MEKETA INVESTMENT GROUP

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September 24, 2018

Mr. Henry Jones
Chairman of the Investment Committee
California Public Employees' Retirement System
400 P Street, Suite 3492
Sacramento, CA 95814

RE: INFRASTRUCTURE PORTFOLIO ANNUAL PROGRAM REVIEW 2018

Dear Mr. Jones:

In our role as the Board Infrastructure Consultant, Meketa Investment Group conducted an annual review of the Infrastructure Portfolio ("the Portfolio") for the period ending June 30, 2018. Our review covered the Portfolio's investment performance, implementation, compliance with applicable investment policies, staffing, and representation of CalPERS' Investment Beliefs. Following a Summary Review, each area is addressed in more detail.

Summary Review[1]

- **Performance:** The Portfolio's 2018 one-year net total return of 20.6% exceeded its Policy Benchmark of CPI + 400 bps (6.4%) by 14.2%.
- **Implementation:** The Net Asset Value ("NAV") was $4.3 billion, up $522 million, or 14%, over the March 31, 2017 NAV of $3.8 billion. This NAV was 1.2% of the Total Fund, versus the 1% Interim Target.
- **Policy Compliance:** The Portfolio is in compliance with the Key Parameters related to risk classification, geography, leverage, and external manager limits, as measured by NAV.
- **Staffing:** The Real Assets Unit ("RAU") had 53 filled positions out of 55 authorized as of June 30, 2018. As noted in prior reports, no positions are formally exclusively dedicated to portfolios, but both currently open and recruited positions will benefit the Infrastructure Portfolio.
- **Investment Beliefs:** In our view, the Infrastructure Portfolio, as implemented by Staff, supports many CalPERS' Investment Beliefs.

Across these areas, we believe the Portfolio's investment activity for the year was appropriate and consistent with the Policy and strategic role of the Portfolio.

[1] All years refer to fiscal years ending June 30, unless otherwise noted. Financial data are as of March 31 for the fiscal years ending June 30, due to the quarter lag in private investment performance reporting from the managers, while staffing and Total Fund data are as of June 30.

Investment Performance

CalPERS' Infrastructure Portfolio continues to significantly outperform its policy benchmark for the reporting period, and all other trailing periods shown below. Absolute returns for the one-year and other trailing periods reflect an increase over the marks as of the last annual reporting period by between 180 and 1070 basis points ("bps"). Benchmark-relative returns, measured as Over (Under) Performance, for all periods shown also reflect an improvement over the last annual reporting period by between 150 and 1080 bps.

FY 2018 Net Returns %	1 Year	3 Year	5 Year	10 Year
Infrastructure Portfolio	20.6	13.0	15.0	14.4
Benchmark CPI+ 400	6.4	5.9	5.5	5.9
Over (Under) Performance	14.2	7.1	9.5	8.5

As we reported in August, approximately 6%, or one-third of the return, came from income, with the rest from appreciation. This is an increase over recent three- and five-year periods that delivered closer to a 4% return from income. The upward trend over the periods is consistent with the maturation of the portfolio.

Among the risk categories, Core continues to deliver the strongest returns, posting 25% for 2018, followed by Value Add at 10%, and Opportunistic at 0%. As we continue to note, the categorical performance rankings are the inverse of what would be expected by definition, as a combination of vintage year effects and manager selection continues to influence absolute and relative performance. International Core, representing 29% of the portfolio, is a key component of Core's impressive returns, posting a 41% return for the year, versus returns between 10% and 17% for domestic Core segments (Commercial, Essential, and Specialized).

Across the segments, Commercial (transportation) and Essential (energy) investments have delivered returns of 17% and 14%, respectively, while Specialized (including both Value Add and Opportunistic risk-return profiles) has lagged at 6%. As noted above, International (all Core) has delivered very strong returns for 2018, and has been consistently the top performing segment over time.

At the partnership level, net returns ranged from -10% to 61% for the year, with 11 posting positive returns and three negative returns. The spread between the highest and lowest performers in Core was 51%, and in Value Add was 70%, with only one partnership in the Opportunistic category (no spread).

Implementation

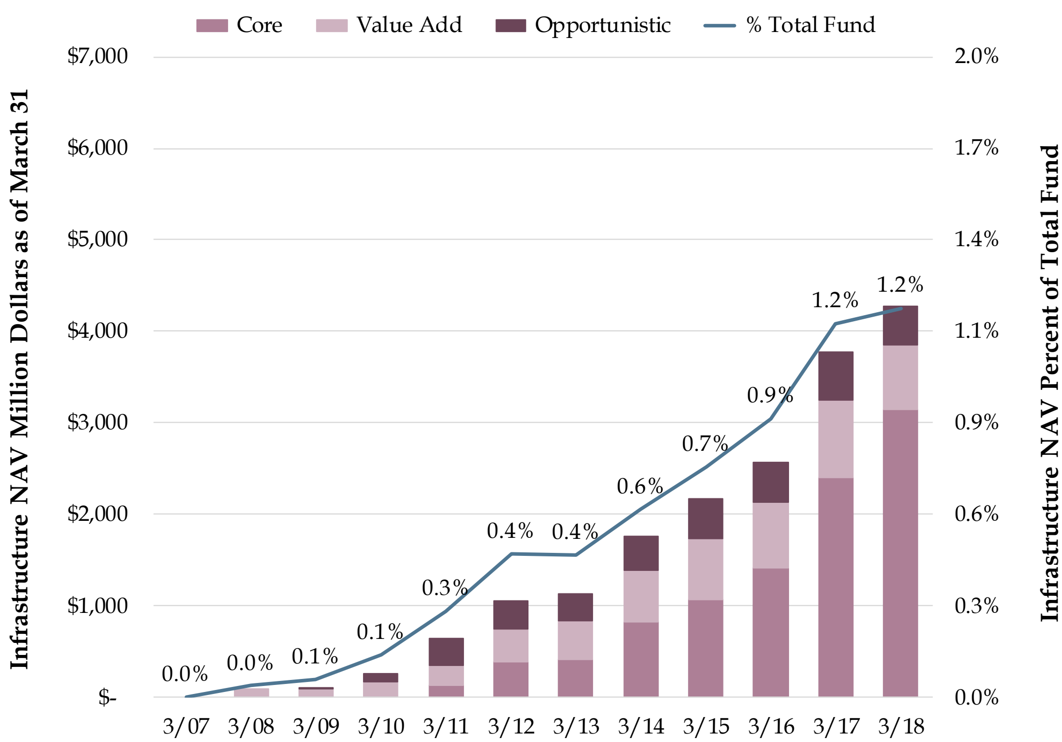
Current NAV and Historical Portfolio Growth

The Portfolio's NAV at 2018 year end was $4.3 billion, a 14% increase over the last reporting period's NAV of $3.8 billion. This exposure represents 1.2% of the Total Fund, compared to the 1% Interim Target (and 2% Policy Target) in effect until

June 30, 2018.[1] Additionally, unfunded commitments were $1.4 billion, down from $1.7 billion last year, with $1.1 billion at CalPERS' discretion, a slight decrease from $1.3 billion in revocable commitments as of a year ago.

Since 2013, the Portfolio has been successfully growing NAV, having crossed the $4 billion mark in 2018, after reaching $3 billion in 2017, and $2 billion in 2015, as seen in Exhibit 1 below. Since 2014, the Portfolio has doubled its share of the Total Fund NAV from 0.6% to 1.2%, which required more than doubling Portfolio NAV (+ ~150%) to keep ahead of the Total Fund's growth during the same period. Exhibit 1 also shows the significant increase in exposure to Core infrastructure, relative to Value Add and Opportunistic, consistent with policy targets.

Exhibit 1. Infrastructure Portfolio NAV, 2007 – 2018

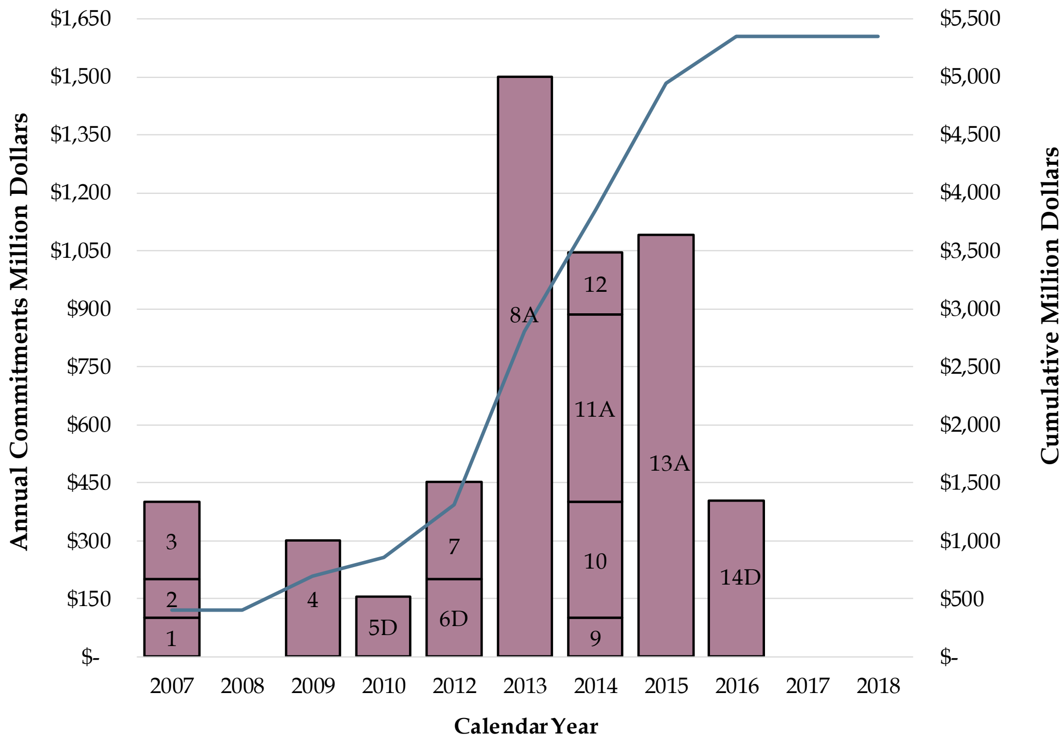


The Portfolio's ability to deploy capital and take advantage of the cash yield and appreciation available from infrastructure investments is directly related to the pacing of commitments to investment vehicles and managers' effectiveness in sourcing deals and executing transactions within their mandates. As seen in Exhibit 2 below, the Portfolio has made almost $5.5 billion in commitments since inception, but historical pacing has been inconsistent, and in some years below levels necessary to more expeditiously reach and maintain target exposures. The lack of new commitments in 2017 reflects a separate account initiative that ultimately was refocused, and belies significant effort Staff devoted to manager

[1] Until June 18, 2018, the Total Fund Investment Policy set the Strategic Asset Allocation Target and Range for Infrastructure and Forestland combined at a 3% Policy Target, and 2% Interim Target (±2%). The Total Fund Policy effective June 18, 2018 sets a new target allocation for the Real Assets Program, as discussed later in this report.

diligence and negotiation. It appears the continuing initiative, with the benefits of lessons learned, will result in several new commitments in the coming months.

Exhibit 2. Infrastructure Portfolio Commitments to New Vehicles, 2007 – 2018
A = Separate Account, D = Direct Investment, otherwise Commingled Fund



FY 2018 Investment Activity

The increase in NAV from 2017 to 2018 of $522 million is mostly attributed to a combination of new contributions to existing investment vehicles and unrealized appreciations totaling $870 million (offset by distributions of $571 million), and the net effect of income, realized appreciation, fees, and other credits. The largest single new investment, made through a separate account established in 2013, represents several hundred million dollars in equity, and is briefly described below. In other contribution activity, a number of managers called capital for smaller investments in new or existing assets, ranging from ~$3 million to ~$50 million per manager. The most significant distributions came from several managers with older vintage year funds, returning in the range of ~$20 million to ~$100 million per manager.

CalPERS purchased a majority equity interest in Rocky Caney Wind, comprising two wind farms, Caney River and Rocky Ridge, located in Kansas and Oklahoma, respectively, as announced on November 30, 2017. Both wind farms sell their output under long-term contracts: Caney River, operating since 2011, delivers its 200 MW to the Tennessee Valley Authority; and Rocky Ridge, operating since 2012, delivers its 149 MW to the Western Farmers Electric Cooperative. The Infrastructure Portfolio acquired the assets from Enel Green Power North America

("Enel") through the Gulf Pacific Power separate account managed by Harbert Management Corporation. Enel retains the balance equity stake and will continue to manage and operate both wind farms.

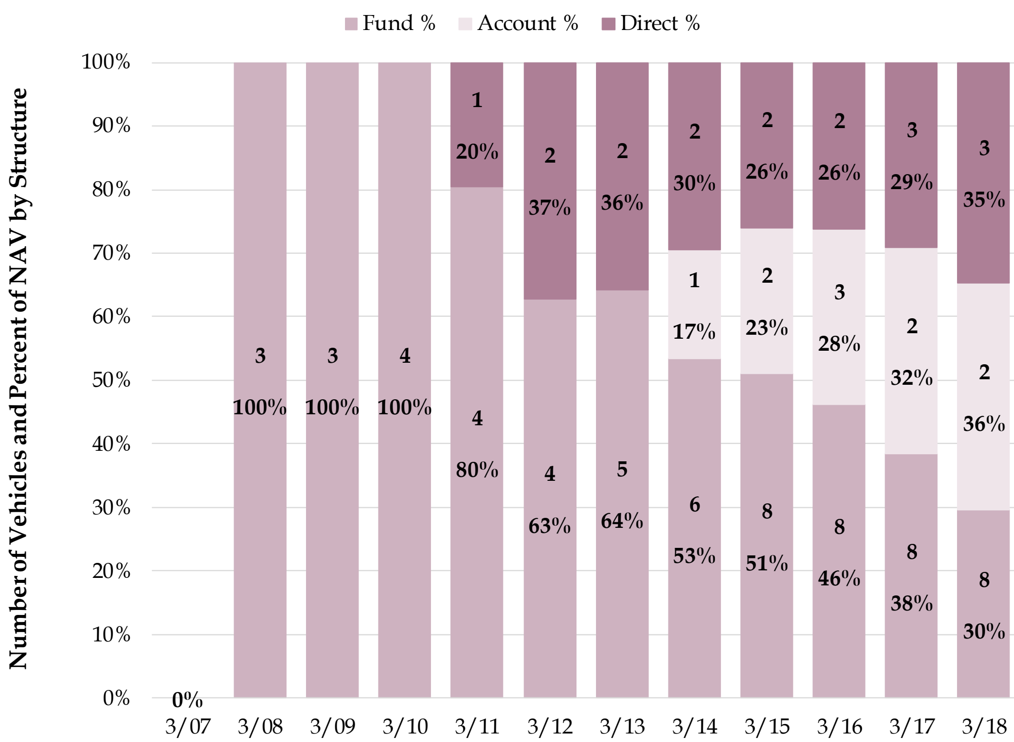
Rocky Caney Wind is consistent with Portfolio strategic objectives, return expectations, and policies, including preference for using separate accounts. It also represents an important success in the competitive market for core renewable assets. This acquisition increases the Portfolio's exposure to renewable infrastructure from 16% to 21%.

Managers and Investment Structures

The Portfolio's investments are managed by eight General Partners, comprising two separate accounts, three direct investments, and eight commingled funds, representing 36%, 35%, and 30% of 2018 NAV, respectively. The number of external managers is unchanged from the prior year, but CalPERS did close one separate account during the year for lack of capital deployment.

As seen in Exhibit 3 below, the current distribution of invested capital across the three structures has continued to evolve away from commingled funds and toward separate accounts and direct investments, consistent with policy preferences.[1] This reflects a combination of executing new separate accounts in 2013 and 2015 and their subsequent deployment, no new commingled fund commitments since 2014, and older funds' declining NAVs as they realize investments and return capital.

Exhibit 3. Infrastructure Investment Structures, 2007 -2018



1 According to the Investment Policy Procedures & Guidelines for the Real Assets Program.

Future Portfolio Evolution

The Board, Staff, and Meketa are cognizant of, and have periodically discussed, the challenges associated with deploying sufficient capital into infrastructure investments that would sustainably translate into the effective allocation. As noted above, the Portfolio has made significant progress over the last several years, and now sits slightly above the Interim Target of 1%, which was in effect for the FY 2018 reporting period, as established under the 2013 Asset Liability Management ("ALM") study.

Moving forward, the Board may wish to have more clarification around Staff's intention for the infrastructure portfolio under the new Real Asset Program-level Policy Target of 13% (±5%). This was generated from the 2018 ALM, effective July 2018, and intentionally does away with prior portfolio-level targets but does not explicitly establish new ones, as the Board and Staff are aware.

To maintain or increase the current level of exposure to infrastructure, the RAU would need to further expand and diversify the types of investment structures and strategy mandates it relies on, in directions and at scales Staff are already contemplating, and perhaps in some ways currently receiving less attention as viable options. A few examples include, but are not limited to the following:

- Continue to expand the number and scope of separate accounts with qualified and proven managers;
- Continue to seek direct investment opportunities with known and respected partners;
- Explore club and consortia vehicles, such as via joint ventures and other structures, with like-minded institutional investors;
- Consider selective commitments to commingled funds for segments, sectors, and geographies where the manager and/or vehicle offers strategic or tactical advantages;
- Consider selective commitments to funds as an avenue to access meaningful co-investment allocations offered fee and carry free; and
- Consider greater deployment to Value Add and Opportunistic investments to target less competitive acquisition markets, especially where longer term hold options are built in, or can be readily effected.

Investment Policy

The following CalPERS policies and guidelines govern the Real Assets Program, and the Infrastructure Portfolio therein:

- Total Fund Investment Policy (the "Fund Policy"), effective June 18, 2018;
- Investment Policy for Real Assets Program (the "Real Assets Policy"), effective March 19, 2018; and
- Investment Policy Procedures & Guidelines for the Real Assets Program ("IPPG"), effective January 1, 2017.

Based on our review, Meketa believes that the Portfolio is in compliance with the Real Assets Policy, related documents, and key parameters, as described below.

Strategic Objectives

- *Stable and predictable cash yield* – Net incomes for trailing one-, three-, and five-year periods ending 2018 were 6.1%, 4.2%, and 3.9%, respectively. This is an increase over 2017 values of 3.3%, 3.1%, and 2.7% for the same periods. Staff reports they expect future net yields to come in between 3% and 5%. The policy expectation is that Core will produce a relative immediate current net income yield after debt service, Value Add a cash yield after an initial period of several years, and Opportunistic low or no cash yield during the holding period. The increasing exposure to Core (see Exhibit 1) should support continuing cash yield.
- *Diversification of equity risk* – Staff reports that the forecasted volatility for infrastructure is 7.4% and its correlation with the Total Fund portfolio is 0.79 (both metrics improved from last year's of 9.1% and 0.85). Among the Real Asset portfolios, this is the lowest volatility, but the highest correlation.[1] Staff reports the five-year correlation between the Real Assets Program overall and an equity benchmark, the FTSE Global All Cap Custom Net, as 0.02. These metrics indicate positive diversification benefits from real assets, including infrastructure.
- *Inflation protection* – The Portfolio seeks to invest in essential infrastructure assets, many of which have explicit inflation adjustment mechanisms, which helps the Portfolio comply with this investment objective. For example, 79% of the Portfolio's March 2018 NAV is invested in concession, contracted, or regulated revenue structures.

[1] Real Estate forecasted volatility is 11.3% and correlation with the Total Fund is 0.70, while Forestland values are 14.3% and 0.57.

Performance Objective and Benchmarks: CPI + 400

For FY 2018, the Portfolio has returned 20.6% against the Policy Benchmark for the period of 6.4%, providing an excess return of 14.2%. As reported above, the Portfolio has also outperformed its benchmark by between 710 and 1420 basis points for the various reported periods. Additionally, from FY 2009 to FY 2018, one-year annual and three-year rolling three-year returns have all been above the benchmark, with the exception of the Portfolio's first year.

Diversification Along Key Parameters

The Portfolio is compliant with all key parameters related to diversification and other limits, as demonstrated in the table below, with summary following.

Key Portfolio Parameter	Policy Range/Limit	NAV 3/31/18 Exposure
Risk Classification	%	%
Core	60-100	81
Value Add	0-25	8
Opportunistic-All Strategies	0-25	11
Opportunistic-Development	0-10	0
Geographic Region	%	%
United States	50-100	54
International Developed	0-50	45
International Developing	0-15	1
International Frontier	0-5	0
Real Asset Segments-Sector(s)[1]	%	%
Commercial-Transportation	0-60	11
Consumer-Communications	0-40	0
Essential-Energy/Water/Waste	0-25	33
Specialized-Opportunistic	0-20	28
International	0-25	29
Manager Exposure[2]	%	%
Largest Partner Relationship	20 max	3
No External Manager	20 max	1
Leverage		
Loan to Value	65% max	46%
Debt Service Coverage Ratio	1.25x min	2.13x
Public Securities[3]	%	%
Directly Invested[4]	10	0

[1] For informational purposes only. These parameters are measured at the Real Assets Program level.
[2] Calculated as NAV plus total unfunded commitments relative to a Real Assets Program base of $46.5 billion.
[3] Measured at the Real Assets Program level.
[4] Staff reports no direct investments in public securities via separately managed accounts; it is possible that one or more of the commingled fund managers could have de minimus positions in public securities.

In summary, we find the following with respect to diversification parameters:

- *Risk*—Exposures are within the middle of the classification policy ranges, with the exception of development stage which has $0 NAV;
- *Geography*—Categorical exposures are at the lower end of their respective ranges, with the exception of International-Developed exposure which is at the higher end of its range;
- *Segment*—Investments represent multiple segments, noting that data are informational, as range targets are set for the Real Assets Program level;
- *Manager*—Exposures are well below the maximums allowed;
- *Leverage*—Metrics are comfortably compliant; and
- *Public Securities*—The Portfolio has no direct exposures.

Staffing and Resources[1]

The Real Assets Program has 55 authorized positions, of which 53 are filled as of June 30, 2018, with authorized positions unchanged from FY 2017 end. During FY 2018, the RAU acted on 18 positions, including RAU promotions, other internal transfers, and new hires. These actions filled the eight vacancies existing at FY 2017 end. During FY 2018, the RAU experienced only two departures, with one individual moving to another position in RAU and the other promoted to a position serving the Total Fund.

With respect to resources for the Infrastructure Portfolio, as noted in previous Meketa reports, the RAU organizes staffing around the six investment segments for both the New Investments Team ("NIT") and the Portfolio Management Group ("PMG"), but not for the Portfolio Analytics, Research, Risk, Government & Operations Team ("PARRGO"). Five of the six segments include one or more infrastructure sector, along with other real assets sectors. As such, NIT and PMG staff are dedicated to specific infrastructure sectors, but also will work on real estate and/or forestland investments. The degree of dedication for NIT staff is fluid, depending on deal flow and active diligence efforts, while PMG staff are explicitly assigned to a specific segment(s) and respective sectors.

Across the two vacancies, filling the PMG Investment Manager position responsible for Commercial, Power, and Water assets will directly benefit the Infrastructure Portfolio, while filling PARRGO's Investment Officer I position will benefit all Real Asset segments. Both positions are under active recruitment.

With respect to staffing levels, the Managing Investment Director reports to us that the total number of staff for the RAU is sufficient for the time being. As Meketa observed in our February APR, the RAU deploys staff using a combination of Portfolio-specific specialization and Program-level generalization, which provides the necessary expertise and workload balancing flexibility across Real Asset

[1] Staffing and resource metrics are as of June 30 of the respective fiscal year.

portfolios. We are comfortable with staffing levels at this time, but will continue to evaluate resources for the Portfolio.

With respect to Meketa providing resources related to the Portfolio during 2018, we supported the Portfolio in the following ways:

- Real Asset Investment Committee ("RAIC")—Attended by phone 23 RAICs, including reviewing materials related to opportunity pipeline, prospect screening, active due diligences, performance reporting, segment plans, manager annual investment plants, policy and guidance matters, and providing comments as applicable.
- Weekly Call with Senior Leadership—Received updates on Infrastructure Portfolio and related RAU activities, including around prospective new investments, existing investments and managers, potential dispositions, staffing, policy and guidance, and Total Fund developments.
- Policy Review and Comment—Reviewed, provided informal comments, and formal opinions on several proposed policy revisions affecting or otherwise relevant to the Infrastructure Portfolio.
- Periodic Reports—Prepared Annual and Semi-Annual Reports for FY 2017, and H2 2017 and H1 2018, respectively.
- Investment Opinion Letters—None requested.

Investment Beliefs

In our view, the Infrastructure Portfolio, as implemented by Staff, is well aligned with CalPERS' Investment Beliefs. We highlight below several Beliefs (#) that are particularly important to the infrastructure asset class, and largely unchanged from our FY 2017 APR.

- *Liabilities must influence the asset structure (#1):* As an asset class, infrastructure consists of long-lived assets that have either/both long-term contracted revenue or stable, inflation-protected revenue, and 79% of the Portfolio's NAV falls into this category. These attributes make infrastructure assets well aligned with CalPERS' time horizon and liability structure.
- *A long time horizon is a responsibility and an advantage (#2):* The Portfolio's investment approach consists of a buy and hold strategy, targeting assets that are long-lived. Shorter-term investors that do not have the liquidity to invest long-term in private infrastructure assets cannot access these assets in the marketplace.
- *CalPERS will take risk only with a strong belief we will be rewarded (#7):* While targeting lower-risk, Core investments, over the last 10 years the Portfolio has returned 14.4% per year, on average, against the Policy Benchmark of 5.9%, delivering 8.5% in over-performance. See for example the increasing exposure to Core over the 2007 – 2018 period in Exhibit 1.

- *Costs matter and need to be effectively managed (#8):* The Portfolio has been successful in negotiating favorable terms with managers, focusing on providing reasonable operations support and strong economic alignment. asset management fee rates are expected to decline as the Portfolio focuses on lower-fee customized separate accounts and direct investments over commingled funds. However, profit sharing fees may increase where managers exceed performance hurdles.
- *Risk to CalPERS is multi-faceted and not fully captured through measures such as volatility or tracking error (#9):* As a private market asset class, infrastructure risk analysis incorporates many risk factors beyond price volatility, including financial and operating leverage, counterparty risk, interest rate risk, regulatory risk, and environmental risks. The additional governance secured under separate accounts and direct investments over commingled funds helps mitigate these risks.

Conclusion

We believe that the Portfolio's performance, investment activity, and portfolio position during the reporting period has been appropriate and consistent with the Policy and the strategic role of the Portfolio. We continue to be impressed with the Portfolio's consistent over-performance, but we also believe these returns will moderate over time, given the countervailing conditions in a very competitive core asset marketplace that benefit divestitures and challenge acquisitions. RAU Staff and the Infrastructure Portfolio's managers appear well situated to navigate their mandates' opportunity set.

Please do not hesitate to contact us if you have questions or require additional information.

Sincerely,

Stephen P. McCourt, CFA
Managing Principal

Lisa Bacon, CAIA
Senior Vice President

SPM/EFB/nca