

2016 State Pension Update: New Accounting, Old Challenges

Special Report

Updated State Liability Metrics: Based on states' 2015 financial reports, Fitch calculates that the median combined burden of states' long-term debt and pensions measured 5.1% of 2015 personal income. Median net tax-supported debt measured 2.4% of personal income, while median net pension liabilities (NPLs), adjusted by Fitch to reflect a 7% return assumption, measured 2.1% of personal income. The median NPL burden, based on the new, more consistent GASB Statement No. 68 (GASB 68) disclosure, is below pension metrics calculated from past state disclosure.

Some States Offloading Pension Burdens: Under the new GASB reporting, some states are offloading certain pension liabilities to K-12 schools or higher education institutions that were formerly reflected as state obligations. For state-subsidized pensions, GASB 68 outlines a more consistent accounting method for allocating NPLs to states. The new accounting leaves unchanged the often much broader role states play overseeing and supporting the pension burden of public entities outside of direct state government.

Market Values Affecting Metrics: Numerous other factors are affecting state-reported pensions as of the GASB 68 transition. Identification of depletion dates and use of consistent valuation methods are raising the reported NPL for some state-reported systems. Reporting pension assets at fair market, instead of smoothed value, is lowering the NPL for many other state-reported systems as unrecognized gains up through their 2014 measurement dates are absorbed.

Near-Term Volatility the Norm: State pension metrics derived from the new GASB data will be more volatile based on yearly market value changes. Despite this characteristic, Fitch believes the new data should provide far better comparability relative to the funding figures formerly available from states. Fitch expects no rating changes from the transition to the new accounting, as the magnitude and growth over time of the liability and associated carrying costs continue to drive Fitch's assessment of pension risks.

Funding and Market Ratios Diverge: Based on 2015 pension system disclosure, with data one year ahead of most states' financial reports, funded ratios in 2015 showed continued gains to a median of 73.1% from 70.7% in 2014. Most systems have now fully recognized past recessionary losses under their asset smoothing policies. In contrast, replacing systems' actuarial values in these ratios with market values revealed a notable decline to 72.3% in 2015 from 76.2% in 2014.

Difficult Investment and Demographic Context: Low returns and weakening demographics will exert upward pressure on system liabilities over time. Although the average investment return assumption, at 7.66% in 2015, has steadily fallen from 8% in 2008, Fitch continues to believe these levels are high given the likely persistence of low interest and inflation rates. Rising retiree numbers highlight the continued erosion of pension demographics, further pressuring liabilities while increasing contribution demands on governments.

Actuarial Contributions Rising: Consistent with recent past years, pension systems in 2015 received higher shares of their actuarially determined employer contributions (ADECs). While beneficial, stronger contribution trends highlight that current funding practices often make amortization of the unfunded liability unlikely, given back-loaded amortization and unrealistically high return assumptions.

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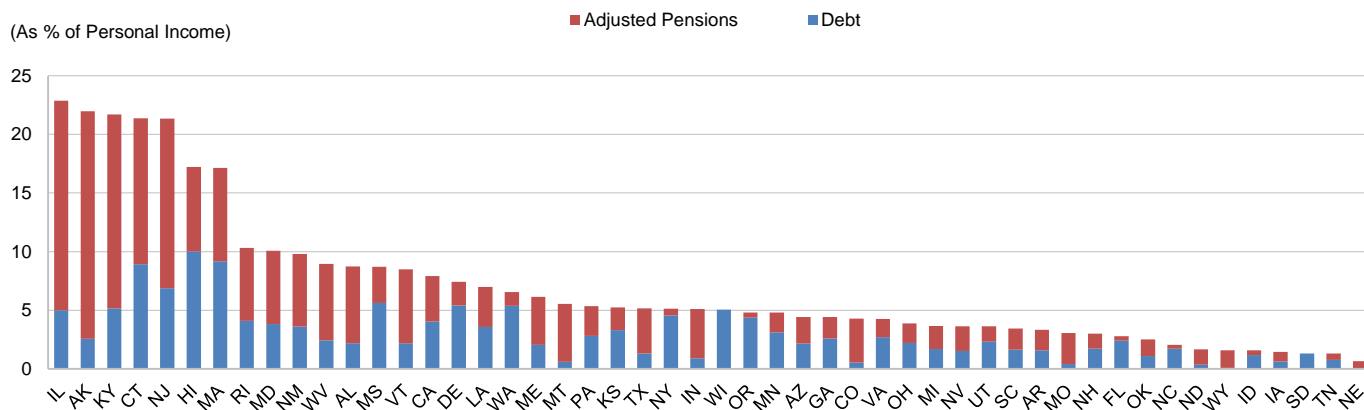
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GASB Transition Affecting State Metrics

The first part of this report provides Fitch's annual update of states' long-term liability metrics. Based on recent data, states' long-term liability burdens remain moderate relative to resources. On a combined basis, the median burden of net tax-supported debt and adjusted NPLs equaled 5.1% of 2015 personal income. Illinois carried the highest liability burden at 22.9%, while Nebraska carried the lowest at 0.6%. States' median debt totaled 2.4% of personal income, while their median Fitch-adjusted NPL totaled 2.1% of personal income (see Appendix A).

Net Tax-Supported Debt and Adjusted Pensions



Source: Fitch's calculations based on state comprehensive annual financial reports, bond disclosures and U.S. Bureau of Economic Analysis data.

To enhance comparability, Fitch continues to adjust the reported gross pension liability (total pension liability [TPL] under the new accounting framework) upward to reflect a 7% discount rate for the vast majority of systems that assume a discount rate higher than 7%. For systems using a discount rate of 7% or lower, including those reporting a depletion date and applying a lower single equivalent discount rate under the new requirements, Fitch leaves the TPL unadjusted. After netting the reported assets for each system disclosed by the state, the adjusted NPL is summed across all reported systems, large and small.

In assessing long-term liability burden, as detailed in Fitch's "U.S. Tax-Supported Rating Criteria" report, Fitch combines each state's outstanding direct debt with its total pension obligations, adjusted to reflect a 7% discount rate for most systems and net of assets set aside to pay for accrued benefits. This figure is measured as a percentage of personal income, reflecting the economic resource base supporting the liability. Both bonded debt and pensions constitute a claim on future resources, and hence, Fitch views them as equivalent obligations. Fitch's metrics for net tax-supported debt are based on each state's most recent debt disclosure and for pensions rely on year-end audited financial statements (fiscal 2015 for most).

Of note, GASB 68 was effective for fiscal years beginning after June 15, 2014, and thus, all states implemented GASB 68 as of their fiscal 2015 comprehensive annual financial reports (CAFRs), except New York, which implemented it as of its fiscal year ended March 31, 2016. Only Alabama has yet to release a 2015 CAFR reflecting the new statement.

Metrics Updated for GASB 68

With this update, Fitch has transitioned to using GASB 68 accounting valuation data as reported in states' CAFRs as its primary source for calculating each state's pension liability burden, instead of using the funding valuation data formerly provided by states in CAFRs, pension system reports or bond documents. Fitch will continue to adjust the reported pension data to reflect a 7% return assumption, as detailed at left.

Given the risks inherent in these complex and variable long-term liabilities, Fitch will continue to review disclosure beyond states' CAFRs to better understand pension credit risks. Other disclosure includes system CAFRs, the funding valuations used to calculate and assess contribution needs and bond disclosures, which often provide insight into how states view their obligations. Pension information continues to evolve, and as it does, Fitch will evaluate and integrate newly available data into its assessment of credit risk.

Related Criteria

[U.S. Tax-Supported Rating Criteria](#)
(April 2016)

Under GASB 67 and 68, the NPL figure that has replaced the unfunded actuarial accrued liability (UAAL) derives from an accounting valuation that is more consistently calculated, which, in Fitch's view, enhances comparability relative to the disparate actuarial approaches captured in funding valuation data. The total pension liability (TPL) is based on a single actuarial cost method (entry age normal), changes to the TPL are recognized in a consistent manner, assets accumulated for benefits — the fiduciary net position (FNP) — are reported at fair market value rather than smoothed, and allocations of the NPL among participating governments for cost-sharing multi-employer (CSME) systems are reasonably consistent.

The median NPL burden reported by states under GASB 68, at 2.1% of personal income, is materially lower than the median unfunded pension liability burden calculated by Fitch in the past, at 3.7% as of Fitch's "2015 State Pension Update," published in October 2015. The lower median burden is due primarily to the GASB 68 accounting changes, discussed in more detail below. Most states' metrics and rankings changed modestly compared to the past, but for several states, the accounting changes have led to significant decreases in reported liabilities (or increases among a handful states).

10 Largest State Pension Metric Changes

(As % of Personal Income)

| State | 2015 Report (%) | 2016 Report (%) | Change (%) | Factor Contributing to Allocation Change |
|----------------|-----------------|-----------------|------------|--|
| Alaska | 11.2 | 19.4 | 8.2 | The state has assumed the NPL associated with actuarially derived subsidies for local schools and governments. |
| New Jersey | 9.4 | 14.5 | 5.1 | Depletion dates have been identified, and single-equivalent discount rates are used to calculate the TPL. |
| South Carolina | 3.9 | 1.8 | (2.1) | The NPL associated with component units, including higher education, have been excluded. |
| West Virginia | 8.9 | 6.5 | (2.4) | Fair market values as of the measurement date are well above smoothed actuarial values as of funding valuation date. |
| Oklahoma | 4.6 | 1.4 | (3.2) | Portions of state contributions are from fixed shares of tax revenues, not actuarially derived contributions. |
| Mississippi | 7.1 | 3.1 | (4.0) | The NPL associated with component units, including higher education, and K-12 schools have been excluded. |
| Pennsylvania | 6.5 | 2.5 | (4.0) | The state subsidy for local school pensions is provided to school districts, rather than directly to the pension system. |
| Hawaii | 11.5 | 7.2 | (4.3) | The NPL associated with component units, including higher education, have been excluded. |
| Kansas | 6.3 | 1.9 | (4.4) | The state views schools as carrying pension liability despite historically appropriating contributions for school pensions. |
| Louisiana | 12.4 | 3.4 | (9.0) | The state reports only small shares of teacher and school employee system liabilities, although it constitutionally guarantees the benefits. |

Some States Shed K–12 and University Liabilities

Two factors contributing to the lower state pension metrics under 2015 CAFRs are how states have recognized liabilities associated with subsidized local pensions, typically for K–12 teachers, and for state component units, typically state universities. These changes are the largest single driver of state pension metric changes compared to how Fitch calculated these numbers in the past, but they disproportionately affect a limited number of the states that sponsor multi-employer systems.

To varying degrees, states often play an active role in the pension systems that cover workers at the local level, particularly school teachers. This includes governance, determining benefits and contributions, and subsidizing some or all contributions. Because pension benefits are

provided as part of a compensation package, the new GASB statements generally view them as a direct responsibility of the employer, even if subsidized by another level of government.

Certain circumstances can trigger a shift of some or all of a local employer's NPL to the state, called a "special funding situation" (SFS). Generally, a SFS arises when a state has a legal obligation to pay some or all of the pension contribution for a local employer, that contribution is made directly to the system rather than indirectly through the employer first, and the contribution is either actuarially derived (i.e. a percentage of payroll) or paid primarily by the state. Nearly 20 states report NPL amounts associated with a SFS, but numerous other states that contribute to local pension systems do not.

In the past, Fitch calculated its state allocations by relying on states' varying approaches for representing their local pension responsibilities. Some reflected explicit portions of multi-employer system obligations or contributions in their CAFRs, much like under the new accounting standard. Others noted more general responsibility for certain local pensions, especially for K-12 schools, reflecting the state's dominant funding role, legislative authorization for the pension or central control over benefits and contributions in the state CAFR, pension CAFR, funding valuation or in bond documents.

Under the new accounting approach, states may retain extensive responsibility, including funding, for local pensions, but this responsibility does not extend to carrying the liability. For example, pensions of K-12 teachers supported within a broader education funding formula, rather than direct system contribution, or local pensions supported through specific tax allocations do not trigger a SFS for the state.

For pension liabilities of component units — legally separate but fiscally linked entities such as higher education systems — Fitch views the disclosure choices made by states in their CAFR notes as reflecting whether states view their pensions as direct state obligations. The notes and required supplementary information (RSI) sections of CAFRs consistently provide detailed pension information on the primary government, including for SFS. However, this information is frequently more limited for component units, particularly those that issue separately audited financial statements. With implementation of the new standard, several states have excluded pensions associated with higher education institutions or other component units, and Fitch's metric is reflecting these changes.

Metrics Exposed to Market Fluctuations

Another factor driving lower pension burdens is higher asset values reported under GASB 68 as of the transition date. The new standard requires that pension-related assets be reported at their fair market value on a "measurement date," generally one year before the fiscal year-end date for most states under GASB 68, rather than at smoothed values, reflecting each system's policy for lagged recognition of gains and losses. Given several years of robust asset value gains earlier in the current economic recovery, many systems had carried significant unrecognized asset gains that have now been fully incorporated with implementation of the new pension standard.

States' fiscal 2015 financial statements are usually based on a 2014 measurement date; in four of the five years through 2014, asset returns were ahead of systems' own investment return assumptions. For systems measured in this report, the average market value gain for the five-year period through 2014 as measured by Fitch was 9.1%, even as target investment return assumptions fell over that period from an average of nearly 8%, to 7.7% by 2014.

More recent experience underscores the fact that the NPL and Fitch's metric for state pensions will display far greater volatility relative to the funding valuation figures used in the past. Fitch cautions that asset returns have been significantly weaker since 2014, a factor that is likely to

push most systems' NPL higher over the next two years as data from the 2015 and 2016 measurement dates are incorporated into state financial reports. For 2015, the market values rose an average of 0.3%, compared to an average 7.66% investment return assumption in that year, and system results for 2016 investment performance announced to date likewise suggest returns well below target levels.

Other Factors Influencing New Figures

Numerous other actuarial and accounting factors have contributed to the changing metrics for many states. GASB identified specific criteria for including certain benefits in the accounting valuation, such as ad-hoc cost-of-living adjustments (COLAs). If such provisions were not captured in past funding valuations, the NPL figure reported under GASB 67 and 68 can be materially higher.

A handful of major statewide systems have reported depletion dates under GASB 68, under which the present value of future benefits must be discounted based on a more conservative single equivalent discount rate (SEIR). The resulting TPL and NPL are typically significantly higher under their accounting valuation than the parallel funding valuation would report.

Pensions Gain, but Fundamentals Unchanged

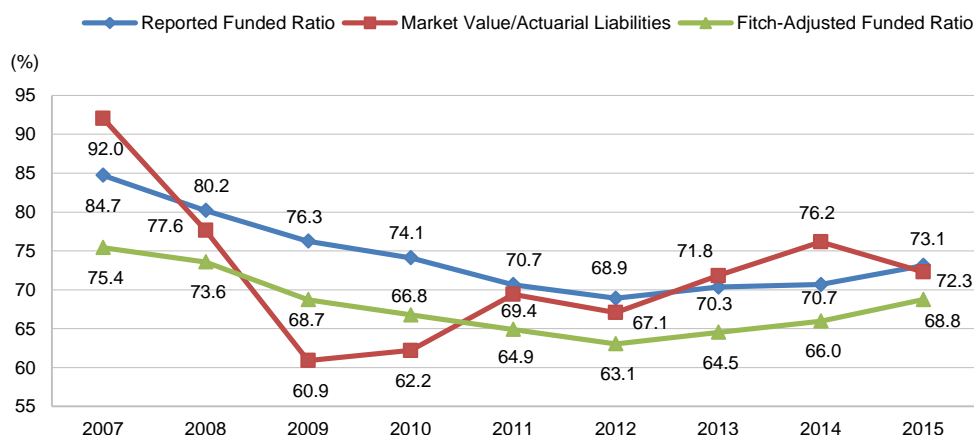
The remainder of this report provides a snapshot of the current condition of major statewide pension systems as a whole and the trends affecting their longer term sustainability as of their 2015 CAFRs and their most recent funding valuations. Continuing a trend in place since 2011, the funded condition of most major systems has stabilized since the severe investment losses experienced in the last downturn.

However, the outlook for pensions remains uncertain, with volatile asset performance, a historically low interest rate environment that suppresses returns and encourages riskier portfolio allocations, rising contribution demands and eroding demographic profiles continuing to pose questions for longer term sustainability for some. Many statewide systems remain well-positioned relative to these uncertainties, particularly those with higher asset positions relative to pension obligations, as well as those with a history of making contribution and benefit adjustments. Nevertheless, other systems have been slower to adjust, resulting in rising liabilities and higher contribution demands on participating governments.

Rising Funded Ratios

The funded status of major systems improved in 2015, with the median funded ratio (measuring actuarial value of assets over actuarial accrued liabilities) rising to 73.1% from 70.7% in 2014 (see *Appendix B*). From the post-recessionary low point of 68.9% in 2012, funded ratios grew only gradually as systems slowly absorbed past recessionary asset declines under their varying asset smoothing policies. For the most part, these losses have now been fully recognized, and thus, the stronger asset gains early in the economic recovery have had more of an impact on reported funded ratios.

Comparative Ratios of Assets to Liabilities



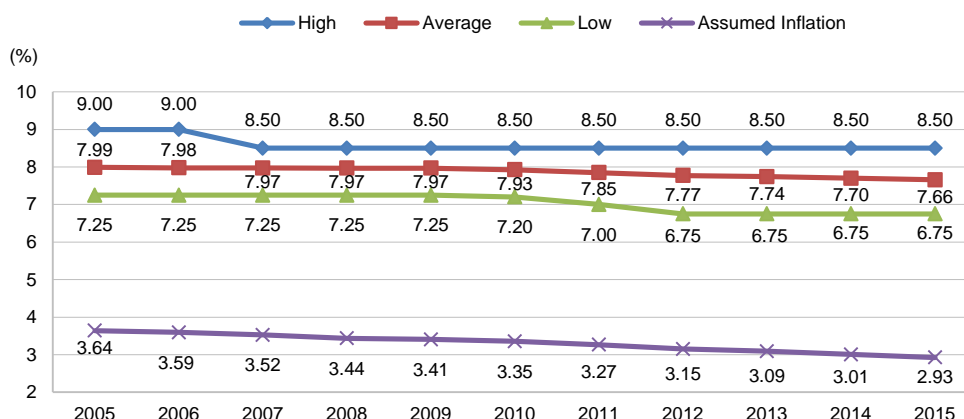
Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

Comparing the two parallel valuations — long-standing funding valuations and the newer accounting valuations required under GASB 67 — has yielded relatively similar results (see *Appendix C*). The median funded ratio for 2015 funding valuations was 73.1%, while the median ratio of FNP to TPL under GASB 67 accounting valuations was 73.4%. As adjusted by Fitch to reflect a more conservative 7% return assumption, the GASB 67 ratio fell to 66.7%. Despite the similar ratios reported under the two valuations, one key difference is that a handful of major statewide systems reported much lower GASB 67 ratios, based on forecast depletion dates and the resulting use of a SEIR, as noted. Over time, the GASB 67 ratio will exhibit significantly more volatility given the use of fair market value for reporting system assets.

Falling Investment Return Assumptions

One factor slowing the improvement of funded ratios is the lower investment return assumptions that pension systems have been incorporating into their valuations since the recession (see *Appendix C*). The median investment return assumption declined incrementally each year from 7.97% in 2008 to 7.66% as of 2015. Two-thirds of major statewide systems lowered their investment return assumptions over this period, and many systems have scheduled additional declines to take effect as of future valuation dates. Because state and local defined benefit pensions use the investment return assumption as the discount rate for calculating the present value of future benefits, the lower investment return assumption has pushed accrued liabilities higher.

Major Statewide Pensions' Investment Return Assumptions

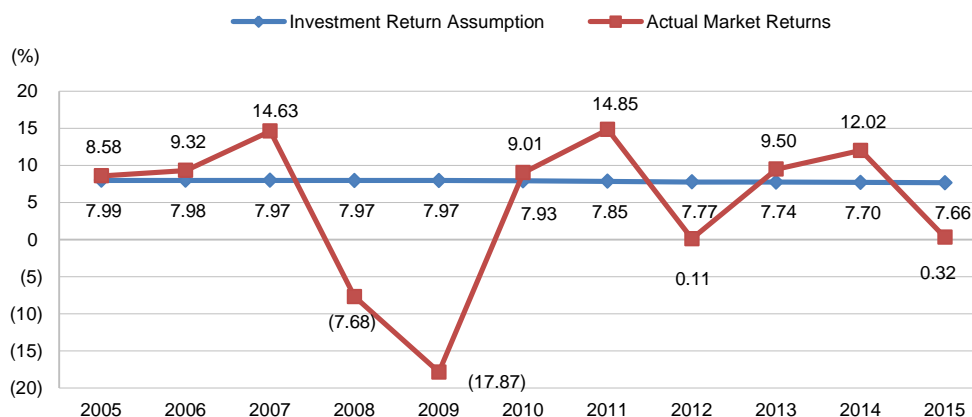


Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

Fitch views high investment return assumptions as being unrealistic, particularly in the context of volatile asset performance and historically low inflation and interest rates, and yet many systems persist with assumed returns of 8% annually or higher. In contrast to the 2015 funded ratio gain, major statewide systems' median market value ratios (measuring their market value of investments to accrued actuarial liabilities) fell to 72.3% in 2015 from 76.2% in 2014. Market volatility has driven ratio changes; median investments rose only 0.3% in 2015 after a 12% gain in 2014. Although actual 2016 portfolio performance is not widely available yet, the performance of major market indices and the actual investment values announced by some plans point to another weak year.

Recent volatility is not uncommon, particularly as pension portfolio managers have diversified into riskier asset classes in an effort to consistently attain average returns that were achievable from lower risk portfolios in past decades. Although past economic expansions included multiyear periods of returns well above assumptions, market values in the current economic expansion have been choppy, and Fitch views a return to consistently higher growth as unlikely in the near term.

Actual vs. Assumed Investment Returns

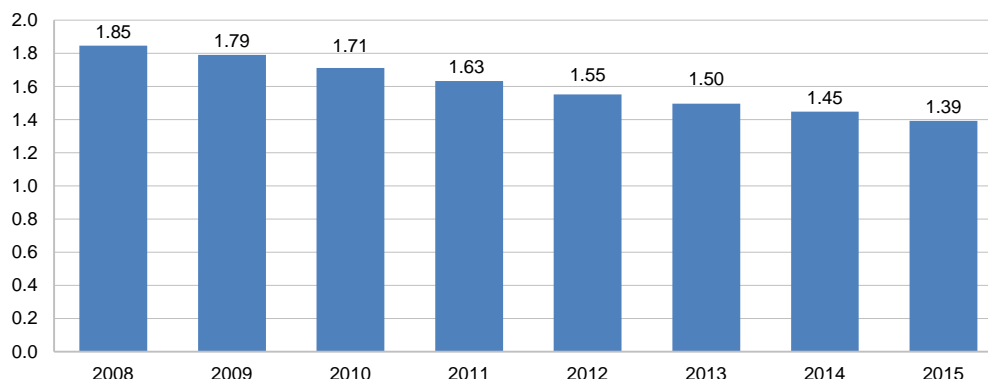


Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

Longer Term Demographic Challenges

The demographic profile of many major statewide pension systems continues to erode, a factor that will add to the uncertainties posed by weaker investment performance (*see Appendix D*). The median ratio of active employees to retirees has fallen steadily since the downturn, to 1.39 in 2015 from 1.85 in 2008, driven entirely by rising number of retirees, even as state and local employment has flattened. Though a longer term pressure, weaker demographic profiles can increase cash flow pressure on systems, particularly those with weaker funded ratios. Net cash outflows rise with longer lifespans and higher retirements, and more assets must be invested in shorter duration, more liquid securities, making achievement of high investment return assumptions more unrealistic, particularly in systems with lower ratios of assets to liabilities. For the roughly 85% of major statewide systems that are contributory, i.e. employee payroll deductions help offset required employer contributions, demographic erosion pushes more of the contribution burden onto employers.

Ratio of Actives to Retirees



Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

Strengthening Contribution Practices

Consistent with the trends in place since the current economic recovery began, in 2015, governments paid a higher share of their ADECs. As of 2015, 66% of major statewide plans received 100% or more of their actuarial contributions, up from 44% in 2011, the post-recessionary low point when many governments cut contributions in response to budgetary stress. In Fitch's view, rising actual contributions reflect both the improving budget situation of many governments as well as rising concerns about the sustainability of pensions (see *Appendix E*).

Despite steady improvement in contribution practices, Fitch cautions that paying the full ADEC is not likely to result in eliminating pension liabilities over time for those systems with pension challenges, and in general, contribution practices remain a source of concern. The ADEC figure is unique to each system, reflecting a range of statutory and institutional factors, funding valuation assumptions, and explicit system funding policies. While eliminating an unfunded liability may be a priority for a given system, other priorities may take precedence, most notably contribution stability and affordability.

Many systems also operate under restrictive statutes that cap annual contributions or increases in contributions as a percentage of payroll. Such restrictions mattered less in an era of rapidly rising investment values and rising payrolls; however, with higher unfunded liabilities and reduced prospects for consistently high returns, statutory caps can prevent corrective increases in contributions, push liabilities higher or shift amortization periods beyond 30 years.

Major Statewide Systems' Actuarial Contributions by Fiscal Year (%)

| % of ADEC Paid | 2011 | 2012 | 2013 | 2014 | 2015 |
|----------------|------|------|------|------|------|
| >100.0 | 44 | 46 | 44 | 56 | 66 |
| 90.0–99.9 | 8 | 10 | 13 | 12 | 8 |
| 80.0–89.9 | 20 | 16 | 11 | 9 | 11 |
| 70.0–79.9 | 6 | 5 | 12 | 11 | 5 |
| 60.0–69.9 | 5 | 8 | 8 | 6 | 3 |
| 50.0–59.9 | 4 | 4 | 2 | 3 | 1 |
| <50.0 | 12 | 10 | 9 | 3 | 3 |

Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

Even without fixed caps, some amortization practices are likely to fall short of eliminating the liability over a reasonable timeframe, even if actual contributions faithfully match the ADEC each year. For example, under open or rolling amortization practices, the period for amortizing the unfunded liability resets each year, with the ADEC recalculated over the new amortization horizon. In the absence of consistently high returns, this can result in unfunded liabilities growing each year, particularly with longer rolling periods.

Appendix A

2016 Debt + Fitch-Adjusted Pensions^a

| State | Issuer Default Rating | Total NTSD (\$000) | Debt as % Personal Income | Rank (Low to High) | Reported Pension Allocation NPL (\$000) | Fitch-Adjusted Pension Allocation NPL (\$000) ^b | Fitch-Adjusted Pension Allocation as % of Personal Income | Rank (Low to High) | Debt and Pension Allocation (\$000) | Debt and Pension Allocation as % of Personal Income | Rank (Low to High) |
|----------------------|-----------------------|--------------------|---------------------------|--------------------|---|--|---|--------------------|-------------------------------------|---|--------------------|
| Alabama ^c | AA+ | 4,031,342 | 2.2 | 22 | 9,087,173 | 12,114,456 | 6.6 | 43 | 16,145,798 | 8.7 | 39 |
| Alaska | AA+ | 1,064,440 | 2.6 | 28 | 6,311,273 | 8,036,735 | 19.4 | 50 | 9,101,175 | 22.0 | 49 |
| Arizona | NR | 5,797,977 | 2.2 | 21 | 4,687,875 | 6,053,881 | 2.3 | 27 | 11,851,858 | 4.4 | 22 |
| Arkansas | NR | 1,822,203 | 1.6 | 15 | 1,227,415 | 1,987,602 | 1.7 | 20 | 3,809,805 | 3.3 | 13 |
| California | AA- | 85,046,655 | 4.0 | 37 | 64,691,664 | 81,705,682 | 3.9 | 34 | 166,752,337 | 7.9 | 36 |
| Colorado | NR | 1,517,617 | 0.5 | 5 | 9,274,774 | 10,525,993 | 3.8 | 32 | 12,043,610 | 4.3 | 20 |
| Connecticut | AA- | 22,001,603 | 8.9 | 48 | 26,319,813 | 30,721,226 | 12.5 | 46 | 52,722,829 | 21.4 | 47 |
| Delaware | AAA | 2,437,000 | 5.4 | 45 | 718,835 | 904,171 | 2.0 | 25 | 3,341,171 | 7.4 | 35 |
| Florida | AAA | 21,637,500 | 2.4 | 26 | 1,591,111 | 3,577,377 | 0.4 | 5 | 25,214,877 | 2.8 | 10 |
| Georgia | AAA | 10,702,973 | 2.6 | 29 | 5,857,812 | 7,526,893 | 1.8 | 22 | 18,229,866 | 4.4 | 21 |
| Hawaii | AA | 6,923,013 | 10.0 | 50 | 4,047,882 | 4,973,465 | 7.2 | 44 | 11,896,478 | 17.2 | 45 |
| Idaho | AA+ | 753,089 | 1.2 | 11 | 207,975 | 249,902 | 0.4 | 4 | 1,002,991 | 1.6 | 5 |
| Illinois | BBB+ | 32,290,617 | 5.0 | 41 | 109,400,809 | 115,521,890 | 17.9 | 49 | 147,812,507 | 22.9 | 50 |
| Indiana | AAA | 2,473,781 | 0.9 | 9 | 11,684,244 | 11,684,244 | 4.2 | 36 | 14,158,025 | 5.1 | 26 |
| Iowa | AAA | 886,830 | 0.6 | 7 | 833,862 | 1,208,126 | 0.8 | 10 | 2,094,956 | 1.5 | 4 |
| Kansas | NR | 4,550,672 | 3.3 | 33 | 1,995,421 | 2,652,596 | 1.9 | 23 | 7,203,268 | 5.2 | 29 |
| Kentucky | AA- | 8,787,482 | 5.1 | 43 | 27,457,253 | 28,230,729 | 16.5 | 48 | 37,018,211 | 21.7 | 48 |
| Louisiana | AA- | 7,162,117 | 3.6 | 34 | 5,589,875 | 6,853,029 | 3.4 | 31 | 14,015,146 | 7.0 | 34 |
| Maine | AA | 1,167,841 | 2.1 | 20 | 1,982,543 | 2,321,300 | 4.1 | 35 | 3,489,141 | 6.1 | 32 |
| Maryland | AAA | 12,809,598 | 3.8 | 36 | 17,453,749 | 21,063,331 | 6.3 | 40 | 33,872,929 | 10.1 | 42 |
| Massachusetts | AA+ | 39,049,300 | 9.2 | 49 | 25,329,962 | 33,865,590 | 8.0 | 45 | 72,914,890 | 17.1 | 44 |
| Michigan | AA | 7,189,374 | 1.7 | 17 | 6,316,837 | 8,319,933 | 2.0 | 24 | 15,509,306 | 3.7 | 17 |
| Minnesota | AAA | 8,694,175 | 3.1 | 32 | 3,058,830 | 4,748,263 | 1.7 | 19 | 13,442,439 | 4.8 | 23 |
| Mississippi | AA | 5,859,453 | 5.6 | 46 | 2,389,417 | 3,200,808 | 3.1 | 30 | 9,060,261 | 8.7 | 38 |
| Missouri | AAA | 1,096,136 | 0.4 | 4 | 4,371,763 | 5,983,743 | 2.3 | 29 | 7,851,097 | 3.1 | 12 |
| Montana | AA+ | 255,340 | 0.6 | 6 | 1,596,977 | 2,142,652 | 5.0 | 37 | 2,397,992 | 5.6 | 31 |
| Nebraska | NR | 15,475 | 0.0 | 1 | 289,309 | 580,724 | 0.6 | 9 | 596,200 | 0.6 | 1 |
| Nevada | AA+ | 1,855,974 | 1.5 | 14 | 1,747,776 | 2,553,526 | 2.1 | 26 | 4,409,500 | 3.6 | 16 |
| New Hampshire | AA+ | 1,274,064 | 1.7 | 19 | 772,344 | 952,597 | 1.3 | 12 | 2,226,661 | 3.0 | 11 |
| New Jersey | A | 36,948,462 | 6.9 | 47 | 77,619,472 | 77,619,472 | 14.5 | 47 | 114,567,934 | 21.3 | 46 |
| New Mexico | NR | 2,846,827 | 3.6 | 35 | 3,667,722 | 4,913,104 | 6.2 | 38 | 7,759,932 | 9.8 | 41 |
| New York | AA+ | 52,965,000 | 4.6 | 40 | 2,336,600 | 6,750,350 | 0.6 | 8 | 59,715,350 | 5.1 | 27 |
| North Carolina | AAA | 6,998,260 | 1.7 | 18 | 595,203 | 1,425,157 | 0.3 | 3 | 8,423,417 | 2.1 | 8 |
| North Dakota | NR | 154,711 | 0.4 | 3 | 364,986 | 550,617 | 1.3 | 13 | 705,328 | 1.7 | 7 |
| Ohio | AA+ | 11,214,422 | 2.2 | 24 | 5,034,965 | 8,422,425 | 1.7 | 18 | 19,636,847 | 3.9 | 18 |
| Oklahoma | AA+ | 1,956,382 | 1.1 | 10 | 1,613,276 | 2,614,604 | 1.5 | 15 | 4,570,986 | 2.6 | 9 |
| Oregon | AA+ | 7,685,434 | 4.4 | 39 | — | 809,385 | 0.5 | 6 | 8,494,819 | 4.8 | 24 |
| Pennsylvania | AA- | 17,893,711 | 2.8 | 31 | 13,965,367 | 16,139,341 | 2.5 | 28 | 34,033,052 | 5.3 | 30 |
| Rhode Island | AA | 2,164,200 | 4.1 | 38 | 2,920,613 | 3,283,628 | 6.2 | 39 | 5,447,828 | 10.3 | 43 |
| South Carolina | AAA | 3,069,813 | 1.6 | 16 | 2,964,283 | 3,384,846 | 1.8 | 21 | 6,454,659 | 3.4 | 14 |
| South Dakota | AAA | 543,335 | 1.3 | 13 | — | — | 0.0 | 1 | 543,335 | 1.3 | 3 |
| Tennessee | AAA | 2,166,603 | 0.8 | 8 | 689,949 | 1,465,965 | 0.5 | 7 | 3,632,568 | 1.3 | 2 |
| Texas | AAA | 16,917,055 | 1.3 | 12 | 36,135,242 | 49,751,517 | 3.9 | 33 | 66,668,572 | 5.2 | 28 |
| Utah | AAA | 2,738,875 | 2.3 | 25 | 1,071,222 | 1,535,413 | 1.3 | 14 | 4,274,288 | 3.6 | 15 |
| Vermont | AAA | 667,566 | 2.2 | 23 | 1,310,079 | 1,916,644 | 6.3 | 41 | 2,584,210 | 8.5 | 37 |
| Virginia | AAA | 11,772,529 | 2.7 | 30 | 6,757,878 | 6,757,878 | 1.5 | 17 | 18,530,407 | 4.2 | 19 |
| Washington | AA+ | 19,986,452 | 5.4 | 44 | 3,252,383 | 4,412,107 | 1.2 | 11 | 24,398,559 | 6.6 | 33 |
| West Virginia | AA | 1,642,639 | 2.4 | 27 | 3,630,568 | 4,430,026 | 6.5 | 42 | 6,072,668 | 9.0 | 40 |
| Wisconsin | AA | 13,381,339 | 5.0 | 42 | — | — | 0.0 | 1 | 13,381,339 | 5.0 | 25 |
| Wyoming | NR | 26,636 | 0.1 | 2 | 348,507 | 495,122 | 1.5 | 16 | 521,758 | 1.6 | 6 |
| Median | | | 2.4 | | | | 2.1 | | | 5.1 | |
| Low | | | 0.0 | | | | 0.0 | | | 0.6 | |
| High | | | 10.0 | | | | 19.4 | | | 22.9 | |

^aCombined pension data by state is estimated by Fitch for all state pension systems whose liability is reported in the notes and required supplementary information sections of state annual reports. ^bFitch-adjusted figures assume an 11% increase in total pension liabilities for every 1% variance between 7% and the plan's investment return assumption. ^cAlabama data based on state share disclosed in bond documents. NR – Not rated. NTSD – Net tax-supported debt. NPL – Net pension liability. Source: Personal income from U.S. Bureau of Economic Analysis as of Sept. 28, 2016. Net tax-supported debt based on most recent state bond disclosure documents.

Appendix B

Ratio of Assets to Liabilities (Funding Basis)

(% Funded as of Actuarial Valuation Date)^a

| System Name | Plan Type ^b | AV Date | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | UAAL – Latest Valuation (\$ Mil.) |
|------------------------------------|------------------------|----------|-------|-------|------|------|------|------|------|------|-------|-----------------------------------|
| Alabama ERS | AME | Sept. 30 | 79.0 | 75.7 | 72.2 | 68.2 | 65.8 | 65.7 | 65.7 | 66.9 | 67.3 | 5,135 |
| Alabama TRS | CSME | Sept. 30 | 79.5 | 77.6 | 74.7 | 71.1 | 67.5 | 66.5 | 66.2 | 67.5 | 68.3 | 10,105 |
| Alaska PERS | CSME | June 30 | 77.8 | 78.8 | 63.0 | 62.4 | 61.9 | 57.1 | 54.5 | 59.7 | 67.0 | 4,407 |
| Alaska TRS | CSME | June 30 | 68.2 | 70.2 | 57.0 | 54.3 | 54.0 | 49.9 | 48.1 | 54.5 | 76.9 | 1,629 |
| Arizona Public Safety Personnel RS | AME | June 30 | 65.2 | 68.8 | 70.0 | 67.7 | 63.7 | 60.2 | 58.7 | 49.2 | 49.0 | 6,468 |
| Arizona State RS | CSME | June 30 | 83.3 | 82.1 | 79.0 | 76.4 | 75.5 | 75.3 | 75.4 | 76.3 | 77.1 | 9,855 |
| Arkansas State Hwy. ERS | SE | June 30 | 98.8 | 101.5 | 96.6 | 91.9 | 91.4 | 89.5 | 90.8 | 90.9 | 87.8 | 199 |
| Arkansas PERP | CSME | June 30 | 89.1 | 89.7 | 78.0 | 74.1 | 70.7 | 68.9 | 74.3 | 77.8 | 79.1 | 1,943 |
| Arkansas TRP | CSME | June 30 | 85.3 | 84.9 | 75.7 | 73.8 | 71.8 | 71.2 | 73.3 | 77.3 | 79.6 | 3,702 |
| California PERF ^c | AME/CSME | June 30 | 87.2 | 86.9 | 83.3 | 83.4 | 82.6 | 83.1 | 75.2 | 76.3 | N.A. | 93,469 |
| California STRF — DB | CSME | June 30 | 87.6 | 87.3 | 78.2 | 71.5 | 69.1 | 67.0 | 66.9 | 68.5 | 68.5 | 76,200 |
| Colorado PERA — State Div. | CSME | Dec. 31 | 73.3 | 67.9 | 67.0 | 62.8 | 57.7 | 59.2 | 57.5 | 57.8 | 57.6 | 10,203 |
| Connecticut SERS | SE | June 30 | 53.6 | 51.9 | 51.9 | 44.4 | 47.9 | 42.3 | 41.2 | 41.5 | 43.3 | 14,880 |
| Connecticut TRS ^d | SE | June 30 | 59.5 | 70.0 | 70.0 | 61.4 | 61.4 | 55.2 | 55.2 | 59.0 | 59.0 | 10,803 |
| Delaware SEPP | SE | June 30 | 103.7 | 103.1 | 98.8 | 96.0 | 94.0 | 91.5 | 91.1 | 92.3 | 91.6 | 761 |
| Florida RS | CSME | July 1 | 105.6 | 105.3 | 87.1 | 86.6 | 86.9 | 86.4 | 85.4 | 86.6 | 86.5 | 22,353 |
| Georgia ERS | CSME | June 30 | 93.0 | 89.4 | 85.7 | 80.1 | 76.0 | 73.1 | 71.4 | 72.8 | 74.1 | 4,424 |
| Georgia TRS | CSME | June 30 | 94.7 | 91.9 | 89.9 | 85.7 | 84.0 | 82.3 | 81.1 | 81.9 | 79.1 | 17,278 |
| Hawaii ERP | CSME | June 30 | 67.5 | 68.8 | 64.6 | 61.4 | 59.4 | 59.2 | 60.0 | 61.4 | 62.2 | 8,775 |
| Idaho PERF ^c | CSME | July 1 | 105.5 | 93.3 | 74.1 | 78.9 | 90.2 | 84.7 | 85.3 | 92.9 | 90.4 | 1,490 |
| Illinois SERS | SE | June 30 | 54.2 | 46.1 | 43.5 | 37.4 | 35.5 | 34.7 | 34.2 | 33.7 | 36.2 | 26,002 |
| Illinois SURS | CSME | June 30 | 68.4 | 58.5 | 54.3 | 46.4 | 44.3 | 42.1 | 41.5 | 42.3 | 43.3 | 22,416 |
| Illinois TRS | CSME | June 30 | 63.8 | 56.0 | 52.1 | 48.4 | 46.5 | 42.1 | 40.6 | 40.6 | 42.0 | 62,687 |
| Indiana 1977 Police Off. & FF PDF | CSME | June 30 | 106.4 | 98.0 | 92.7 | 98.8 | N.A. | 91.9 | 95.2 | 98.3 | 105.5 | (259) |
| Indiana PERF | CSME | June 30 | 97.5 | 93.1 | 85.2 | 80.5 | N.A. | 76.6 | 80.2 | 82.4 | 78.6 | 3,849 |
| Indiana STRS (Pre-1996) | CSME | June 30 | 36.0 | 37.7 | 31.9 | 33.1 | 32.0 | 30.1 | 31.8 | 32.8 | 30.4 | 11,846 |
| Indiana STRS (1996) | CSME | June 30 | 96.0 | 104.1 | 93.1 | 94.7 | 91.7 | 90.7 | 93.8 | 96.1 | 92.5 | 445 |
| Iowa PERS | CSME | June 30 | 90.2 | 89.1 | 81.2 | 81.4 | 79.9 | 79.9 | 81.0 | 82.7 | 83.7 | 5,455 |
| Kansas PERS | CSME | Dec. 31 | 70.8 | 58.8 | 63.7 | 62.2 | 59.2 | 56.4 | 59.9 | 62.3 | 67.1 | 8,539 |
| Kentucky ERS-Non Hazardous | CSME | June 30 | 56.9 | 52.5 | 45.0 | 38.3 | 33.3 | 27.3 | 23.2 | 21.0 | 19.0 | 10,009 |
| Kentucky TRS | CSME | June 30 | 71.9 | 68.2 | 63.6 | 61.0 | 57.4 | 54.5 | 51.9 | 53.6 | 55.3 | 13,930 |
| Louisiana School Employees RS | CSME | June 30 | 80.0 | 76.6 | 65.5 | 61.0 | 59.9 | 61.6 | 62.1 | 66.9 | 70.7 | 728 |
| Louisiana SERS | SE | June 30 | 67.2 | 67.6 | 60.8 | 57.7 | 57.6 | 55.9 | 60.2 | 59.3 | 62.1 | 6,898 |
| Louisiana TRS | CSME | June 30 | 71.3 | 70.2 | 59.1 | 54.4 | 55.1 | 55.4 | 56.4 | 57.4 | 60.9 | 11,189 |
| Maine SETPP | CSME | June 30 | 74.1 | 74.1 | 67.7 | 66.0 | 77.6 | 77.0 | 77.7 | 81.4 | 82.2 | 2,241 |
| Maryland Employees RPS | CSME | June 30 | 79.5 | 77.2 | 63.9 | 62.8 | 62.8 | 62.5 | 63.3 | 65.9 | 66.7 | 7,788 |
| Maryland Teachers RPS | CSME | June 30 | 81.1 | 79.6 | 66.1 | 65.4 | 66.3 | 65.8 | 67.1 | 70.7 | 71.9 | 10,939 |
| Massachusetts SERS ^d | SE | Dec. 31 | 89.4 | 71.6 | 76.5 | 81.0 | 73.8 | 69.1 | 70.3 | 67.5 | 63.5 | 13,500 |
| Massachusetts TRS ^d | SE | Dec. 31 | 73.9 | 58.2 | 63.0 | 66.3 | 60.7 | 55.7 | 56.3 | 54.3 | 52.8 | 21,969 |
| Michigan PSERS | CSME | Sept. 30 | 88.7 | 83.6 | 78.9 | 71.1 | 64.7 | 61.3 | 59.6 | 59.9 | 60.6 | 41,000 |
| Michigan SERS | SE | Sept. 30 | 86.2 | 82.8 | 78.0 | 72.6 | 65.5 | 60.3 | 60.3 | 61.6 | 64.2 | 5,800 |
| Minnesota General Employees RF | CSME | June 30 | 73.3 | 73.6 | 70.0 | 76.4 | 75.2 | 73.5 | 72.8 | 73.5 | 76.3 | 5,587 |
| Minnesota Public Emp. P&F Fund | CSME | June 30 | 91.7 | 88.4 | 83.2 | 87.0 | 82.9 | 78.3 | 81.2 | 80.0 | 83.6 | 1,384 |
| Minnesota SERF | CSME | June 30 | 92.5 | 90.2 | 85.9 | 87.3 | 86.3 | 82.7 | 82.0 | 83.0 | 85.7 | 1,869 |
| Minnesota TRF | CSME | July 1 | 87.5 | 82.0 | 77.4 | 78.5 | 77.3 | 73.0 | 71.6 | 74.1 | 77.1 | 5,865 |
| Mississippi PERS | CSME | June 30 | 73.7 | 72.9 | 67.3 | 64.2 | 62.2 | 58.0 | 57.7 | 61.0 | 60.4 | 15,977 |
| Missouri DOT & Hwy. Patrol ERS | SE | June 30 | 58.2 | 59.1 | 47.3 | 42.2 | 43.3 | 46.3 | 46.2 | 49.2 | 52.9 | 1,749 |

^aFunded ratios are as of the valuation date rather than the financial statement date. ^bAs of latest valuation. ^cIdaho and Oregon systems report actuarial assets on a market value basis; California PERF converted to a market value basis as of June 30, 2013. ^dHistorically, systems have performed biennial valuations. ^eFormal valuation date is Jan. 1 of the following year; Fitch reports above as Dec. 31 to improve comparability. CSME – Cost-sharing multi-employer. AME – Agent multiple employer.

SE – Single employer. AV – Actuarial valuation. UAAL – unfunded actuarial accrued liability. ERS – Employees Retirement System. TRS – Teachers Retirement System. PERS – Public Employees Retirement System. RS – Retirement System. PERP – Public Employees Retirement Plan. TRP – Teachers Retirement Plan. PERF – Public Employees Retirement Fund. STRS – State Teachers Retirement System. PERA – Public Employees Retirement Association. SERS – State Employees Retirement System. TRS – Teachers Retirement System. SEPP – State Employees Pension Plan. ERP – Employees Retirement Plan. SURS – State University Retirement System. FF – Firefighters. PDF – Pension & Disability Fund. SETPP – State Employees & Teachers Pension Plan. RPS – Retirement & Pension System. PSERS – Public School Employees Retirement System. RP – Retirement Plan. RF – Retirement Fund. P&F-Police & Firefighters. DOT – Department of Transportation. SEP – State Employees Plan. PFRS – Police & Firefighters Retirement System. TPAF – Teacher Pension & Annuity Fund. PRS – Pension & Retirement System. LEOFF – Law Enforcement Officers & Fire Fighters. PP – Pension Plan. N.A. – Not available.

Source: Fitch's calculations based on system comprehensive annual financial reports and valuations. *Continued on next page.*

Ratio of Assets to Liabilities (Funding Basis) (continued)

(% Funded as of Actuarial Valuation Date)^a

| System Name | Plan Type ^b | AV Date | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | UAAL - Latest Valuation (\$ Mil.) |
|--|------------------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------------------|
| Missouri SEP | SE | June 30 | 86.8 | 85.9 | 83.0 | 80.4 | 79.2 | 73.2 | 72.7 | 75.1 | 75.0 | 2,935 |
| Montana PERS | CSME | June 30 | 91.0 | 90.2 | 83.5 | 74.2 | 70.2 | 67.4 | 80.2 | 74.4 | 76.1 | 1,544 |
| Montana TRS | CSME | July 1 | 79.6 | 79.9 | 66.2 | 65.4 | 61.5 | 59.2 | 66.8 | 65.4 | 67.5 | 1,741.6 |
| Nebraska School RS | CSME | July 1 | 90.5 | 90.6 | 86.6 | 82.4 | 80.4 | 76.6 | 77.1 | 82.7 | 88.0 | 1 |
| Nebraska SERS — Cash Balance ^c | SE | Dec. 31 | 103.4 | 96.9 | 93.9 | 93.6 | 91.5 | 93.6 | 99.2 | 103.9 | 102.5 | (33) |
| Nevada PERS | CSME | June 30 | 77.2 | 76.2 | 72.5 | 70.5 | 70.2 | 71.0 | 69.3 | 71.5 | 73.2 | 12,352 |
| New Hampshire RS | CSME | June 30 | 67.0 | 67.8 | 58.3 | 58.5 | 57.4 | 56.1 | 56.7 | 60.7 | 63.4 | 4,207 |
| New Jersey PFRS — Local | CSME | June 30 | 79.7 | 75.9 | 72.7 | 79.6 | 78.0 | 77.8 | 76.9 | 76.3 | 76.7 | 7,271 |
| New Jersey PFRS — State | CSME | June 30 | 69.1 | 62.5 | 56.8 | 59.7 | 55.3 | 53.1 | 50.8 | 47.2 | 44.4 | 2,512 |
| New Jersey PERS — Local | CSME | June 30 | 81.4 | 78.8 | 71.2 | 77.3 | 77.0 | 74.5 | 74.0 | 73.5 | 73.0 | 7,936 |
| New Jersey PERS — State | CSME | June 30 | 70.1 | 65.9 | 56.5 | 58.8 | 55.0 | 50.4 | 48.1 | 43.8 | 41.0 | 12,767 |
| New Jersey TPAF | CSME | June 30 | 74.7 | 70.8 | 63.8 | 67.1 | 62.8 | 59.3 | 58.2 | 54.0 | 51.1 | 27,058 |
| New Mexico Educational ERS | CSME | June 30 | 70.5 | 71.5 | 67.5 | 65.7 | 63.0 | 60.7 | 61.9 | 63.1 | 63.7 | 6,542 |
| New Mexico PERS | CSME | June 30 | 92.8 | 93.3 | 84.2 | 78.5 | 70.5 | 65.3 | 72.9 | 75.8 | 74.9 | 4,712 |
| New York State & Local ERS | CSME | April 1 | 105.8 | 107.3 | 101.0 | 93.9 | 90.2 | 87.2 | 88.5 | 92.0 | 93.8 | 10,417 |
| New York State & Local PFRS | CSME | April 1 | 106.5 | 108.0 | 103.8 | 96.7 | 91.9 | 87.9 | 89.5 | 93.0 | 93.2 | 2,006 |
| North Carolina Teachers' & State ERS | CSME | Dec. 31 | 104.7 | 99.3 | 95.9 | 95.4 | 94.0 | 94.2 | 94.8 | 95.6 | N.A. | 2,981 |
| North Dakota PERS | CSME | July 1 | 93.3 | 92.6 | 85.1 | 73.4 | 70.5 | 65.1 | 62.0 | 64.5 | 68.6 | 958 |
| North Dakota Teachers' Fund For Ret. | CSME | July 1 | 79.2 | 81.9 | 77.7 | 69.8 | 66.3 | 60.9 | 58.8 | 61.8 | 61.6 | 1,325 |
| Ohio PERS | CSME | Dec. 31 | 96.0 | 75.3 | 75.0 | 79.1 | 77.4 | 80.9 | 82.4 | 83.8 | 85.0 | 13,771 |
| Ohio STRS | CSME | June 30 | 82.2 | 79.1 | 60.0 | 59.1 | 58.8 | 56.0 | 66.3 | 69.3 | 69.3 | 30,359 |
| Oklahoma Firefighters PRS | CSME | June 30 | 61.6 | 61.8 | 54.2 | 53.4 | 63.7 | 60.9 | 58.8 | 62.1 | 65.0 | 1,169 |
| Oklahoma Police PRS | CSME | June 30 | 79.9 | 82.2 | 76.3 | 74.9 | 93.0 | 90.2 | 89.3 | 94.6 | 98.2 | 40 |
| Oklahoma PERS | CSME | July 1 | 72.6 | 73.0 | 66.8 | 66.0 | 80.7 | 80.2 | 81.6 | 88.6 | 93.6 | 576 |
| Oklahoma TRS | CSME | June 30 | 52.5 | 50.5 | 49.8 | 47.9 | 56.7 | 54.8 | 57.2 | 63.2 | 66.6 | 6,921 |
| Oregon PERS c | CSME | Dec. 31 | 112.2 | 80.2 | 85.8 | 86.9 | 82.0 | 90.7 | 95.9 | 83.6 | 78.7 | 16,200 |
| Pennsylvania PSERS | CSME | June 30 | 85.8 | 86.0 | 79.2 | 75.1 | 69.1 | 66.3 | 63.8 | 62.0 | 60.6 | 37,336 |
| Pennsylvania SERS | CSME | Dec. 31 | 97.1 | 89.0 | 84.4 | 75.2 | 65.3 | 58.8 | 59.2 | 59.4 | 58.0 | 19,452 |
| Rhode Island ERS-State | CSME | June 30 | 57.5 | 62.3 | 59.0 | 59.8 | 57.4 | 56.3 | 56.5 | 56.1 | 56.6 | 1,895 |
| Rhode Island ERS-Teachers | CSME | June 30 | 55.4 | 61.0 | 58.1 | 61.8 | 59.7 | 58.8 | 59.0 | 58.2 | 58.8 | 2,655 |
| South Carolina Police Officers' RS | CSME | July 1 | 84.7 | 77.9 | 76.3 | 74.5 | 72.8 | 71.1 | 69.2 | 69.5 | 69.2 | 1,895 |
| South Carolina RS | CSME | July 1 | 69.7 | 69.3 | 67.8 | 65.5 | 67.4 | 64.7 | 62.5 | 62.7 | 62.0 | 16,753 |
| South Dakota RS | CSME | June 30 | 97.1 | 97.2 | 91.8 | 96.3 | 96.4 | 92.6 | 100.0 | 100.0 | 100.0 | — |
| Tennessee Closed State & Teachers ^{d,e} | CSME | July 1 | 96.2 | 96.2 | 90.6 | 90.6 | 92.1 | 92.1 | 93.3 | 93.3 | 95.2 | 1,733 |
| Texas ERS | SE | Aug. 31 | 95.6 | 92.6 | 89.8 | 85.4 | 84.5 | 82.6 | 77.4 | 77.2 | 76.3 | 8,018 |
| Texas TRS | CSME | Aug. 31 | 89.2 | 90.5 | 83.1 | 82.9 | 82.7 | 81.9 | 80.8 | 80.2 | 80.2 | 32,968 |
| Utah PERS — Noncontributory ^e | CSME | Dec. 31 | 95.1 | 86.5 | 85.7 | 82.7 | 79.0 | 76.4 | 80.9 | 84.8 | 86.5 | 3,458 |
| Utah Public Safety RS ^e | CSME | Dec. 31 | 90.7 | 81.6 | 80.6 | 77.1 | 75.4 | 73.8 | 79.3 | 83.2 | 85.1 | 355 |
| Vermont State RS | SE | June 30 | 100.8 | 94.1 | 78.9 | 81.2 | 79.6 | 77.7 | 76.7 | 77.9 | 75.1 | 543 |
| Vermont State Teachers RS | CSME | June 30 | 84.9 | 80.9 | 65.4 | 66.5 | 63.8 | 61.6 | 60.5 | 59.9 | 58.6 | 1,175 |
| Virginia RS | AME/CSME | June 30 | 82.3 | 84.0 | 80.2 | 72.4 | 69.9 | 65.8 | 65.9 | 69.6 | 73.3 | 22,628 |
| Washington LEOFF — Plan 1 | CSME | June 30 | 122.6 | 128.4 | 125.4 | 126.9 | 134.6 | 135.0 | 125.1 | 127.2 | 125.5 | (1,097) |
| Washington LEOFF — Plan 2 | CSME | June 30 | 128.8 | 133.5 | 127.9 | 124.3 | 118.7 | 113.7 | 108.9 | 107.3 | 105.5 | (482) |
| Washington PERS — Plan 1 | CSME | June 30 | 70.7 | 70.9 | 69.9 | 74.1 | 70.7 | 68.9 | 62.6 | 61.0 | 58.3 | 5,239 |
| Washington PERS — Plan 2/3 | CSME | June 30 | 101.5 | 101.1 | 99.3 | 97.2 | 97.1 | 99.4 | 91.7 | 90.0 | 88.4 | 3,715 |
| Washington TRS — Plan 1 | CSME | June 30 | 76.7 | 76.8 | 75.3 | 84.7 | 81.1 | 79.1 | 71.2 | 68.7 | 64.5 | 3,237 |
| Washington TRS — Plan 2/3 | CSME | June 30 | 112.7 | 107.9 | 101.8 | 100.5 | 99.3 | 103.7 | 95.6 | 93.6 | 91.9 | 879 |
| West Virginia PERS | CSME | July 1 | 97.0 | 84.2 | 79.7 | 74.6 | 78.4 | 77.6 | 79.7 | 83.1 | 86.8 | 848 |
| West Virginia TRS | CSME | July 1 | 51.3 | 50.0 | 41.3 | 46.5 | 53.7 | 53.0 | 57.9 | 66.2 | 66.0 | 3,508 |
| Wisconsin RS | CSME | Dec. 31 | 99.6 | 99.7 | 99.8 | 99.8 | 99.9 | 99.9 | 99.9 | 100.0 | 100.0 | 24 |
| Wyoming Law Enforcement RP ^e | CSME | Dec. 31 | 97.4 | 95.9 | 83.4 | 102.2 | 99.9 | 95.9 | 92.3 | 93.7 | 98.8 | 7 |
| Wyoming Public Employees PP ^e | CSME | Dec. 31 | 94.0 | 78.6 | 87.5 | 84.6 | 81.9 | 78.6 | 77.6 | 79.0 | 78.2 | 1,898 |

^aFunded ratios are as of the valuation date rather than the financial statement date. ^bAs of latest valuation. ^cIdaho and Oregon systems report actuarial assets on a market value basis; California PERF converted to a market value basis as of June 30, 2013. ^dHistorically, systems have performed biennial valuations. ^eFormal valuation date is Jan. 1 of the following year; Fitch reports it here as Dec. 31 to improve comparability. CSME – Cost-sharing multi-employer. AME – Agent multiple employer.

SE – Single employer. AV – Actuarial valuation. UAAL – unfunded actuarial accrued liability. ERS – Employees Retirement System. TRS – Teachers Retirement System. PERS – Public Employees Retirement System. RS – Retirement System. PERP – Public Employees Retirement Plan. TRP – Teachers Retirement Plan. PERF – Public Employees Retirement Fund. STRS – State Teachers Retirement System. PERA – Public Employees Retirement Association. SERS – State Employees Retirement System. TRS – Teachers Retirement System. SEPP – State Employees Pension Plan. ERP – Employees Retirement Plan. SURS – State University Retirement System. FF – Firefighters. PDF – Pension & Disability Fund. SETPP – State Employees & Teachers Pension Plan. RPS – Retirement & Pension System. PSERS – Public School Employees Retirement System. RP – Retirement Plan. RF – Retirement Fund. P&F-Police & Firefighters. DOT – Department of Transportation. SEP – State Employees Plan. PFRS – Police & Firefighters Retirement System. TPAF – Teacher Pension & Annuity Fund. PRS – Pension & Retirement System. LEOFF – Law Enforcement Officers & Fire Fighters. PP – Pension Plan. N.A. – Not available.

Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

Appendix C

Comparative Ratios of Assets to Liabilities

(% as of Most Recent Valuation Date)

| System Name | Latest Funding Valuation | | | | Latest Accounting Valuation | | | | Fitch-Adjusted FNP/TPL (%) |
|------------------------------------|--------------------------|-----------------|-------------------|--------------------------|-----------------------------|-----------------|-------------------|----------------|----------------------------|
| | Valuation Date | AVA/ AAL (%) | Discount Rate (%) | Rate Chg. Since 2008 (%) | Measurement Date | FNP/ TPL (%) | Discount Rate (%) | Depletion Date | |
| Alabama ERS | 9/30/15 | 67.3 | 8.00 | 0.00 | 9/30/15 | 66.1 | 8.00 | — | 59.6 |
| Alabama TRS | 9/30/15 | 68.3 | 8.00 | 0.00 | 9/30/15 | 67.5 | 8.00 | — | 60.8 |
| Alaska PERS | 6/30/15 | 67.0 | 8.00 | (0.25) | 6/30/15 | 64.0 | 8.00 | — | 57.6 |
| Alaska TRS | 6/30/15 | 76.9 | 8.00 | (0.25) | 6/30/15 | 73.8 | 8.00 | — | 66.5 |
| Arizona Public Safety Personnel RS | 6/30/15 | 49.0 | 7.85 | (0.65) | 6/30/15 | 47.9 | 7.85 | — | 43.8 |
| Arizona State RS | 6/30/15 | 77.1 | 8.00 | 0.00 | 6/30/15 | 68.4 | 8.00 | — | 61.6 |
| Arkansas State Hwy. ERS | 6/30/15 | 87.8 | 8.00 | 0.00 | 6/30/15 | 100.5 | 8.00 | — | 90.5 |
| Arkansas PERP | 6/30/15 | 79.1 | 7.50 | (0.50) | 6/30/15 | 80.4 | 7.50 | — | 76.2 |
| Arkansas TRP | 6/30/15 | 79.6 | 8.00 | 0.00 | 6/30/15 | 82.2 | 8.00 | — | 74.1 |
| California PERF (State) | 6/30/15 | 69.4 | 7.50 | (0.25) | 6/30/14 | 74.0 | 7.65 | — | 69.0 |
| California STRF | 6/30/15 | 68.5 | 7.50 | (0.50) | 6/30/15 | 74.0 | 7.60 | — | 69.4 |
| Colorado PERA — State Div. | 12/31/15 | 57.6 | 7.50 | (1.00) | 12/31/15 | 56.1 | 7.50 | — | 53.2 |
| Connecticut SERS | 6/30/15 | 43.3 | 8.00 | (0.25) | 6/30/15 | 39.2 | 8.00 | — | 35.3 |
| Connecticut TRS | 6/30/15 | 59.0 | 8.50 | 0.00 | 6/30/15 | 61.6 | 8.50 | — | 52.8 |
| Delaware SEPP | 6/30/15 | 91.6 | 7.20 | (0.80) | 6/30/15 | 92.7 | 7.20 | — | 90.7 |
| Florida RS | 7/01/15 | 86.5 | 7.65 | (0.10) | 6/30/15 | 92.0 | 7.65 | — | 85.9 |
| Georgia ERS | 6/30/15 | 74.1 | 7.50 | 0.00 | 6/30/15 | 76.2 | 7.50 | — | 72.2 |
| Georgia TRS | 6/30/15 | 79.1 | 7.50 | 0.00 | 6/30/15 | 81.4 | 7.50 | — | 77.2 |
| Hawaii ERP | 6/30/15 | 62.2 | 7.65 | (0.35) | 6/30/15 | 62.4 | 7.65 | — | 58.3 |
| Idaho PERF | 7/01/15 | 90.4 | 7.50 | (0.25) | 6/30/15 | 91.4 | 7.10 | — | 90.0 |
| Illinois SERS | 6/30/15 | 36.2 | 7.25 | (1.25) | 6/30/15 | 35.2 | 7.02 | 2067 | 35.2 |
| Illinois SURS | 6/30/15 | 43.3 | 7.25 | (1.25) | 6/30/15 | 42.4 | 7.12 | 2072 | 41.8 |
| Illinois TRS | 6/30/15 | 42.0 | 7.50 | (1.00) | 6/30/15 | 41.5 | 7.47 | 2081 | 39.4 |
| Indiana 1977 Police Off. & FF PDF | 6/30/15 | 105.5 | 6.75 | (0.75) | 6/30/15 | 103.2 | 6.75 | — | 103.2 |
| Indiana PERF | 6/30/15 | 78.6 | 6.75 | (0.75) | 6/30/15 | 77.4 | 6.75 | — | 77.4 |
| Indiana STRS (Pre-1996) | 6/30/15 | 30.4 | 6.75 | (0.50) | 6/30/15 | 30.0 | 6.75 | — | 30.0 |
| Indiana STRS (1996) | 6/30/15 | 92.5 | 6.75 | (0.50) | 6/30/15 | 91.1 | 6.75 | — | 91.1 |
| Iowa PERS | 6/30/15 | 83.7 | 7.50 | 0.00 | 6/30/15 | 85.2 | 7.50 | — | 80.8 |
| Kansas PERS | 12/31/15 | 67.1 | 8.00 | 0.00 | 6/30/15 | 65.0 | 8.00 | — | 58.5 |
| Kentucky ERS-Non Hazardous | 6/30/15 | 19.0 | 7.50 | (0.25) | 6/30/15 | 18.8 | 7.50 | — | 17.9 |
| Kentucky TRS | 6/30/15 | 55.3 | 7.50 | 0.00 | 6/30/15 | 42.5 | 4.88 | 2038 | 42.5 |
| Louisiana School Employees RS | 6/30/15 | 70.7 | 7.00 | (0.50) | 6/30/15 | 74.5 | 7.00 | — | 74.5 |
| Louisiana SERS | 6/30/15 | 62.1 | 7.75 | (0.50) | 6/30/15 | 62.7 | 7.75 | — | 57.9 |
| Louisiana TRS | 6/30/15 | 60.9 | 7.75 | (0.50) | 6/30/15 | 62.5 | 7.75 | — | 57.7 |
| Maine SETPP | 6/30/15 | 82.2 | 7.13 | (0.63) | 6/30/15 | 81.2 | 7.13 | — | 80.0 |
| Maryland Employees RPS | 6/30/15 | 66.7 | 7.55 | (0.20) | 6/30/15 | 66.3 | 7.55 | — | 62.5 |
| Maryland Teachers RPS | 6/30/15 | 71.9 | 7.55 | (0.20) | 6/30/15 | 70.7 | 7.55 | — | 66.7 |
| Massachusetts SERS | 1/01/16 | 63.5 | 7.50 | (0.75) | 6/30/15 | 69.7 | 7.75 | — | 64.0 |
| Massachusetts TRS | 1/01/16 | 52.8 | 7.50 | (0.75) | 6/30/15 | 56.9 | 7.75 | — | 52.5 |
| Michigan PSERS | 9/30/15 | 60.6 | 8.00 | 0.00 | 9/30/15 | 62.9 | 8.00 | — | 56.7 |
| Michigan SERS | 9/30/15 | 64.2 | 8.00 | 0.00 | 9/30/15 | 66.1 | 8.00 | — | 59.6 |
| Minnesota General Employees RF | 6/30/15 | 76.3 | 8.00 | (0.50) | 6/30/15 | 78.2 | 7.90 | — | 71.2 |
| Minnesota Public Emp. P&F Fund | 6/30/15 | 83.6 | 8.00 | (0.50) | 6/30/15 | 86.6 | 7.90 | — | 78.8 |
| Minnesota SERF | 6/30/15 | 85.7 | 8.00 | (0.50) | 6/30/15 | 88.3 | 7.90 | — | 80.4 |
| Minnesota TRF | 7/01/15 | 77.1 | 8.00 | (0.50) | 6/30/15 | 76.8 | 8.00 | — | 69.2 |
| Mississippi PERS | 6/30/15 | 60.4 | 7.75 | (0.25) | 6/30/15 | 61.7 | 8.00 | — | 55.6 |
| Missouri DOT & Hwy. Patrol ERS | 6/30/15 | 52.9 | 7.75 | (0.50) | 6/30/14 | 53.6 | 7.75 | — | 49.5 |
| Missouri SEP | 6/30/15 | 75.0 | 8.00 | (0.50) | 6/30/15 | 72.6 | 8.00 | — | 65.4 |
| Montana PERS | 6/30/15 | 76.1 | 7.75 | (0.25) | 6/30/15 | 78.4 | 7.75 | — | 72.4 |
| Montana TRS | 7/01/15 | 67.5 | 7.75 | 0.00 | 6/30/15 | 69.3 | 7.75 | — | 64.0 |
| Nebraska School RS | 7/01/15 | 88.0 | 8.00 | 0.00 | 6/30/14 | 90.7 | 8.00 | — | 81.7 |
| Nebraska SERS — Cash Balance | 1/01/16 | 102.5 | 7.75 | 0.00 | 6/30/15 | 108.8 | 7.75 | — | 100.5 |
| Nevada PERS | 6/30/15 | 73.2 | 8.00 | 0.00 | 6/30/15 | 75.1 | 8.00 | — | 67.7 |

^aOregon's 2015 funding valuation is a draft reflecting the impact of recent court decision reversing some reforms, which are still reflected in the accounting valuation figures. AVA – Actuarial value of assets. AAL – Actuarial accrued liability. FNP – Fiduciary net position. TPL – Total pension liability. Note: See Appendix B for other acronyms. Source: Fitch's calculations based on system comprehensive annual financial reports and valuations. *Continued on next page.*

Comparative Ratios of Assets to Liabilities (continued)

(% as of Most Recent Valuation Date)

| System Name | Latest Funding Valuation | | | | Latest Accounting Valuation | | | | Fitch- |
|--------------------------------------|--------------------------|-----------------|----------------------|---------------------------|-----------------------------|-----------------|----------------------|-------------------|-------------------------|
| | Valuation Date | AVA/ AAL (%) | Discount Rate (%) | Chg. Since 2008 (%) | Measurement Date | FNP/ TPL (%) | Discount Rate (%) | Depletion Date | Adjusted FNP/TPL (%) |
| New Hampshire RS | 6/30/15 | 63.4 | 7.75 | (0.75) | 6/30/15 | 65.5 | 7.75 | — | 60.5 |
| New Jersey PFRS — State/Local | 6/30/15 | 72.6 | 7.90 | (0.35) | 6/30/15 | 52.8 | 5.79 | 2045 | 52.8 |
| New Jersey PERS — State/Local | 6/30/15 | 59.5 | 7.90 | (0.35) | 6/30/15 | 38.2 | 4.90 | 2033 | 38.2 |
| New Jersey TPAF | 6/30/15 | 51.1 | 7.90 | (0.35) | 6/30/15 | 28.7 | 4.13 | 2027 | 28.7 |
| New Mexico Educational ERS | 6/30/15 | 63.7 | 7.75 | (0.25) | 6/30/15 | 64.0 | 7.75 | — | 59.1 |
| New Mexico PERS | 6/30/15 | 74.9 | 7.75 | (0.25) | 6/30/15 | 77.0 | 7.75 | — | 71.1 |
| New York State & Local ERS | 4/01/15 | 93.8 | 7.50 | (0.50) | 3/31/16 | 90.7 | 7.00 | — | 90.7 |
| New York State & Local PFRS | 4/01/15 | 93.2 | 7.50 | (0.50) | 3/31/16 | 90.2 | 7.00 | — | 90.2 |
| North Carolina Teachers' & State ERS | 12/31/14 | 95.6 | 7.25 | 0.00 | 6/30/15 | 94.6 | 7.25 | — | 92.1 |
| North Dakota PERS | 6/30/15 | 68.6 | 8.00 | 0.00 | 6/30/15 | 77.7 | 8.00 | — | 70.0 |
| North Dakota Teachers' Fund For Ret. | 7/01/15 | 61.6 | 7.75 | (0.25) | 6/30/15 | 62.1 | 7.75 | — | 57.4 |
| Ohio PERS | 12/31/15 | 85.0 | 8.00 | 0.00 | 12/31/15 | 81.2 | 8.00 | — | 73.1 |
| Ohio STRS | 7/01/15 | 69.3 | 7.75 | (0.25) | 6/30/15 | 72.1 | 7.75 | — | 66.6 |
| Oklahoma Firefighters PRS | 7/01/15 | 65.0 | 7.50 | 0.00 | 6/30/15 | 68.3 | 7.50 | — | 64.7 |
| Oklahoma Police PRS | 7/01/15 | 98.2 | 7.50 | 0.00 | 6/30/15 | 99.8 | 7.50 | — | 94.6 |
| Oklahoma PERS | 7/01/15 | 93.6 | 7.50 | 0.00 | 6/30/15 | 96.0 | 7.50 | — | 91.0 |
| Oklahoma TRS | 6/30/15 | 66.6 | 8.00 | 0.00 | 6/30/15 | 70.3 | 8.00 | — | 63.3 |
| Oregon PERS ^a | 12/31/15 | 78.7 | 7.50 | (0.25) | 6/30/15 | 91.9 | 7.75 | — | 84.9 |
| Pennsylvania PSERS | 6/30/15 | 60.6 | 7.50 | (0.75) | 6/30/15 | 54.4 | 7.50 | — | 51.5 |
| Pennsylvania SERS | 12/31/15 | 58.0 | 7.50 | (1.00) | 12/31/15 | 58.9 | 7.50 | — | 55.8 |
| Rhode Island ERS-State | 6/30/15 | 56.6 | 7.50 | (0.75) | 6/30/15 | 55.0 | 7.50 | — | 52.2 |
| Rhode Island ERS-Teachers | 6/30/15 | 58.8 | 7.50 | (0.75) | 6/30/15 | 57.6 | 7.50 | — | 54.6 |
| South Carolina Police Officers' RS | 7/01/15 | 69.2 | 7.50 | (0.50) | 6/30/15 | 64.6 | 7.50 | — | 61.2 |
| South Carolina RS | 7/01/15 | 62.0 | 7.50 | 0.25 | 6/30/15 | 57.0 | 7.50 | — | 54.0 |
| South Dakota RS | 6/30/15 | 100.0 | 7.50 | (0.25) | 6/30/15 | 104.1 | 7.50 | — | 98.7 |
| Tennessee Closed State & Teachers | 7/01/15 | 95.2 | 7.50 | 0.00 | 6/30/15 | 96.3 | 7.50 | — | 91.3 |
| Texas ERS | 8/31/15 | 76.3 | 8.00 | 0.00 | 8/31/15 | 64.4 | 6.86 | 2053 | 64.4 |
| Texas TRS | 8/31/15 | 80.2 | 8.00 | 0.00 | 8/31/15 | 78.4 | 8.00 | — | 70.7 |
| Utah PERS - Noncontributory | 1/01/16 | 86.5 | 7.50 | (0.25) | 12/31/15 | 85.1 | 7.50 | — | 80.7 |
| Utah Public Safety RS | 1/01/16 | 85.1 | 7.50 | (0.25) | 12/31/15 | 83.7 | 7.50 | — | 79.3 |
| Vermont State RS | 6/30/15 | 75.1 | 7.95 | (0.30) | 6/30/15 | 74.9 | 7.95 | — | 67.8 |
| Vermont State Teachers RS | 6/30/15 | 58.6 | 7.95 | (0.30) | 6/30/15 | 58.2 | 7.95 | — | 52.7 |
| Virginia RS | 6/30/15 | 73.3 | 7.00 | (0.50) | 6/30/15 | 75.0 | 7.00 | — | 75.0 |
| Washington LEOFF — Plan 1 | 6/30/15 | 125.5 | 7.80 | (0.20) | 6/30/15 | 127.4 | 7.50 | — | 120.7 |
| Washington LEOFF — Plan 2 | 6/30/15 | 105.5 | 7.50 | (0.50) | 6/30/15 | 111.7 | 7.50 | — | 105.9 |
| Washington PERS — Plan 1 | 6/30/15 | 58.3 | 7.80 | (0.20) | 6/30/15 | 59.1 | 7.50 | — | 56.0 |
| Washington PERS — Plan 2/3 | 6/30/15 | 88.4 | 7.80 | (0.20) | 6/30/15 | 89.2 | 7.50 | — | 84.6 |
| Washington TRS — Plan 1 | 6/30/15 | 64.5 | 7.80 | (0.20) | 6/30/15 | 65.7 | 7.50 | — | 62.3 |
| Washington TRS — Plan 2/3 | 6/30/15 | 91.9 | 7.80 | (0.20) | 6/30/15 | 92.5 | 7.50 | — | 87.7 |
| West Virginia PERS | 7/01/15 | 86.8 | 7.50 | 0.00 | 6/30/15 | 91.3 | 7.50 | — | 86.5 |
| West Virginia TRS | 7/01/15 | 66.0 | 7.50 | 0.00 | 6/30/15 | 66.3 | 7.50 | — | 62.8 |
| Wisconsin RS | 12/31/15 | 100.0 | 7.20 | (0.60) | 12/31/15 | 102.7 | 7.20 | — | 100.5 |
| Wyoming Law Enforcement RP | 1/01/16 | 98.8 | 7.75 | (0.25) | 12/31/15 | 87.5 | 7.75 | — | 80.8 |
| Wyoming Public Employees PP | 1/01/16 | 78.2 | 7.75 | (0.25) | 12/31/15 | 73.4 | 7.75 | — | 67.8 |

^aOregon's 2015 funding valuation is a draft reflecting the impact of recent court decision reversing some reforms, which are still reflected in the accounting valuation figures. AVA – Actuarial value of assets. AAL – Actuarial accrued liability. FNP – Fiduciary net position. TPL – Total pension liability. Note: See Appendix B for other acronyms. Source: Fitch's calculations based on system comprehensive annual financial reports and valuations. *Continued on next page.*

Appendix D

Ratio of Active Members to Retirees and Beneficiaries^a

| System Name | 2008 | 2015 |
|--------------------------------------|-------|-------|
| Alabama ERS | 2.42 | 1.91 |
| Alabama TRS | 2.03 | 1.59 |
| Alaska PERS ^b | 1.36 | 0.60 |
| Alaska TRS ^b | 0.94 | 0.50 |
| Arizona Public Safety Personnel RS | 2.56 | 1.67 |
| Arizona State RS | 2.41 | 1.53 |
| Arkansas State Hwy. ERS | 1.33 | 1.11 |
| Arkansas PERP | 1.88 | 1.38 |
| Arkansas TRP | 2.62 | 1.69 |
| California PERF | 1.76 | 1.42 |
| California STRF — DB | 2.11 | 1.53 |
| Colorado PERA — State Div. | 1.78 | 1.49 |
| Connecticut SERS | 1.40 | 1.09 |
| Connecticut TRS | 1.80 | 1.50 |
| Delaware SEPP | 1.72 | 1.47 |
| Florida RS | 2.49 | 1.66 |
| Georgia ERS | 2.13 | 1.28 |
| Georgia TRS | 2.86 | 1.89 |
| Hawaii ERP | 1.84 | 1.52 |
| Idaho PERF | 2.16 | 1.57 |
| Illinois SERS | 1.09 | 0.93 |
| Illinois SURS | 1.61 | 1.14 |
| Illinois TRS | 1.81 | 1.39 |
| Indiana 1977 Police Off. & FF PDF | 5.18 | 3.58 |
| Indiana PERF | 2.30 | 1.75 |
| Indiana STRS (Pre-1996) ^b | 0.85 | 0.32 |
| Indiana STRS (1996) | 18.40 | 12.68 |
| Iowa PERS | 1.92 | 1.50 |
| Kansas PERS | 2.29 | 1.70 |
| Kentucky ERS-Non Hazardous | 1.36 | 1.01 |
| Kentucky TRS | 1.85 | 1.45 |
| Louisiana School Employees RS | 1.08 | 0.93 |
| Louisiana SERS | 1.54 | 0.81 |
| Louisiana TRS | 1.43 | 1.07 |
| Maine SETPP | 1.55 | 1.20 |
| Maryland Employees RPS | 1.62 | 1.16 |
| Maryland Teachers RPS | 1.96 | 1.48 |
| Massachusetts SERS | 1.70 | 1.53 |
| Massachusetts TRS | 1.79 | 1.45 |
| Michigan PSERS b | 1.67 | 1.02 |
| Michigan SERS b | 0.59 | 0.24 |
| Minnesota General Employees RF | 2.25 | 1.61 |
| Minnesota Public Emp. P&F Fund | 1.52 | 1.00 |
| Minnesota SERF | 1.85 | 1.34 |
| Minnesota TRF | 1.63 | 1.28 |
| Mississippi PERS | 2.25 | 1.63 |
| Missouri DOT & Hwy. Patrol ERS | 1.17 | 0.85 |
| Missouri SEP | 1.80 | 1.16 |
| Montana PERS | 1.70 | 1.37 |
| Montana TRS | 1.55 | 1.23 |
| Nebraska School RS | 2.47 | 1.88 |
| Nebraska SERS — Cash Balance | 33.06 | 10.58 |
| Nevada PERS | 2.78 | 1.77 |
| New Hampshire RS | 2.23 | 1.53 |
| New Jersey PFRS — State & Local | 1.42 | 0.91 |
| New Jersey PERS — State & Local | 2.63 | 1.56 |
| New Jersey TPAF | 2.15 | 1.56 |
| New Mexico Educational ERS | 2.04 | 1.38 |

^aCalculations based on most recent fiscal years and exclude terminated vested members not yet receiving benefits.

^bSystem closed to new employees. Note: See Appendix B for acronyms. Source: Fitch's calculations based on system comprehensive annual financial reports and valuations. *Continued on next page.*

Ratio of Active Members to Retirees and Beneficiaries^a (continued)

| System Name | 2008 | 2015 |
|--|-------|------|
| New Mexico PERS | 2.11 | 1.38 |
| New York State & Local ERS | 1.61 | 1.24 |
| New York State & Local PFRS | 1.13 | 0.94 |
| North Carolina Teachers' & State ERS | 2.32 | 1.62 |
| North Dakota PERS | 2.81 | 2.27 |
| North Dakota Teachers' Fund for Retirement | 1.51 | 1.31 |
| Ohio PERS | 2.14 | 1.58 |
| Ohio STRS | 1.37 | 1.04 |
| Oklahoma Firefighters PRS | 1.31 | 1.21 |
| Oklahoma Police PRS | 1.80 | 1.52 |
| Oklahoma PERS | 1.73 | 1.34 |
| Oklahoma TRS | 1.96 | 1.53 |
| Oregon PERS | 1.56 | 1.24 |
| Pennsylvania PSERS | 1.57 | 1.23 |
| Pennsylvania SERS | 1.03 | 0.84 |
| Rhode Island ERS – State | 1.15 | 1.01 |
| Rhode Island ERS – Teachers | 1.50 | 1.22 |
| South Carolina Police Officers' RS | 2.40 | 1.58 |
| South Carolina RS | 1.86 | 1.39 |
| South Dakota RS | 1.95 | 1.54 |
| Tennessee Closed State & Teachers ^b | 1.93 | 1.22 |
| Texas ERS | 1.85 | 1.42 |
| Texas TRS | 2.91 | 2.19 |
| Utah PERS – Noncontributory ^b | 2.95 | 1.40 |
| Utah Public Safety RS | 2.10 | 1.24 |
| Vermont State RS | 1.85 | 1.36 |
| Vermont State Teachers RS | 1.92 | 1.13 |
| Virginia RS | 2.50 | 1.84 |
| Washington LEOFF — Plan 1 ^b | 0.06 | 0.02 |
| Washington LEOFF — Plan 2 | 17.42 | 5.18 |
| Washington PERS — Plan 1 ^b | 0.24 | 0.09 |
| Washington PERS — Plan 2/3 | 8.76 | 3.91 |
| Washington TRS — Plan 1 ^b | 0.18 | 0.05 |
| Washington TRS — Plan 2/3 | 21.65 | 6.55 |
| West Virginia PERS | 1.75 | 1.41 |
| West Virginia TRS | 0.70 | 1.03 |
| Wisconsin RS | 1.84 | 1.33 |
| Wyoming Law Enforcement RP | 4.21 | 2.58 |
| Wyoming Public Employees PP | 1.91 | 1.48 |

^aCalculations based on most recent fiscal years, and exclude terminated vested members not yet receiving benefits.

^bSystem closed to new employees. Note: See Appendix B for abbreviations.

Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

Appendix E

ARC/ADEC Paid and Amortization Summary^a

| System Name | % of ADEC Paid | | | | | Amortization – Funding Basis ^b | | |
|------------------------------------|----------------|-------|-------|-------|-------|---|---------|----------|
| | 2011 | 2012 | 2013 | 2014 | 2015 | Period (Years) | Basis | Method |
| Alabama ERS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Layered | Level \$ |
| Alabama TRS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Layered | Level \$ |
| Alaska PERS | 86.0 | 92.7 | 89.2 | 106.8 | 231.7 | 25.0 | Closed | Level % |
| Alaska TRS | 78.6 | 84.6 | 85.2 | 102.5 | 527.7 | 24.0 | Closed | Level % |
| Arizona Public Safety Personnel RS | 104.9 | 104.6 | 103.7 | 95.9 | 96.5 | 21.0 | Closed | Level % |
| Arizona State RS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 29.0 | Closed | Level \$ |
| Arkansas State Hwy. ERS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | N.A. | N.A. | N.A. |
| Arkansas PERP | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Closed | Level % |
| Arkansas TRP | 95.9 | 89.9 | 88.7 | 83.3 | 86.0 | 30.0 | Closed | Level % |
| California PERF | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 29.0 | Closed | Level % |
| California STRF — DB | 46.7 | 45.8 | 44.1 | 50.9 | 53.1 | 32.0 | Closed | Level % |
| Colorado PERA — State Div. | 85.0 | 83.0 | 79.0 | 83.1 | 80.4 | 30.0 | Layered | Level % |
| Connecticut SERS | 87.5 | 100.0 | 99.9 | 100.0 | 99.5 | 19.4 | Closed | Level % |
| Connecticut TRS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 20.4 | Closed | Level % |
| Delaware SEPP | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 20.0 | Open | Level % |
| Florida RS | 83.0 | 60.0 | 66.0 | 100.0 | 100.0 | 30.0 | Layered | Level % |
| Georgia ERS | 100.0 | 100.0 | 100.0 | 100.2 | 100.2 | 19.4 | Closed | Level \$ |
| Georgia TRS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Layered | Level % |
| Hawaii ERP | 91.8 | 83.7 | 87.2 | 92.6 | 102.2 | 26.0 | Open | Level % |
| Idaho PERF | 85.5 | 84.5 | 96.6 | 95.7 | 98.2 | 25.0 | Open | Level % |
| Illinois SERS | 87.5 | 86.5 | 87.9 | 86.8 | 88.2 | 30.0 | Open | Level % |
| Illinois SURS | 61.4 | 68.3 | 90.5 | 96.3 | 94.2 | 30.0 | Open | Level % |
| Illinois TRS | 84.7 | 74.6 | 79.8 | 87.8 | 82.0 | 30.0 | Open | Level % |
| Indiana 1977 Police Off. & FF PDF | 113.5 | 102.3 | 121.8 | 135.5 | 123.2 | 27.0 | Closed | Level \$ |
| Indiana PERF | 97.7 | 88.5 | 98.2 | 98.3 | 103.6 | 27.0 | Closed | Level \$ |
| Indiana STRS (Pre-1996) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 26.0 | Closed | Level \$ |
| Indiana STRS (1996) | 123.4 | 117.0 | 108.0 | 109.6 | 115.4 | 26.0 | Closed | Level \$ |
| Iowa PERS | 82.3 | 98.2 | 98.0 | 100.0 | 101.9 | 29.0 | Closed | Level % |
| Kansas PERS | 74.0 | 67.0 | 75.0 | 79.4 | 74.5 | 18.0 | Closed | Level % |
| Kentucky ERS-Non Hazardous | 50.7 | 48.7 | 57.9 | 57.0 | 100.1 | 29.0 | Closed | Level % |
| Kentucky TRS | 152.9 | 73.5 | 70.8 | 68.4 | 61.2 | 30.0 | Open | Level % |
| Louisiana School Employees RS | 80.7 | 93.4 | 92.2 | 102.0 | 100.0 | 29.3 | Closed | Level \$ |
| Louisiana SERS | 82.2 | 89.3 | 86.2 | 86.3 | 103.6 | 30.0 | Open | Level % |
| Louisiana TRS | 90.2 | 100.0 | 99.0 | 103.3 | 107.5 | 30.0 | Open | Level \$ |
| Maine SETPP | 101.7 | 100.0 | 100.0 | 100.0 | 100.0 | 13.0 | Closed | Level % |
| Maryland Employees RPS | 68.8 | 65.9 | 66.9 | 72.9 | 83.9 | 23.0 | Layered | Level % |
| Maryland Teachers RPS | 75.1 | 71.2 | 77.5 | 73.6 | 89.4 | 23.0 | Layered | Level % |
| Massachusetts SERS | 92.0 | 83.7 | 77.9 | 79.8 | 75.0 | 24.0 | Closed | Level % |
| Massachusetts TRS | 111.0 | 90.2 | 80.7 | 80.8 | 75.0 | 24.0 | Closed | Level % |
| Michigan PSERS | 81.5 | 83.4 | 70.6 | 75.6 | 90.1 | 24.0 | Closed | Level % |
| Michigan SERS | 94.8 | 81.9 | 99.0 | 112.9 | 114.5 | 22.0 | Closed | Level \$ |
| Minnesota General Employees RF | 111.1 | 99.1 | 86.5 | 80.3 | 83.2 | 18.0 | Closed | Level % |
| Minnesota Public Emp. P&F Fund | 88.2 | 80.0 | 66.6 | 86.4 | 77.7 | 26.0 | Closed | Level % |
| Minnesota SERF | 81.1 | 80.7 | 66.9 | 65.6 | 73.6 | 26.0 | Closed | Level % |
| Minnesota TRF | 63.4 | 66.4 | 62.7 | 65.0 | 76.9 | 23.0 | Closed | Level % |
| Mississippi PERS | 100.0 | 100.0 | 100.0 | 105.2 | 107.1 | 32.2 | Open | Level % |
| Missouri DOT & Hwy. Patrol ERS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 16.0 | Closed | Level % |
| Missouri SEP | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 29.0 | Closed | Level % |
| Montana PERS | 54.6 | 53.7 | 93.8 | 94.0 | 102.4 | 30.0 | Open | Level % |
| Montana TRS | 98.3 | 81.9 | 70.2 | 100.0 | 100.0 | 28.0 | Open | Level % |
| Nebraska School RS | 89.0 | 88.0 | 79.0 | 100.0 | 100.0 | 26.0 | Layered | Level % |
| Nebraska SERS — Cash Balance | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 25.0 | Layered | Level \$ |
| Nevada PERS | 88.0 | 96.0 | 86.0 | 93.1 | 95.8 | 30.0 | Layered | Level % |
| New Hampshire RS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 24.0 | N.A. | Level % |
| New Jersey PFRS — Local | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Open | Level \$ |
| New Jersey PFRS — State | — | 14.3 | 28.6 | 29.7 | 33.6 | 30.0 | Open | Level \$ |

^aARC -- Annual required contribution. ^bAs of most recent funding valuation. ^cSystem reorganized as of 2014; 2014 figure reflects only the primary government, not systemwide. ADEC -- Actuarially determined employer contribution. Note: See Appendix B for all other acronyms. N.A. - Not available. Source: Fitch's calculations based on system comprehensive annual financial reports and valuations. *Continued on next page.*

ARC/ADEC Paid and Amortization Summary (continued)^a

| System Name | % ADEC Paid | | | | | Amortization – Funding Basis ^b | | |
|--|-------------|-------|-------|-------|-------|---|---------|----------|
| | 2011 | 2012 | 2013 | 2014 | 2015 | Period (Years) | Basis | Method |
| New Jersey TPAF | 1.4 | 14.0 | 27.7 | 18.2 | 23.4 | 30.0 | Open | Level \$ |
| New Mexico Educational ERS | 81.6 | 63.4 | 62.3 | 75.5 | 87.6 | 27.0 | Closed | Level % |
| New Mexico PERS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Open | Level % |
| New York State & Local ERS ^d | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | N.A. | N.A. | N.A. |
| New York State & Local PFRS ^d | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | N.A. | N.A. | N.A. |
| North Carolina Teachers' & State ERS | 73.0 | 100.0 | 104.0 | 100.0 | 100.0 | 12.0 | Closed | Level \$ |
| North Dakota PERS | 38.9 | 41.6 | 49.9 | 57.2 | 65.9 | 20.0 | Open | Level % |
| North Dakota Teachers' Fund For Ret. | 68.4 | 66.5 | 113.2 | 104.8 | 110.2 | 28.0 | Closed | Level % |
| Ohio PERS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 19.0 | Closed | Level % |
| Ohio STRS | 50.8 | 41.5 | 45.6 | 89.0 | 105.9 | 30.0 | Closed | Level % |
| Oklahoma Firefighters PRS | 44.9 | 66.3 | 66.6 | 68.5 | 84.4 | 29.0 | Closed | Level \$ |
| Oklahoma Police PRS | 38.5 | 94.2 | 83.3 | 74.1 | 113.8 | 5.0 | Closed | Level \$ |
| Oklahoma PERS | 62.9 | 109.4 | 105.2 | 108.2 | 145.5 | 13.0 | Closed | Level % |
| Oklahoma TRS | 77.6 | 115.9 | 113.1 | 117.3 | 132.3 | 14.0 | Open | Level % |
| Oregon PERS | 100.0 | 83.0 | 72.0 | 100.0 | 100.0 | 20.0 | Layered | Level % |
| Pennsylvania PSERS | 27.0 | 38.1 | 46.1 | 67.2 | 78.5 | 24.0 | Layered | Level % |
| Pennsylvania SERS | 42.8 | 53.9 | 60.2 | 76.9 | 92.5 | 30.0 | Closed | Level \$ |
| Rhode Island ERS-State | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 20.0 | Layered | Level % |
| Rhode Island ERS-Teachers | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 20.0 | Layered | Level % |
| South Carolina Police Officers' RS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 27.0 | Open | Level % |
| South Carolina RS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Open | Level % |
| South Dakota RS | 100.0 | 100.0 | 100.0 | 121.9 | 115.1 | — | Closed | Level % |
| Tennessee Closed State & Teachers ^c | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 8.0 | Closed | Level \$ |
| Texas ERS | 58.5 | 49.2 | 50.7 | 66.3 | 67.9 | 31.0 | Open | Level % |
| Texas TRS | 86.0 | 74.0 | 74.0 | 79.1 | 93.6 | 33.0 | Open | Level % |
| Utah PERS — Noncontributory | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 20.0 | Open | Level % |
| Utah Public Safety RS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 20.0 | Open | Level % |
| Vermont State RS | 84.5 | 140.2 | 130.4 | 132.0 | 125.1 | 22.0 | Closed | Level % |
| Vermont State Teachers RS | 104.2 | 109.6 | 108.1 | 106.3 | 100.1 | 22.0 | Closed | Level % |
| Virginia RS | 46.7 | 59.6 | 75.8 | 75.8 | 83.5 | 29.0 | Closed | Level % |
| Washington LEOFF — Plan 1 | 100.0 | 100.0 | 100.0 | 100.0 | N.A. | 10.0 | Closed | Level % |
| Washington LEOFF — Plan 2 ^d | 156.9 | 136.9 | 144.3 | 99.6 | 100.0 | N.A. | N.A. | N.A. |
| Washington PERS — Plan 1 | 33.1 | 50.6 | 49.8 | 102.2 | 101.8 | 10.0 | Open | Level % |
| Washington PERS — Plan 2/3 ^d | 80.3 | 94.5 | 95.3 | 97.4 | 96.5 | N.A. | N.A. | N.A. |
| Washington TRS — Plan 1 | 47.0 | 44.1 | 43.1 | 96.4 | 102.4 | 10.0 | Open | Level % |
| Washington TRS — Plan 2/3 ^d | 72.4 | 92.1 | 98.9 | 97.7 | 99.2 | N.A. | N.A. | N.A. |
| West Virginia PERS | 83.3 | 105.3 | 96.6 | 102.9 | 103.4 | 21.0 | Closed | Level \$ |
| West Virginia TRS | 106.3 | 105.3 | 100.8 | 113.0 | 107.9 | 20.0 | Closed | Level \$ |
| Wisconsin RS | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 30.0 | Closed | Level % |
| Wyoming Law Enforcement RP | 153.3 | 135.0 | 122.5 | 112.7 | 108.5 | 30.0 | Open | Level % |
| Wyoming Public Employees PP | 93.4 | 88.2 | 81.2 | 70.8 | 85.9 | 30.0 | Open | Level % |

^aARC – Annual required contribution. ^bAs of most recent funding valuation. ^cSystem reorganized as of 2014; 2014 figure reflects only the primary government, not systemwide. ^dSystem use aggregate cost method and thus does not report amortization. ADEC – Actuarially determined employer contribution. Note: See Appendix B for all other acronyms. N.A. – Not available.

Source: Fitch's calculations based on system comprehensive annual financial reports and valuations.

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