Pennsylvania Public School Employees' Retirement System

June 30, 2017 Actuarial Valuation

Board Presentation

December 8, 2017

Conduent Human Resource Services
Retirement Consulting

Disclosures

The information contained herein is developed for the Board of Trustees and Staff of the Pennsylvania Public School Employees' Retirement System (PSERS) by Conduent HR Services (Conduent) using actuarial principles and techniques in accordance with all applicable Actuarial Standards of Practice (ASOPs). This document provides key results of the June 30, 2017 actuarial valuation. Interested parties may refer to the full June 30, 2017 Actuary's Report, which is scheduled to be released in January 2018, for a detailed explanation regarding data, assumptions, methods, and plan provisions that underlie the valuation results. In the interim, interested parties may refer to the full Actuary's Report on the June 30, 2016 actuarial valuation for a detailed explanation regarding assumptions, methods and plan provisions that underlie the valuation.

The material contained herein is based on census and financial data, actuarial assumptions and methods, and plan provisions applicable to the June 30, 2017 actuarial valuation of PSERS. Where presented, historical information is based on the parameters of the corresponding actuarial valuation. No third party recipient of Conduent's work product should rely upon Conduent's work product absent involvement of Conduent or without our approval.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. An analysis of the potential range of future results is beyond the scope of this valuation.

Where presented, references to "funded ratio" and "unfunded accrued liability" are to measurements made on the basis of the actuarial value of assets. It should be noted that the same measurements made using the market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratios presented are appropriate for evaluating the need for and level of future contributions but provide no indication of the funded status of the plan if the plan were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

David L. Driscoll is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. Edward Quinn and Salvador Nakar are Members of the American Academy of Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. We are available to answer any questions on the material contained herein, or to provide explanations or further details as may be appropriate.

Agenda

- Overview of 2016 - 2017 fiscal year
- Report on June 30, 2017 valuation results

Overview of 2016/2017 Fiscal Year

- The time-weighted rate of return on the market value of assets was 10.14% *(per Aon Hewitt)*
  - Expected return for the period July 1, 2016 to June 30, 2017 was 7.25%
  - Due to the asset smoothing method approach in use for determining the Actuarial Value of Assets (AVA), the AVA rate of return for the year was approximately 3%, which reflects continued recognition of past asset losses

- The Act 120 minimum employer pension contribution rate is the employer normal cost rate

- Act 5 of 2017 was passed in June of 2017. Effective immediately, Class TE and Class TF members are eligible to elect a cost neutral Option 4 lump sum distribution at retirement. In addition, the actuarial value of assets is constrained to be no less than 70% and no more than 130% of the market value of assets. Both of these provisions have been reflected in the June 30, 2017 valuation of the System.

- The proportion of eligible participants who are assumed to elect Premium Assistance coverage remained at 63% for determination of the Premium Assistance contribution rate.

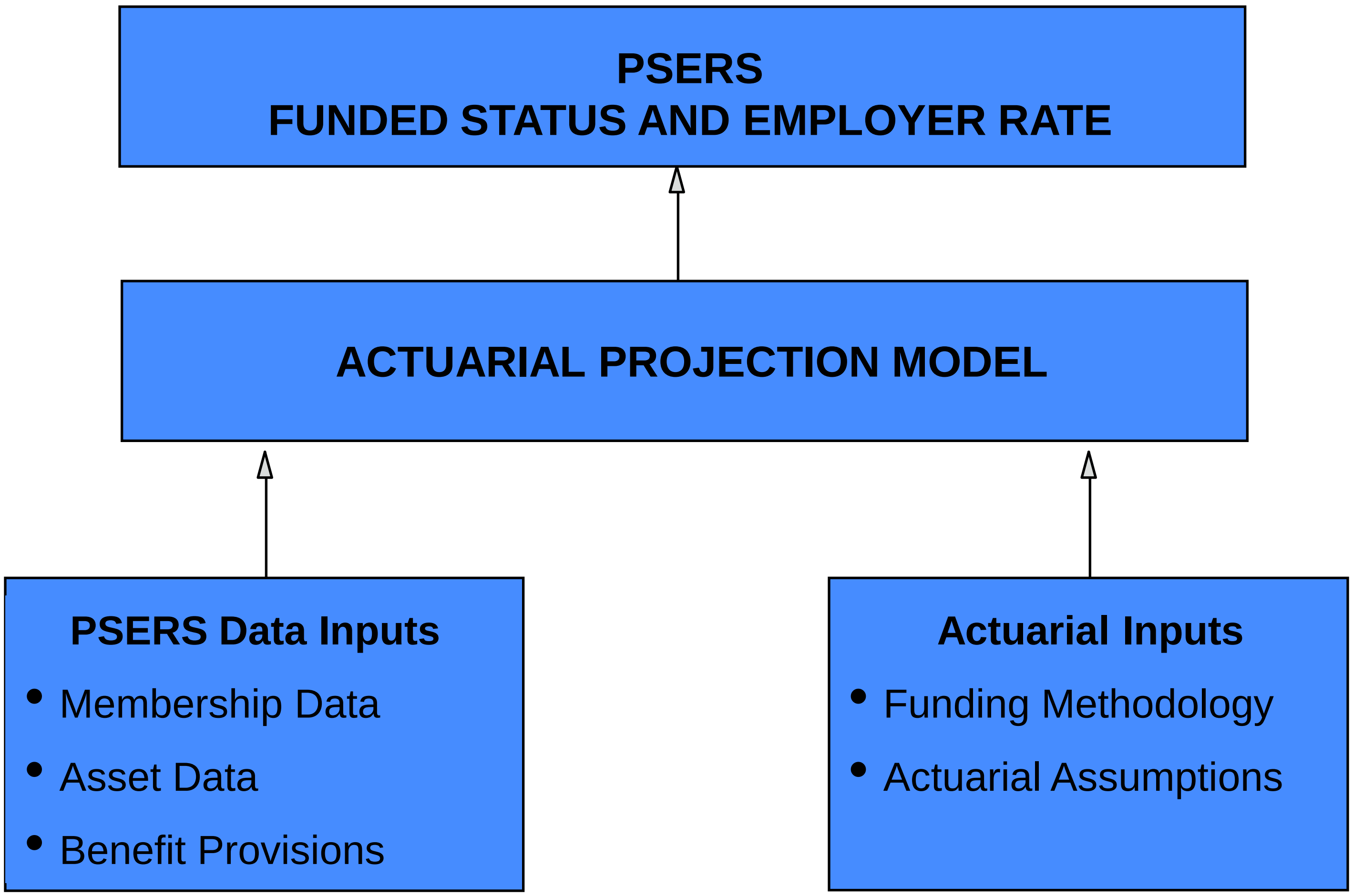
Results of Actuarial Valuation

- Employer contribution rate
  - The fiscal year 2018/2019 actuarially required employer contribution rate is 33.43%
    - 32.60% Pension plus 0.83% Premium Assistance
  - The Act 120 minimum employer pension rate is the normal cost rate of 7.59%
  - The fiscal year 2017/2018 actuarially required employer contribution rate is 32.57%
    - 31.74% Pension plus 0.83% Premium Assistance

Results of Actuarial Valuation

- Security of promised benefits
  - Accrued liability exceeds actuarial value of assets by $44.5 billion
  - Funded status based on the System's actuarial value of assets is 56.3%
    - Funded status as of June 30, 2016 based on the System's actuarial value of assets was 57.3%
    - The above funded ratios have no relationship to the possible funded position on a settlement-of-liabilities basis.

- Net actuarial (gain) or loss
  - Comparison of actual experience to expected
  - Experience loss for fiscal year ended June 30, 2017 is $1.434 billion
    - Actuarial asset loss of $2.405 billion
    - Actuarial liability gain of ($0.971) billion
  - Act 5 liability gain of ($0.007) billion
  - The fiscal year 2017 actuarially required employer contribution rate was made. There was no actuarial experience due to (over)/under-contribution.


PSERS
FUNDED STATUS AND EMPLOYER RATE
ACTUARIAL PROJECTION MODEL
PSERS Data Inputs
• Membership Data
• Asset Data
• Benefit Provisions
Actuarial Inputs
• Funding Methodology
• Actuarial Assumptions

Active Membership Statistics

Item	June 2017		June 2016
Class T - C	3,447		3,682
Class T - D	184,831		195,477
Class T - E	56,453		48,628
Class T - F	11,214		9,293
Total Number	255,945		257,080
	-0.44	%	
Annualized salaries	$ 13.034	Bil	$ 12.851 Bil
(Total salaries)	+1.42	%	
Average compensation	$ 50,924		$ 49,989
	+1.87	%	
Average age	45.2	Yrs.	45.1 Yrs.
Average service	11.4	Yrs.	11.3 Yrs.
Funding year	2018-2019		2017-2018
Appropriation payroll (est.)	$ 13.775	Billion	$ 13.449 Billion

Annuitant Membership Statistics

Item	June 2017	June 2016
Number		
Annuitants	209,715	204,843
Survivors and beneficiaries*	11,128	10,809
Disabled annuitants	9,171	9,176
Total	230,014	224,828
	2.31 %	
Annual annuities		
Annuitants	$ 5.479 Bil	$ 5.342 Bil
Survivors and beneficiaries	0.156 Bil	0.146 Bil
Disabled annuitants	0.181 Bil	0.178 Bil
Total	$ 5.816 Bil	$ 5.666 Bil
	2.65 %	
Average annuities		
Annuitants	$ 26,128	$ 26,081
Survivors and beneficiaries	$ 14,019	$ 13,543
Disabled annuitants	$ 19,740	$ 19,350
Total	$ 25,287	$ 25,203
	0.33 %	

* Excludes 2,141 beneficiaries in 2017 and 1,181 beneficiaries in 2016 who are only entitled to a lump sum distribution.

Market Value of Assets

Item	June 2017	June 2016
Beginning of year	$ 49.957 Bil	$ 51.706 Bil
Contributions	4.958	4.292
Benefits	(6.584)	(6.469)
Investment income	4.948	0.428
End of year	$ 53,279 Bil	$ 49.957 Bil
Rate of return	10.14 % *(per Aon Hewitt)*	1.29 % *(per Aon Hewitt)*
Expected rate of return*	7.25 %	7.50 %

* Based on prior year's valuation interest rate

Actuarial Value of Assets
Ten-year asset smoothing method

1. Market value of assets June 30, 2017 — $ 53.279 Bil
2. Determination of deferred gain (loss)

Fiscal Year	Gain (Loss)	Recognized Amount – FY16/17	Percent Deferred	Deferred Amount
2016/2017	$ 0.847 Bil	$ 0.085 Bil	90.00 %	$ 0.762 Bil
2015/2016	(3.794)	(0.379)	80.00	(3.035)
2014/2015	(2.918)	(0.292)	70.00	(2.043)
2013/2014	2.864	0.286	60.00	1.718
2012/2013	(0.153)	(0.015)	50.00	(0.076)
2011/2012	(3.246)	(0.325)	40.00	(1.298)
2010/2011	4.598	0.460	30.00	1.379
2009/2010	1.449	0.145	20.00	0.290
2008/2009	(21.138)	(1.879)	8.89	(1.879)
2007/2008	(6.545)	(0.491)	0.00	0.000
	$ (21.491) Bil	$ (2.405) Bil		$ (4.182) Bil

3. Preliminary actuarial value of assets 6/30/2017: (1) – (2) — $ 57.461 Bil

Actuarial Value of Assets
Ten-year asset smoothing method

Per Act 5 of 2017, the Actuarial Value of Assets must be in a 30% range of the Market Value of Assets:

1. Preliminary Actuarial Value of Assets = $57.461 Billion
2. 70% of the Market Value of Assets = .70 x $53.279 Billion = $37.295 Billion
3. 130% of the Market Value of Assets = 1.30 x $53.279 Billion = $69.263 Billion
4. Actuarial Value of Assets = (1) not less than (2) nor greater than (3) = $57.461 Billion

<u>Notes:</u>

- The 30% corridor limits how far the 10-year asset smoothing method can depart from market value of assets.

- The corridor will (decrease)/increase the unfunded accrued liability contribution rate if the actuarial value of assets is (less than 70%)/greater than 130% of the market value of assets.

Actuarial Cost Method

- PSERS Cost Method
  - Entry Age Normal
  - Required by Code
- Entry age normal method: allocation of reserve over members' working lifetimes
  - Pension benefit earned during year (normal cost)
  - Payment toward unfunded accrued liability
- Goal: full reserve at retirement

Accrued Liability

	June 2017	June 2016
Annuitants and Inactives	$ 58.129 Billion	$ 57.144 Billion
Active members	43.720	42.845
Accrued Liability Pension	$ 101.849	$ 99.989
Health care payments	0.124	0.125
Total Accrued liability	$ 101.973 Billion	$ 100.114 Billion

Unfunded Accrued Liability and Funded Status

Item	June 2017	June 2016
Accrued Liability Pension	$101.849 Bil	$99.898 Bil
Healthcare Payments	0.124	0.125
Total Accrued liability	$101.973 Bil	$100.114 Bil
Assets		
Market value of assets	$53.279 Bil	$49.957 Bil
Actuarial value of assets	$57.461 Bil	$57.390 Bil
Unfunded accrued liability		
Market value of assets*	$48.694 Bil	$50.157 Bil
Actuarial value of assets**	$44.512 Bil	$42.724 Bil
Funded status		
Market value of assets	52.2%	49.9%
Actuarial value of assets	56.3%	57.3%

* Similar to GASB 67 Net Pension Liability.

** Act 120 amortization is over a period of 24 years with amounts increasing as a level percent of compensation.

Employer Contribution Rate

Item	June 2017 (FY18/19)	June 2016 (FY17/18)
Normal cost rate	15.16%	15.24%
Member rate (average)	(7.57)	(7.54)
Employer normal cost rate	7.59%	7.70%
Unfunded accrued liability rate	25.01	24.04
Preliminary pension rate	32.60%	31.74%
Act 120 minimum pension rate (employer normal cost rate)	7.59%	7.70%
Final pension rate	32.60%	31.74%
Health insurance rate	0.83	0.83
Total	33.43%	32.57%

Note: The total employer contribution rate is pension rate plus the health insurance rate.

Funding Methodology

Goal - Full Reserve at Retirement

Benefit	Annual Cost	Rate Component
Projected Retirement Benefit	Level % Pay	Normal Cost Rate
Accrued Benefit:		
(1) Unfunded accrued liability as of the June 30, 2010 valuation	24-Year Amortization Level % Pay	Accrued Liability Rate
(2) Legislation which increase liability (e.g. COLAs or ERI windows)	10-Year Amortization Level % Pay	Supplemental Liability Rate
(3) Actuarial Gains and Losses and Assumption Changes	24-Year Amortization Level % Pay	Experience Adjustment Factor

Unfunded Accrued Liability Rate

Rate Component	June 2017 (FY18/19)	June 2016 (FY17/18)
Accrued liability rate	10.75%	10.64%
Supplemental liability rate	0.00	0.00
Experience adjustment factor	14.26	13.40
Unfunded accrued liability rate	25.01%	24.04%

2017 Net Actuarial Loss

1.	Investment return loss[1]	$	2,405 Mil
	Experience (gains) and losses		
	- New entrants and pickups		290
	- Individual salary increases		(486)
	- Mortality		(77)
	- Terminations (retirement/disability/terminations)		(127)
	- FY2017 retiree form of payment data update[2]		(156)
	- Data/misc		(415)
	- Total	$	(971) Mil
2.	Net actuarial experience loss: (1) + (2)	$	1,434 Mil

[1]3.00% actuarial rate of return vs. 7.25% expected. Actuarial rate of return based on 10 year averaging of (gains)/losses.
[2]PSERS Staff updated the data as of June 30, 2017 to reflect contingent beneficiaries who had predeceased the member and member had elected a Joint and Survivor Option.

Health Insurance Account 2018/2019 Employer Rate

Estimated number of eligible annuitants in FY 2019/2020		152,800
Estimated number of eligible annuitants who elect coverage		96,264
1. Estimated balance at 6/30/2018	$	120.3 Mil
2. Disbursements FY 2018/2019	$	116.1
3. Disbursements FY 2019/2020	$	117.5
4. Required contribution: (2) + (3) – (1)	$	113.3
5. FY 2018/2019 membership payroll	$	13,775 Mil
6. Health insurance employer rate: (4) ÷ (5) (rounded up)		0.83%

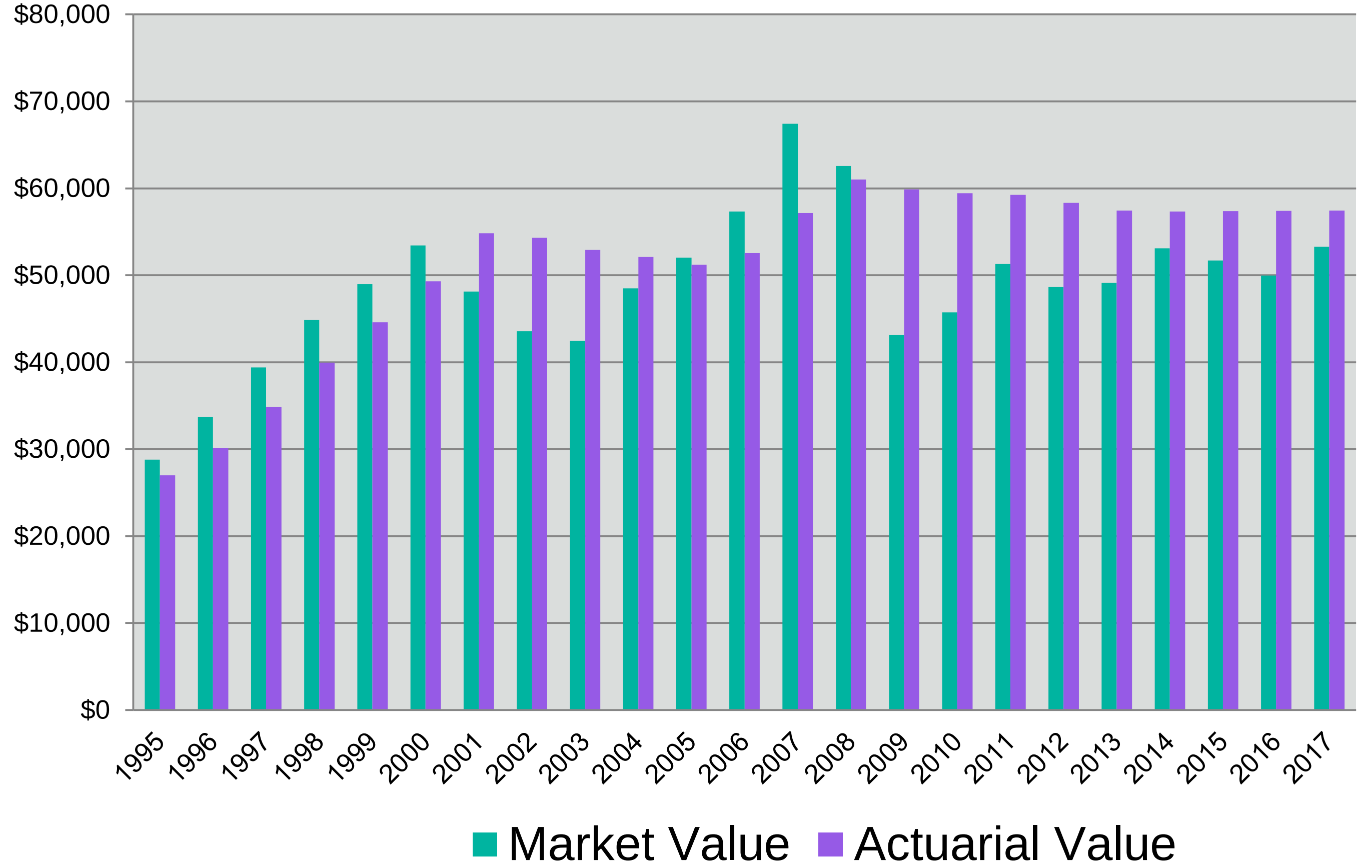
Notes:

63% of eligible annuitants are assumed to elect coverage. This is the same assumption used in the prior valuation.

Actuarial Accrued Liability disclosed under GASB 74 as of June 30, 2017 is $2,161 million, based on a discount rate of 3.13%.

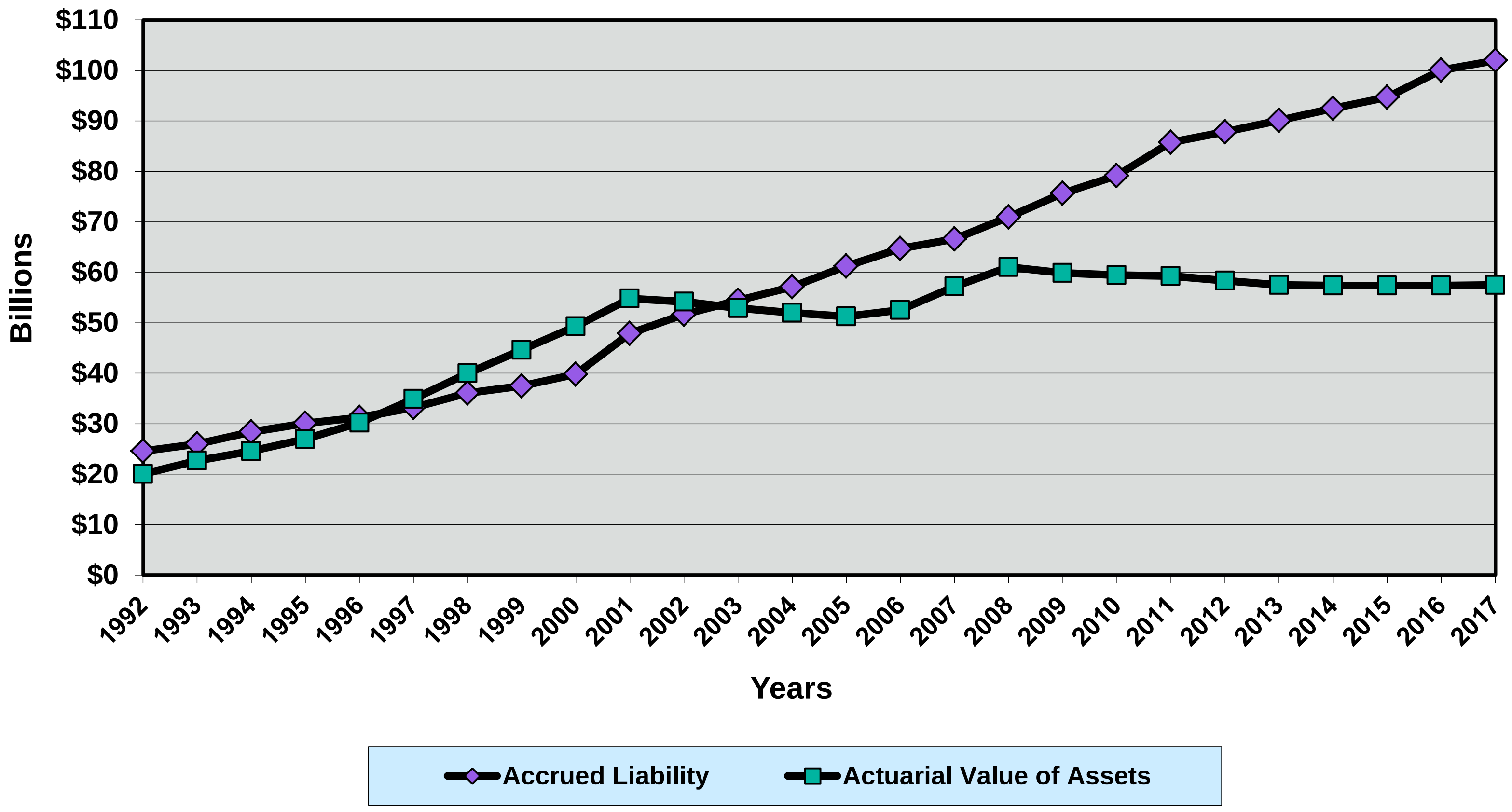
Appendices

Comparison of Asset Values ($ Millions)



Note: Beginning with the 2010 valuation, the actuarial value of assets reflects the 10-year asset smoothing method enacted by Act 120.

Accrued Liability and Actuarial Value of Assets: 1992 - 2017



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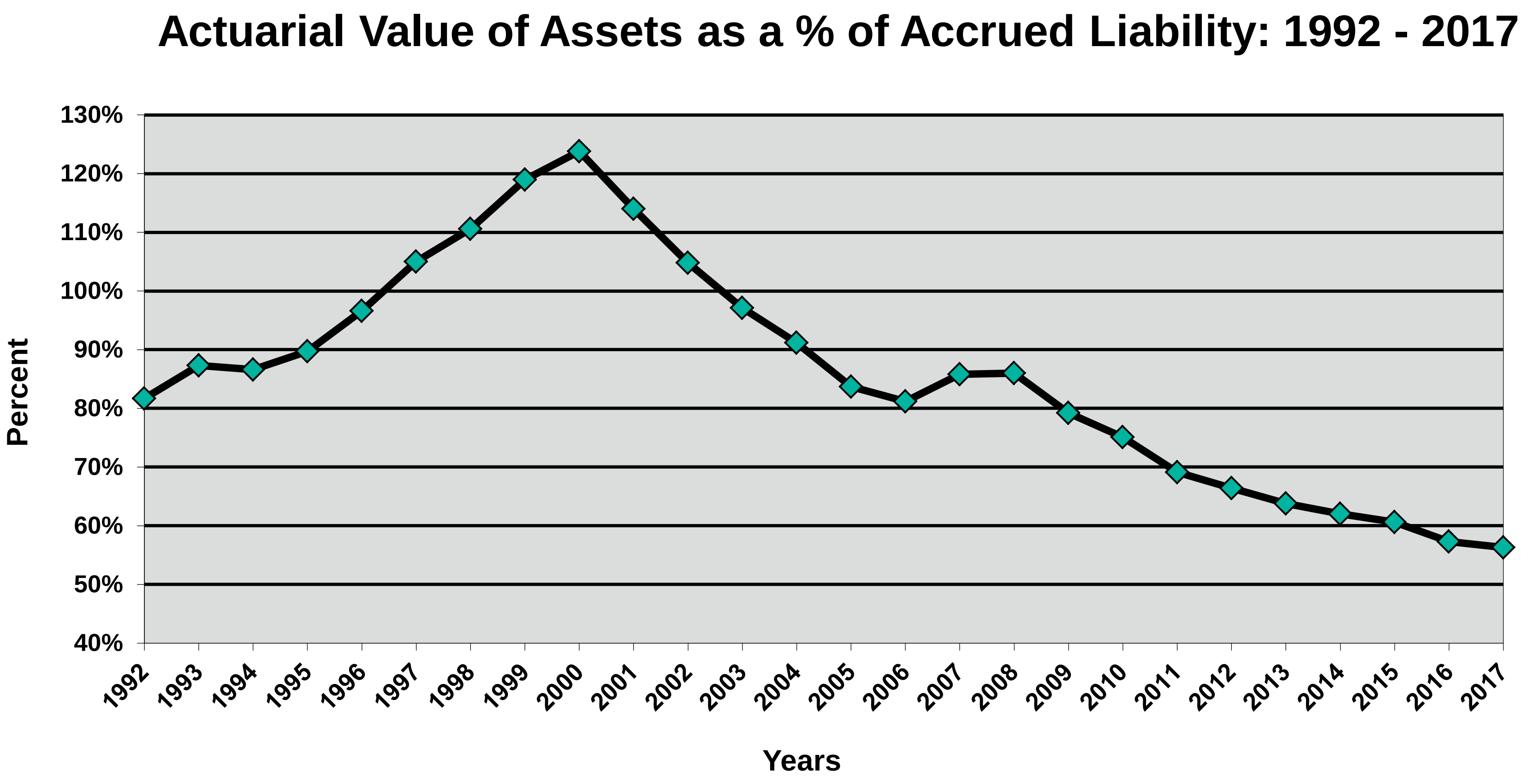
Financial Position Funded Status



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Total Contribution Rate

Fiscal Year	Normal Cost	Unfunded Accrued Liability	Health Care Contribution	Total Employer	Member Contribution (Average)*	Total Contribution Rate
18/19	7.59%	25.01%	.83%	33.43%	7.57%	41.00%
17/18	7.70	24.04	.83	32.57	7.54	40.11
16/17	8.31	20.89	.83	30.03	7.52	37.55
15/16	8.38	19.44	.84	25.84**	7.49	33.33
14/15	8.46	17.51	.90	21.40**	7.46	28.86
13/14	8.57	15.25	.93	16.93**	7.43	24.36
12/13	8.66	12.99	.86	12.36**	7.40	19.76
11/12	8.12	10.15	.65	8.65**	7.37	16.02
10/11	8.08	(0.50)	.64	5.64***	7.34	12.98
09/10	7.35	(3.72)	.78	4.78	7.32	12.10
08/09	6.68	(3.37)	.76	4.76	7.29	12.05
07/08	6.68	(.24)	.69	7.13	7.25	14.38
06/07	6.62	(.95)	.74	6.46	7.21	13.67
05/06	7.61	(4.28)	.69	4.69	7.16	11.85
04/05	7.48	(7.10)	.23	4.23	7.12	11.35
03/04	7.25	(4.27)	.79	3.77	7.08	10.85
02/03	7.20	(10.03)	.97	1.15	7.10	8.25
01/02	5.63	(6.05)	1.09	1.09	6.43	7.52
00/01	6.29	(4.65)	.30	1.94	5.77	7.71
99/00	6.40	(2.04)	.25	4.61	5.72	10.33
98/99	6.33	(.44)	.15	6.04	5.69	11.73
97/98	6.44	2.17	.15	8.76	5.65	14.41

* Act 9 member rate change took effect January 1, 2002.

** Act 120 limited the employer pension contribution of 27.82% to 25.00% for Fiscal Year 15/16 (prior rate of 20.50% + 4.50% collar), 25.97% to 20.50% for Fiscal Year 14/15 (prior rate of 16.00% + 4.50% collar), 23.82% to 16.00% for Fiscal Year 13/14 (prior rate of 11.50% + 4.50% collar), 21.65% to 11.50% for Fiscal Year 12/13 (prior rate of 8.00% + 3.50% collar) and18.27% to 8.00% for Fiscal Year 11/12 (prior rate of 5.00% + 3.00% collar).

*** Act 46 reduced the employer pension contribution from 7.58% to 5.00% for Fiscal Year 10/11.

30-Year History of Member and Employer Contribution Rates

Notes:

* Act 46 reduced the employer pension contribution from 7.58% to 5.00% for Fiscal Year 10/11.

** Act 120 limited the employer pension contribution of 27.82% to 25.00% for Fiscal Year 15/16 (prior rate of 20.50% + 4.50 collar), 25.97% to 20.50% for Fiscal Year 14/15 (prior rate of 16.00% + 4.50% collar), 23.82% to 16.00% for Fiscal Year 13/14 (prior rate of 11.50% + 4.50% collar), 21.65% to 11.50% for Fiscal Year 12/13 (prior rate of 8.00% + 3.50% collar) and 18.27% to 8.00% for Fiscal Year 11/12 (prior rate of 5.00% + 3.00% collar).

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