projected mortality improvements for the future. Given that experience analysis is required to be performed every four years the projection periods are sufficient to reflect anticipated improvements until the next study is performed.

B. Disabled Life Mortality Rates:
Males and females: RP 2000 with 10 year set forward

C. Termination Rates Before Retirement
Rates based on the number of active members in the pension plan, years of service, and the type of plan participants (non-uniform or uniform).

Municipal Participants (Non-Uniform)		
	Number of Active Members in Plan	
Service	<25	25+
<1	15.0%	18.0%
1	15.0%	18.0%
2	11.0%	14.0%
3	8.0%	12.0%
4	7.0%	9.0%
5	6.0%	9.0%
6	5.5%	8.0%
7	5.5%	7.5%
8	5.5%	6.5%
9	4.0%	5.0%
10+	2.5%	4.0%

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

Uniform Participants	Number of Active Members in Plan	
Service	<25	25+
<1	12.0%	13.0%
1	12.0%	10.0%
2	12.0%	7.0%
3	9.0%	7.0%
4	7.0%	6.0%
5	5.0%	5.0%
6	5.0%	4.0%
7	5.0%	3.0%
8	4.5%	3.0%
9	4.0%	3.0%
10+	3.0%	3.0%

D. Disability Incidence Rates:

Municipal - 40% of 1964 OASDI (Social Security) Experience for Males with adjustments. Sample rates are:

Age	Rate
25	0.014%
35	0.029%
45	0.064%
55	0.134%
65	0.658%

Uniformed plans – 60% of 1964 OASDI (Social Security) Experience for Males with adjustments. Sample rates are:

Age	Rate
25	0.031%
35	0.058%
45	0.136%
55	0.335%
65	1.123%

Type of Disability:
(a) 15% of disablements are assumed to be service related for municipal plans, and

(b) 50% of disablements are assumed to be service related for uniform plans.

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

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

F. Salary Scale:

Age	Total Rate[1] (including inflation)
25	7.05%
30	5.44%
35	4.55%
40	4.26%
45	3.97%
50	3.72%
55	3.44%
60	3.28%
65	2.80%

[1]Add 2% for each of the first three years of service.

G. Rates of Retirement:

(a) Municipal Members:

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

Age	Rate[1]
<45	2%
45	8%
46	10%
47 – 50	15%
51 – 54	17%
55	22%
56 – 59	14%
60 – 64	18%
65	25%
66 – 74	20%
75	100%

[1] Rates indicated are adjusted by adding 5% (and 10% for ages 60-62 under current rate assumptions) for the year in which the member is first eligible for normal retirement.

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

(b) Uniform Members:

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

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

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

80% of active members and are assumed to be married for retirees with the 50% Joint and Survivor form of payment. 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 3.3% compounded annually;
(b) The Consumer Price Index will increase 2.8% compounded annually; and
(c) The Average Total Wages of All Workers will increase by 3.3% compounded annually.

J. Post-Retirement Cost of Living Increases (if applicable)/Inflation: 2.8% per year, subject to plan limitations.

K. Investment Return Assumption for municipal assets:

5.50% 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 increased by 5%.

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

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

Rationale for Assumptions: An experience study is completed every four 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, 2009 – December 31, 2013.

Actuarial Methods:

Contribution requirements are individually determined for each participating municipality, on an actuarial basis as described below, 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:

Sum of all audited reserve accounts as of the valuation date, including Member, Municipal, Retired, Disability, and DROP Reserves, and a one-year administration expense reserve, plus the portion of any additional investment income to be distributed as "excess interest." 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 actuarial value of assets. Once the preliminary actuarial value of assets 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 excess interest.

The Actuarial Value of Assets are set equal to reserves under the System based on the unique legislative structure of PMRS, which are increased annually at a rate agreed on by the Board named "Regular Interest" as defined under the Pennsylvania Municipal Retirement Law. Therefore, these assets do not necessarily 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.
   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

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

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 subject to comply with Actuarial Standards of Practice (ASOP), when defining the Actuarial Value of Assets, does 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: Entry Age Normal 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 pay 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 percent 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.

Funding of the Unfunded Actuarial Liability:

Actuarial gains (or losses), including the effect of contributions greater or lesser 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);

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

(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 Reserve account, which at the time of retirement receives a transfer from the municipal and member 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 the 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 estimate roll forward liabilities:

The defined benefit pension plans for municipalities are valued explicitly every odd calendar year. For the even calendar years, the liabilities for these plans are estimated by rolling forward the liabilities. With the implementation of GASB 68, which required an individual report to be issued for each pension plan, the liabilities for the municipalities with defined benefit plans were rolled forward based on the actual benefit payments. These liabilities reflect the assumption changes and any material changes to the liabilities that may have occurred since the prior actuarial valuation. These roll forward liabilities were reflected in this report. The liabilities for all participants in pay status for these municipal pension plans are explicitly valued every year. The roll forward active and deferred vested liabilities were proportionally adjusted based on the prior year liabilities net of in pay status liabilities.

All other liabilities for the county and cash balance plans were explicitly valued as of January 1, 2016 based on the data, plan provisions, methods and assumptions.

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 four years at the July 2015 Board Meeting. At that meeting, the Board approved updated actuarial assumptions including mortality rates, termination rates, retirement rates, and the salary scale effective January 1, 2016 and detailed throughout this appendix. A complete listing of the assumption changes effective with this valuation can be located in Cheiron's report entitled "Experience Study Results" dated July 14, 2015.