

2. Joint Meeting of the ERS Board of Trustees and Investment Advisory Committee

May 22, 2019



Public Agenda #1.1

Call Meeting to Reconvene the Board of Trustees

May 22, 2019

Public Agenda #1.2

Call Meeting of the Investment Advisory Committee to Order

May 22, 2019

Public Agenda #2.1

Review and Approval of the Minutes to the March 6, 2019 Joint Meeting of the Board of Trustees and Investment Advisory Committee – (Action)

May 22, 2019

Questions?
Action Item

Public Agenda #3.1

Review of Investment Performance for the First Calendar Quarter of 2019

May 22, 2019

Tom Tull, CFA, Chief Investment Officer

Carlos Chujoy, Risk Officer

Sam Austin and Tim Bruce, NEPC

QUARTERLY PERFORMANCE REPORT

EMPLOYEES RETIREMENT SYSTEM OF TEXAS

May 22, 2019

Sam Austin, Partner

Tim Bruce, Partner



BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | PORTLAND | SAN FRANCISCO

EXECUTIVE SUMMARY

NEPC, LLC

ERS TRUST DASHBOARD

	CYTD	FYTD
Fund Performance	6.4%	0.3%
Policy Benchmark	8.2%	0.6%
Excess Return	-1.8%	-0.3%
3 Yr Tracking Error	1.52%	

Largest Contributors (Quarter)

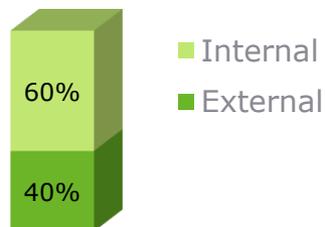
Private Real Estate, Absolute Return and Rates outperformed, contributed +0.1% each relative to the policy benchmark

Largest Detractors (Quarter)

Private Equity underperformed, detracted -1.8% from relative returns versus policy

Profile
Market Value at 3/31/2019:
\$28.3 Billion
Actuarial Accrued Liability 8/31/18:
\$39.0 Billion
Actuarial Assumed Rate of Return:
7.50%
Retirees and Beneficiaries 8/31/2018:
111,361
Retirement Payments Annually 8/31/2018:
\$2.4 Billion
ERS Trust Funding Ratio 8/31/2018
70.20%

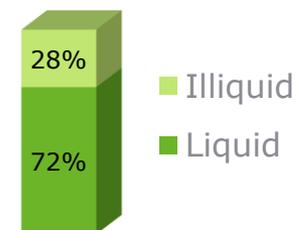
Management



Allocation



Liquidity



TOTAL FUND PERFORMANCE DETAIL (NET OF FEES)

	Market Value(\$)	3 Mo(%)	Fiscal YTD(%)	1 Yr(%)	3 Yrs(%)	5 Yrs(%)	10 Yrs(%)
Total Fund	28,285,241,189	6.4	0.3	4.2	8.7	6.4	10.1
<i>Total Fund Policy Index</i>		8.2	0.6	4.2	8.1	6.1	10.0
<i>Long Term Public Index</i>		10.1	-1.0	2.6	8.6	5.6	10.4

- **One-year ended March 31, 2019, the Fund equaled the policy benchmark, returning 4.2%.**
- **The Fund's assets decreased from \$28.36 billion to \$28.29 billion in the past calendar year which includes a \$1.46 billion investment gain in the first calendar quarter of 2019.**



TOTAL FUND PERFORMANCE DETAIL (NET OF FEES)

3 Years Ending March 31, 2019

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	Sortino Ratio RF
Total Fund	8.73%	4.90%	1.53	1.51
Total Fund Policy Index	8.12%	5.98%	1.15	1.15

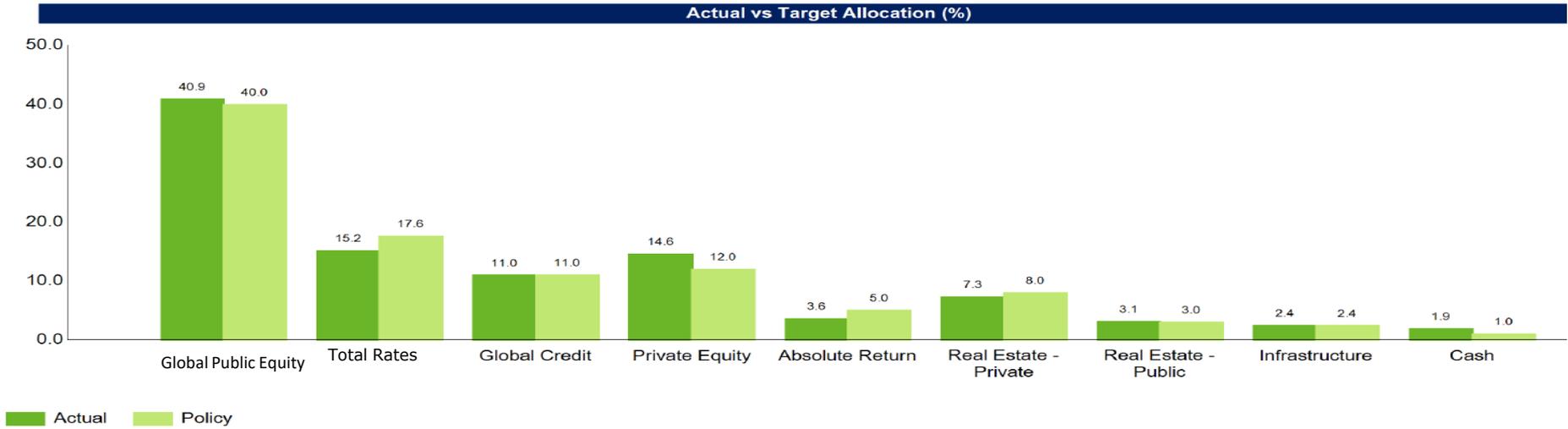
5 Years Ending March 31, 2019

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	Sortino Ratio RF
Total Fund	6.44%	5.57%	1.02	1.41
Total Fund Policy Index	6.12%	6.56%	0.82	1.16

- **Three-year period ended March 31, 2019, the return of 8.7% outperformed the benchmark by 0.6%. On a risk-adjusted basis, the Sharpe and Sortino Ratios over this period indicate active management benefited the Plan.**
- **Five-year period ended March 31, 2019, the Fund returned 6.4% per year and outperformed the policy benchmark by 0.3%. On a risk-adjusted basis, the Fund's Sharpe Ratio (1.02 vs. 0.82) and Sortino Ratio (1.41 vs. 1.16) indicate strong returns per unit of risk taken and strong returns per unit of downside risk experienced relative to the policy benchmark.**



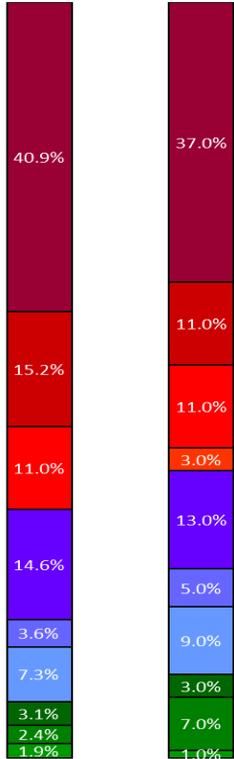
TOTAL FUND ASSET GROWTH SUMMARY



Summary of Cash Flows

	Last Three Months	Fiscal Year-To-Date	One Year	Three Years	Five Years
Beginning Market Value	\$26,873,073,745	\$29,009,798,984	\$28,361,237,547	\$24,770,637,779	\$25,381,543,189
Contributions	\$2,794,254,621	\$6,273,645,230	\$10,610,142,142	\$27,080,589,359	\$44,256,169,638
Withdrawals	-\$2,892,441,150	-\$6,856,263,724	-\$11,649,008,526	-\$30,144,601,200	-\$49,491,447,766
Net Cash Flow	-\$51,452,228	-\$535,884,192	-\$992,132,083	-\$3,017,277,540	-\$5,188,543,827
Net Investment Change	\$1,463,619,672	-\$188,673,602	\$916,135,726	\$6,531,880,950	\$8,092,241,827
Ending Market Value	\$28,285,241,189	\$28,285,241,189	\$28,285,241,189	\$28,285,241,189	\$28,285,241,189

FUND ASSET ALLOCATION VS. POLICY TARGETS

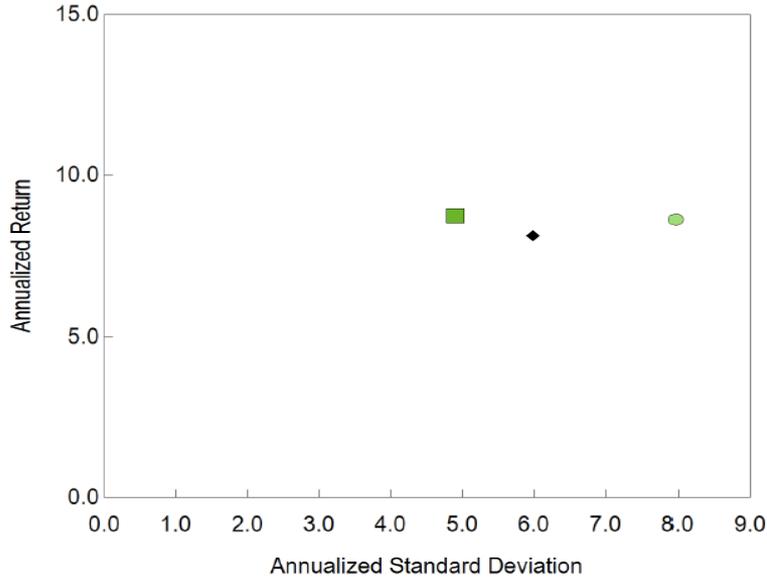


Asset Allocation on March 31, 2019					
	Current	Current	Long-Term Target	Long-Term Target Range	
Public Equity	\$11,575,153,032	40.9%	37.0%	27.0% - 47.0%	
Total Rates	\$4,291,537,087	15.2%	11.0%		
Global Credit	\$3,106,223,729	11.0%	11.0%	1.0% - 21.0%	
Opportunistic Credit	-	-	3.0%	0.0% - 8.0%	
Private Equity	\$4,136,214,124	14.6%	13.0%	8.0% - 18.0%	
Absolute Return	\$1,023,905,324	3.6%	5.0%	0.0% - 10.0%	
Real Estate - Private	\$2,063,543,148	7.3%	9.0%	4.0% -14.0%	
Real Estate - Public	\$875,033,798	3.1%	3.0%	0.0% - 13.0%	
Infrastructure	\$682,566,518	2.4%	7.0%	2.0% - 12.0%	
Cash	\$531,064,428	1.9%	1.0%	0.0% - 1.0%	
Total	\$28,285,241,189	100.0%	100.0%		



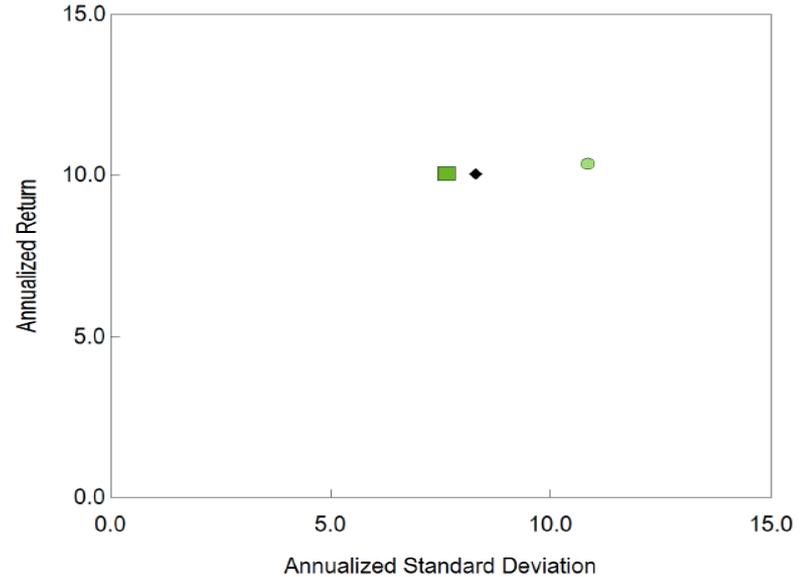
TOTAL FUND RISK/ RETURN

3 Years Ending March 31, 2019



- Total Fund
- ◆ Total Fund Policy Index
- Long Term Public Index

10 Years Ending March 31, 2019



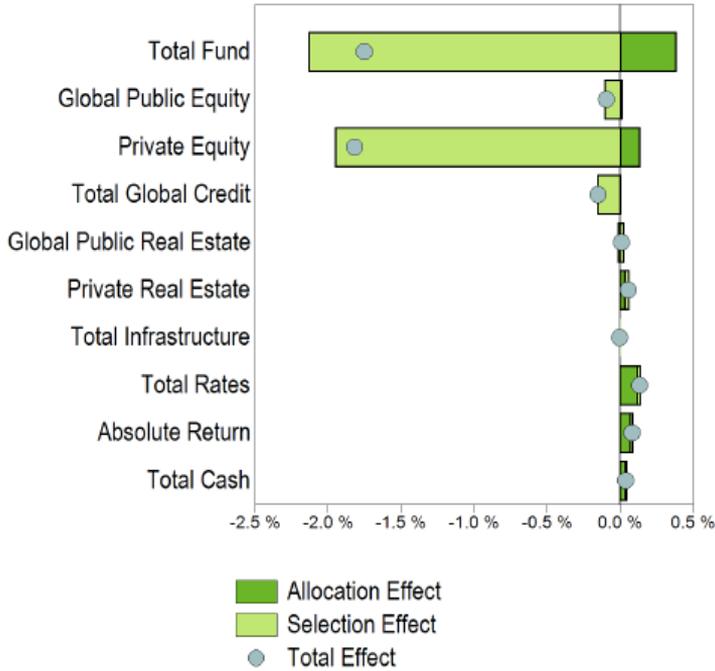
- Total Fund
- ◆ Total Fund Policy Index
- Long Term Public Index



Note: Long Term Public Index is comprised of 79% MSCI ACW IMI and 21% Barclays Intermediate Treasury Index. Index Definitions can be found in the appendix.

TOTAL FUND ATTRIBUTION ANALYSIS

Attribution Effects
3 Months Ending March 31, 2019



Attribution Summary
3 Months Ending March 31, 2019

	Wtd. Actual Return	Wtd. Index Return	Excess Return	Selection Effect	Allocation Effect	Total Effects
Global Public Equity	12.1%	12.4%	-0.3%	-0.1%	0.0%	-0.1%
Private Equity	-0.5%	12.4%	-12.9%	-1.9%	0.1%	-1.8%
Total Global Credit	6.0%	7.3%	-1.2%	-0.1%	0.0%	-0.2%
Global Public Real Estate	15.5%	14.8%	0.7%	0.0%	0.0%	0.0%
Private Real Estate	1.8%	1.5%	0.3%	0.0%	0.0%	0.1%
Total Infrastructure	1.5%	1.5%	0.0%	0.0%	0.0%	0.0%
Total Rates	1.7%	1.6%	0.1%	0.0%	0.1%	0.1%
Absolute Return	1.9%	1.6%	0.3%	0.0%	0.1%	0.1%
Total Cash	0.9%	0.6%	0.3%	0.0%	0.0%	0.0%
Total	6.4%	8.2%	-1.8%	-2.1%	0.4%	-1.8%

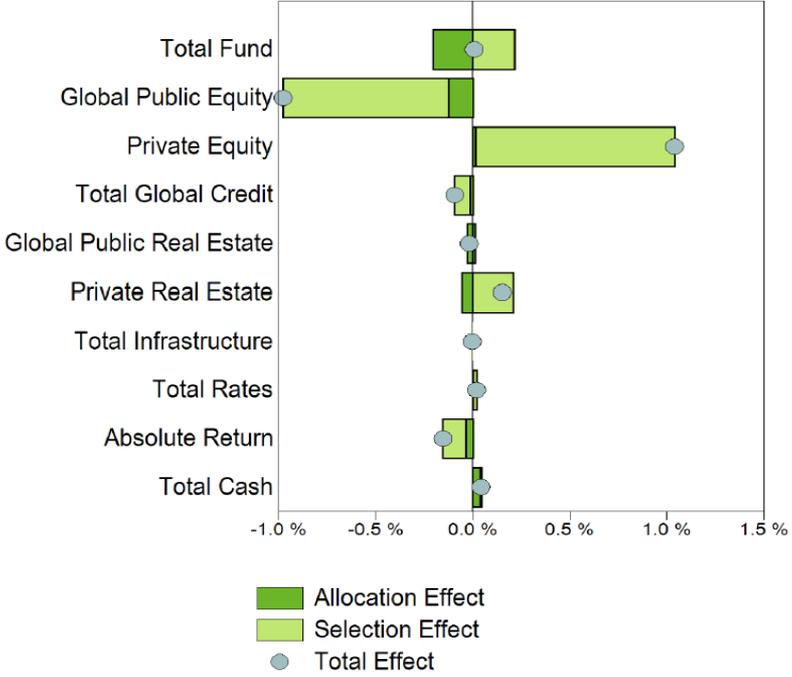
Note: Not all assets marked through March 31, 2019 within Private Equity, Total Global Credit, Private Real Estate, Total Infrastructure and Absolute Return.



* Total Fund Attribution Analysis uses policy weights.

TOTAL FUND ATTRIBUTION ANALYSIS

Attribution Effects
1 Year Ending March 31, 2019



Attribution Summary						
1 Year Ending March 31, 2019						
	Wtd. Actual Return	Wtd. Index Return	Excess Return	Selection Effect	Allocation Effect	Total Effects
Global Public Equity	0.3%	2.2%	-1.9%	-0.9%	-0.1%	-1.0%
Private Equity	11.3%	2.5%	8.8%	1.0%	0.0%	1.0%
Total Global Credit	5.2%	5.9%	-0.7%	-0.1%	0.0%	-0.1%
Global Public Real Estate	14.3%	14.0%	0.3%	0.0%	0.0%	0.0%
Private Real Estate	10.4%	7.4%	3.0%	0.2%	-0.1%	0.2%
Total Infrastructure	6.0%	6.0%	0.0%	0.0%	0.0%	0.0%
Total Rates	3.9%	3.8%	0.1%	0.0%	0.0%	0.0%
Absolute Return	3.2%	6.1%	-2.9%	-0.1%	0.0%	-0.2%
Total Cash	2.5%	2.1%	0.4%	0.0%	0.0%	0.0%
Total	4.2%	4.2%	0.0%	0.2%	-0.2%	0.0%

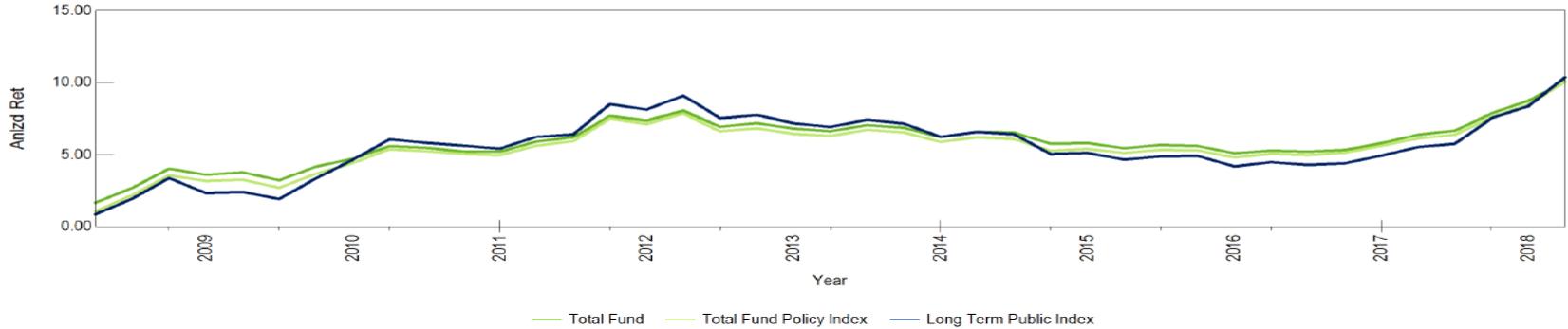
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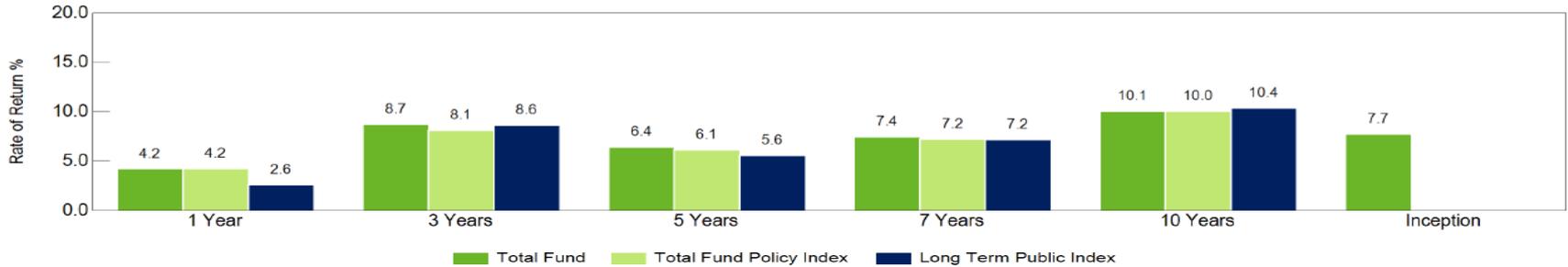
* Total Fund Attribution Analysis uses policy weights.

LONG TERM INVESTMENT RESULTS

Rolling 10 Year Annualized Return (%)



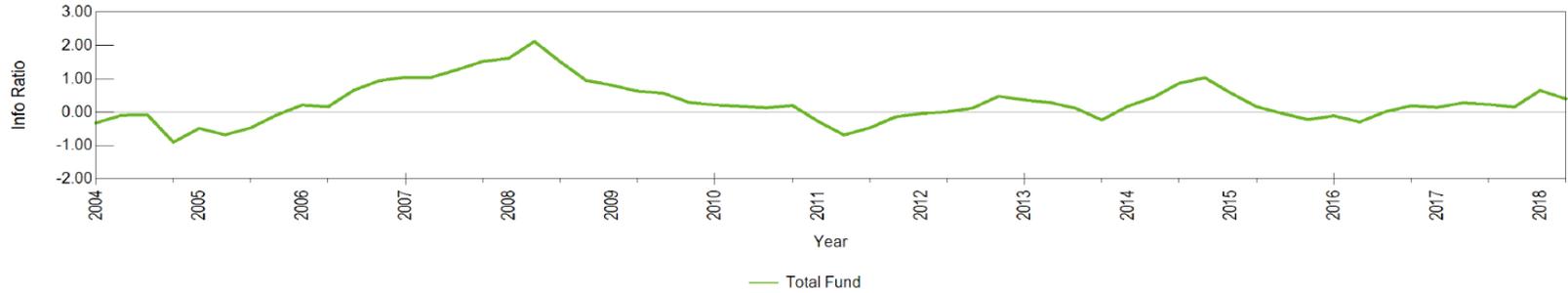
Return Summary
Ending March 31, 2019



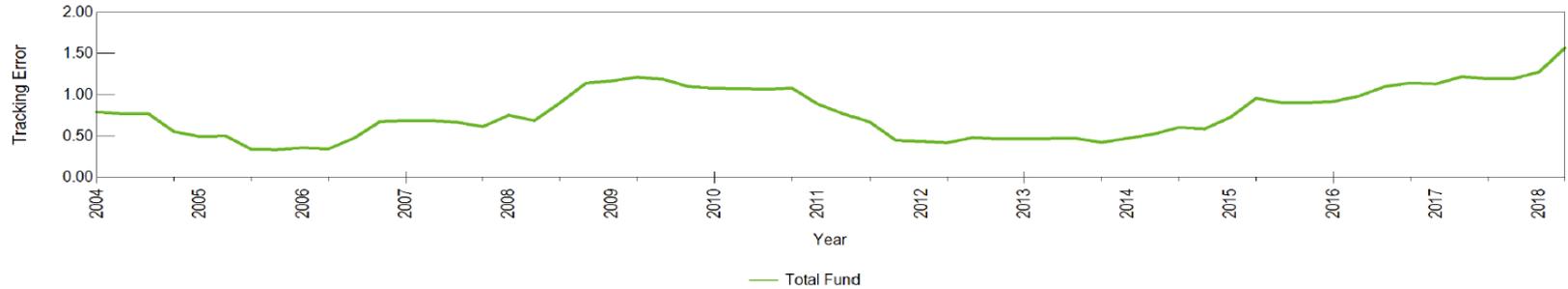
Note: Long Term Public Index is comprised of 79% MSCI ACW IMI and 21% Barclays Intermediate Treasury Index. Index Definitions can be found in the appendix.

ROLLING INFORMATION RATIO AND TRACKING ERROR

Rolling 3 Year Information Ratio



Rolling 3 Year Tracking Error



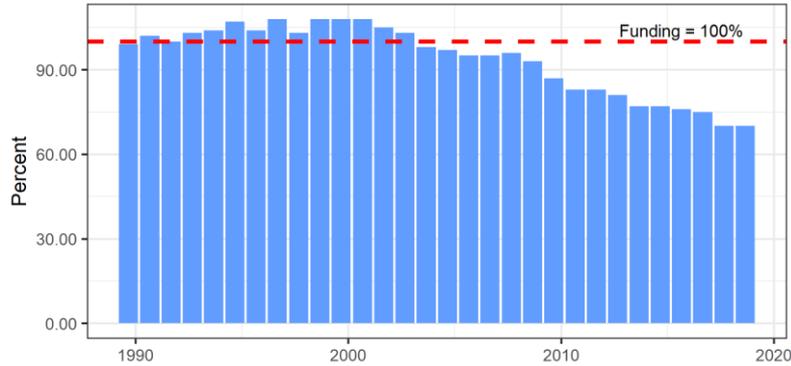
SUMMARY PERFORMANCE COMMENTARY

- **Over the past 10 years Total Fund returns have been strong on an absolute basis, yet, the Plan has underperformed slightly (-0.1%). Returns have outperformed the Fund's actuarial rate of return.**
- **In the past one-year period ended March 31, 2019 the Fund equaled its policy benchmark.**
 - Private Equity contributed +1.0% to total outperformance vs. the policy benchmark primarily due to strong manager returns
 - Global Public Equity detracted -1.0% from Fund returns vs. the policy benchmark primarily due to underperformance within International Equity
 - Private Real Estate outperformed contributing +0.2% to returns vs. the policy benchmark
- **In the past one-year, portfolio positioning at the asset class level has had a slight negative impact on Total Fund returns vs. policy benchmark (-0.2%), however, strong management resulted in Total Fund returns that equal the policy benchmark.**
 - Over-weights to Global Public Equity and under-weight to Private Real Estate contributed negatively (-0.2%) to Total Fund returns vs. the policy benchmark
 - Manager selection within Global Public Equity negatively contributed to Total Fund returns vs. the policy benchmark (-0.9%)



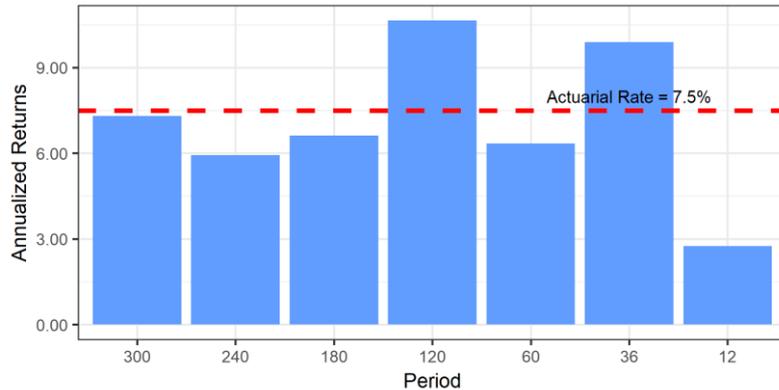
ERS Funding, Market Return Assumptions, Historical Performance and Risk

As is the case nationwide, ERS's funding status is subpar and has been challenged over 10 years now: a number of factors have contributed to this condition.



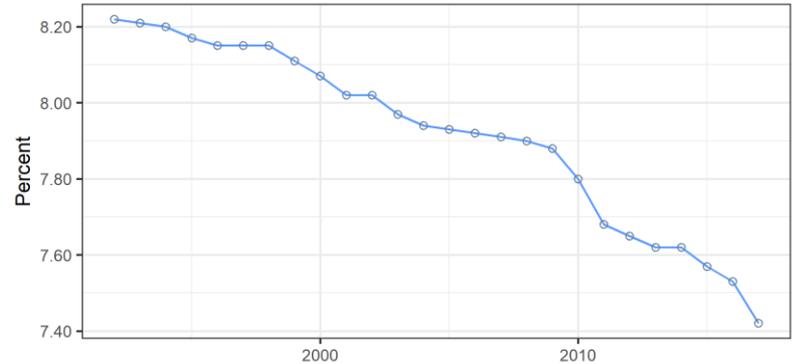
Source: ERS, Data from 8/31/1989 to 8/31/2018

With that said, ERS returns have exceeded the actuarial rate of return over the past 3 and 10-year periods ending February 2019.



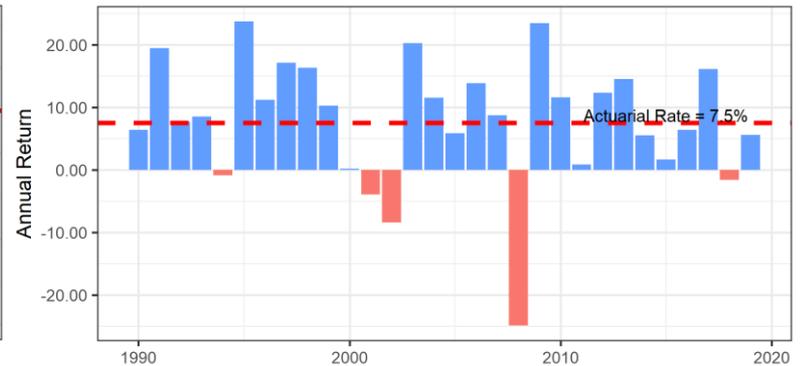
Source: ERS, Data from 1994 to 02/28/2019.

One of those conditions has been return expectations. They have been coming down over the past two decades which poses a challenge to growing assets in the future...



Source: Census of Governments, Data from 1992 to 2017.

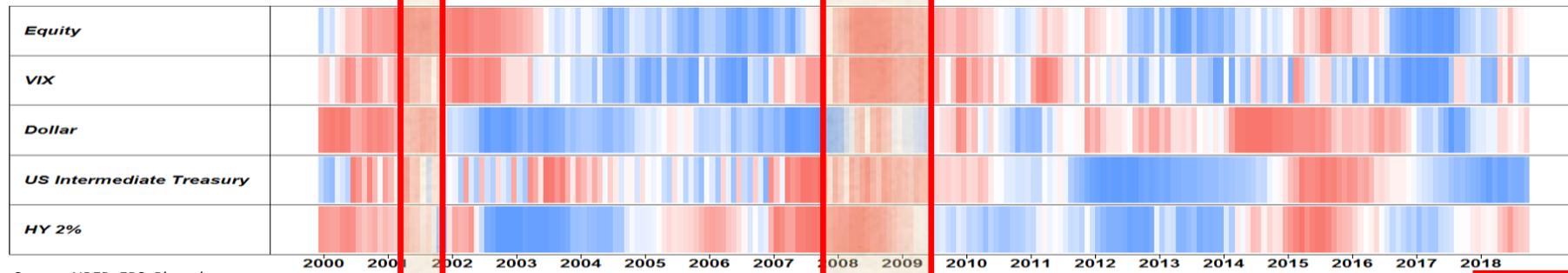
On a calendar year basis, ERS has met and exceeded its actuarial rate for a number of years since the 90s...



Source: ERS, Data begins 04/30/1987 and ends 02/28/2019.

ERS Total Plan Return Drivers, Sensitivities and Stress Test

Our work has identified 5 major drivers that when taken together helps to explain 97% of the variability of returns of the plan. The coloring denotes a state of positive/negative returns.

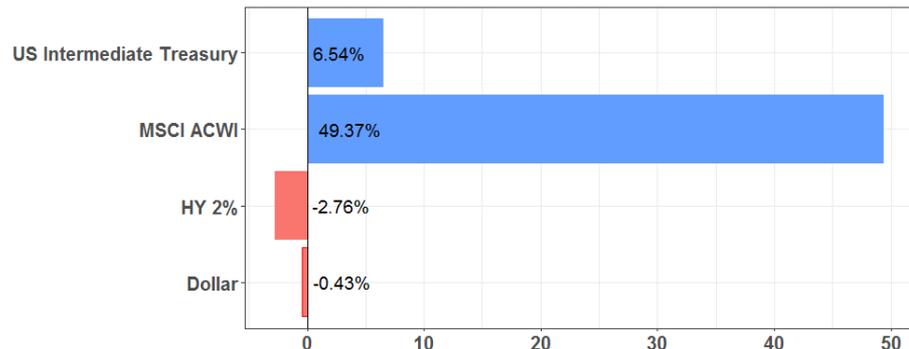


Source: NBER, ERS, Bloomberg

Recession

The chart below shows the plans' sensitivity level to these drivers and on the right we show a stress test of the plan to various events taking into account the plan's factor sensitivities.

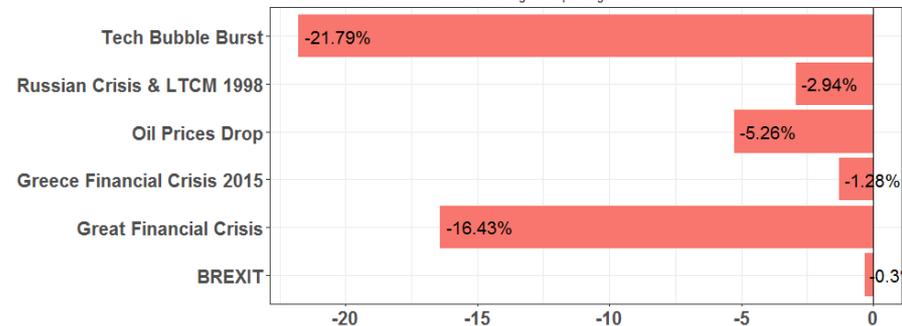
Total Trust - Beta Sensitivities



Source: ERS, Bloomberg
 Time Period: 1998-12-31 to 2019-02-28
 R-Squared = 96.81%

Total Trust

Contribution of factors to stressed returns during corresponding events



Source: ERS, Bloomberg
 Time Period: 1998-12-31 to 2019-02-28
 Methodology: Stress = Beta Sensitivity x Factor Returns During Event

Questions?

Public Agenda #4.1

Fixed Income Program Market Update and Program Overview

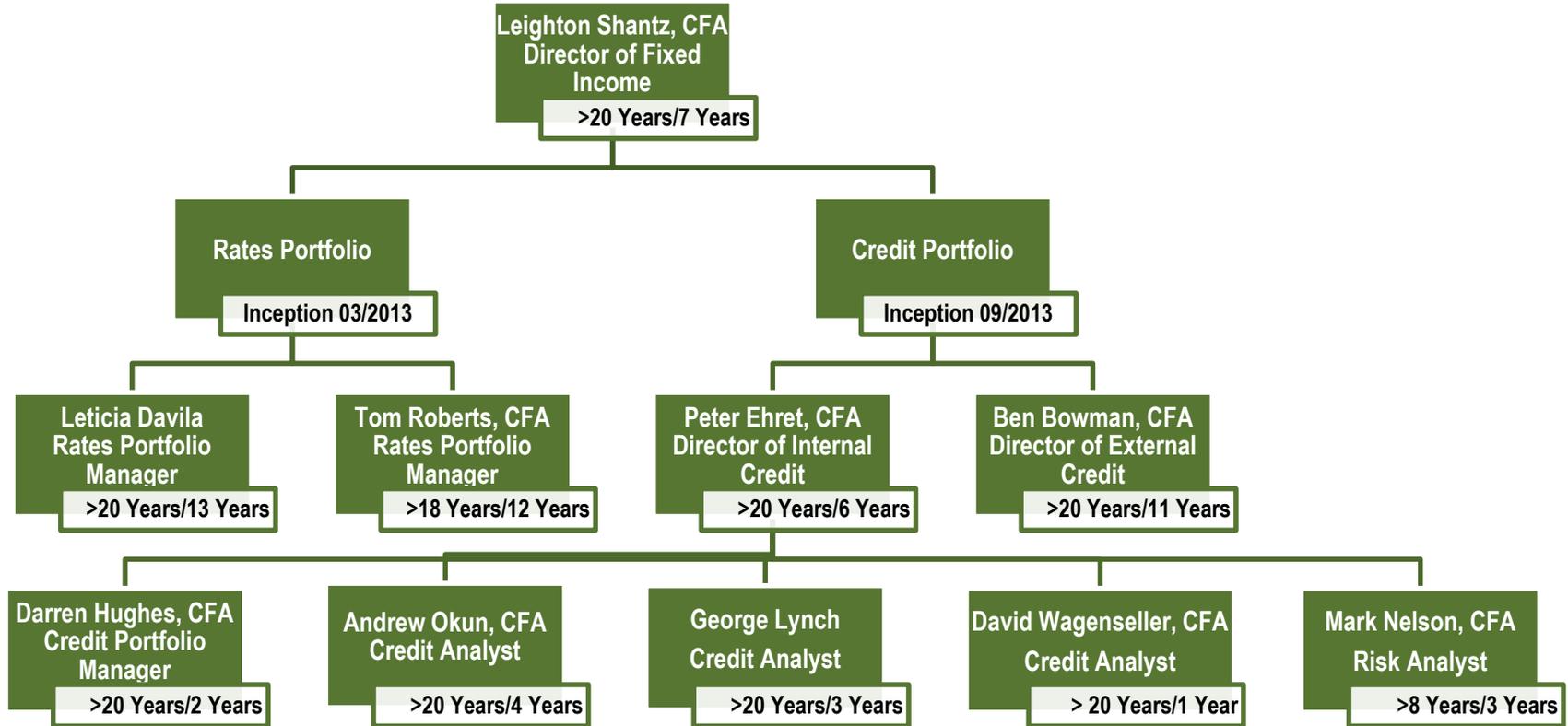
May 22, 2019

Leighton Shantz, CFA, Director of Fixed Income

Peter Ehret, CFA, Director of Internal Credit

Leticia Davila, Rates Portfolio Manager

Fixed Income Team



Return Summary

Periodic Annualized Total Rates of Return

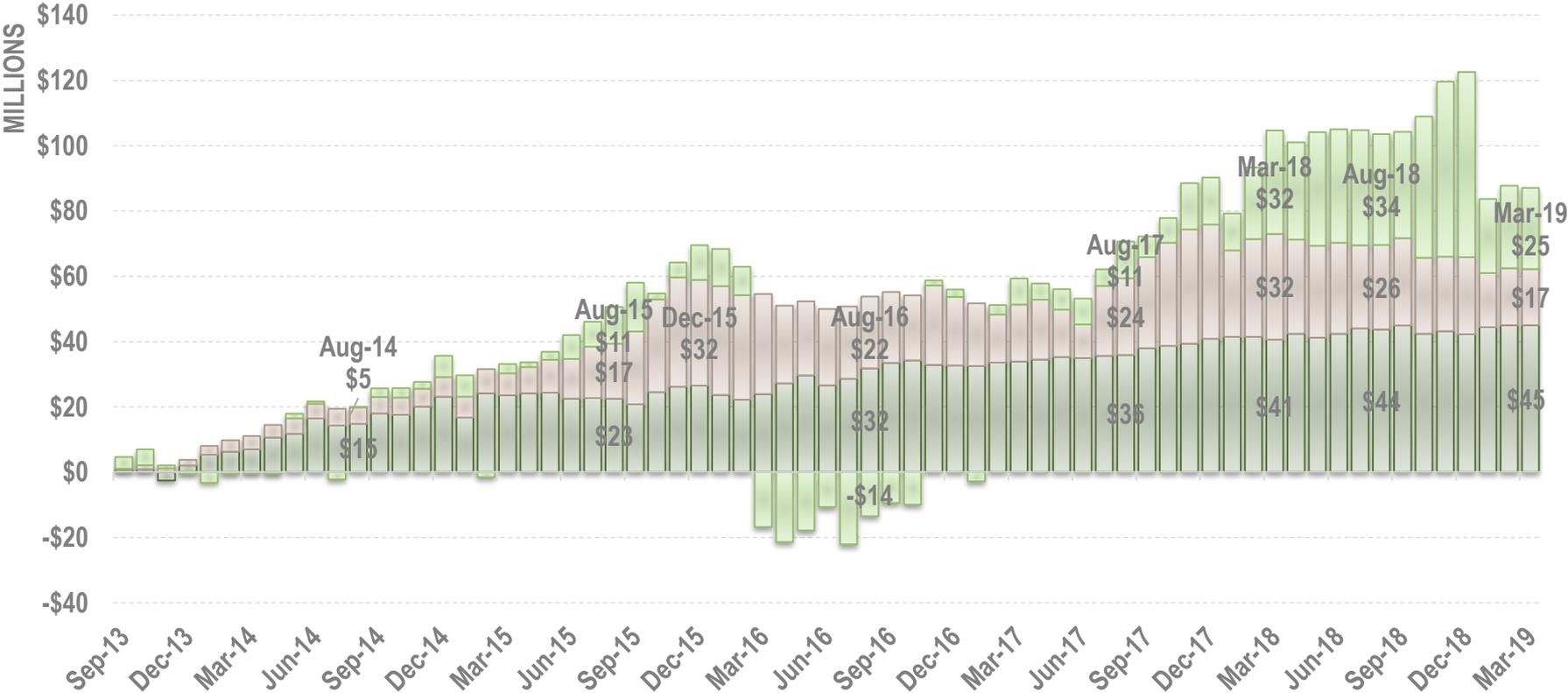


PORTFOLIO	FYTD	1-YEAR	3-YEARS	5-YEARS
RATES	+337 bps	+392 bps	+113 bps	+184 bps
BENCHMARK	+333 bps	+380 bps	+95 bps	+166 bps
DIFFERENCE	+4 bps	+12 bps	+18 bps	+18 bps
CREDIT	+244 bps	+524 bps	+902 bps	+518 bps
BENCHMARK	+296 bps	+593 bps	+856 bps	+469 bps
DIFFERENCE	-52 bps	-69 bps	+46 bps	+49 bps

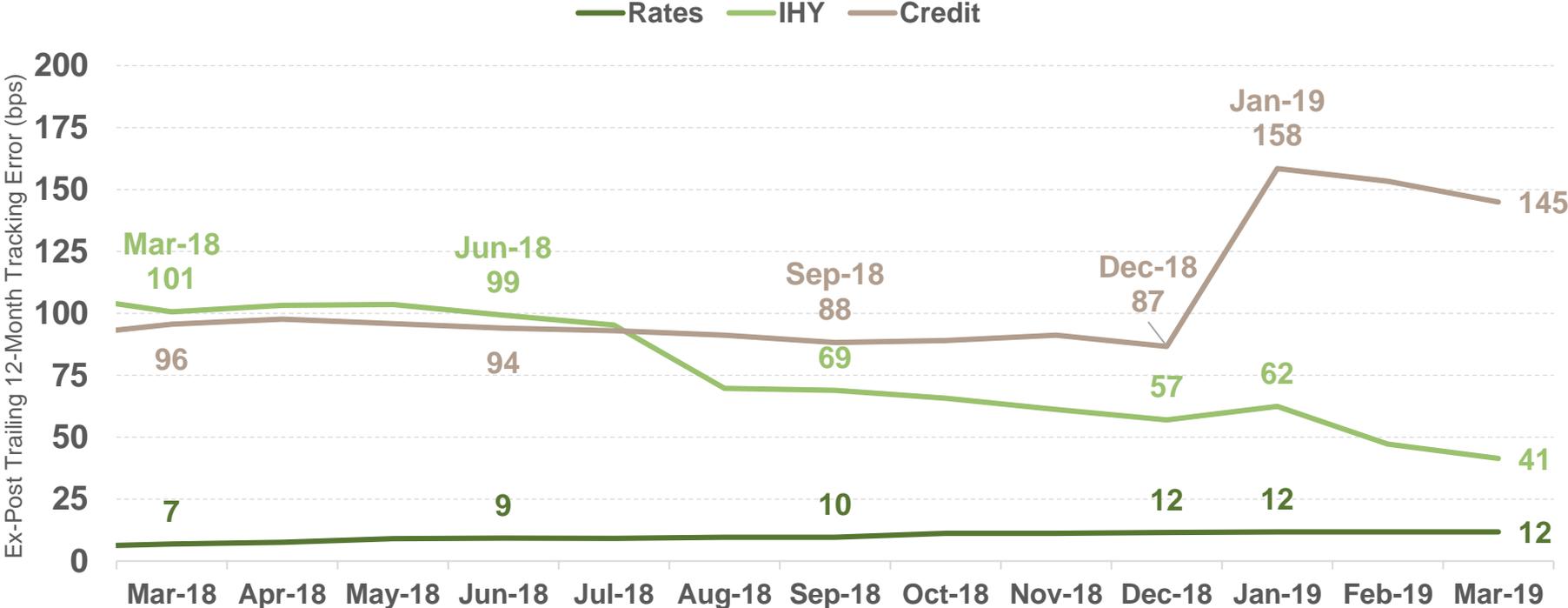
Cumulative Excess Return



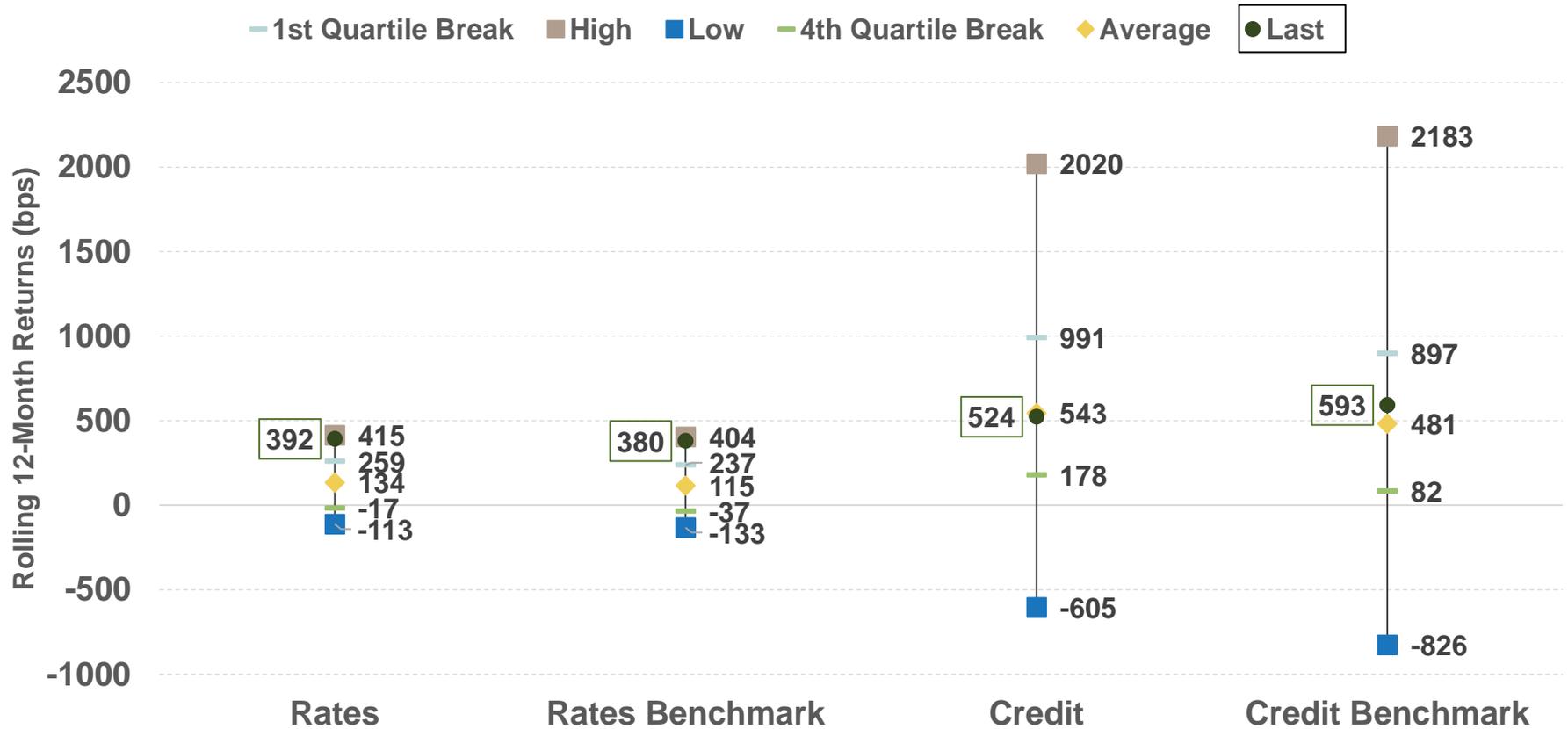
■ Rates ■ Internal Credit ■ External Credit



Rolling 12-Month Tracking Error



Rolling 12-Month Return Dispersion



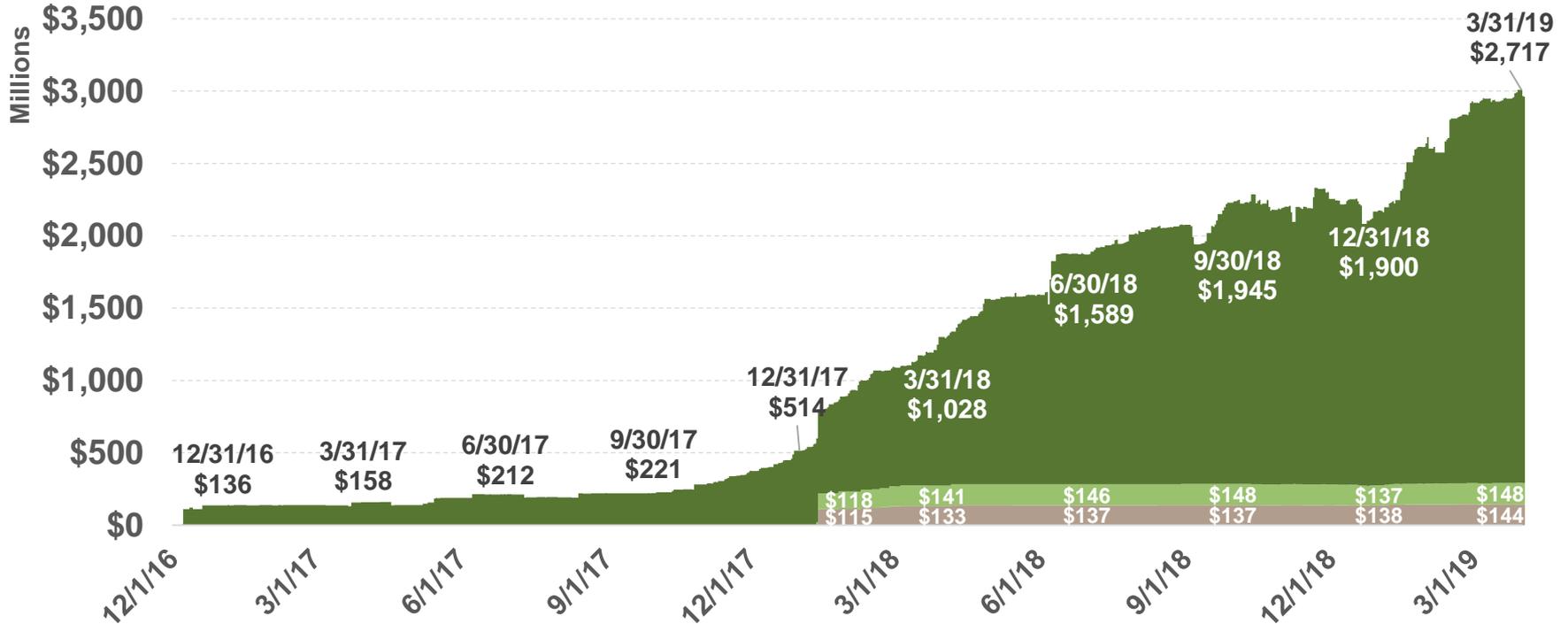
External Credit Investments



NAME	COMMIT	DRAWN	STRATEGY	IRR	\$ GAIN
CLO	\$200mm	\$188mm	CLO Mezzanine & Equity	+963 bps	+38.9 million
BCA	\$150mm	\$105mm	Special Situations HF	+636 bps	+\$40.4 million
BDC	\$100mm	\$70mm	Private BDC	+441 bps	+\$5.2 million
GOF	\$125mm	\$40mm	Opportunistic Distress	+650 bps	+\$6.5 million
BSP	\$75mm	\$40mm	Middle Mkt Distress	+584 bps	+\$2.5 million
BPCP	\$75mm	\$12mm	Middle Mkt Origination	+1069 bps	+\$1.2 million
VWH	\$50mm	\$10mm	Residential NPL	+86 bps	+\$35 thousand
LLSD	\$50mm	\$35mm	Liquidations	+1434 bps	+\$10.5 million

As of March 31 or last report

Market Capitalization of ETFs



Questions?

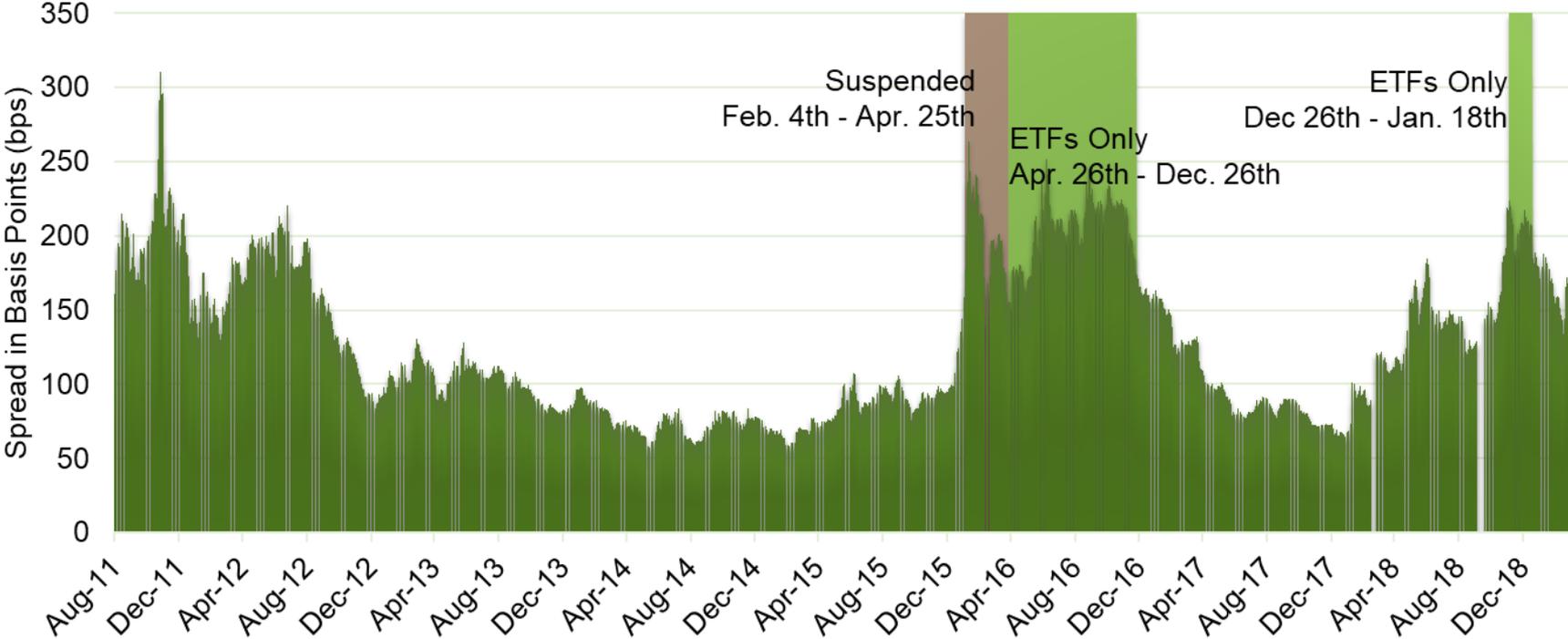
Public Agenda #4.2

Fixed Income Program Review of Securities Lending

May 22, 2019

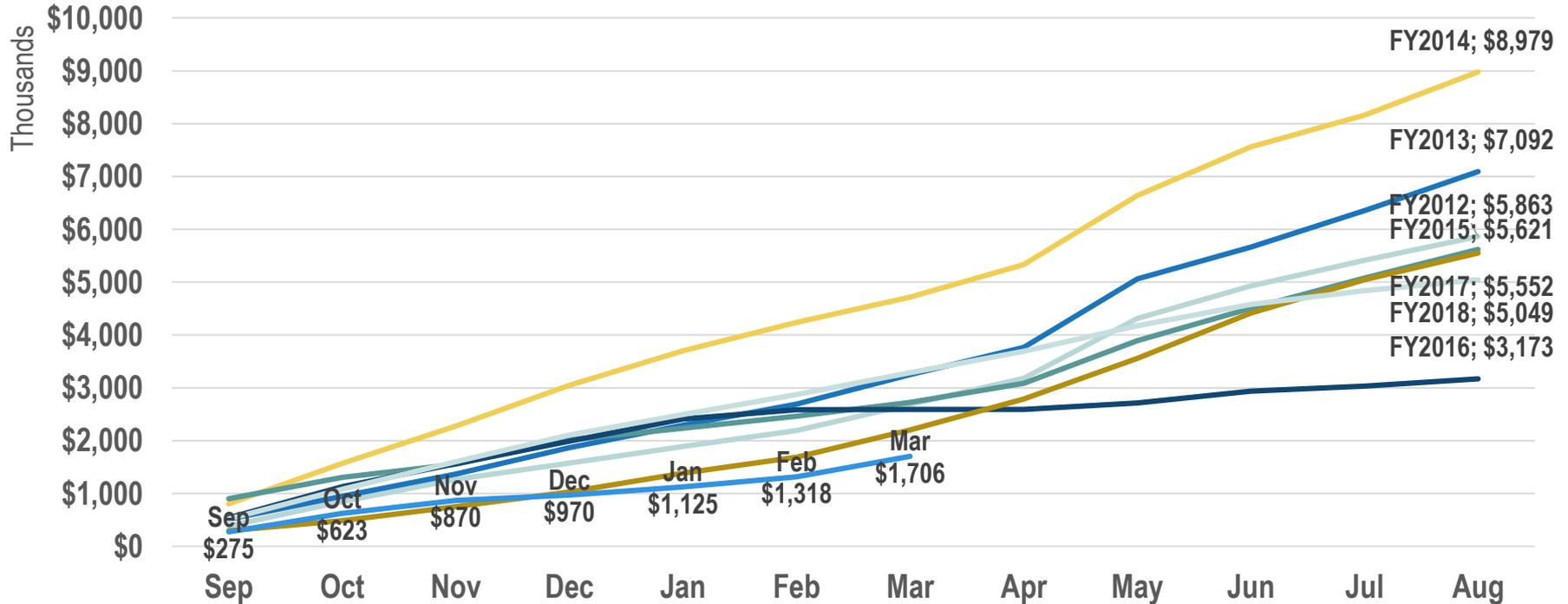
Leighton Shantz, CFA, Director of Fixed Income

CDS Spread of Lending Agent



Securities Lending Revenue Comparison

Fiscal Year-to-Date



Questions?

Public Agenda Item #5.1

Market Update and Real Estate Program Overview



May 22, 2019

Robert Sessa, CFA, Director of Real Estate
Annie Xiao, Real Estate Portfolio Manager

Market Update & Program Overview



Agenda

- Real Estate Overview
- Staffing
- Listed Securities as of March 31, 2019
- Private Real Estate
- Accomplishments
- Initiatives

Market Update & Program Overview



Overview

Target Weights:

12% of Pension Fund

Current weight 10.4% or
\$2.9 billion as of March 31



Market Update & Program Overview



Staffing

Bob Sessa, CFA Director of Real Estate

- 25 years work experience, 18 real estate
- BS from Fordham University and MBA from UT Austin

Annie Xiao, CFA Portfolio Manager

- Covers Int'l Listed Securities
- 18 years work experience, 13 real estate
- BS from Zhengzhou University and MBA from Duke

Ken McDowell, CPA Portfolio Manager

- Private Real Estate Focused
- 28 years work experience, 28 real estate
- BA and BS from Ohio State University

Amy Cureton Portfolio Manager

- Private Real Estate, 16 years work experience, 11 real estate
- BA and MBA from UT Austin

Simon Mok Portfolio Manager

- Private Real Estate Focused
- 20 years work experience, 17 real estate
- BA and MPA from UT Austin

Tony Cardona Portfolio Manager

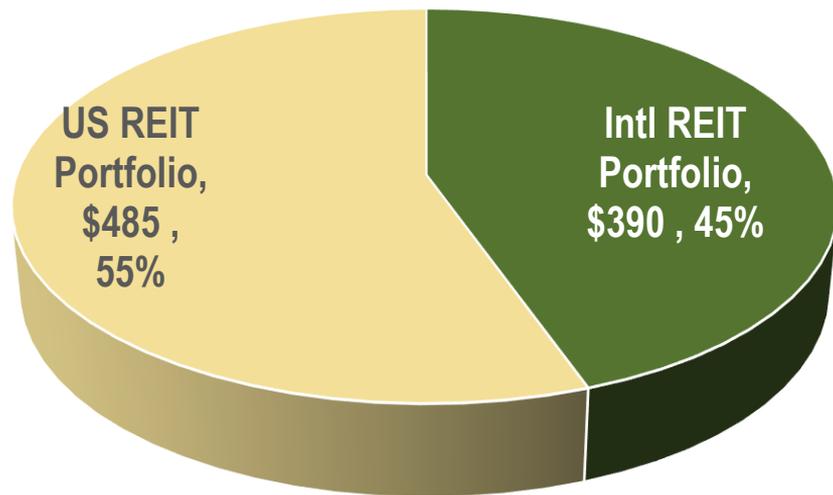
- Public Real Estate Focused
- 10 years work experience, 5 real estate
- BS from Cornell University

Market Update & Program Overview

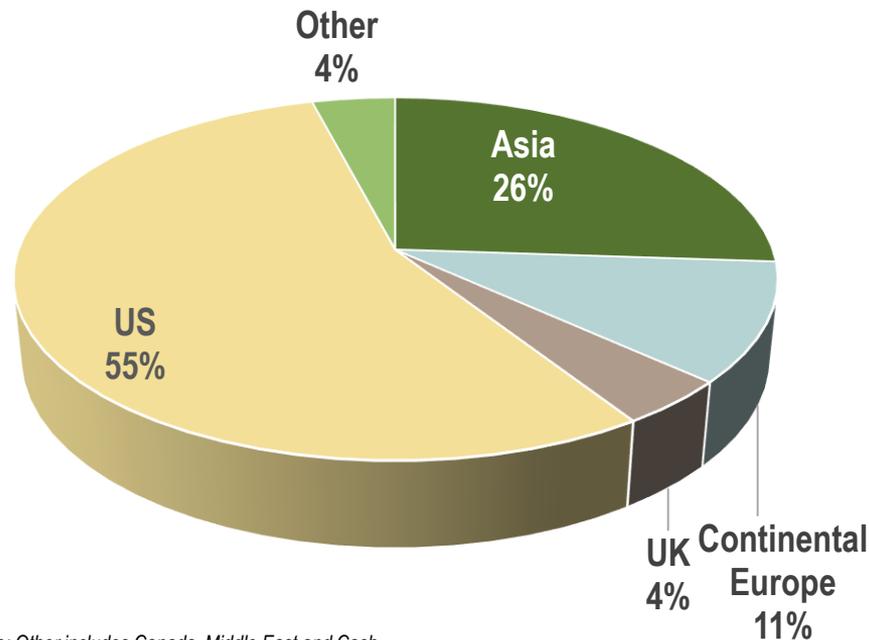
Listed Securities as of March 31, 2019



Total Portfolio: \$875 million



Total Portfolio - Geography



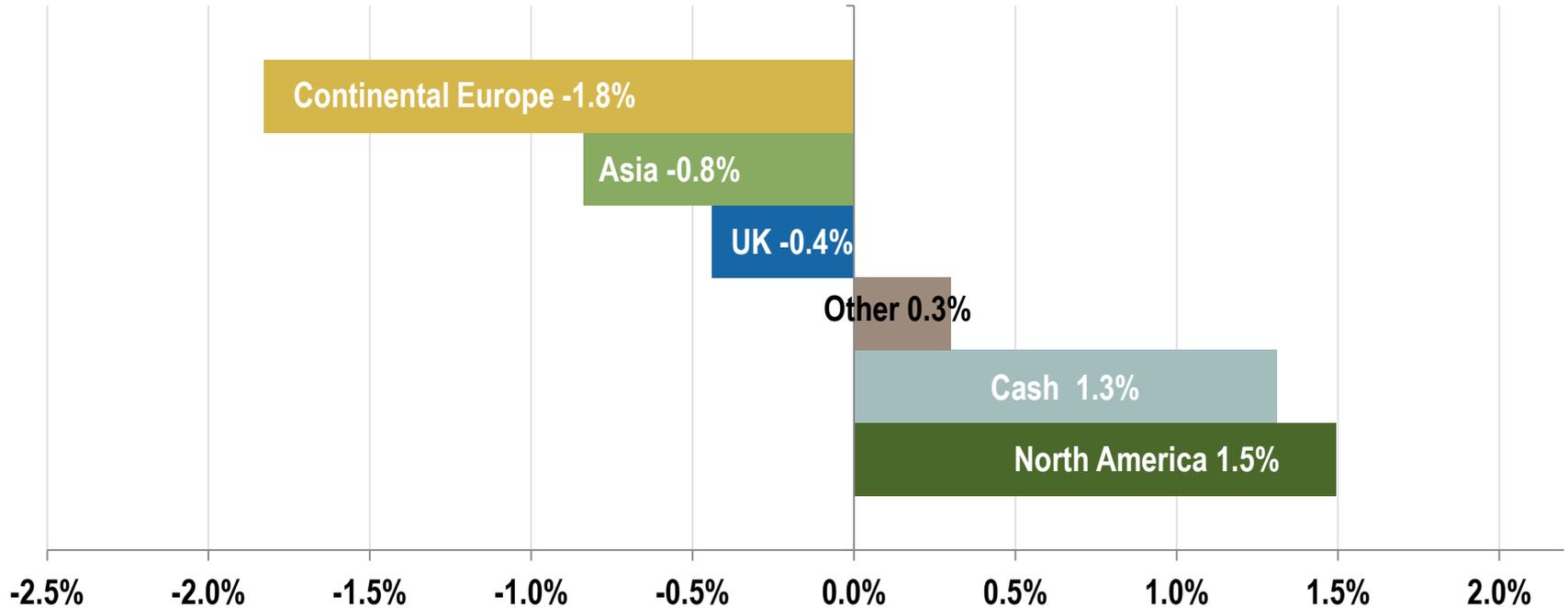
Note: Other includes Canada, Middle East and Cash

Market Update & Program Overview

Listed Securities as of March 31, 2019



Portfolio Over/Underweight

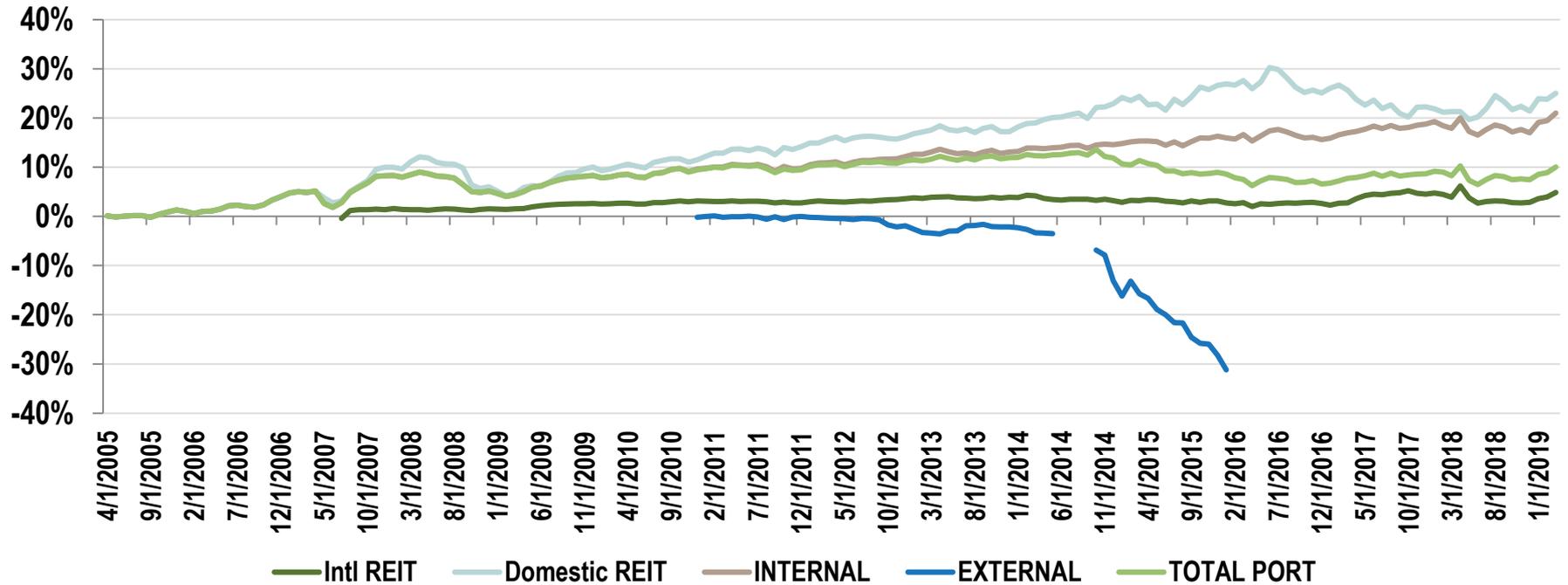


Market Update & Program Overview

Excess Total Return as of March 31, 2019



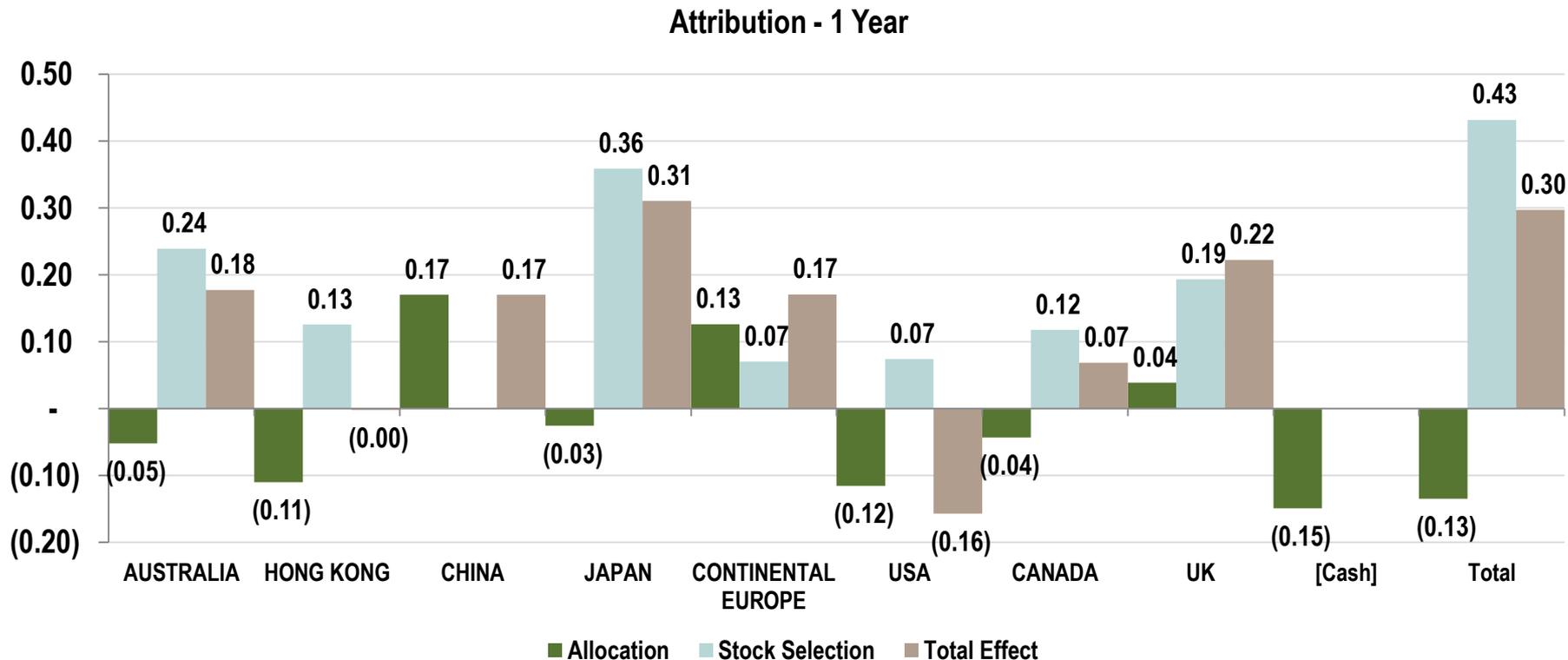
Since Inception Cumulative Excess Total Return



Market Update & Program Overview



Attribution as of March 31, 2019 – One Year

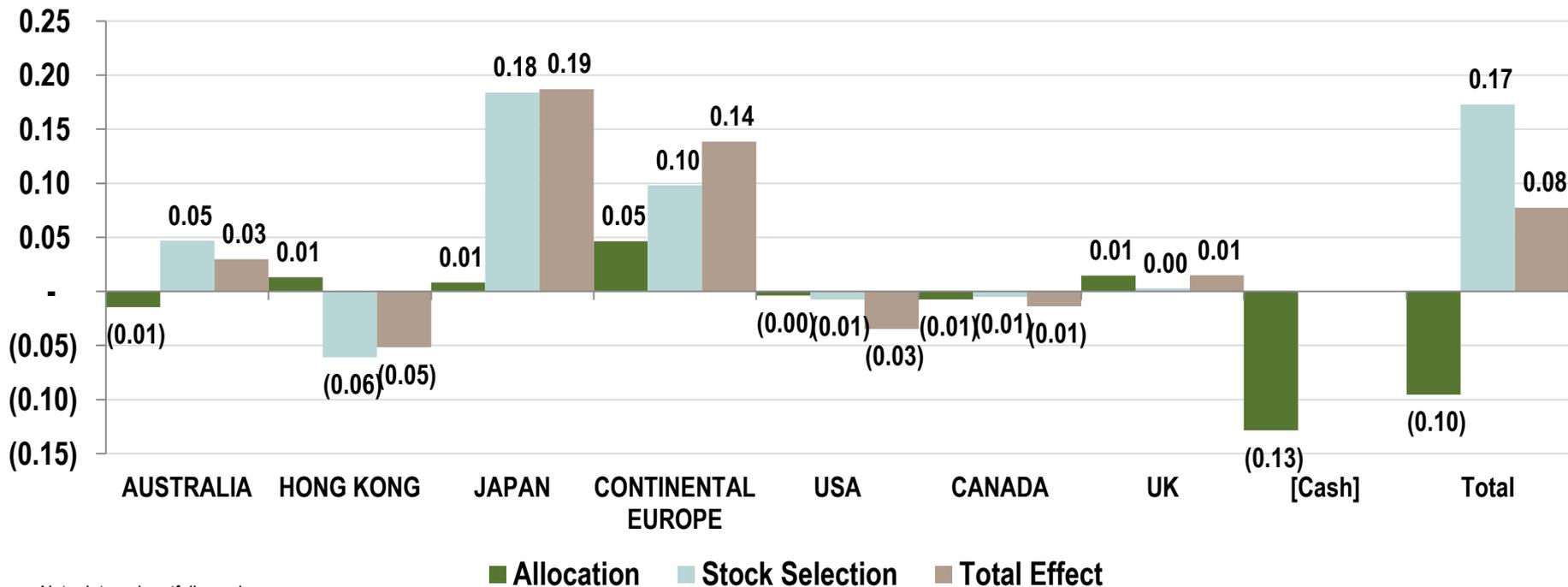


Market Update & Program Overview

Attribution as of March 31, 2019 – Five Years



Attribution - 5 Years



Note: Internal portfolios only

Market Update & Program Overview

Private Real Estate as of March 31, 2019



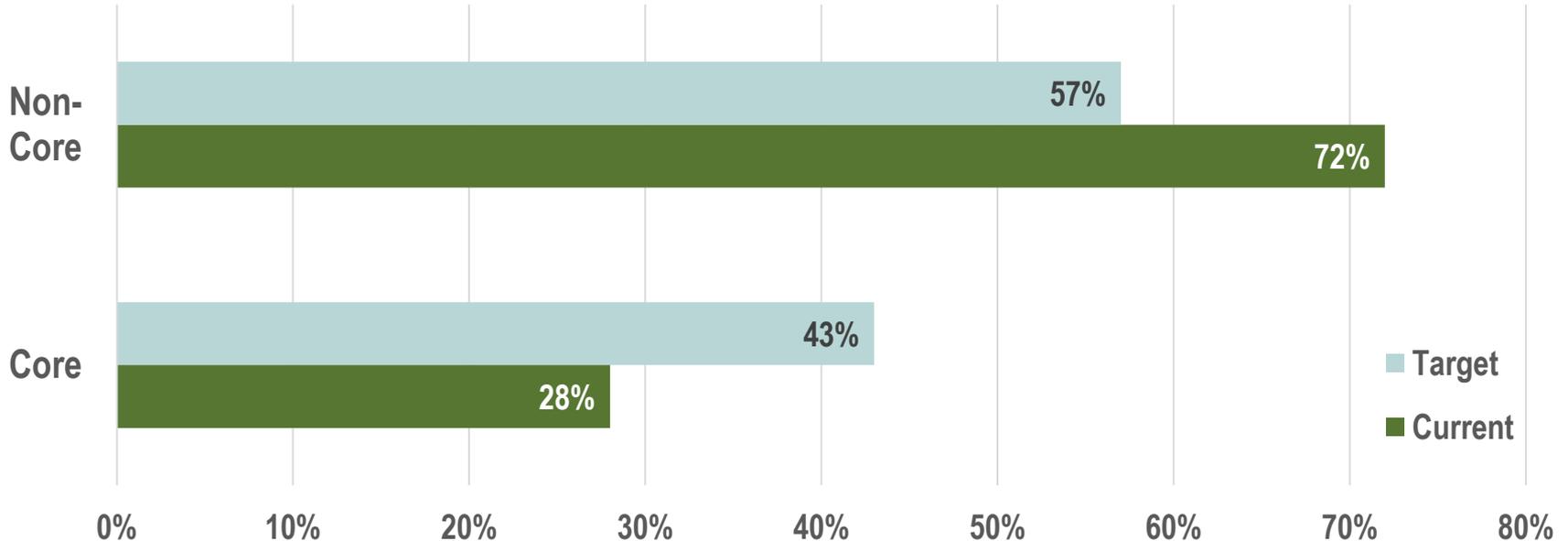
- **PORTFOLIO NET ASSET VALUE:** \$2.1 billion
- **INVESTMENT TYPE:** Equity 90%; Debt 10%
- **OVERALL LOAN TO VALUE RATIO:** 52%
- **COMMITMENTS:**
 - Total Portfolio (since inception) \$4.0 billion with 63 Investments and 32 managers
 - FY 2019 Committed \$270 million to 4 deals
- **PROGRAM AVERAGE ECONOMICS:**
 - Management Fee: 111 bps
 - Carry: 16.90%
- **CAPITAL CALLED:**
 - Since Inception \approx \$3.2 billion
 - FY 2019 \$241 million
- **DISTRIBUTIONS:**
 - Since Inception \approx \$2.4 billion
 - FY 2019 \$248 Million

Market Update & Program Overview



Asset Allocation vs. Target as of March 31, 2019

Current Allocation vs Target Allocation



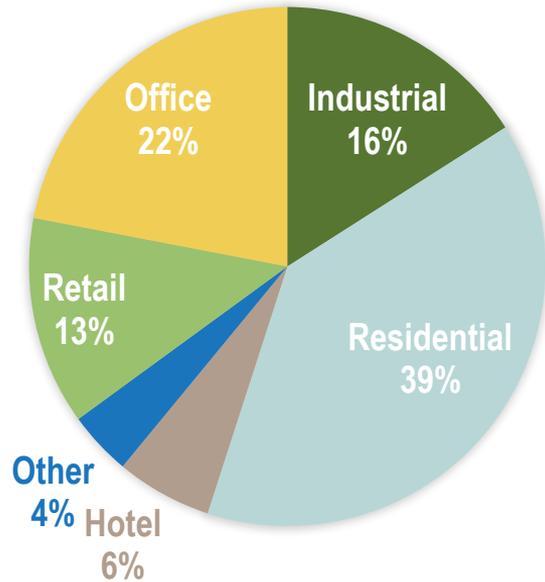
Note: Current allocation based on current NAV + unfunded commitments (economic exposure)

Market Update & Program Overview

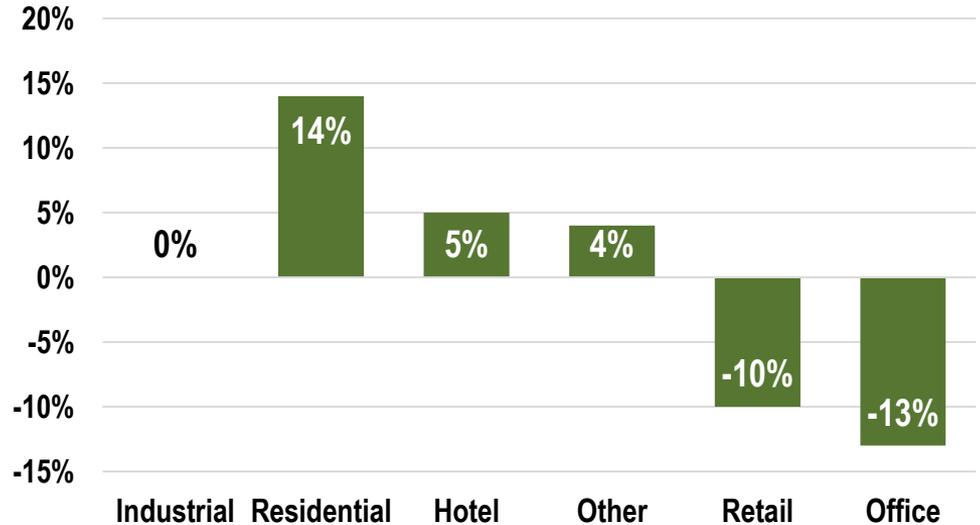
Property Type Weights as of December 31, 2018



ERS Portfolio by Property Type
Based on ERS' NAV, US Only



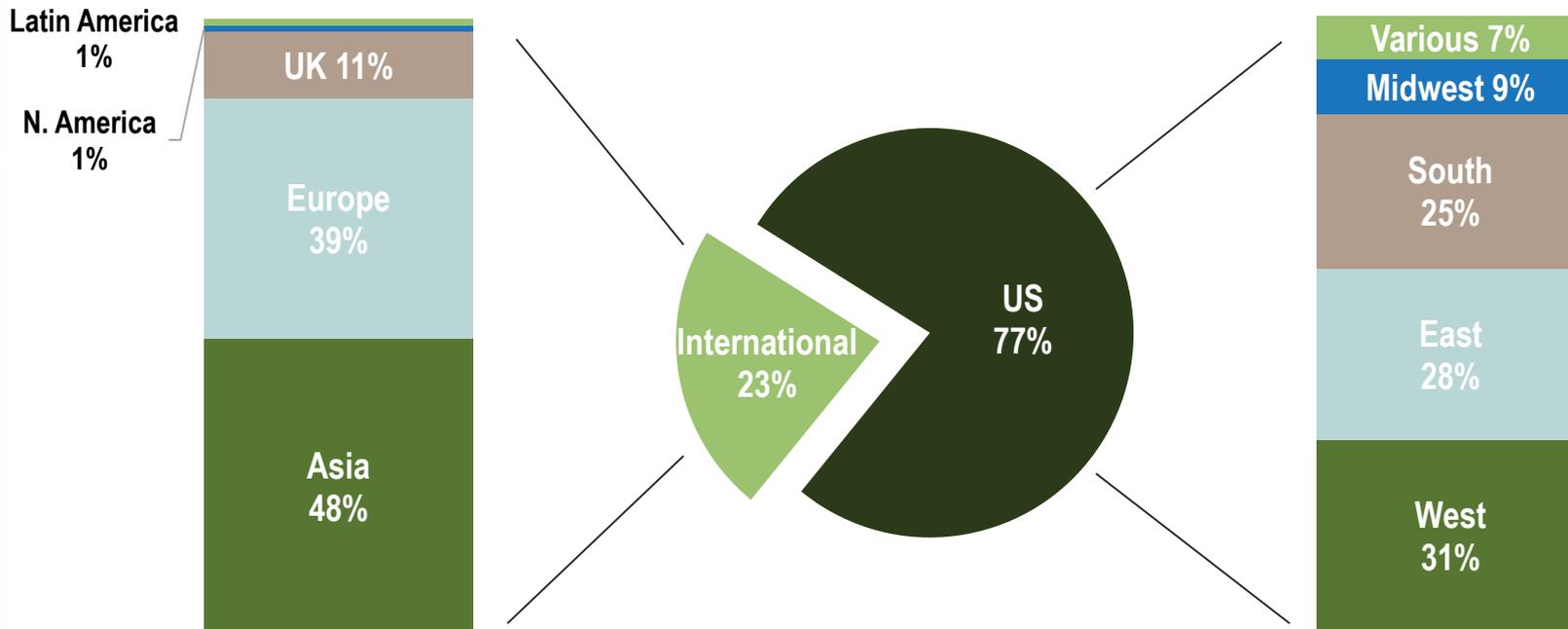
ERS Portfolio Compared to NCREIF Property Index Benchmark, US Only



Note, if exclude niche sectors from Resi and Office, the resi overweight drops to 4% and the office underweight increases to -18%

Market Update & Program Overview

Geographic Weights Based on ERS' NAV as of Dec.31, 2018



Market Update & Program Overview

FY 2019 Accomplishments



- Both Internal REIT and Private Real Estate portfolio have outperformed the benchmark for the 1,3,5 years and since inception period
- Committed \$270 million to Private Real Estate through March 31, 2019 (closed on 4 investments)
- Negotiated an estimated \$115 million in savings since inception plus non-economic terms to improve corporate governance
- Option strategies continue to be used in listed real estate portfolios
- Co-Hosted the multi-asset class Emerging Manager conference in February 2019
- In compliance with the Real Estate Guidelines – one manager approaching 15% manager concentration limit

Market Update & Program Overview

FY 2020 Initiatives



- Continue committing capital to Private Real Estate on a selective basis
- Focus on non-core fund commitments to existing managers, niche strategies and co-investments while also selectively considering core investments and debt
- Targeting \$650 million in commitments with a range of \$325 million to \$975 million and 4 to 12 new commitments
- Continue to improve upon the REIT investment process and performance
- Co-Host the 5th Biennial Real Estate Emerging Manager (REEM) conference in January 2020
- Seeking one Analyst

Questions?

Public Agenda Item #5.2

Real Estate Program

Proposed Changes to the Real Estate Guidelines – (Action)

May 22, 2019

Robert Sessa, CFA, Director of Real Estate
Amy Cureton, Real Estate Portfolio Manager
Tony Cardona, Real Estate Portfolio Manager

Proposed Changes to the Real Estate Guidelines



1) Simplify the Private Real Estate Asset Class Guideline Subcategories

- Eliminate the detailed domestic and international target weightings by region, which will simplify compliance procedures and conform to other ERS asset class guidelines
- Current guidelines:
 - +/- 20% weight to the NCREIF Property Index (i.e. West, Midwest, South and East) for domestic exposure
 - International has underlying regional targets to Asia 20% - 50%, Europe 20% - 50%, the Americas 0% - 30%, Other International 0% - 20% and Emerging Countries 0% - 40%.

See Exhibit A for detailed changes to the Real Estate Guidelines

Proposed Changes to the Real Estate Guidelines



2) Real Estate Technology and Services (e.g. Property Technology)

- Allow investments in property technology and other real estate supporting companies
 - Limited to 5% of the real estate portfolio
 - “PropTech” broadly refers to technological solutions that solve problems for the real estate industry. Investment opportunities may be in the underlying technology itself (venture capital) or in companies supporting real estate, innovating and potentially disrupting how property is constructed, occupied, managed, and transacted
- Enable Staff to stay better informed of new innovations that might affect current and future ERS’ real estate investments and earn an appropriate risk/adjusted return

See Exhibit A for detailed changes to the Investment Policy Statement and Real Estate Guidelines

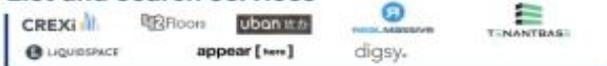
Proposed Changes to the Real Estate Guidelines



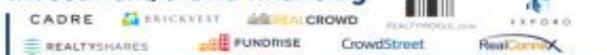
Real Estate Tech Market Map

Commercial

List and search services



Investment/crowd financing



Tech brokerage



Online settlement



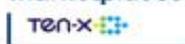
Marketing/viz



Leasing and deal management



Marketplaces



Events/alternative office



Mortgage and lending



Data, valuation, analytics



Property management



Energy management 020



Residential

Tech brokerage



Marketing/viz



Investment/crowd financing



Data, valuation, analytics



Property management and leasing



List and search services



Mortgage and lending

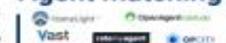


020

Agent tools



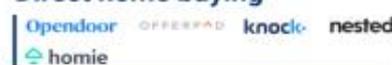
Agent matching



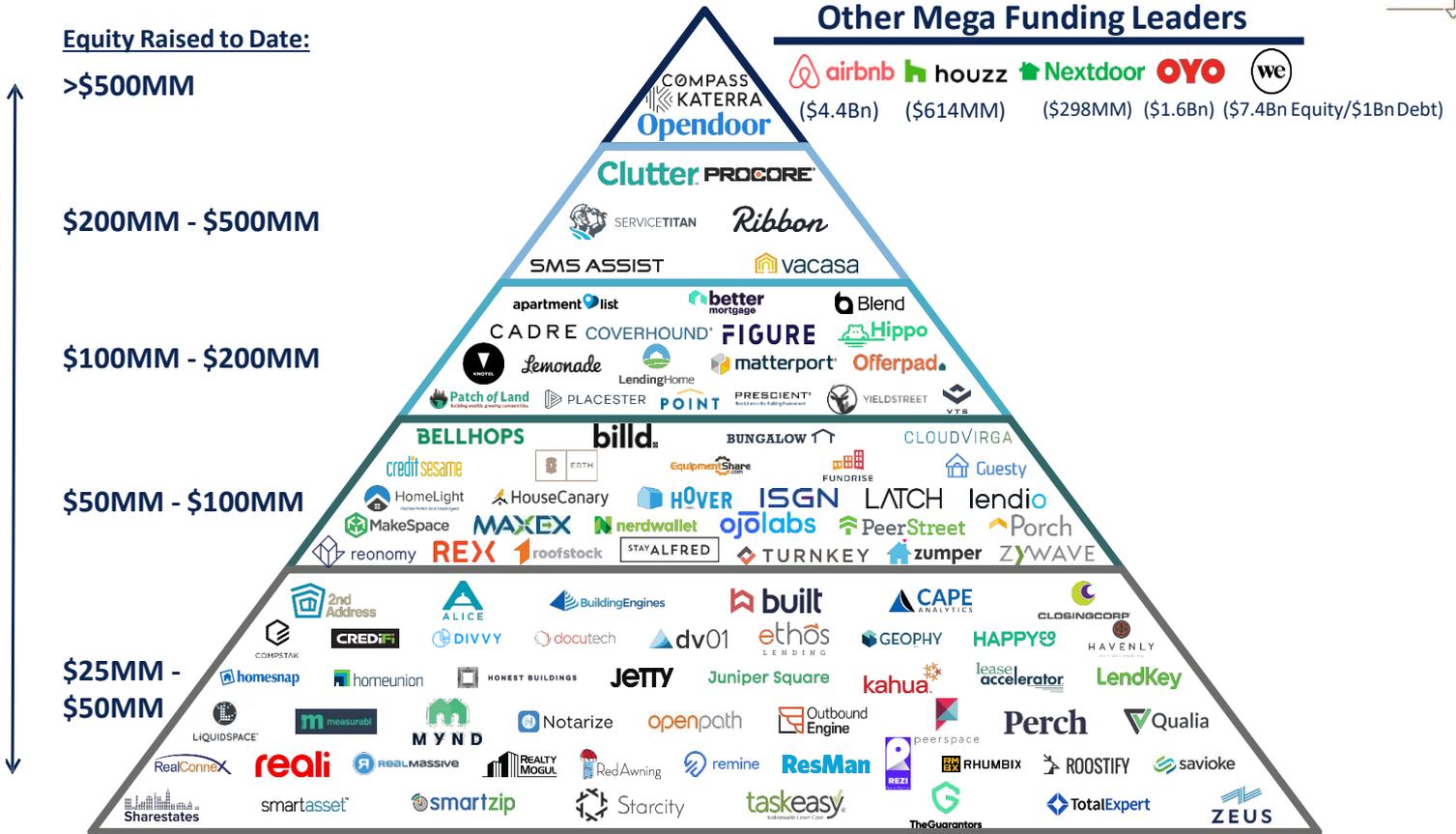
Title and closing



Direct home buying



Real Estate Private Company Funding Leaders



Source: Pitchbook, Company filings, Company websites, press releases.

Questions?

Public Agenda Item #5.3

Real Estate Program

*Review and Approval of Proposed Real Estate Annual Tactical Plan
for Fiscal Year 2020 – (Action)*

May 22, 2019

Robert Sessa, CFA, Director of Real Estate
Ken McDowell, CPA, Real Estate Portfolio Manager

Proposed FY 2020 Tactical Plan

Overview



- Private Real Estate Annual Tactical Plan is a guideline for investing
- Current value of Private Real Estate is \$2.1 billion
- Currently at 7.3% of the total ERS portfolio (target allocation is 9%)
- Commitments will target \$650 million for FY2020, with a range of \$325 million to \$975 million
- \$50 million - \$100 million commitment sizes, but may be smaller or larger for niche or special situations

Proposed FY 2020 Tactical Plan

Fiscal Year 2019 in Review



FY 2019 Tactical Plan			FY 2019 Actual (as of March 31, 2019)	
Category	Number of new Investments	New Commitment in millions (range)	Number of New Commitments	Commitment Amount
Core	0 – 2	\$100 (\$0 - \$150)	0	\$0
Non-Core	4 – 10	\$450 (\$200 - \$700)	4	\$270
Total	5 – 12	\$550 (\$275 - \$825)	4	\$270

Proposed FY 2020 Tactical Plan



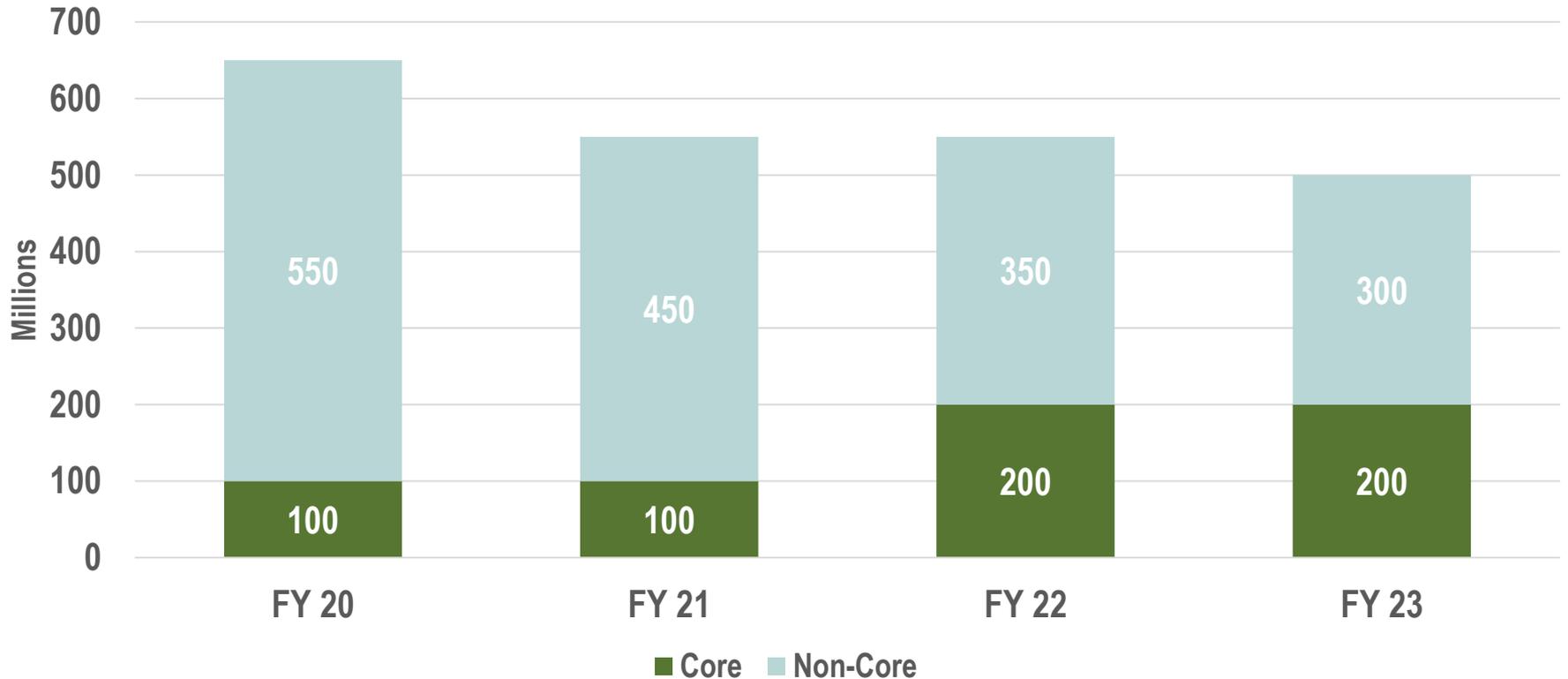
FY 2020 Proposed Tactical Plan

Category	Number of new Investments	New Commitment in millions (range)	
Core	0 – 2	\$100	(\$0 - \$150)
Non-Core	4 – 12	\$550	(\$275 - \$825)
Total	4 – 12	\$650	(\$325 - \$975)

Proposed FY 2020 Tactical Plan

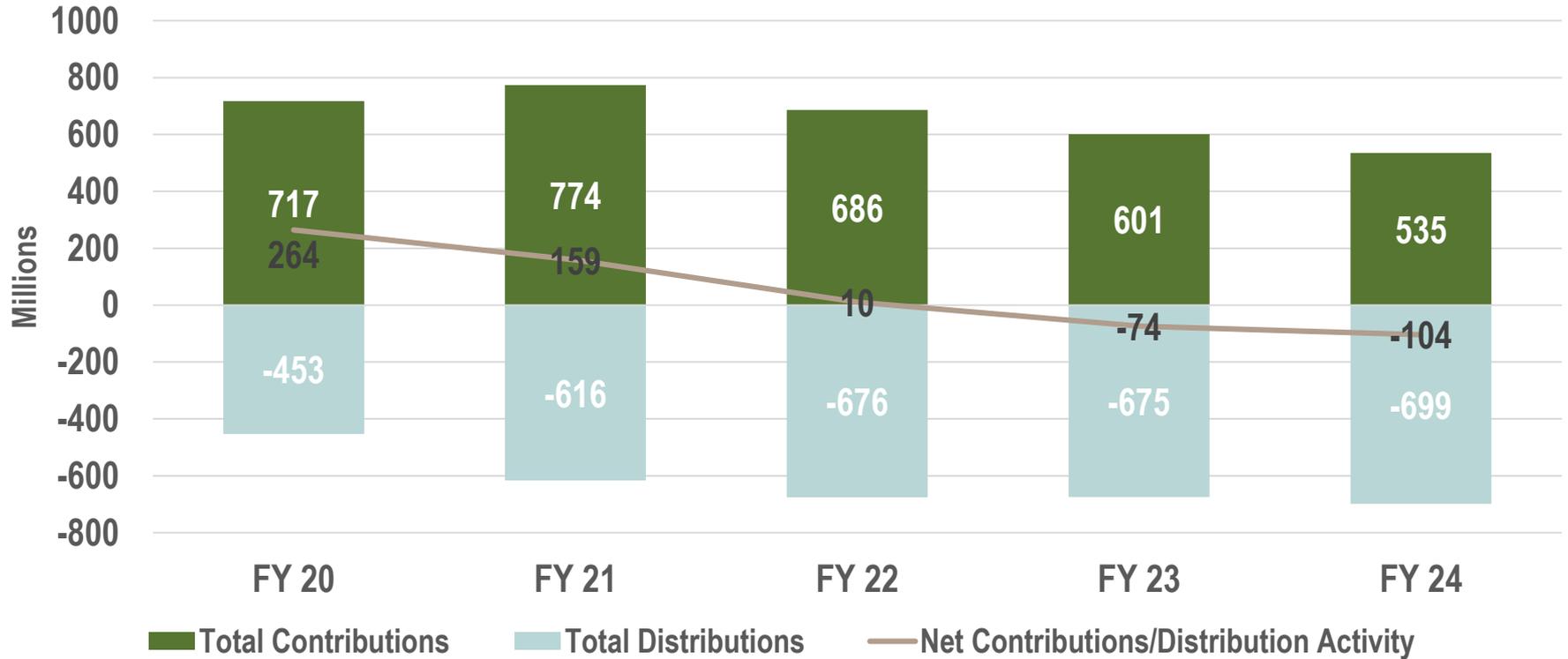


Targeted New Commitments Through Fiscal Year 2023



Proposed FY 2020 Tactical Plan

Projected Cash Flows Through FY2024



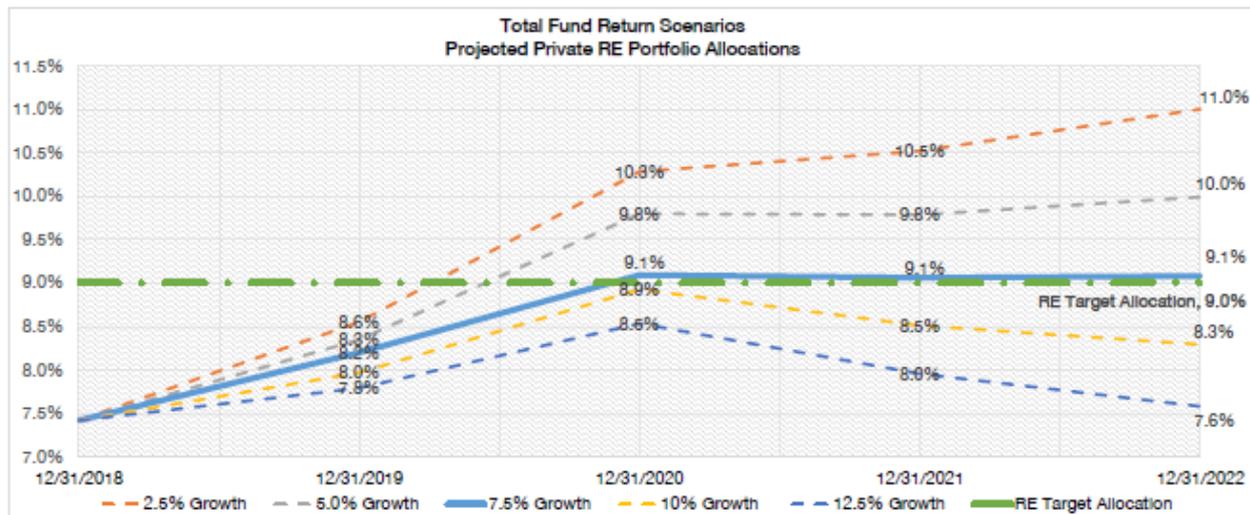
Proposed FY 2020 Tactical Plan

Real Estate Portfolio Pacing



Employees Retirement System of Texas

Private Real Estate Portfolio Pacing Analysis



Fiscal Year 2020 Pacing Plan Analysis Summary

	Estimate		Projected (Portfolio Growth Rate 7.5%)				
	3/31/2019	12/31/2019	12/31/2020	12/31/2021	12/31/2022	12/31/2023	
Total Plan Size	\$ 28,285.00	\$ 29,876.03	\$ 32,116.73	\$ 34,525.49	\$ 37,114.90	\$ 39,898.52	
Total Private Real Estate Target NAV	\$ 2,545.65	\$ 2,688.84	\$ 2,890.51	\$ 3,107.29	\$ 3,340.34	\$ 3,590.87	
Projected Private Core NAV	\$ 615	\$ 722	\$ 825	\$ 935	\$ 1,133	\$ 1,358	
Projected Private Non-Core NAV	\$ 1,462	\$ 1,733	\$ 2,199	\$ 2,237	\$ 2,267	\$ 2,285	
Total Projected Private Real Estate NAV	\$ 2,078	\$ 2,455	\$ 3,024	\$ 3,172	\$ 3,400	\$ 3,643	

Proposed FY 2020 Tactical Plan

Near Term Strategy



- Build relationships of scale with strong partners and small groups of investors
- Niche type funds that are likely to be resilient through economic downturns (medical office, self-storage and manufactured housing and debt funds)
- Co-Investments and separate accounts to leverage strategic partnerships
- Explore long term holds for select investments, including core
- Selective international investments – Asia and Advanced Emerging Asia, possibly Europe

Questions?
Action Item

Public Agenda Item #6.1

*Review and Approval of Proposed Revisions to the Private Equity
Annual Tactical Plan for Fiscal Year 2019 – (Action)*

May 22, 2019

Ricky Lyra, Private Equity Portfolio Manager

Private Equity FY2019 Tactical Plan Amendment

IAC and Board Approval Request



- **Approved FY 2019 ERS Private Equity Tactical Plan:**

- Invest in 9-18 commitments totaling \$1.0 billion (including co-investments)
- Commitment target range +/- 25% (\$750M – \$1.25B)

- **Review and consideration of FY 2019 ERS Private Equity Annual Tactical Plan Amendment:**

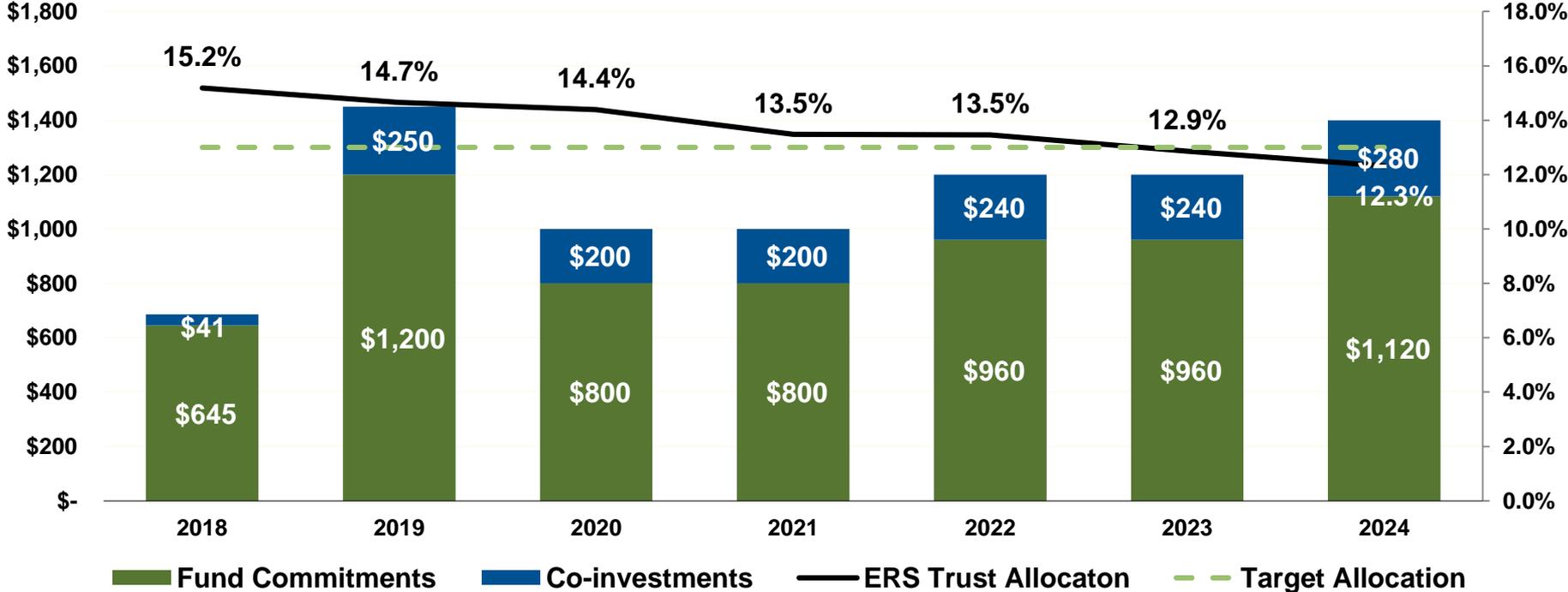
- Propose to invest in 9-14 commitments totaling \$1.45 billion (including co-investments)
- Commitment target range +/- 25% (\$1.1B – \$1.8B)

Private Equity FY2019 Tactical Plan

7.5% Trust Growth



Commitments and Allocation Forecast

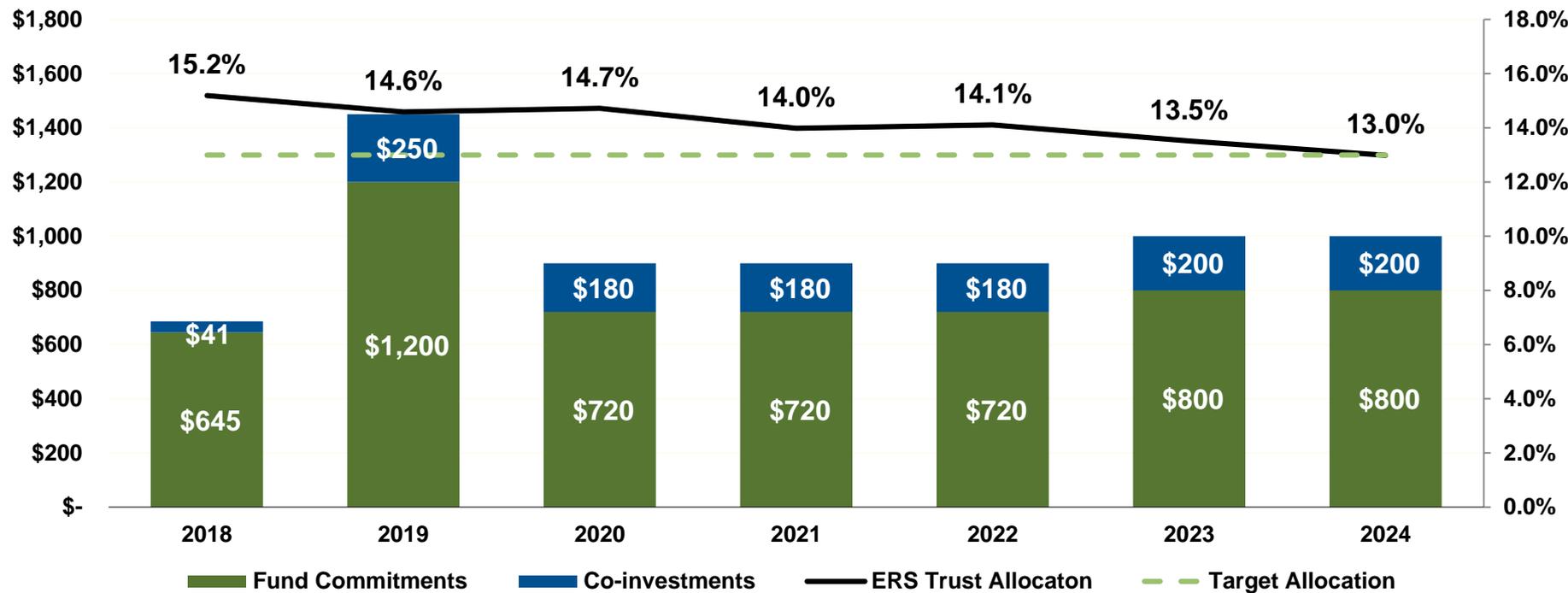


Private Equity FY2019 Tactical Plan

Sensitivity – 3.75% Trust Growth



Commitments and Allocation Forecast



Questions?
Action Item

Public Agenda Item #7.1

Private Infrastructure Program Market Update and Program Overview

May 22, 2019

Pablo de la Sierra Perez, Director of Infrastructure and Natural Resources
Ryan Wilkinson, Infrastructure Portfolio Manager
Asif Hussain and Diell Bakalli, CBRE Caledon

Agenda - Key Topics

- Team Update
- Portfolio Update as of March 31, 2019
- Market Update
- Goals and Objectives for FY2020
- Long Term Goals and Objectives
- Infrastructure Consultant

Pablo De La Sierra Pérez

Director of Infrastructure and Natural Resources

- Joined ERS August 2014
- 16+ years infrastructure and energy investment experience
- Background in direct investing and consulting
- MS Ind. Engineering from Universidad De Oviedo

Ryan Wilkinson

Infrastructure Portfolio Manager

- Joined ERS February 2017
- 8+ years experience infrastructure and energy investment experience
- Background in direct investing and consulting
- BS Economics, MS Finance from John Hopkins University

Private Infrastructure Program Overview

Portfolio Update as of March 31, 2019



- Inception through March 31, 2019: 15 Funds, 14 co-investments, **\$1,578 million committed**
- **Net Asset Value (“NAV”) of \$683.1 million or 2.4% of system assets**
 - Includes 3 legacy Special-Situation investments
 - 1.01x TVPI¹, 0.25x DPI¹, 0.20 % IRR
 - \$806 million Unfunded Commitments
- Policy Benchmark: CPI+400
- FY2018: committed \$468 million vs a \$450 million target
- FY2019: targeting \$450 million in commitments
 - \$212 million already committed²
 - Additional \$150 - \$200 million expected

1. TVPI, or Total Value to Paid in Capital, is equal to (NAV + Distributions) / Paid in Capital;
DPI, or Distributed to Paid in Capital, is equal to Distributions / Paid in Capital

2. Through March 31, 2019

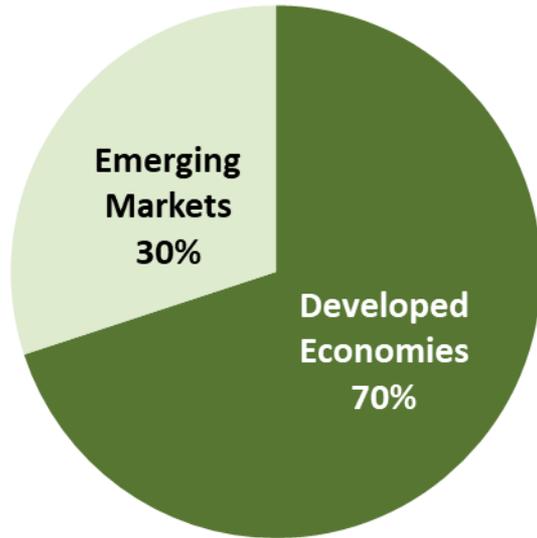
Private Infrastructure Program Overview



Portfolio Update as of March 31, 2019

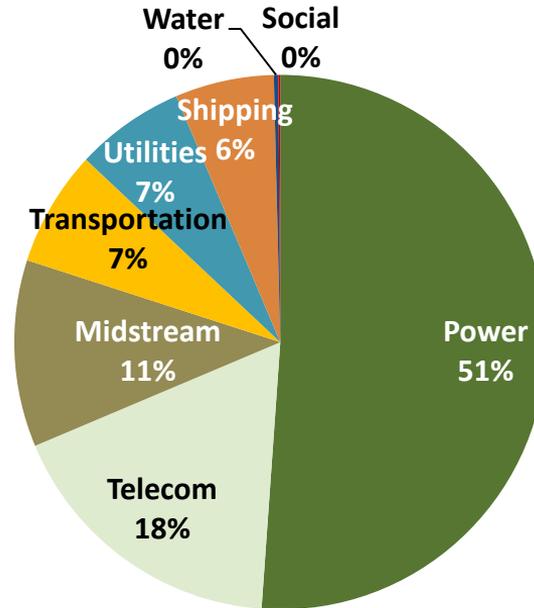
Geography

(based on NAV)



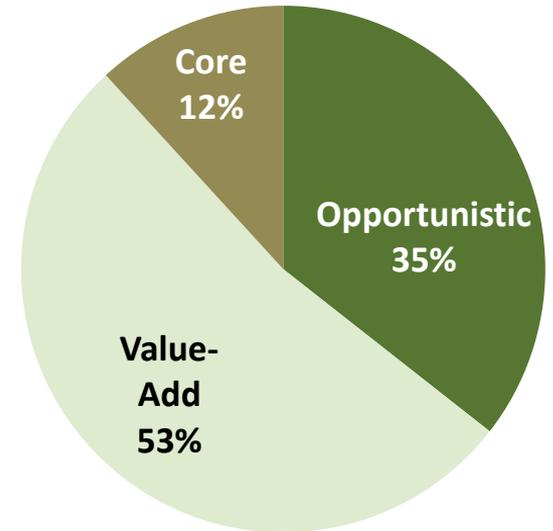
Sector

(based on NAV)



Strategy

(based on NAV)



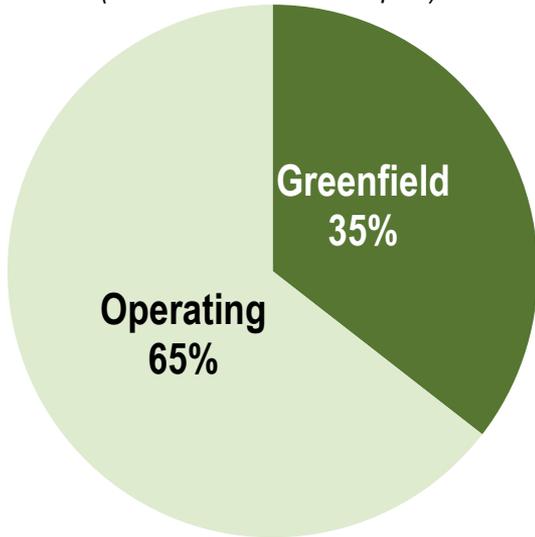
Private Infrastructure Program Overview

Portfolio Update as of March 31, 2019



New Construction vs. Operating

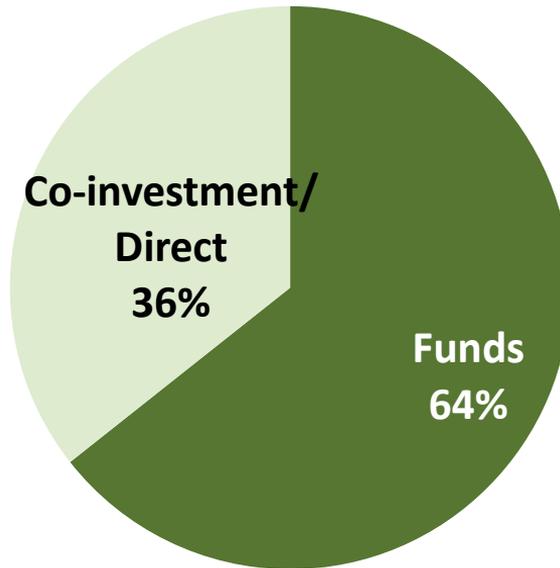
(based on committed capital)



Greenfield is new construction.

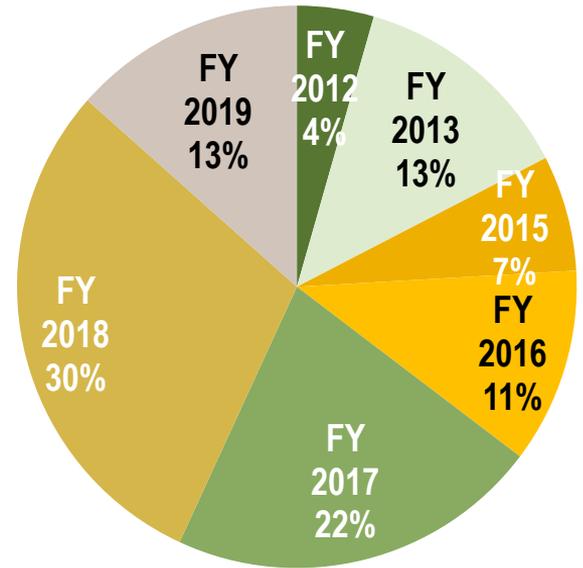
Vehicle

(based on committed capital)



Vintage

(based on committed capital)

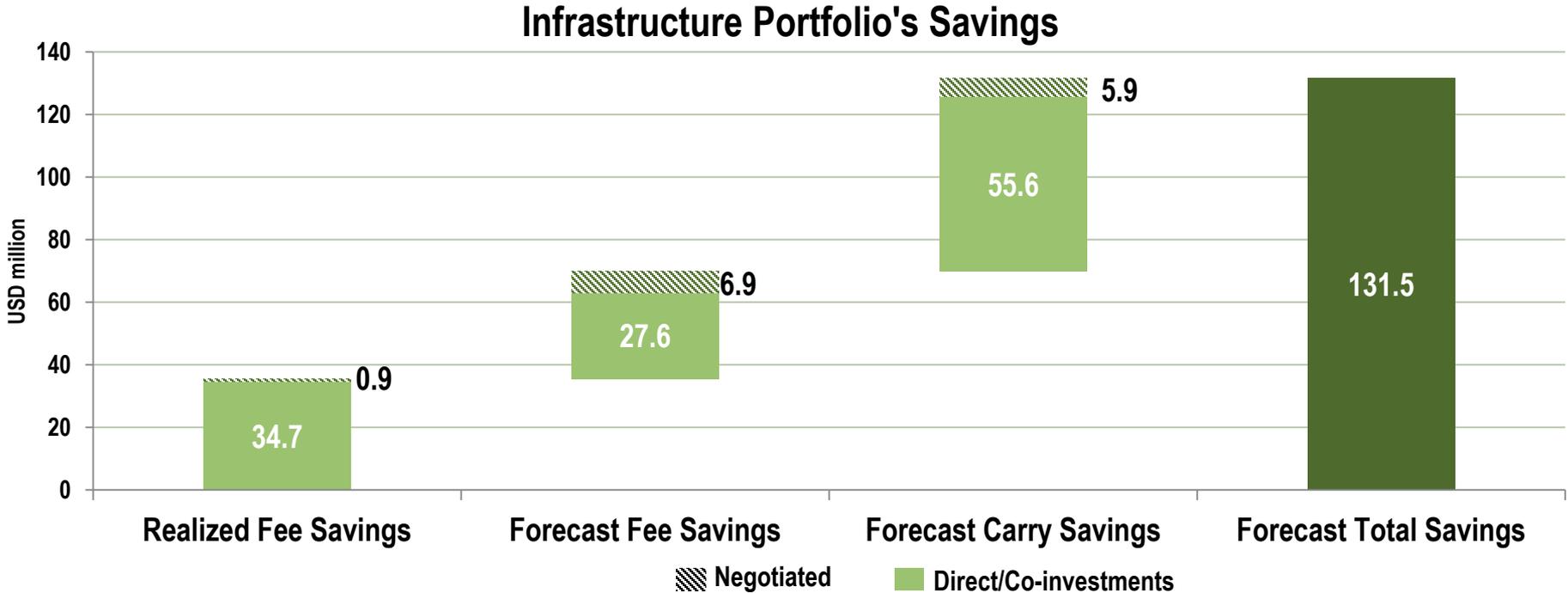


Private Infrastructure Program Overview

Portfolio Economics and Fee Savings



- March 31, 2019, portfolio's averages: Management Fee 0.89%; Carry: 12.1%



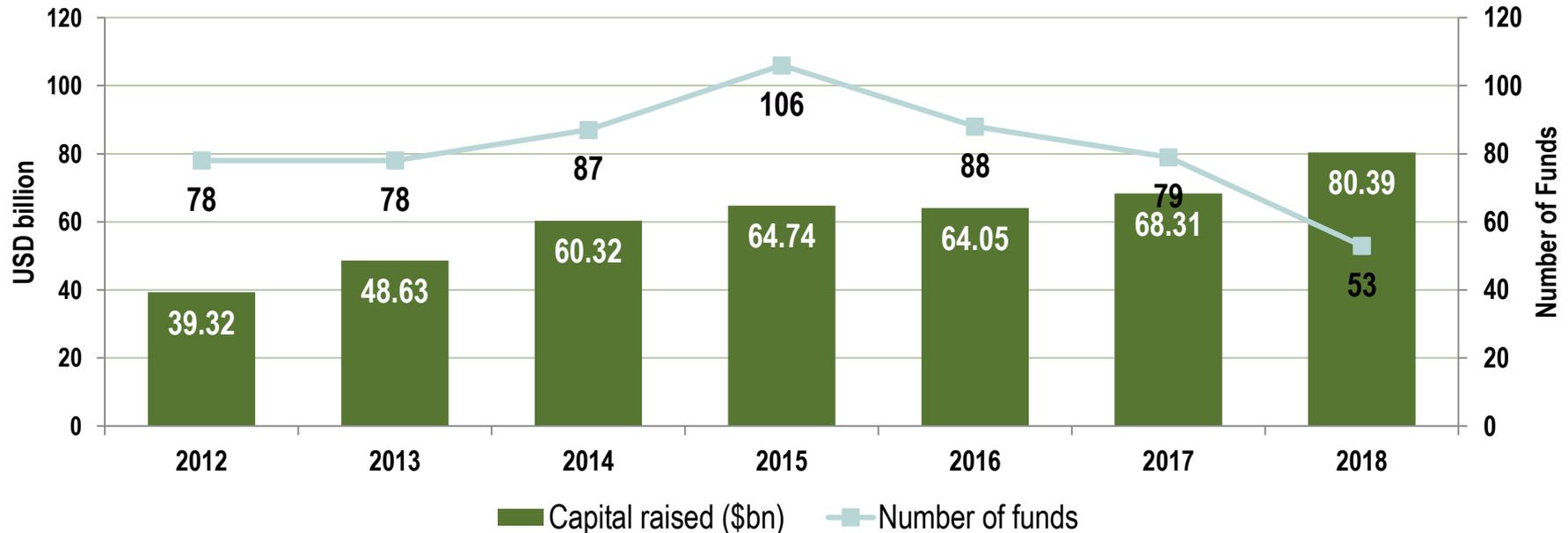
Private Infrastructure Program Overview

Market Update



Fundraising level continues to be strong.

Year-on-year infrastructure fundraising



Market update

- Energy, Power and Utilities remain largest subsectors
 - Midstream, renewables
- Digital infrastructure / telecommunications consolidating as a new subsector
- Expanding private infrastructure universe:
 - Battery / Distributed Energy
- New construction (Greenfield) and upgrades to existing infrastructure
- Direct investments / co-investments

- Strong need for global infrastructure investment continues
- Developing asset class
 - Standardization and market information
- Strong fundraising activity
- Fund investment model
- Evolving technologies:
 - Power supply
 - Digital Infrastructure
 - Transport-related
- Political environment

Private Infrastructure Program Overview

Goals and Objectives for FY2020



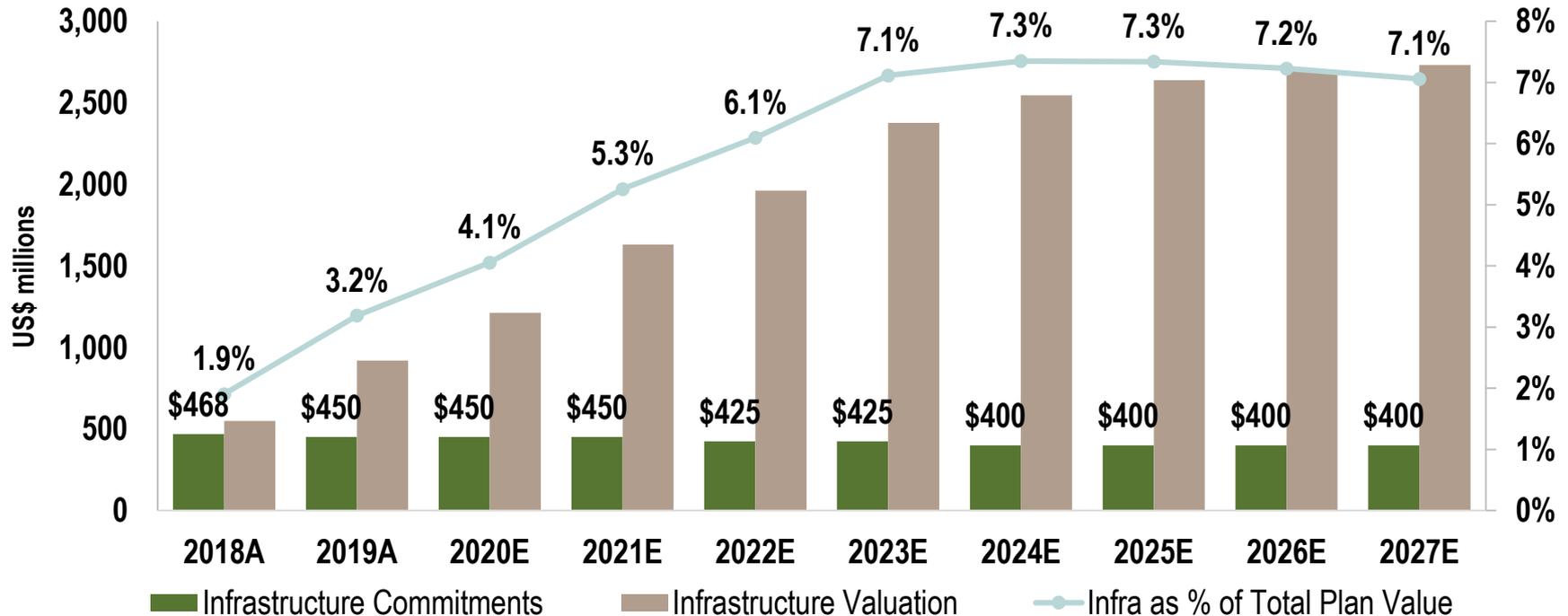
- Continue pursuing direct investments and co-investments
- Seek to diversify portfolio
- Manage portfolio concentration
- Explore efficient ways to deploy
- Execute Tactical Plan
- Seeking one analyst

Private Infrastructure Program Overview

Long Term Goals and Objectives



Reaching allocation in 2023



Private Infrastructure Program Overview

Infrastructure Consultant Performance



- New consultant transition
- Frequent calls with staff/in-person meetings
- Annual on-site visit at consultant office expected in late 2019 / early 2020
- Investment Recommendations for deals
- Participation in Internal Investment Committee Meetings
- Staff reviewed the Infrastructure Program Guidelines with consultant
 - Proposed changes – agenda item 7.2

Questions?



PRIVATE INFRASTRUCTURE PROGRAM
REVIEW
& MARKET OUTLOOK 2019
MAY 22, 2019

CBRE
CALEDON



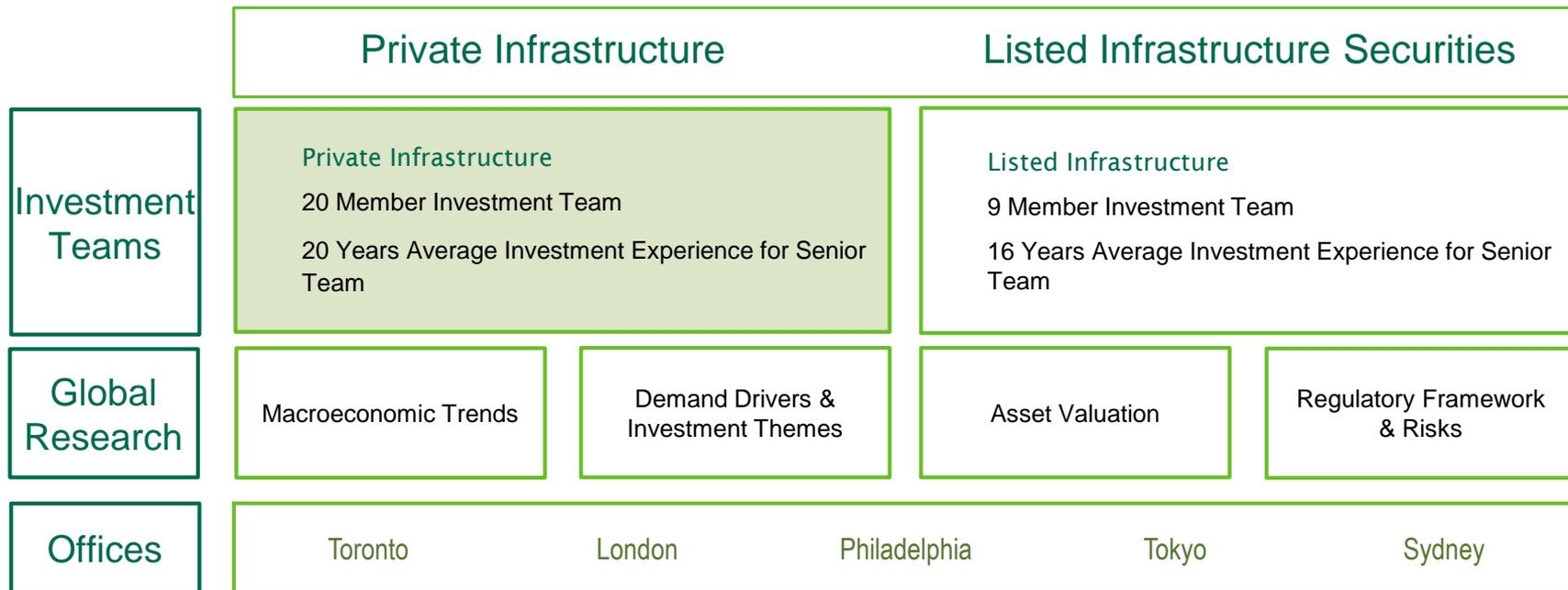
I. CBRE CALEDON INTRODUCTION

CBRE GLOBAL INVESTORS

The team consists of 29 investment professionals



CBRE Infrastructure Platform and Resources



CBRE CALEDON INFRASTRUCTURE

The private infrastructure team is based in Toronto and London



INVESTMENT TEAM

Stephen Dowd Partner, Global Head of Infrastructure*†	Andreas Köttering Partner, Head of Infrastructure, Europe*	Asif Hussain Partner, Infrastructure*	Jeff DeBlock Partner, Infrastructure*	David Rogers Founding Partner, CEO*†	Martin Day Partner, Head of Strategy*†	Justin Kusinski Partner, Private Equity*						
Noi Spyratos Vice President	Aaron Vale Vice President	Lee Anderson Vice President	Diell Bakalli Sr. Associate	Angel Liang Associate	Michael Sun Associate	Matthew Ryan Associate	David Xu Associate	Michael Chi Associate	Ali Bhimani Analyst	Tammy Ha Analyst	Allison Williams Analyst	Joel Ovelese Analyst

CORPORATE AND INVESTOR SERVICES

Dennis Pellarin Partner, COO & EVP Finance†	Robert Chen Partner, CFO & CCO	Robert Shaw Legal Counsel	Munny Sodhi Compliance Manager	12	7
				Finance Managers and Analysts	Business Development and Client Service

ADVISORY COMMITTEE

Colleen Sidford Co-Chair Ontario Power Generation **	Don Morrison Co-Chair OMERS **	Patrick Madigan Macquarie **	Dean Metcalf Ontario Teachers' Pension Plan **

* Member of Investment
Committee

† Member of
Management Committee

** Advisory committee's
past employers



II. ERS PRIVATE INFRASTRUCTURE PROGRAM

PRIVATE INFRASTRUCTURE

Portfolio Snapshot

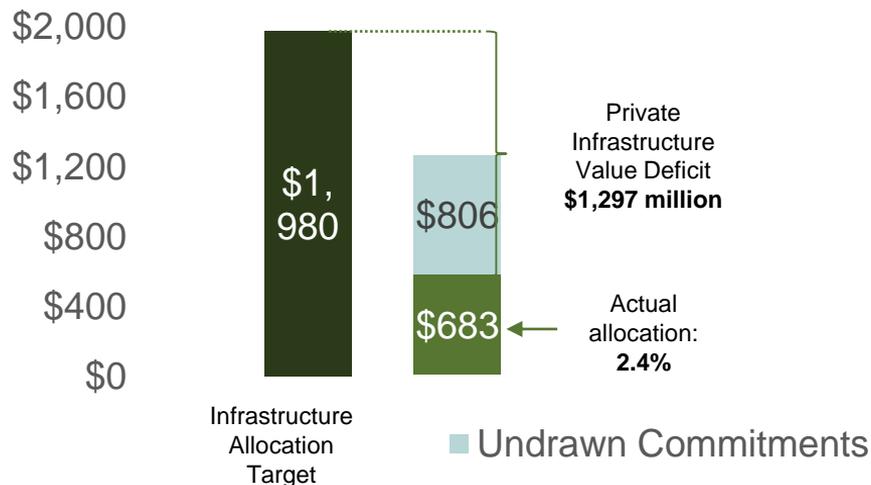


- Since inception through to March 31, 2019, the Private Infrastructure Portfolio has made \$1,578 million of commitments into 15 infrastructure funds and 11 co-investments⁽²⁾.
- **Since January 1, 2018**, the Team made 5 fund commitments and 3 co-investments, amounting to \$428 million and \$143 million, respectively.

Total Trust Market Value ⁽¹⁾



➤
Infrastructure Allocation Target
7%



(1) Estimated as of March 31, 2019

(2) Excludes Legacy Investments

PORTFOLIO SNAPSHOT

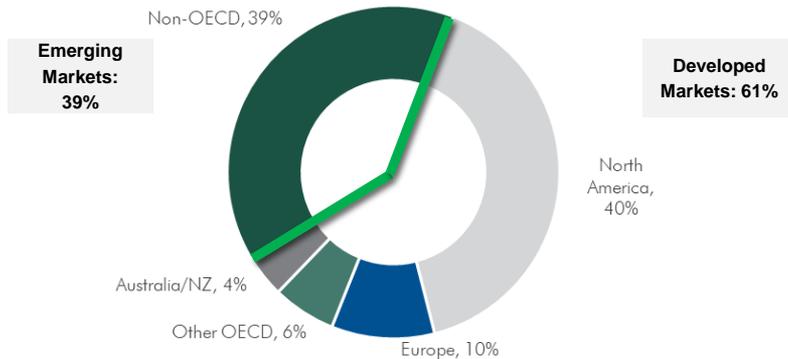
Geographic & Industry Exposure



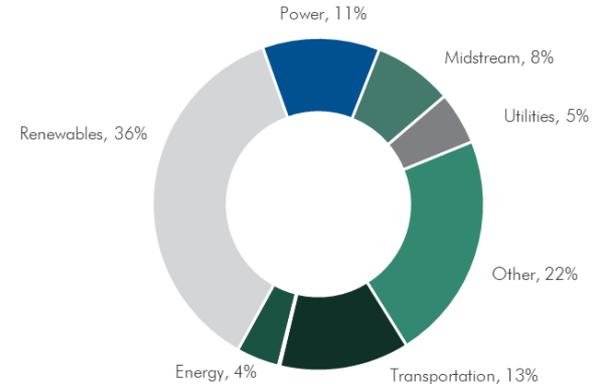
Though still in the early stages of program development, ERS' infrastructure portfolio is well-diversified

- Prudent diversification by vintage year, strategy, regulatory structure, geography, and sector is important. A long-term goal of the program is to create a private infrastructure portfolio that is diversified across geographies and industry sectors.
- Although currently more heavily weighted towards the US market and the renewables sector, the ERS infrastructure portfolio is in compliance with board-approved targets

Private Infrastructure Allocation



Portfolio Summary by Industry



CONCLUSIONS & RECOMMENDATIONS



Opportunity remains for patient and disciplined investors

- The investable universe for infrastructure continues to grow
- The climbing asset pricing trend is expected to continue for core infrastructure. The equity risk premium for core infrastructure assets could continue to decline to a new, lower equilibrium
- Deal flow is broadly diversified by geography and type of investment
- Rising asset prices and declining discount rates create incentives for “style drift”
- Value is achievable by those who are able to execute through a variety of transaction structures and sourcing strategies

Recommendations

- Focus on quality core managers operating in Europe, Canada, and Australasia
- Concentrating larger commitment sizes to fewer funds and General Partners, secures more meaningful relationships with high quality managers and favorable management fees, governance rights and access to more co-investment opportunities
- Raise the General Partner concentration cap and target
- Small and mid-market managers are a promising area
- Greenfield and buy-and-build opportunities may present a good opportunity to earn a premium return relative to brownfield assets



III. PRIVATE INFRASTRUCTURE MARKET OVERVIEW

INFRASTRUCTURE FUNDRAISING

Global attraction for infrastructure has continued to increase



\$80_{BN}

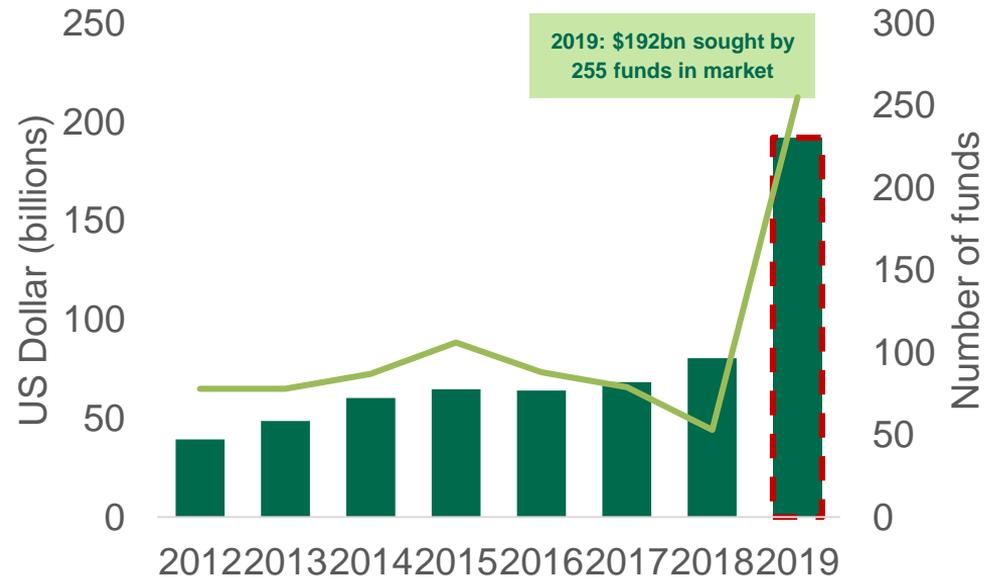
worth of infrastructure funds
had reached final close in
2018

10

largest funds secured 70% of
all capital raised in 2018

Fund managers have begun to scale the size of their newer funds significantly with many managers raising funds 500% the size they had raised less than a decade ago.

Unlisted Infrastructure Fundraising (2012 – 2019)



INFRASTRUCTURE MARKET ACTIVITY

Last twelve months (LTM)



TOTAL DEAL ACTIVITY

There has been significant global deal activity in infrastructure

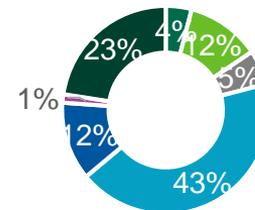
1387

Total Number of
Transactions Completed

LTM TRANSACTIONS BY GEOGRAPHY

Europe continues to represent the largest infrastructure investment opportunity globally with over 40% of all transactions

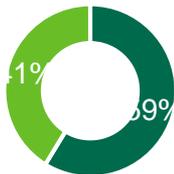
- Africa
- Asia
- Australasia
- Europe



LTM TRANSACTIONS BY TYPE

Investors continue to seek operating infrastructure assets

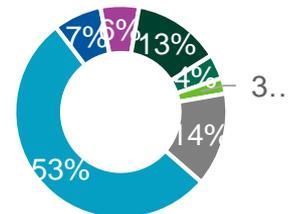
- Brownfield
- Greenfield



LTM TRANSACTIONS BY SECTOR

The renewable sector continues to provide ample deal flow as investors seek move away from traditional power sources

- Environment
- Other
- Power
- Renewables



OVERVIEW BY GEOGRAPHY

Need for infrastructure a global issue



North America

US growth remained solid due to fiscal stimulus and a healthy consumer, market volatility towards the end of the year led to a significant re-rating in equity valuations

Europe

Surge in infrastructure focused capital, with funds raising \$23 billion, a 93% increase over the previous year, causing an inflation on valuations and further segmentation to “hyper core.”

Asia-Pacific

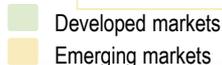
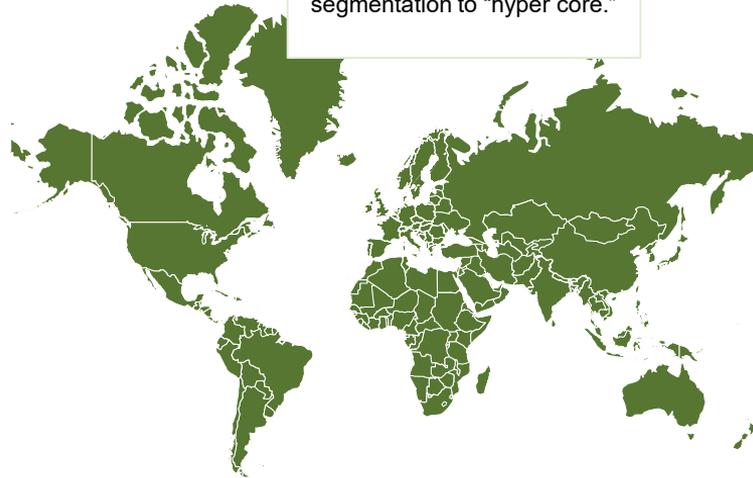
Growing at a pace above North America and Europe. Its positive long-term outlook is driving infrastructure demand. Strong policy and reform agendas supporting infrastructure investments.

Latin America

Demand growth in Chile, Colombia, Peru and Brazil is driving significant new electricity and gas transmission buildouts. Attractive markets due to growing middle classes, favorable demographics and significant infrastructure deficits

Australia

Government putting forward the Treasury Law Amendment Bill 2018 expected to adversely impact foreign investor returns and their ability to remain competitive



Questions?

Public Agenda Item #7.2

*Consideration of Proposed Revisions to the ERS' Infrastructure
Program Guidelines – (Action)*

May 22, 2019

Pablo De La Sierra Perez, Director of Infrastructure and Natural Resources

- Single-transaction Infrastructure Investment Committee approval limits:
 - Clarify (re-insertion) and consolidate to 0.6% of the Trust for both funds and co-investments/direct
- Increase Manager Concentration target and limit from 10% and 20% to 15% and 25%
- Miscellaneous clean-up and clarifications

Questions?
Action Item

Public Agenda Item #7.3

Consideration of Proposed Private Infrastructure Annual Tactical Plan for Fiscal Year 2020 – (Action)

May 22, 2019

Pablo De La Sierra Perez, Director of Infrastructure and Natural Resources

ERS Private Infrastructure Tactical Plan

FY2020 IAC and Board Approval Request



- Review and consideration of FY2020 ERS Private Infrastructure Annual Tactical Plan:
 - Propose to invest in 4-8 investments with commitments totaling \$450MM (including co-investments/direct investments)
 - Commitment target range +/- 30% (\$315MM - \$585MM)
 - Seek to diversify from a sector perspective
 - Continue to focus on co-investments / direct investments and establishing key relationships

Questions?
Action Item

Public Agenda Item #8.1

Review and Consideration of Investments Benchmarking – (Action)

May 22, 2019

Tom Tull, CFA, Chief Investment Officer

Sam Austin and Tim Bruce, NEPC

BENCHMARKING

EMPLOYEES RETIREMENT SYSTEM OF TEXAS

May 2019

Sam Austin, Partner

Tim Bruce, Partner

Mike Malchenko, Senior Analyst



BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | PORTLAND | SAN FRANCISCO

BEST PRACTICES IN BENCHMARKING

- **Benchmarks are not model portfolios**
 - but may be in certain efficient asset sectors based on investment beliefs and risk budget
- **Benchmarks should allow for ease of implementation and may facilitate tactical asset allocation**
- **Benchmark returns and characteristics serve as a baseline for risk assessment in the portfolio**
 - Active risk budget, portfolio structure, active implementation and investment manager skill are informed by benchmarks
 - Ex-poste risk adjusted returns use benchmarks as inputs and are key to evaluating implementation quality
 - Ex-ante risk analysis is keyed off of benchmarks
- **Benchmarks may serve as a base-line for compliance monitoring**
- **Benchmarks that are absolute return based pose issues when assessing volatility and or risk, both ex-ante and ex-poste**
- **Evaluate validity using CFA Institute's SAMURAI framework**

FRAMEWORK FOR EVALUATING APPROPRIATE BENCHMARKS

**Valid benchmarks (per the CFA Institute) must meet certain criteria.
The CFA Institute outlines these requirements as SAMURAI.**

Is the benchmark:

Specified in advance: Benchmark is known to all at start of evaluation period

Appropriate: The benchmark should accurately reflect the manager's performance style

Measurable: You must be able to measure the results

Unambiguous: A good benchmark's components should be known

Reflective: Of manager's current investment expertise

Accountable: Manager should agree that the benchmark is an appropriate measure

Investable: You should be able to replicate and invest in a benchmark



RECOMMENDATIONS AND CONCLUSION

- **SAMURAI analysis has not uncovered any significant issues with benchmarks used**

Recommendations:

- **Change Domestic Public Equity underlying component benchmarks to MSCI USA IMI from S&P 1500**
- **Change Private Equity asset class benchmark to Wilshire Associates Trust Universe Comparison Services (TUCS) Master Trusts – Public Plans > \$5 Billion Median Total Private Equity**
 - NEPC's preference is to benchmark private equity to a public markets equivalent plus 2% - 4% premium. It is acceptable that staff prefers the Wilshire (TUCS) peer universe as a benchmark recognizing an alignment between private equity performance benchmarking and incentive compensation benchmarking
- **Change Absolute Return Portfolio benchmark to US 3-month Treasury Bill + 3.50% premium**
- **Public and private markets benchmarks used are broadly in line with industry best practices**
 - Consider better disclosure/ benchmark definitions in reporting
- **Benchmarks are aligned well with Investment Policy objectives**



Questions?
Action Item

Public Agenda Item #9.1

Review of Long-term Investment Return Projections

May 22, 2019

Tom Tull, CFA, Chief Investment Officer

Sam Austin and Tim Bruce, NEPC

ASSET ALLOCATION MODELING

EMPLOYEES RETIREMENT SYSTEM OF TEXAS

May 22, 2019

Sam Austin, Partner

Tim Bruce, Partner

Mike Malchenko, Sr. Analyst



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CAPITAL MARKET FORECAST COMPARISON OVER NEAR-TERM HORIZON

	Asset Class	Policy Asset Allocation	NEPC		AON	
			Return	Risk	Return	Risk
Risk Seeking: 79%	Global Equity	37%	7.0%	17.6%	7.3%	18.5%
	Private Equity	13%	8.8%	19.6%	9.3%	24.5%
	Total Global Equity	50%	7.5%	17.8%		
	Global Credit	11%	5.5%	11.8%	5.2%	12.0%
	Opportunistic Credit	3%	6.8%	8.7%	6.5%	9.0%
	REITs	3%	6.8%	20.0%		
	Private Real Assets - Infrastructure/Land	7%	6.3%	12.0%	7.0%	12.0%
	Private Real Estate	9%	6.7%	14.5%	7.5%	15.0%
Real Assets	19%	6.8%	12.3%			
Risk Reduction/ Liquidity Assets: 21%	Fixed Income - Rates	11%	2.5%	4.7%	2.6%	3.0%
	Absolute Return	5%	6.5%	3.6%	6.2%	4.4%
	Cash	1%	2.5%	1.0%	2.4%	1.0%

Expected Return (Geometric) 5-7 Yr	6.68%
Standard Deviation (Asset)	12.0%
Sharpe Ratio 5 - 7 Yr	0.35

7.20%*
11.6%*
0.41*

* Denotes AON's 10 year capital market assumption
Modeling assumptions are outlined in the agenda item exhibit



EXPECTED RETURNS

	Aon Capital Market Assumption	NEPC Core Return Assumption
Inflation	2.50%	2.20%
5-7 Year Expected Return	–	6.68%
10-Year Expected Return	7.20%	–
Estimated Risk	12.00%	12.60%
Sharpe Ratio	0.38	0.35
20-Year Expected Return	7.40%	7.51%
30-Year Expected Return	7.60%	7.75%

EXPECTED RETURN COMPARISON 2017 VS 2019

	NEPC 2017		AON 2017	NEPC 2019		
	5-7 Yr	30 Yr	20 Yr	5-7 Yr	20 Yr	30 Yr
Expected Return	6.62%	7.62%	7.40%	6.68%	7.51%	7.75%
Expected Volatility	12.74%		11.60%	12.02%		

Modeling Assumptions

- Global Equity is modeled using NEPC Global Equity assumption; uses MSCI ACWI IMI Weights
- Private Equity is modeled using July 2017 Customized ERS ALM modeling: 13% VC, 46% Buyouts, 7% Distressed Debt, 3% Mezzanine, 8% Natural Resources, 23% Secondaries. 2017 Private Equity uses NEPC capital market forecast
- Global Credit is modeled using July 2017 Customized ERS ALM modeling: 7% High Yield, 4% EMD
- Opportunistic Credit is modeled using July 2017 Customized ERS ALM modeling: 1.5% Direct Lending + 1.5% Real Estate Debt
- Private Real Estate is modeled using July 2017 Customized ERS ALM modeling: 42.8% Core RE + 57.2% Non-Core RE. This is derived from the 30/40/30 Core, Non-Core/REIT assumption.
- Fixed Income- Rates is modeled using July 2017 Customized ERS ALM modeling assuming 5 yr Duration Treasuries
- Absolute Return is modeled using ERS ALM modeling

CORE RETURN ASSUMPTIONS

	Asset Class	5-7 Year Return	Change 2019-2018	Volatility	
	Cash	2.50%	+0.50%	1.00%	
	US Inflation	2.25%	-0.25%	-	
	Equity	Large Cap Equities	6.00%	+0.75%	16.50%
		International Equities (Unhedged)	6.75%	-0.75%	20.50%
Emerging International Equities		9.25%	+0.25%	28.00%	
	<i>Private Equity*</i>	<i>10.01%</i>	+2.01%	24.16%	
Rates/Credit	Treasuries	2.50%	+0.25%	5.50%	
	<i>Core Bonds*</i>	<i>3.04%</i>	+0.29%	<i>6.10%</i>	
	High Yield Bonds	5.25%	+1.50%	12.50%	
	<i>Private Debt*</i>	<i>7.60%</i>	+1.10%	<i>11.97%</i>	
Real Assets	Commodities	4.25%	-0.50%	19.00%	
	Midstream Energy	8.25%	+1.00%	18.50%	
	REITs	6.75%	+0.25%	20.00%	
	Core Real Estate	6.00%	+0.25%	13.00%	
Multi-Asset	<i>US 60/40*</i>	<i>5.07%</i>	+0.53%	<i>10.45%</i>	
	<i>Global 60/40*</i>	<i>5.08%</i>	+0.17%	<i>10.95%</i>	
	<i>Absolute Return**</i>	<i>6.47%</i>		<i>3.4%</i>	

*Calculated as a blend of other asset classes ** Modeled using ERS assumption



Questions?

Public Agenda Item #10.1

Presentation of Trustee Recognition

May 22, 2019

Craig Hester, Chairman of the Board of Trustees

Porter Wilson, Executive Director

Public Agenda Item #11.1

Reminder date for the next Joint Meeting of the Board of Trustees and Investment Advisory Committee, the next meeting of the Board of Trustees, and the next meeting of the Audit Committee

May 22, 2019

Next Meeting Dates



2019 Meeting Dates

Wednesday, March 6, 2019

Wednesday, May 22, 2019

Wednesday, August 21, 2019

2-Day Workshop:

Tuesday – Wednesday, December 10-11, 2019

Public Agenda Item #12.1

*Adjournment of the Joint Meeting of the Board of Trustees and
Investment Advisory Committee*

May 22, 2019

Public Agenda Item #12.2

Recess of the Board of Trustees

Following a temporary recess, the Board of Trustees will reconvene to take up the Board agenda items

May 22, 2019