# INVESTMENT MANAGEMENT COMMITTEE

**July 2018**

**TEACHER RETIREMENT SYSTEM OF TEXAS MEETING**
**BOARD OF TRUSTEES**
**AND**
**INVESTMENT MANAGEMENT COMMITTEE**

*(Committee Chair and Members: Mr. Colonnetta, Chair; Mr. Corpus; Mr. Hollingsworth; Mr. Moss and Ms. Ramirez)*

*All or part of the July 26, 2018, meeting of the TRS Investment Management Committee and Board of Trustees may be held by telephone or video conference call as authorized under Sections 551.130 and 551.127 of the Texas Government Code. The Board intends to have a quorum and the presiding officer of the meeting physically present at the following location, which will be open to the public during the open portions of the meeting:* ***1000 Red River, Austin, Texas 78701 in the TRS East Building, 5th Floor, Boardroom***.

**AGENDA**

**July 26, 2018 – 12:15 p.m.**
**TRS East Building, 5th Floor, Boardroom**

1. Call roll of Committee members.

2. Consider the approval of the proposed minutes of the April 19, 2018 committee meeting – Committee Chair.

3. CIO Update – Jerry Albright

4. State of the Energy Markets – Dan Pickering, Tudor Pickering Holt and Co.

5. Discuss the First Quarter 2018 Performance Review – Steve Voss, Mike McCormick and Mike Comstock, Aon Hewitt.

6. Annual Update on External Private Markets – Eric Lang, Neil Randall, Grant Walker and Carolyn Hansard.

7. Review of Proposed Modifications to Investment Policy Statement – Katy Hoffman and James Nield.

8. Receive an update on London satellite office and discussion of potential office in Asia – Brian Guthrie and Jerry Albright.

9. Review Board Advisors' roles and consider recommending to the Board the adoption of a resolution selecting one or more Advisors recommended by Staff as

NOTE: The Board of Trustees (Board) of the Teacher Retirement System of Texas will not consider or act upon any item before the Investment Management Committee (Committee) at this meeting of the Committee. This meeting is not a regular meeting of the Board. However, because the full Committee constitutes a quorum of the Board, the meeting of the Committee is also being posted as a meeting of the Board out of an abundance of caution.

required by Section 1.3 of the Investment Policy Statement, including consideration of a finding that deliberating or conferring on the selection of the Board Advisors in open meeting would have a detrimental effect on the position of the retirement system in negotiations with a third person – Katy Hoffman.

**Minutes of the Investment Management Committee**

**April 19, 2018**

The Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on April 19, 2018, in the boardroom located on the fifth floor of the TRS East Building offices at 1000 Red River Street, Austin, Texas.

**Committee Members present:**
Mr. David Corpus, Acting Chair
Mr. Jarvis Hollingsworth
Ms. Dolores Ramirez

**Other Board Members present:**
Mr. John Elliott
Dr. Greg Gibson
Mr. James D. Nance
Ms. Nanette Sissney

**Others present:**

| | |
|---|---|
| Brian Guthrie, TRS | Steve Huff, Fiduciary Counsel, Reinhart Boerner Van Deuren s.c. |
| Ken Welch, TRS | Steve Voss, Aon Hewitt |
| Don Green, TRS | Mike Comstock, Aon Hewitt |
| Carolina de Onis, TRS | Mike McCormick |
| Jerry Albright, TRS | Mr. Sandy Rattray, Man Group |
| Jase Auby, TRS | |
| James Nield, TRS | |
| Dale West, TRS | |
| Brad Gilbert, TRS | |
| Heather Traeger, TRS | |
| Katherine Farrell, TRS | |
| Dr. Keith Brown, Investment Advisor | |

Investment Management Committee Acting-Chair Mr. Corpus called the meeting to order at 2:36 p.m.

1. **Call roll of Committee members.**

Ms. Farrell called the roll. A quorum was present, Mr. Colonnetta and Mr. Moss were absent.

2. **Consider the approval of the proposed minutes of the December 14, 2018 committee meeting – Committee Acting-Chair David Corpus.**

On a motion by Ms. Ramirez, seconded by Mr. Hollingsworth, the committee voted to approve the proposed minutes for the December 14 2018, Investment Management Committee meeting as presented.

3. **Hedge Fund Challenges and Opportunities – Mr. Sandy Rattray, Man Group CIO.**

Mr. Jase Auby introduced Mr. Rattray. He said Man Group manages money on TRS behalf in two portfolios: $500 million in emerging markets mandated in public equity and $267 million mandated in the hedge fund portfolio. He said Mr. Rattray is also one of the co-inventors of the VIX Index.

Mr. Rattray discussed some of the challenges and opportunities facing the hedge fund industry. He said despite what is being reported in the press, the industry keeps growing but his concern is that the alpha is not growing at the same speed as the assets of the industry are growing. Mr. Rattray noted for the larger investors, that they will often do the simpler strategies in house. He said his company assists by providing advice on that and on the more complex strategies. He noted the hedge funds produce a diversifying set of returns that are not correlated with equity or bond markets and that is a driver for why people are investing in hedge funds today, diversification.

Mr. Rattray said one of the opportunities out there is data. He stated there has been a massive growth of data, storage and processing power. Because there is so much data that a human could not read it all and uncover patterns. He said the next stage is to get machines to be able to read better or interpret data better.

Mr. Rattray discussed hedge fund fees and costs. He said for companies producing results there are people in the global market that are prepared to pay, a quality-based thing. However, he said costs for running the funds is very significant and as an industry has not focused on them. He said for an industry that is growing but alpha is not, returns can be improved by being tough on the amount of charges that are placed into hedge funds.

4. **Discuss the Fourth Quarter 2017 Performance Review – Steve Voss, Mike McCormick and Mike Comstock, Aon Hewitt.**

Mr. Mike Comstock stated that this is the fourth quarter report and all data reviewed is through December 31, 2018. He said there has been a lot of consistent alpha and favorable returns. He said as to a large extent, as public equities go, so does the trust fund, and 2017 was extraordinary as it related to public equity performance. He also noted that about 10 percent of the trust fund assets are in emerging market equities and the return in 2017 was over 37 percent. Mr. Comstock reported an 8 ½ percent return in 2017 was very good. He said at year end, the assets were north of $150 billion. Mr. Comstock stated in review of the asset allocations, the monies are exactly where they are intended to be, in line with policy ranges and close to the target allocations. He said moving forward they expect an increased volatility and returns should be a bit more modest.

Mr. Mike McCormick stated the return on the fund was 17.3 percent and the benchmark was 16.26 percent with an alpha of 1.04 percent. He noted that all the main components of the real asset portfolio was driving the results. Mr. McCormick spoke to the low volatility, over the past three year period there has been a 5 percent volatility. He said they believe this level of volatility is not sustainable.

5. **Semi-annual Risk Report – James Nield.**

Mr. James Nield stated that the risk report, now being presented in the Investment Committee, focuses on eight key risk metrics. He said everything was in compliance and all within the expected ranges for the metrics. He focused particularly on three key risk metrics with more detail: asset allocation, tracking error and liquidity.

6. **Overview of Public Equity Markets – Dale West.**

Mr. Auby introduced Mr. West by stating the public equity allocation is 44 percent of the Trust assets. Mr. West stated the group came together as a single unit six months ago as a result of the global equity best practices project. He said since last summer, the internal quantitative portfolios represented only about 7 percent of the public equity portfolio. As of end of January, they have increased their weight to 23 percent and are on track to get them to about a third of the overall portfolio by the end of the year. Mr. West reported the fastest growing of the portfolios was the multi-factor portfolio, which was designed to provide direct exposure to the risk premiums. He said for the last six months they have increased their passive investments in the U.S. portfolio from 2 percent to 37 percent. This was due to the U.S. markets running so efficiently. He said the second leg of the solution was to lean heavier on internal quantitative strategies, both internal and external. Mr. West concluded by saying they will continue to grow internal quantitative capabilities, both with existing portfolios and through the research and development pipeline.

7. **Annual Update on Hedge Funds – Brad Gilbert.**

Mr. Brad Gilbert reported on the overall performance. He said hedge funds are $12 billion for the Trust, representing an 8 percent allocation. Mr. Gilbert discussed the portfolios performances and their mandates.

Mr. Gilbert provided an update on the progress in the effort to realign the fee structures with the managers to one-or-thirty fee structure. He said for the past 18 months they have focused on improving the alignment of the hedge fund fee structures. He reported 75 percent of the portfolio is on a fee structures that is in line with this philosophy. Mr. Gilbert concluded by stating they continue to look for ways to improve and innovate.

8. **Review Board Advisors roles including consider recommending to the Board approval of a Resolution selecting an Advisor consistent with 1.3 of the Investment Policy Statement; and consideration of a finding that deliberating or conferring on the selection of the Board Advisor in open meeting would have a detrimental effect on the position of the retirement system in negotiations with a third person – Jerry Albright.**

On a motion by Mr. Hollingsworth, seconded by Ms. Ramirez, the committee voted unanimously to find that deliberating or conferring on the selection of the Board advisors in open meeting would be a detrimental effect on the position of the Retirement System in negotiations with a third person.

At 4:09 p.m., Mr. Corpus announced, without objection that the committee would recess to go into executive session under Section 825.11(e) of the Government Code to discuss Board procurement matters.

At 5:15 p.m. the committee reconvened in open meeting.

On a motion by Mr. Hollingsworth, seconded by Ms. Ramirez, the committee unanimously voted to recommend to the Board the proposed resolution selecting an advisor consistent with Section 1.3 of the Investment Policy Statement.

Without further discussion, the meeting adjourned at 5:16 p.m.

APPROVED BY THE **INVESTMENT MANAGEMENT COMMITTEE** OF THE BOARD OF TRUSTEES OF THE TEACHER RETIREMENT SYSTEM OF TEXAS ON THE 26TH DAY OF JULY 2018.

| | |
|---|---|
| ______________________________ | _________________ |
| Katherine H. Farrell<br>Secretary of the TRS Board of Trustees | Date |

# Chief Investment Officer Update

Jerry Albright, Chief Investment Officer

July 2018

TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT MANAGEMENT DIVISION

# CIO Update

## General IMD Update

- Trust Value is $151 billion as of Q1 2018
- Talent Management
  - Managing turnover and retention of current investment staff
  - Added five new investment professionals with an average 15 years of experience
  - Completed McGlagan compensation study
- Internal Priorities
  - Building the Fleet
  - Finalizing project with McKinsey
  - Semi-Annual Portfolio Reviews were conducted in February/March 2018
  - Space planning for growth of IMD
  - Diversity and Inclusion Plan
  - Continue to evaluate all aspects of IMD for better efficiencies and increase net returns
- Recent Awards
  - US Institutional Risk Premia Manager of the Year
  - Institutional Investor Most Wanted Allocators
  - 2018 aiCIO Next Gen Award: Ashley Baum

## Upcoming IMD Items

- Key Dates & Upcoming Events
  - SPN Joint Summit (New York City) – August 1
  - Senior management annual talent review planned for September 2018
  - CII Semi-Annual Fall Conference (Boston) – October 24-26
- September Investment Management Committee
  - AON Hewitt Q2 '18 Performance Review
  - Market Update
  - SPN Public & Private Annual Report
  - Risk Report
- Other September Board Items
  - Investment Policy Statement
  - Review Investment PIPP

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ASSET MANAGEMENT

# Energy – Off the Bottom, Now What?!

*Presentation to TRS Board of Trustees*

*July 26, 2018*

# Energy – Cyclical And In The Opportunity Zone

| | Last TPH/TRS Board Presentation | June 29, 2018 |
|---|---|---|
| WTI Crude Oil Price, $/bbl | $97.85 | $74.29 |
| US Oil Production, mmbbls/day | 7.3 | 10.5 |
| Global Oil Demand | 90.6 | 99.1 |
| Henry Hub Natural Gas Price, $/mcf | $3.66 | $2.91 |
| US Natural Gas Production, bcf/day | 66 | 80 |
| S&P 500 (SPX) | 1,626 | 2,718 |
| Energy ETF (XLE) | 81 | 76 |


Source: Raymond James research

# Finding (and Filling) the Gaps

**2004 - 2008**

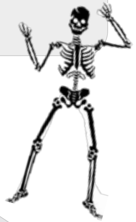
Gas Shale


**2008 - 2014**

Shale Shifts to Oil Land Grab

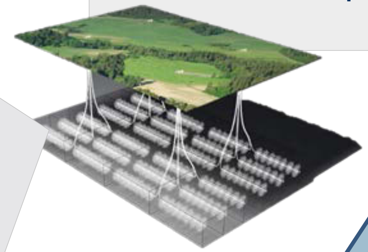
**2014 - 2016**

Survival Mode



**2017 - 2018+**

Measured Exploitation



**2018+**

Disruptors -
Electrics, LNG, Renewables and
New Technologies

## Evolving Opportunity Set for Investors Requires Flexibility

Public ⟺ Private

Upstream ⟺ Midstream ⟺ OFS

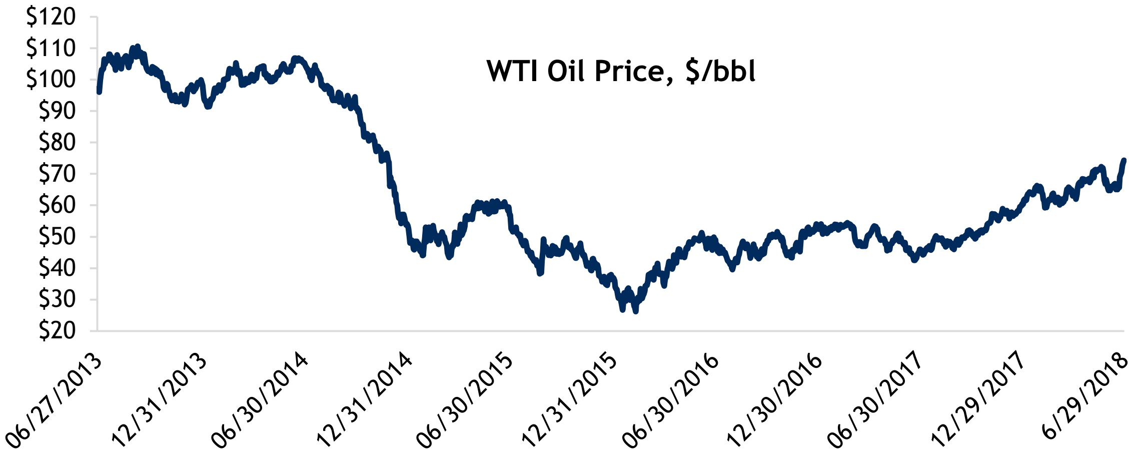
Equity ⟺ Debt

# Ongoing Changes… But Not Widespread Disruption

| Trends in the World of Energy | What We Believe |
|---|---|
| ■ US shale and OPEC now share role of swing producer<br>■ US shale exceeding expectations | ■ US energy is a growth business (Shale!)<br>■ OPEC is near productive capacity<br>■ More volatility given short-cycle shale |
| ■ Peak oil demand being contemplated | ■ Peak oil demand is not soon (2030+?)<br>■ Oil demand annual growth 1%+ (105 mmbbls/day in five years) |
| ■ Geopolitical dynamics mostly ignored | ■ Markets are too complacent about upside risks |
| ■ Continued globalization of natural gas (LNG)<br>■ Renewables more economically competitive | ■ Growth: Electrics > Renewables > Gas > Oil > Coal<br>■ Regulation/Mandates will drive electrics (Watch China/ Europe) |
| ■ Investor viewpoints have shifted<br>▪ Capital Discipline vs Growth<br>▪ Lower Equilibrium Price Expectations<br>▪ Exit/Divestment<br>■ Significant capital available for energy/infrastructure | ■ Energy outperforms broad market through at least 2020 |

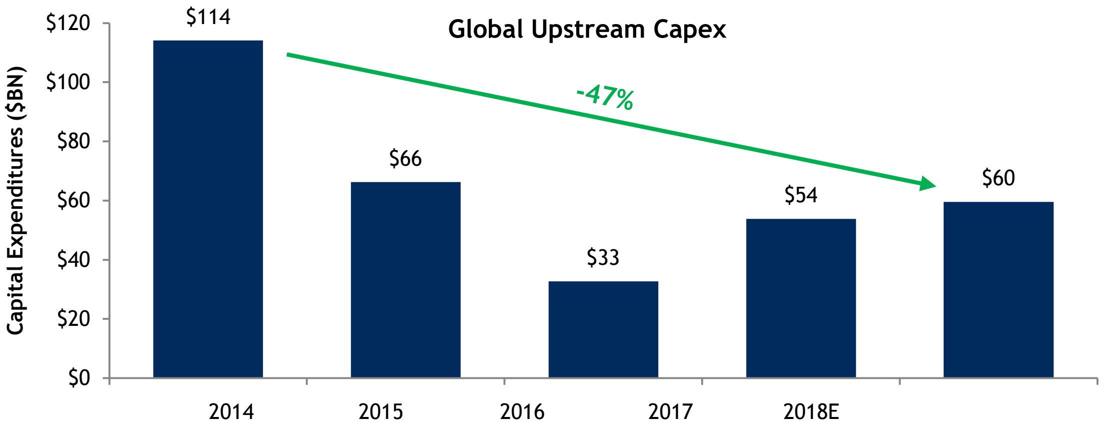
# Oil Emerging From A Painful Down-cycle

## Oil Clawing Back Toward $70/bbl Equilibrium Price



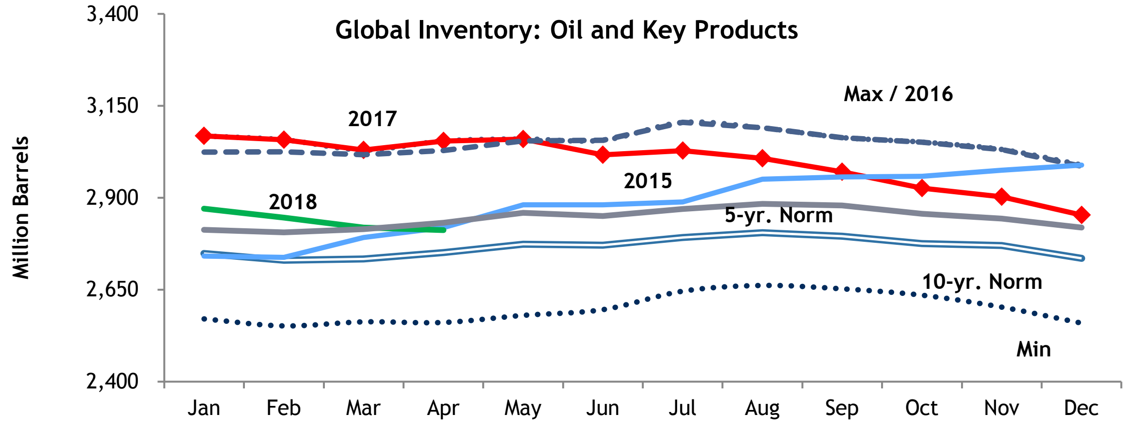

*Source: FactSet as of 6/29/18*

## Global Upstream Spending Still Anemic



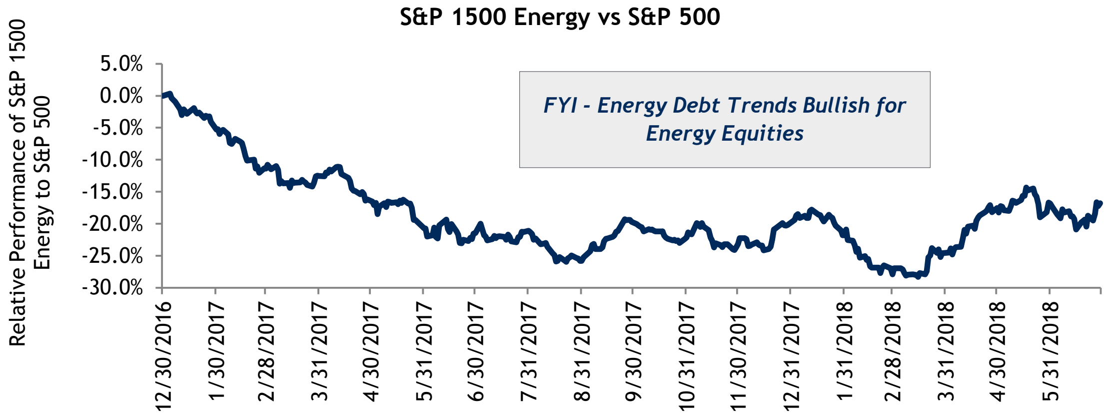

*Source: TPH Asset Management, TPH Research universe of 32 companies*

## Inventory Back to 5 Year Averages




*Source: IEA*

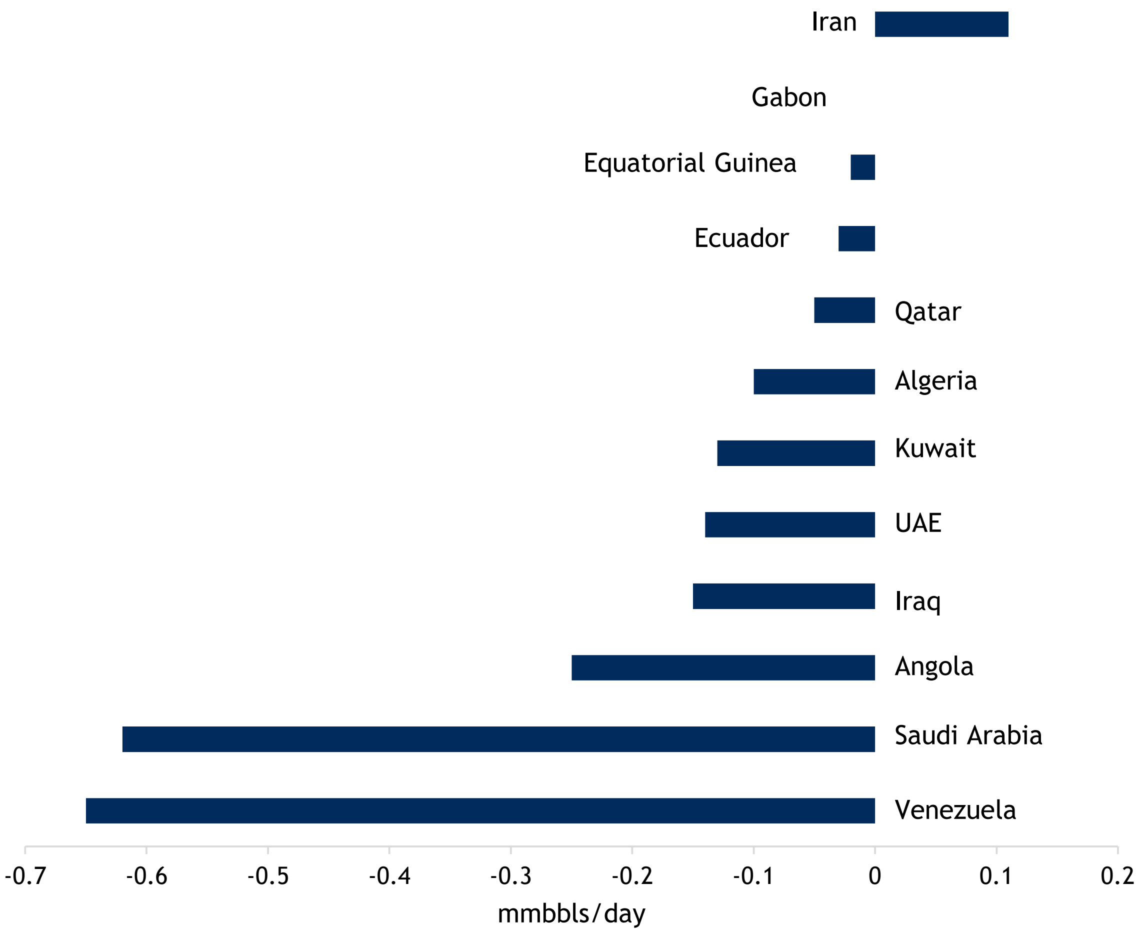
## Energy Stocks Notably Lagging Market




*Source: Bloomberg as of 6/29/18, TPH Asset Management*

# Very Tight Market After Impending OPEC/Russia Return

**OPEC Production Since Nov 2016 Cut**




- Return to pre-cut levels nets 800-1,000 kbbls/day
- Venezuela, Angola and Qatar have no rebound ability
- Iran sanctions will lower production

**In Our Opinion,**
**Countries with Excess Productive Capacity**

- Saudi Arabia … maybe 500 kbbls/day
- Kuwait/UAE … maybe 200 kbbls/day
- Russia … ~200 kbbls/day

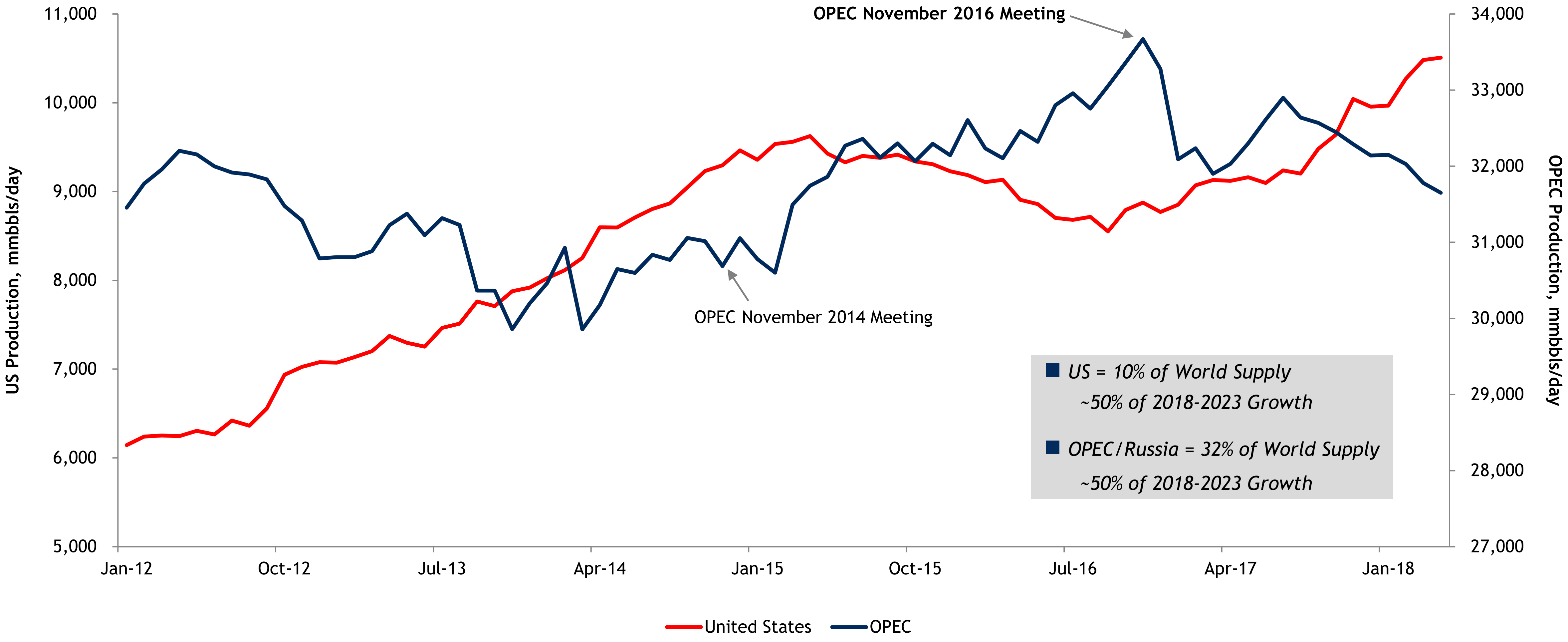
## COILED SPRING

- Less than 1-2mmbbls/day "easy" capacity in a 100mmbbl/day market
- It's an OPEC/Russia and US shale game for next 5+ years

*Source: IEA*

# The Two Big Kahuna's For This Cycle

**US and OPEC Oil Production**



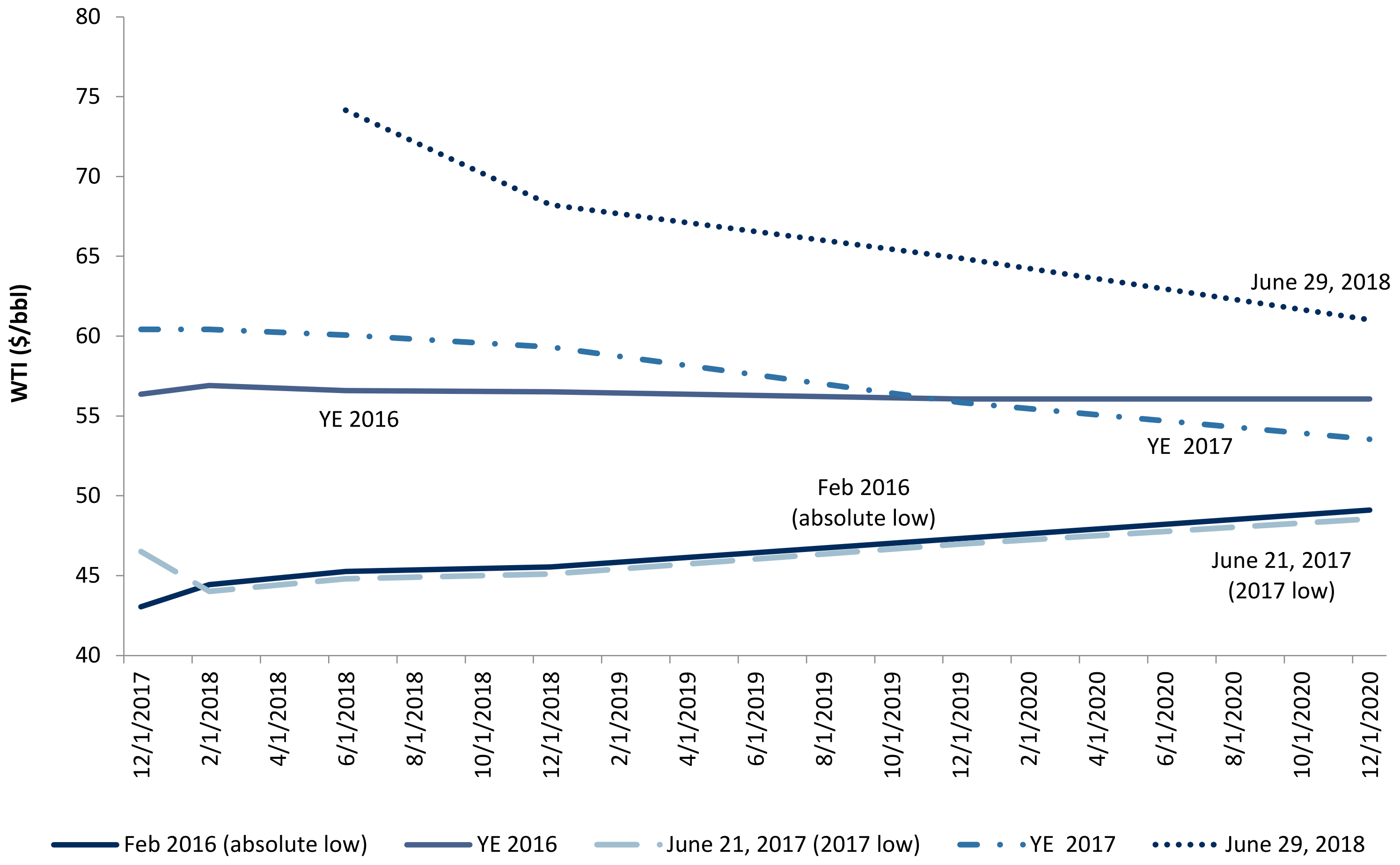

*Source: IEA*

# Watch the Shape of the Forward Curve!

*Backwarded curve says market remains skeptical. December 2022 crude currently trading at $56.53/bbl*

## 2018-2020 NYMEX Strip

| 2018-2020 NYMEX Strip | |
|---|---|
| Feb 5, 2016 (absolute low) | $47.32/bbl |
| Dec 31, 2016 | $56.21/bbl |
| Jun 21, 2017 (2017 low) | $46.88/bbl |
| Dec 31, 2017 | $56.24/bbl |
| June 29, 2018 | $64.72/bbl |

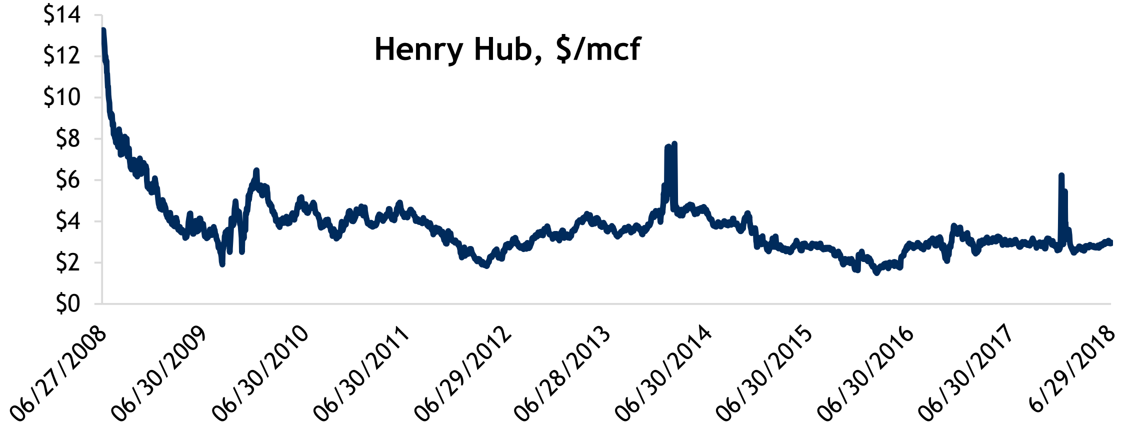



*Source: Bloomberg*

**Drives Transactions, Valuations and Sentiment**

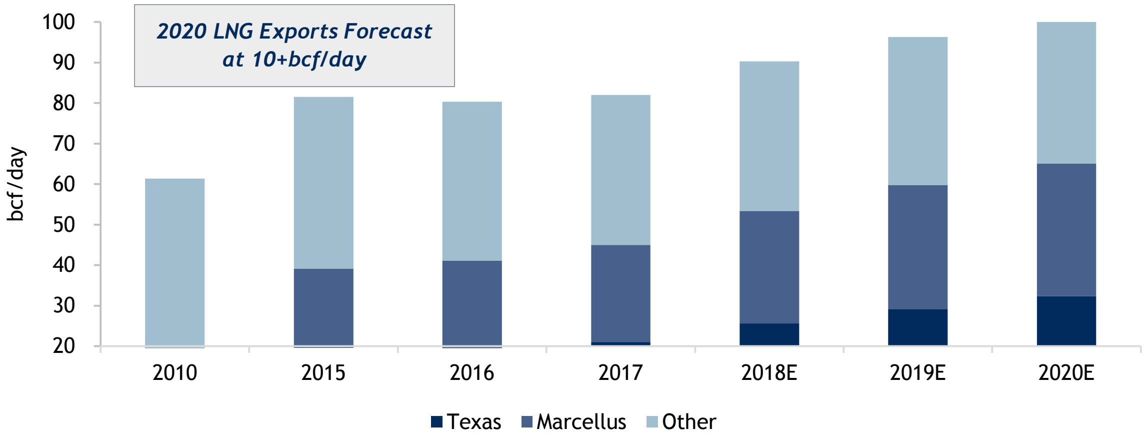
# US A Key Part of Globalizing Gas Market

## US Gas Price – Rangebound … Forever?



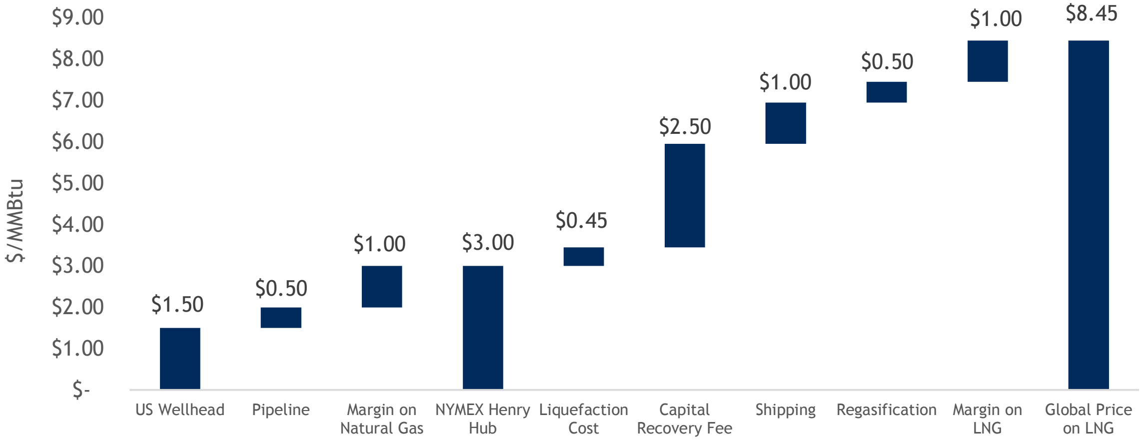

*Source: FactSet as of 6/29/18*

## US Gas Production Up Dramatically



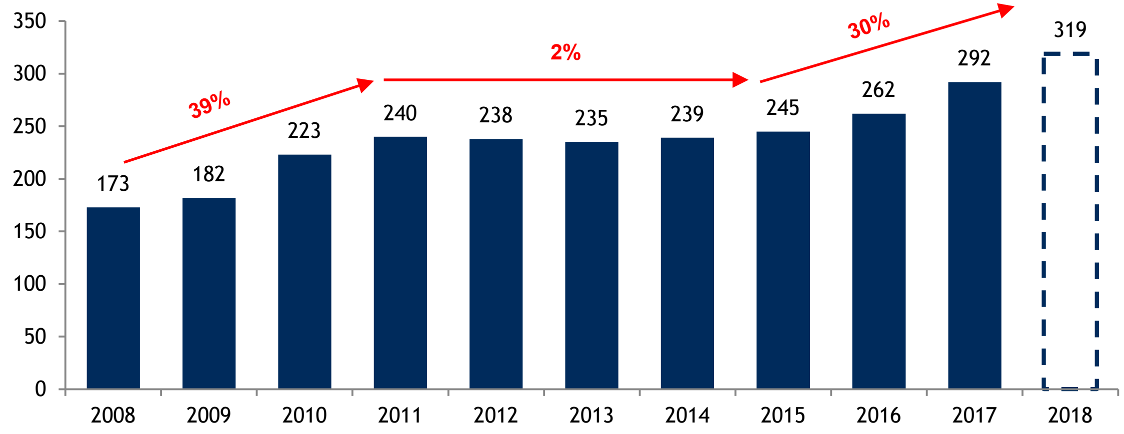

*Source: TPH Research*

## The LNG Value Chain




*Source: Bloomberg, TPH Asset Management*

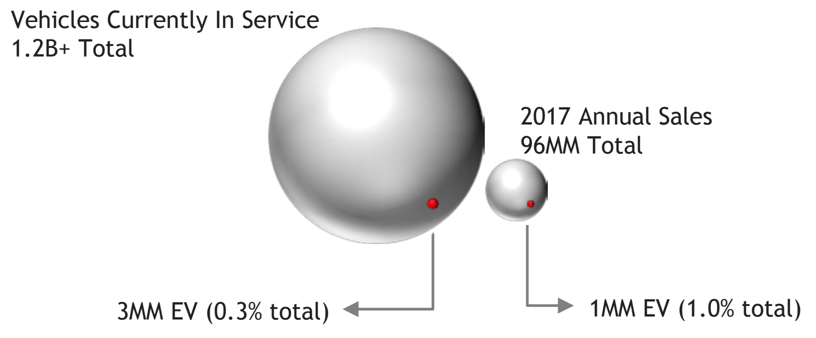
## LNG Volumes, Growing 7%/year for Past Decade




*Source: Poten & Partners, Factset*

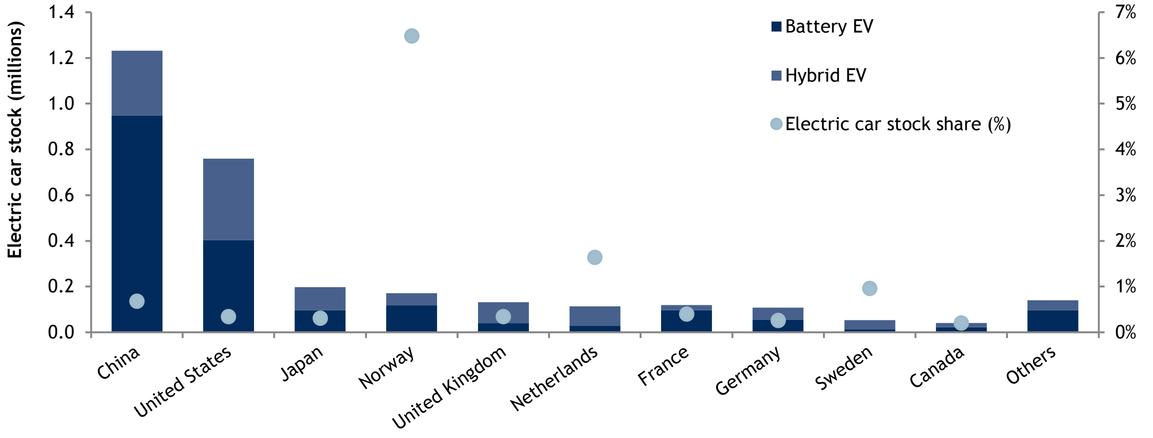
# Electric Vehicles – Impactful Eventually…Not This Cycle

## EV's are Currently a Tiny Part of Car Market



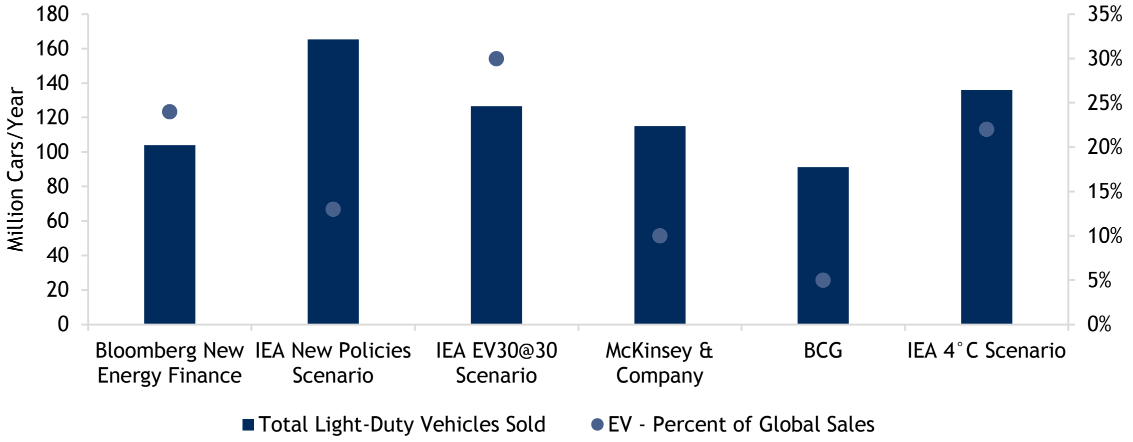

*Source: IEA, Wards, Statista*

## China Biggest Player; Norway Biggest Share



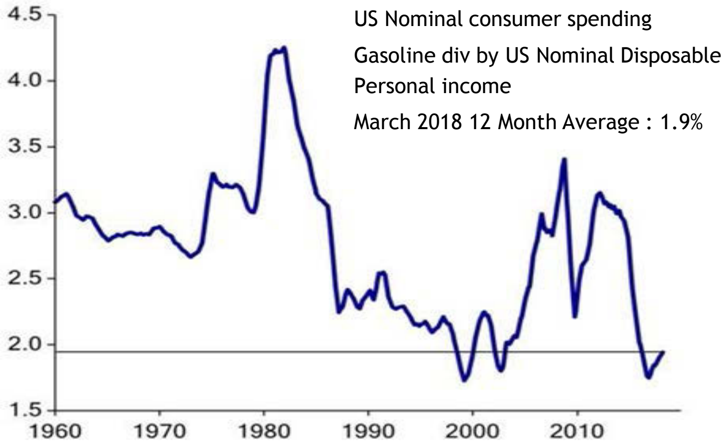

*Source: IEA analysis based on country submissions, complemented ACEA (2018), EAFO (2018a).*

## EV Sales Forecast for 2030 – Opinions Vary!




*Source: IEA, Bloomberg, McKinsey & Company, Boston Consulting Group*

## Gasoline Still Very Affordable




***Even if EV becomes 10% of new car sales (from <1%), US gasoline consumption still grows through 2025***

*Source: Evercore*

# Conclusion

- Energy remains a cyclical business – oil upcycle underway
- Natural Gas = Volume Story
- Equilibrium Prices
  - $70 +/- $5/bbl
  - $2.75-$3/mcf
- OPEC return will unveil tightness
- Electrics capturing more mindshare than market share
- Energy will outperform through 2020 – Don't Be Underweight!


Source: Raymond James research

**Get on the Train… Stay on the Train**

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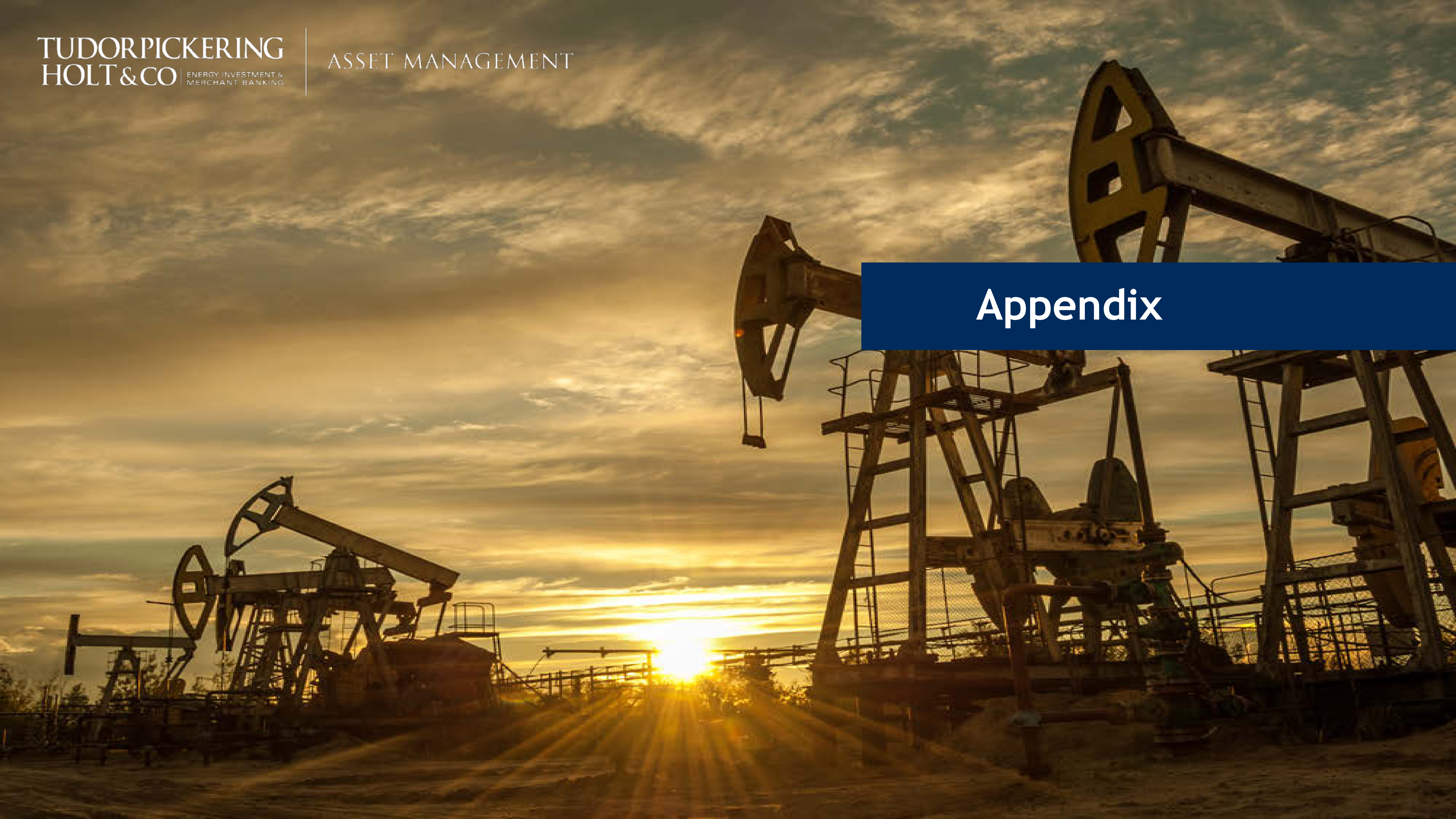
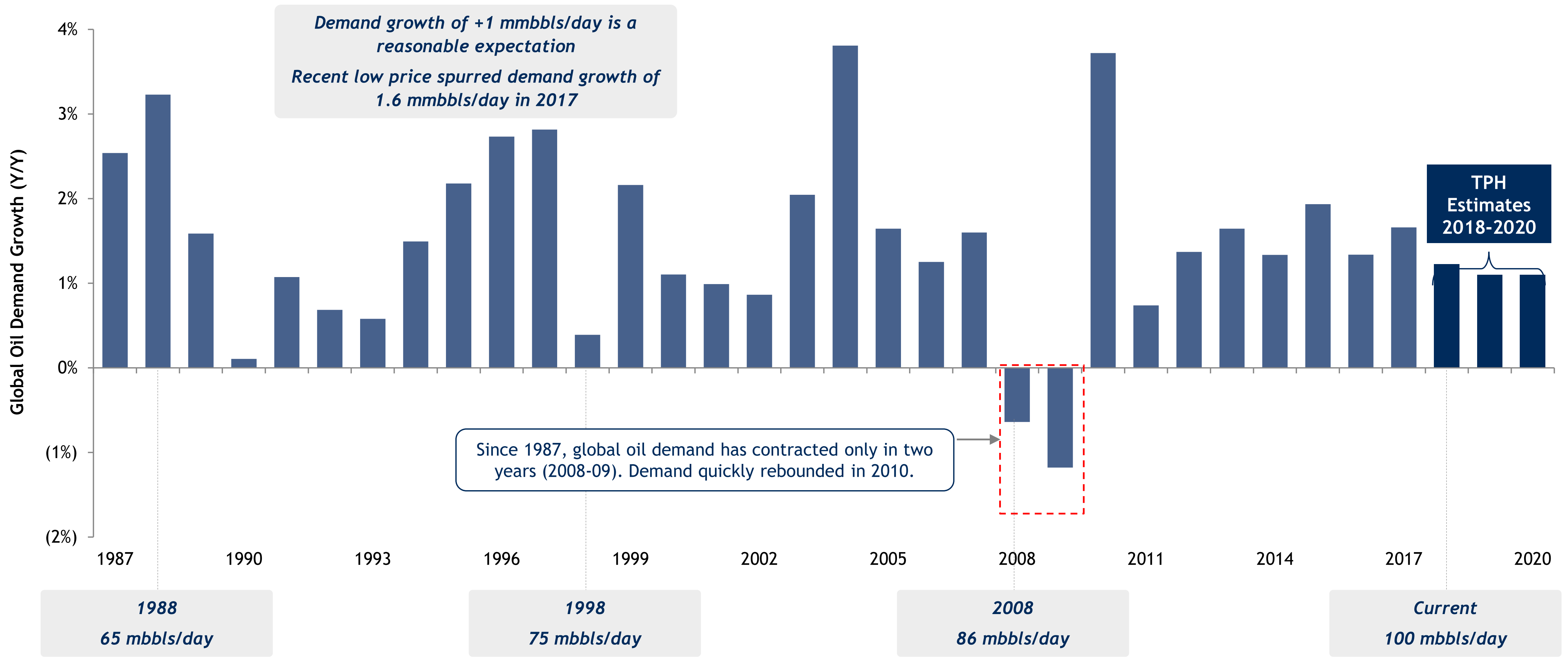


# Appendix

# Appendix
## *Demand Growth*

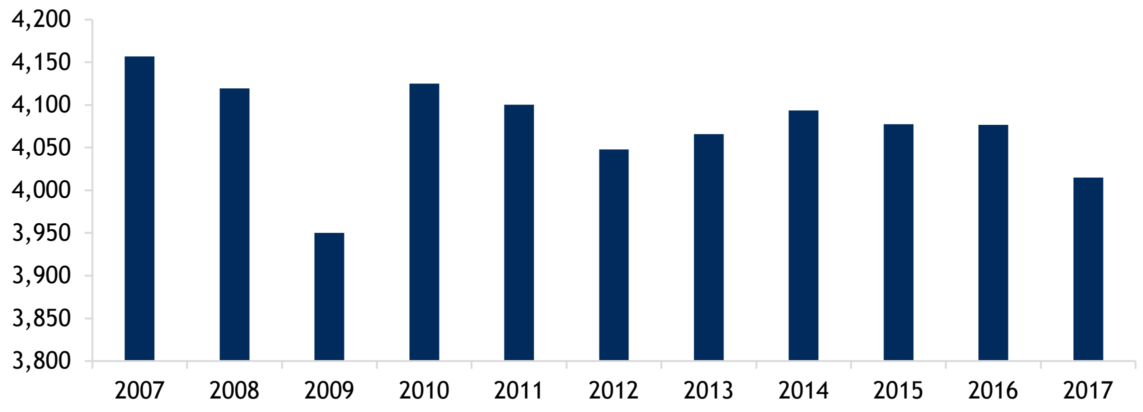
**Global Oil Demand: Historical and TPH Estimates**




*Source: TPH Research, TPH Asset Management*

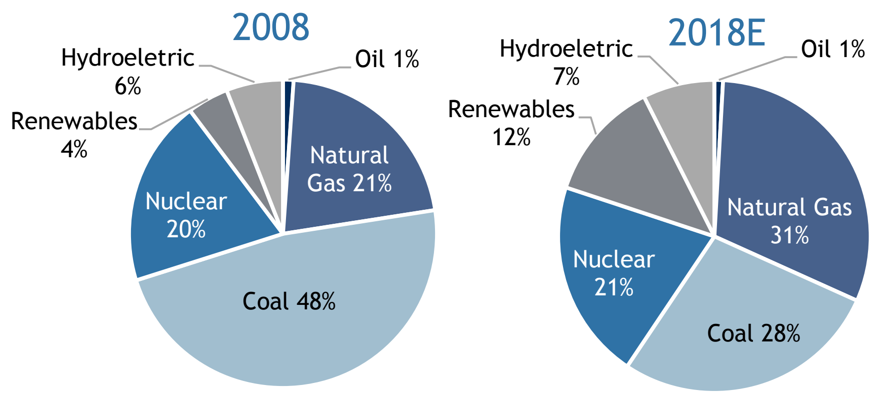
# Appendix
## *Power Generation Demand*

### US Electricity Demand, mwh



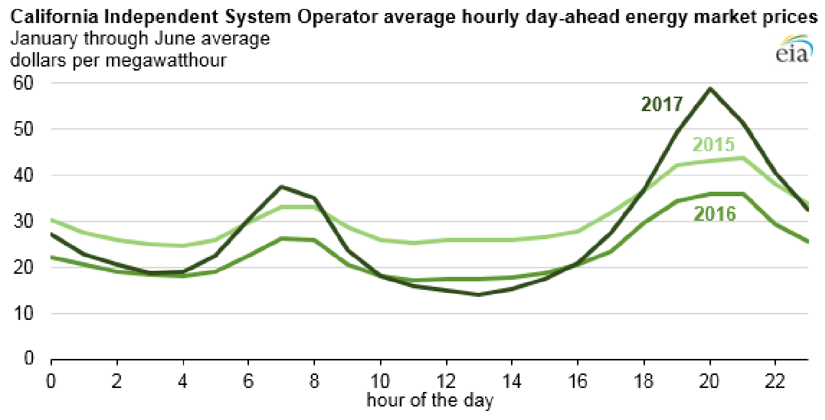

*Source: EIA*

### Sources of US Electricity




*Source: EIA*

### Renewables Change The Market



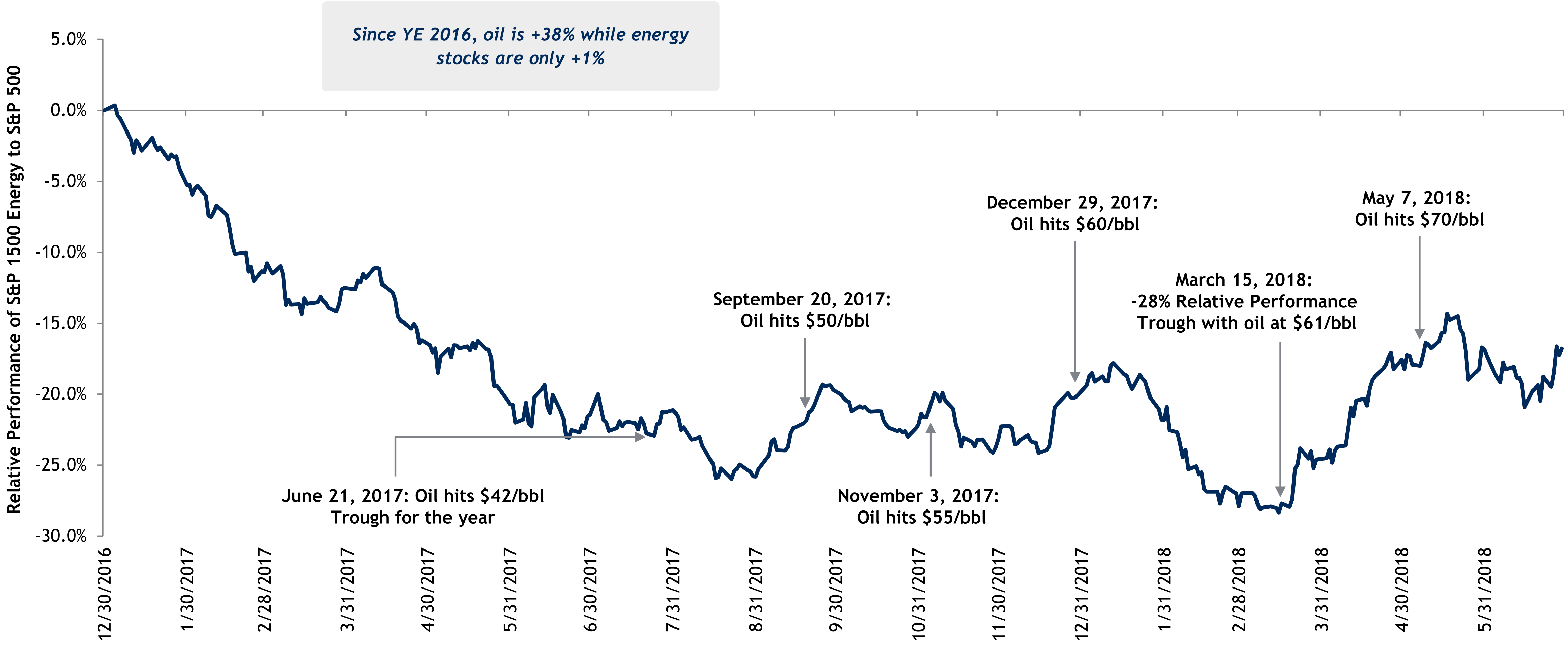

*Source: Lazard, EIA*

### Our Thoughts…

- Gas/Renewables have won the fight for incremental power generation
- Renewables competitive on newbuild economics…particularly with subsidies
- Renewables are intermittent…must have backup
- Gas wins on global scale

# Appendix
*Relative Performance*

## S&P 1500 Energy Relative Performance to S&P 500




*Source: Bloomberg as of 6/29/18*

# Disclosure Statement

## About The Firm

Tudor, Pickering, Holt & Co., LLC is an integrated energy investment and merchant bank, providing high quality advice and services to institutional and corporate clients. Through the company's two broker-dealer units, Tudor, Pickering, Holt & Co. Securities, Inc. (TPHCSI) and Tudor, Pickering, Holt & Co. Advisors, LLC (TPHCA), the company offers securities and investment banking services to the energy community. TPH Asset Management, LLC (TPHAM) is an SEC registered investment adviser that delivers a suite of energy investment strategies. TPH Partners Management, LLC is a relying advisor of TPHAM. Certain employees of TPHAM are also employees of TPHCSI.

The firm, headquartered in Houston, Texas, has approximately 160 employees and offices in Calgary, Canada; Denver, Colorado; and New York, New York. Its affiliate, Tudor, Pickering Holt & Co. International, LLP, is located in London, England. Its Canadian affiliate, Tudor, Pickering, Holt & Co. Securities – Canada, ULC, is located in Calgary, Alberta.

Past Performance is not indicative of future results.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# Disclosure Statement, cont'd

S&P Supercomposite 1500 Energy Index ("S15ENRS"): The S&P Composite 1500® combines three leading indices, the S&P 500®, the S&P MidCap 400®, and the S&P SmallCap 600® to cover approximately 90% of the U.S. market capitalization. It is designed for investors seeking to replicate the performance of the U.S. equity market or benchmark against a representative universe of tradable stocks.

Energy Sector Index SPDR (XLE) - The Energy Select SPDR (XLE) is an Exchange Traded Fund (ETF) that tracks the Energy Sector Index, or the energy sector of the S&P 500 (SPX). The fund invests up to 95% of its total assets in common stocks in the Oil, Natural Gas and Oil & Gas Drilling & Exploration industries.

The Dow Jones Industrial Average is a price-weighted average of 30 blue-chip stocks that are generally the leaders in their industry. It has been a widely followed indicator of the stock market since October 1, 1928.

Standard and Poor's 500 Index is a capitalization-weighted index of 500 stocks. The index is designed to measure performance of the broad domestic economy through changes in the aggregate market value of 500 stocks representing all major industries. The index was developed with a base level of 10 for the 1941-43 base period.

Front Month WTI (CL1) - Crude oil is the world's most actively traded commodity, and the NYMEX Division light, sweet crude oil futures contract is the world's most liquid forum for crude oil trading, as well as the world's largest-volume futures contract trading on a physical commodity. Because of its excellent liquidity and price transparency, the contract is used as a principal international pricing benchmark. The contract trades in units of 1,000 barrels, and the delivery point is Cushing, Oklahoma, which is also accessible to the international spot markets via pipelines. The contract provides for delivery of several grades of domestic and internationally traded foreign crudes, and serves the diverse needs of the physical market. Light, sweet crudes are preferred by refiners because of their low sulfur content and relatively high yields of high-value products such as gasoline, diesel fuel, heating oil, and jet fuel.

With the expiration of the December, 2006 contract, exchange will list 72 continuous monthly contracts. Crude futures expire when the PIT session ends on the day of expiration.

Front Month Henry Hub (NG1) - Natural gas accounts for almost a quarter of United States energy consumption, and the NYMEX Division natural gas futures contract is widely used as a national benchmark price. The futures contract trades in units of 10,000 million British thermal units (mmBtu). The price is based on delivery at the Henry Hub in Louisiana, the nexus of 16 intra- and interstate natural gas pipeline systems that draw supplies from the region's prolific gas deposits. The pipelines serve markets throughout the U.S. East Coast, the Gulf Coast, the Midwest, and up to the Canadian border. An options contract and calendar spread options contracts provide additional risk management opportunities.

# Teacher Retirement System of Texas

## Performance Review: First Quarter 2018



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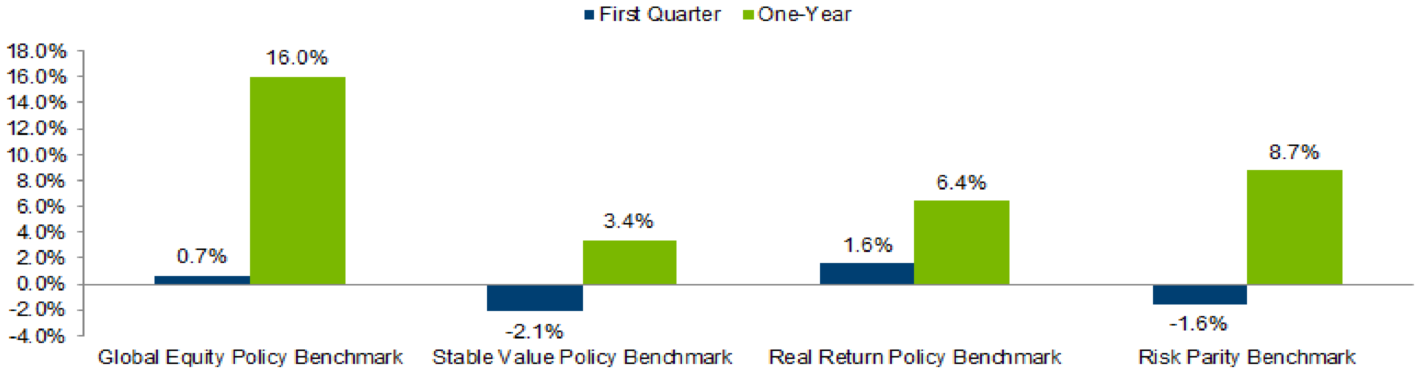
# Summary

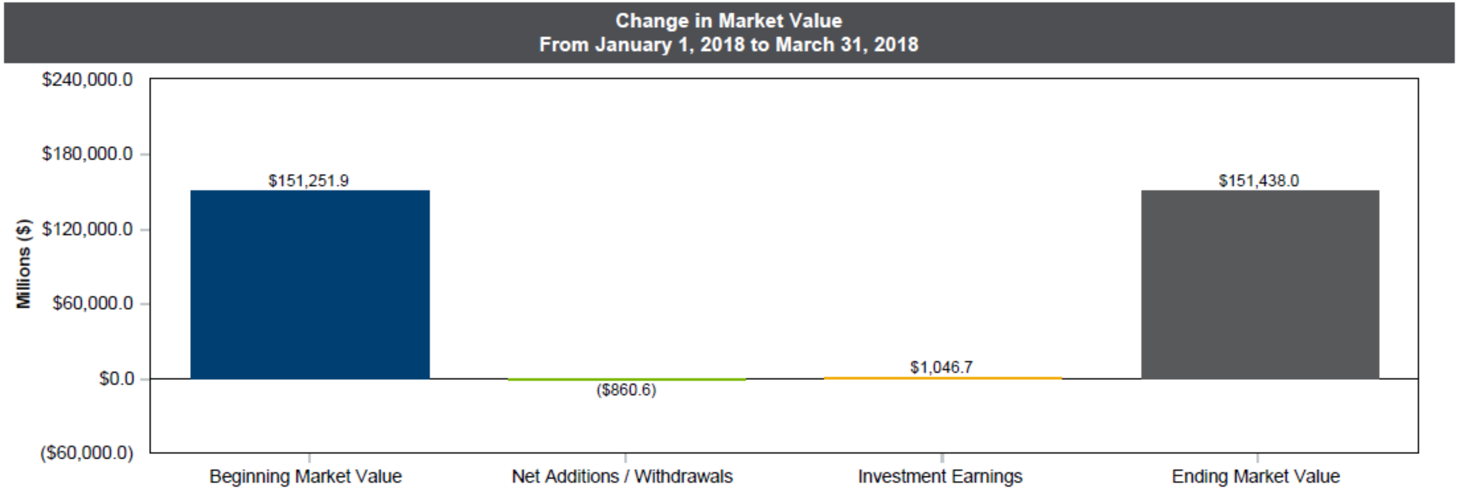



- The first quarter was marked by an increase in volatility across global investment markets, expectations of a pick-up in inflation and growing fears over a possible trade war between the U.S. and China were key drivers; broad equity and fixed income indices declined, with few exceptions
- Against this difficult backdrop, the TRS investment portfolio returned 0.7% for the quarter which outperformed its benchmark by 0.4 percentage points
  - Active management in real assets, non-US developed equities, stable value hedge funds and ENRI were the largest contributors
- For the trailing twelve months, TRS returned 12.7%, outperforming its performance benchmark by 1.1 percentage points
  - Superior relative manager returns in real assets, private equity, US Treasuries and stable value hedge funds contributed most to the outperformance

# 1. Market Summary – First Quarter 2018

| | First Quarter | One Year | Three Years | Five Years | Ten Years |
|---|---|---|---|---|---|
| **Global Equity:** | | | | | |
| MSCI U.S.A. IMI Index | -0.6% | 13.8% | 10.3% | 13.1% | 9.8% |
| MSCI EAFE + Canada Index | -2.0 | 13.9 | 5.3 | 6.0 | 2.6 |
| MSCI Emerging Markets Index | 1.4 | 24.9 | 8.8 | 5.0 | 3.0 |
| HFRI Fund of Funds Composite Index | 0.3 | 5.6 | 1.9 | 3.4 | 1.6 |
| State Street Private Equity Index (qtr lagged) | 4.8 | 17.6 | 11.1 | 12.1 | 7.5 |
| Global Equity Policy Benchmark | 0.7 | 16.0 | 8.8 | 9.3 | 6.3 |
| **Stable Value:** | | | | | |
| Bloomberg Barclays Long Treasury Index | -3.3% | 3.5% | 0.4% | 3.3% | 5.8% |
| HFRI Fund of Funds Conservative Index | 0.6 | 3.4 | 1.7 | 3.0 | 1.3 |
| 3 Month LIBOR + 2% | 1.0 | 3.6 | 3.0 | 2.7 | 2.7 |
| 90 Day U.S. Treasury Bill | 0.4 | 1.1 | 0.5 | 0.3 | 0.3 |
| Stable Value Policy Benchmark | -2.1 | 3.4 | 0.8 | 3.2 | 5.1 |
| **Real Return:** | | | | | |
| Bloomberg Barclays U.S. TIPS Index | -0.8% | 0.9% | 1.3% | 0.0% | 2.9% |
| NCREIF ODCE (qtr lagged) | 1.8 | 6.7 | 9.4 | 10.5 | 4.1 |
| Energy, Natural Resources & Infrastructure Benchmark | 3.2 | 11.0 | | | |
| Goldman Sachs Commodities Index | 2.2 | 13.8 | -4.2 | -11.9 | -10.8 |
| Real Return Policy Benchmark | 1.6 | 6.4 | 6.9 | 7.2 | 4.9 |
| **Risk Parity:** | | | | | |
| Risk Parity Benchmark | -1.6 | 8.7 | 3.9 | 4.6 | |
| **TRS Policy Benchmark** | **0.3%** | **11.6%** | **6.9%** | **7.8%** | **6.2%** |

# 2. Market Value Change




## Summary of Cash Flow

| | 1 Quarter | 1 Year | 3 Years | 5 Years |
|---|---|---|---|---|
| **Total Fund** | | | | |
| Beginning Market Value | 151,251,851,617 | 137,891,754,267 | 132,344,804,004 | 117,516,017,708 |
| + Additions / Withdrawals | -860,557,523 | -3,004,917,811 | -10,800,463,232 | -19,543,705,391 |
| + Investment Earnings | 1,046,712,281 | 16,551,169,919 | 29,893,665,604 | 53,465,694,059 |
| **= Ending Market Value** | **151,438,006,376** | **151,438,006,376** | **151,438,006,376** | **151,438,006,376** |





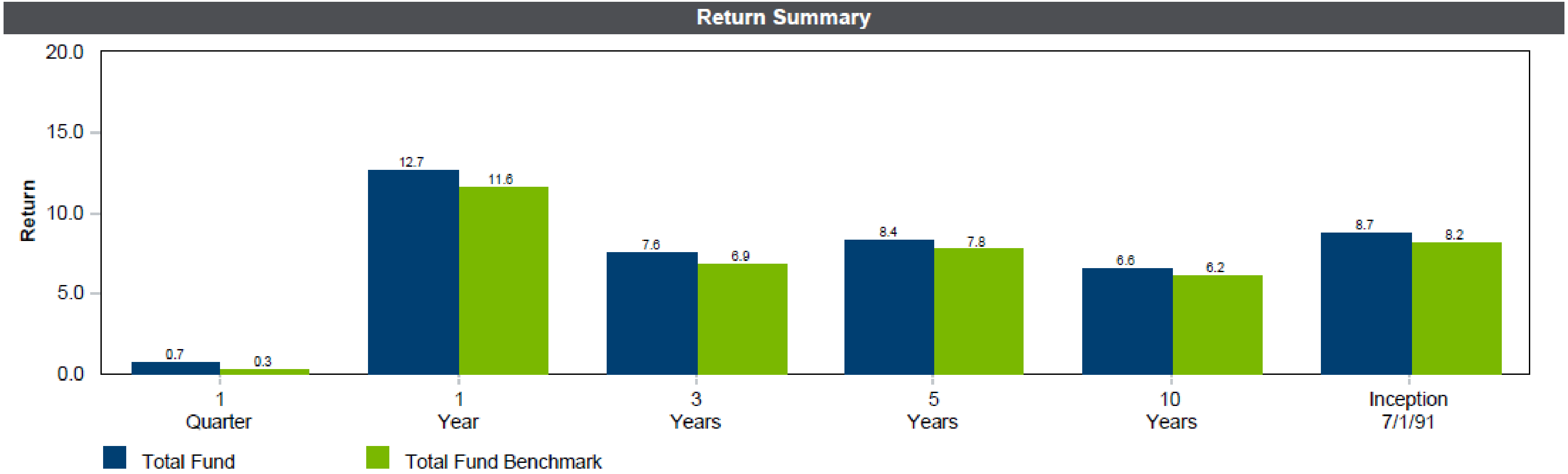
Empower Results®

# 3. Asset Allocation Detail

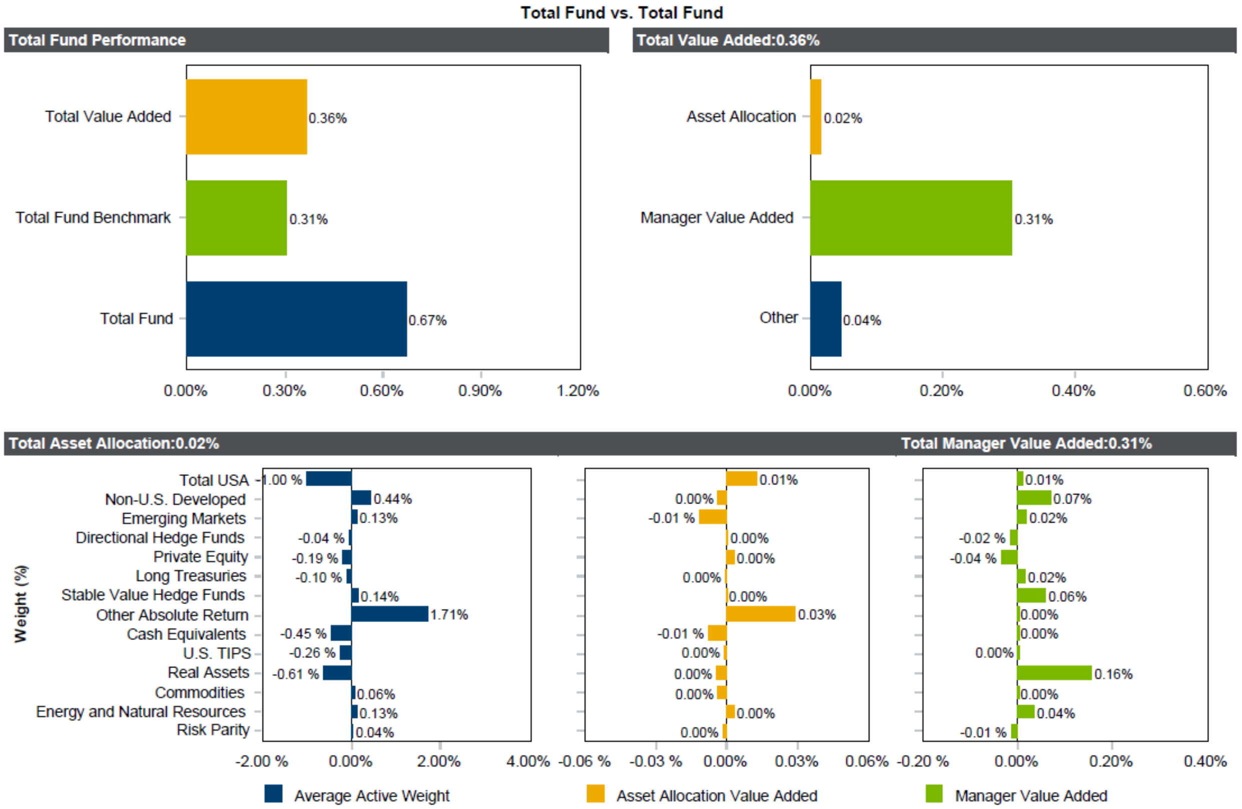
| | Market Value ($ in millions) as of 3/31/2018 | | Interim Policy Target | Relative Allocation to Interim Policy Target | Long Term Policy Target | Long Term Policy Ranges |
|---|---|---|---|---|---|---|
| | ($) | (%) | | | | |
| **Total Fund** | $151,438 | **100%** | | **---** | **100.0%** | **--** |
| Total U.S.A. | $26,068 | 17.2% | 18.9% | -1.7% | 18.0 | 13-23% |
| Non-U.S. Developed | $20,666 | 13.6% | 13.9% | -0.2% | 13.0 | 8-18% |
| Emerging Markets | $14,447 | 9.5% | 9.9% | -0.4% | 9.0 | 4-14% |
| Directional Hedge Funds | $5,881 | 3.9% | 4.0% | -0.1% | 4.0 | 0-10% |
| Private Equity | $19,578 | 12.9% | 12.5% | +0.5% | 13.0 | 8-18% |
| **Global Equity** | $86,639 | **57.2%** | **59.1%** | **-1.9%** | **57.0** | **50-64%** |
| Long Treasuries | $17,891 | 11.8% | 11.9% | -0.1% | 11.0 | 0-20% |
| Stable Value Hedge Funds | $6,310 | 4.2% | 4.0% | +0.2% | 4.0 | 0-10% |
| Absolute Return (including OAR) | $2,490 | 1.6% | 0.0% | +1.6% | 0.0 | 0-20% |
| Cash | $704 | 0.5% | 1.0% | -0.5% | 1.0 | 0-5% |
| **Stable Value** | $27,396 | **18.1%** | **16.9%** | **+1.2%** | **16.0** | **11-21%** |
| TIPS | $5,350 | 3.5% | 3.9% | -0.4% | 3.0 | 0-8% |
| Real Assets | $17,553 | 11.6% | 11.1% | +0.5% | 14.0 | 9-19% |
| Energy, Natural Resource and Inf. | $6,834 | 4.5% | 4.0% | +0.5% | 5.0 | 0-10% |
| Commodities | $89 | 0.1% | 0.0% | +0.1% | 0.0 | 0-5% |
| **Real Return** | $29,826 | **19.7%** | **19.0%** | **+0.7%** | **22.0** | **17-27%** |
| Risk Parity | $7,577 | 5.0% | 5.0% | +0.0% | 5.0 | 0-10% |
| **Risk Parity** | $7,577 | **5.0%** | **5.0%** | **+0.0%** | **5.0** | **0-10%** |

*Note: Asset allocation information shown above is based upon PureView reporting. The excess returns shown above may not be a perfect difference between the actual and benchmark returns due entirely to rounding.*

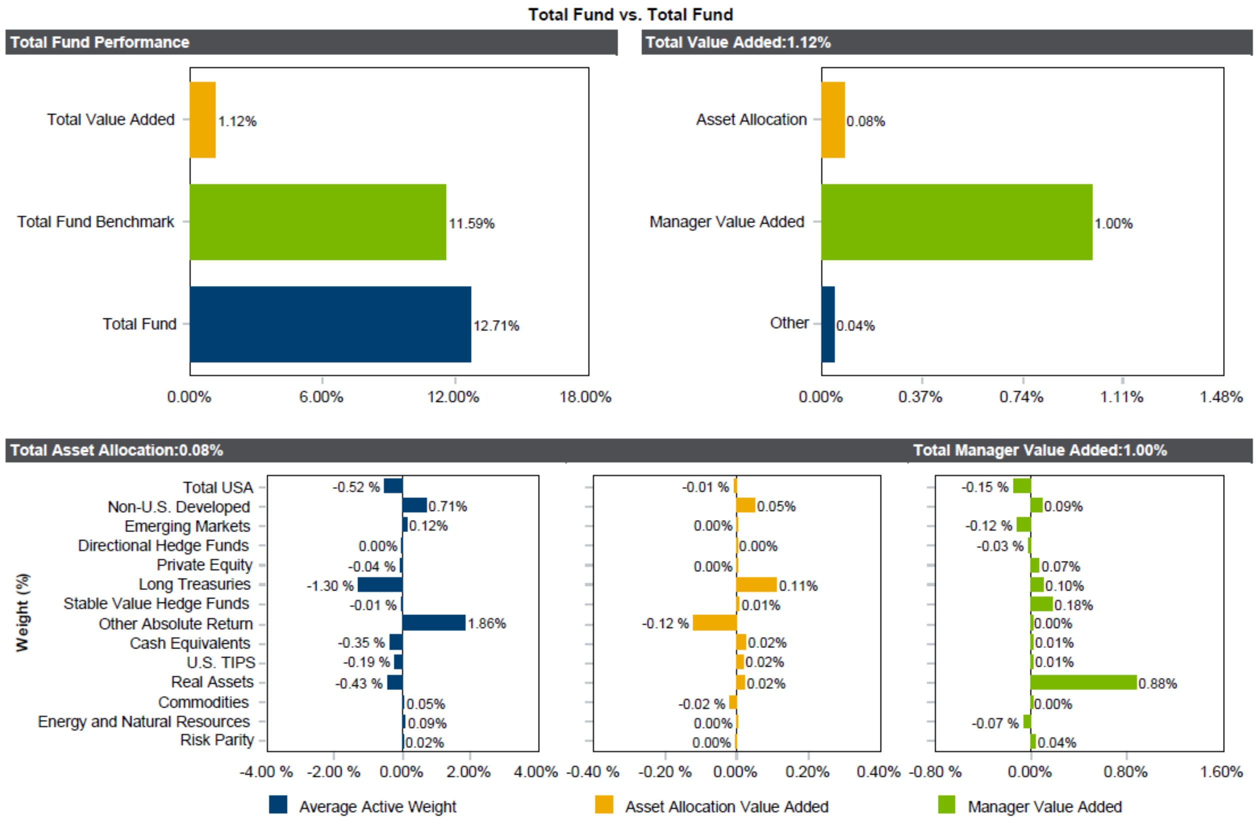
# 4. Total TRS Performance Ending 3/31/2018



# 5. Total Fund Attribution – One Quarter Ending 3/31/2018



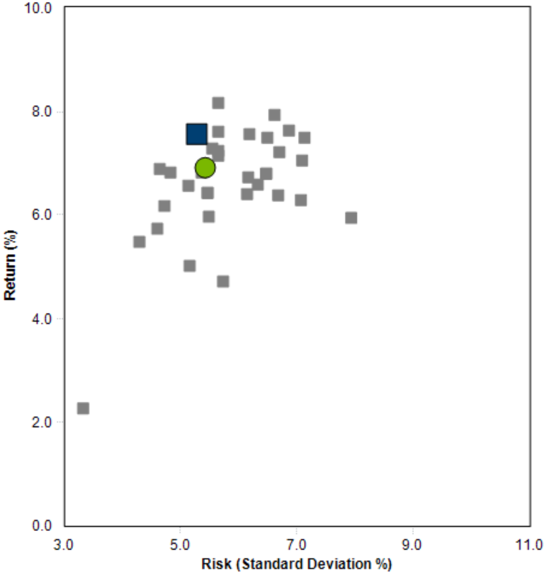
# 5. Total Fund Attribution – One Year Ending 3/31/2018



# 6. Risk Profile: Total Fund Risk-Return vs. Peers

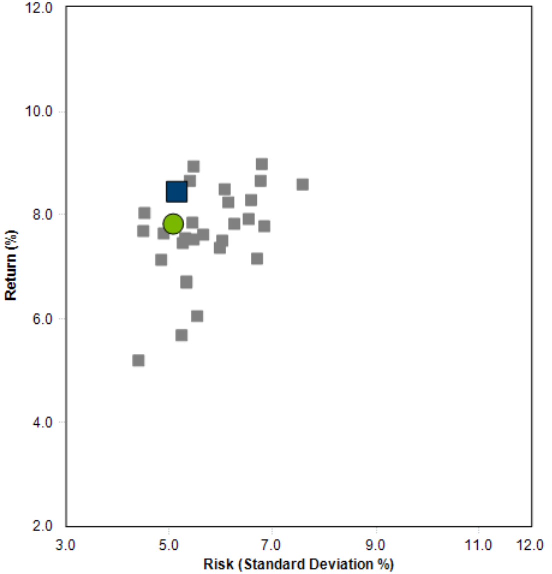
All Public Plans > $10B-Total Fund

**Annualized Return vs. Annualized Standard Deviation**
**3 Years Ending March 31, 2018**




| | Return | Standard Deviation |
|---|---|---|
| Total Fund | 7.6 | 5.3 |
| Total Fund Benchmark | 6.9 | 5.4 |
| — Median | 6.8 | 5.7 |

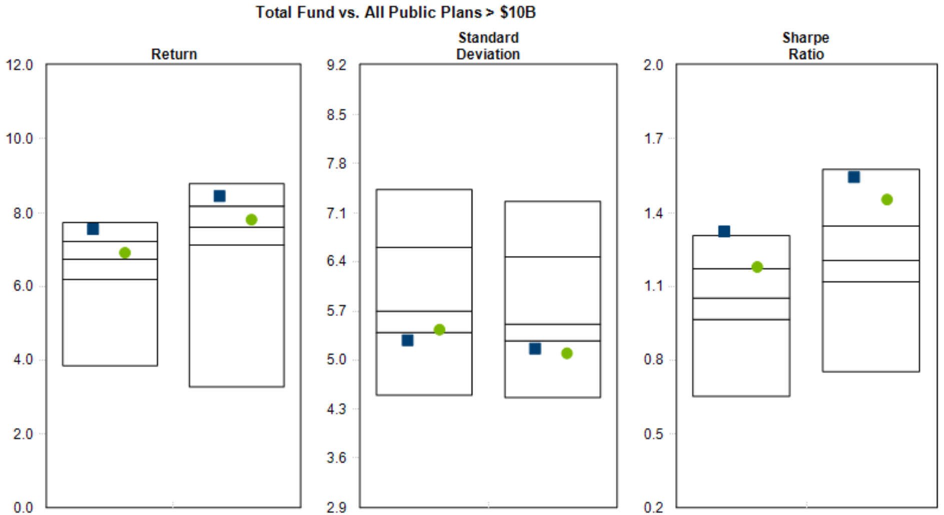
**Annualized Return vs. Annualized Standard Deviation**
**5 Years Ending March 31, 2018**




| | Return | Standard Deviation |
|---|---|---|
| Total Fund | 8.4 | 5.2 |
| Total Fund Benchmark | 7.8 | 5.1 |
| — Median | 7.6 | 5.5 |

*Note: Public Plan peer group composed of 34 and 30 public funds with total assets in excess of $10B as of 3/31/2018 respectively for the periods above. An exhibit outlining the asset allocation of the peer portfolios is provided in the appendix of this report.*

# 6. Risk Profile: Trailing 3-Year and 5-Year Risk Metrics Peer Comparison




| | Return 3 Years | Return 5 Years | Standard Deviation 3 Years | Standard Deviation 5 Years | Sharpe Ratio 3 Years | Sharpe Ratio 5 Years |
|---|---|---|---|---|---|---|
| ■ Total Fund | 7.6 (13) | 8.4 (19) | 5.3 (78) | 5.2 (81) | 1.3 (4) | 1.5 (7) |
| ● Total Fund Benchmark | 6.9 (36) | 7.8 (39) | 5.4 (75) | 5.1 (81) | 1.2 (19) | 1.5 (15) |
| 5th Percentile | 7.7 | 8.8 | 7.4 | 7.3 | 1.3 | 1.6 |
| 1st Quartile | 7.2 | 8.2 | 6.6 | 6.5 | 1.2 | 1.3 |
| Median | 6.8 | 7.6 | 5.7 | 5.5 | 1.1 | 1.2 |
| 3rd Quartile | 6.2 | 7.1 | 5.4 | 5.3 | 1.0 | 1.1 |
| 95th Percentile | 3.9 | 3.3 | 4.5 | 4.5 | 0.7 | 0.8 |
| Population | 34 | 30 | 34 | 30 | 34 | 30 |

# 7. Global Equity: Performance Summary Ending 3/31/2018

| | First Quarter | One Year | Three Years | Five Years |
|---|---|---|---|---|
| **Total Global Equity** | **0.8%** | **15.8%** | **8.6%** | **9.7%** |
| Global Equity Benchmark | **0.7%** | 16.0 | 8.8 | 9.3 |
| *Difference* | *+0.1* | *-0.2* | *-0.2* | *+0.4* |
| **Total U.S. Equity** | **-0.5** | **13.0** | **8.9** | **11.7** |
| Total U.S. Equity Benchmark | **-0.6** | **13.8** | 10.3 | 13.1 |
| *Difference* | *+0.1* | *-0.8* | *-1.4* | *-1.4* |
| **Non-U.S. Equity** | **-0.2** | **18.2** | **7.4** | **6.6** |
| Non-U.S. Benchmark | **-0.6** | **18.4** | **6.9** | **5.8** |
| *Difference* | *+0.4* | *-0.2* | *+0.5* | *+0.8* |
| **Non-U.S. Developed** | **-1.5** | **14.6** | **5.7** | **7.3** |
| MSCI EAFE + Canada | **-2.0** | 13.9 | 5.3 | **6.0** |
| *Difference* | *+0.5* | *+0.7* | *+0.4* | *+1.3* |
| **Emerging Markets** | **1.6** | **23.6** | **9.5** | **5.8** |
| MSCI Emerging Markets | **1.4** | **24.9** | **8.8** | **5.0** |
| *Difference* | *+0.2* | *-1.3* | *+0.7* | *+0.8* |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# 7. Global Equity: Performance Summary Ending 3/31/2018 (cont'd)

| | First Quarter | One Year | Three Years | Five Years |
|---|---|---|---|---|
| **Directional Hedge Funds** | **-0.1%** | **5.0%** | **2.1%** | **3.7%** |
| HFRI Fund of Funds Composite Index | **0.3%** | **5.6%** | **1.9%** | **3.4%** |
| *Difference* | *-0.4* | *-0.6* | *+0.2* | *+0.3* |
| **Total Public Equity** | **-0.3** | **15.0** | **7.6** | **8.6** |
| Public Equity Benchmark | **-0.5** | **15.4** | **7.9** | **8.5** |
| *Difference* | *+0.2* | *-0.4* | *-0.3* | *+0.1* |
| **Total Private Equity** | **4.7** | **18.6** | **12.8** | **14.6** |
| Private Equity Benchmark | **4.9** | **17.7** | **12.0** | **12.2** |
| *Difference* | *-0.2* | *+0.9* | *+0.8* | *+2.4* |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# 8. Stable Value: Performance Summary Ending 3/31/2018

| | First Quarter | One Year | Three Years | Five Years |
|---|---|---|---|---|
| **Total Stable Value** | **-1.3%** | **5.4%** | **2.2%** | **4.8%** |
| Total Stable Value Benchmark | **-2.1%** | **3.4%** | **0.8%** | **3.2%** |
| *Difference* | *+0.8* | *+2.0* | *+1.4* | *+1.6* |
| **Long Treasuries** | **-3.1** | **4.5** | **-0.5** | **3.8** |
| Treasury Benchmark | **-3.3** | **3.5** | **0.4** | **3.3** |
| *Difference* | *+0.2* | *+1.0* | *-0.9* | *+0.5* |
| **Stable Value Hedge Funds** | **2.0** | **7.6** | **4.9** | **5.3** |
| Hedge Funds Benchmark | **0.6** | **3.4** | **1.7** | **3.0** |
| *Difference* | *+1.4* | *+4.1* | *+3.2* | *+2.3* |
| **Other Absolute Return** | **2.0** | **6.4** | **5.0** | **8.0** |
| Other Absolute Return Benchmark | **1.0** | **3.6** | **3.0** | **2.7** |
| *Difference* | *+1.0* | *+2.8* | *+2.0* | *+5.3* |
| **Cash Equivalents** | **0.7** | **3.0** | **2.0** | **2.6** |
| Cash Benchmark | **0.4** | **1.1** | **0.5** | **0.3** |
| *Difference* | *+0.3* | *+1.9* | *+1.5* | *+2.3* |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# 9. Real Return: Performance Summary Ending 3/31/2018

| | First Quarter | One Year | Three Years | Five Years |
|---|---|---|---|---|
| **Total Real Return** | **2.7%** | **10.6%** | **8.9%** | **8.2%** |
| Real Return Benchmark | **1.6%** | **6.4%** | **6.9%** | **7.2%** |
| *Difference* | *+1.1* | *+4.2* | *+2.0* | *+1.0* |
| **TIPS** | **-0.8** | **1.1** | **1.4** | **0.2** |
| U.S. TIPS Benchmark | **-0.8** | **0.9** | **1.3** | **0.0** |
| *Difference* | *+0.0* | *+0.2* | *+0.1* | *+0.2* |
| **Real Assets** | **3.3** | **14.0** | **12.1** | **12.4** |
| Real Asset Benchmark | **1.8** | **6.7** | **9.4** | **10.5** |
| *Difference* | *+1.5* | *+7.3* | *+2.7* | *+1.9* |
| **Energy, Natural Resource and Infrastructure** | **4.1** | **9.4** | **--** | **--** |
| Energy and Natural Resources Benchmark | **3.2** | **11.0** | -- | -- |
| *Difference* | *+0.9* | *-1.6* | -- | -- |
| **Commodities** | **-7.2** | **-19.8** | **-1.8** | **-15.8** |
| Commodities Benchmark | **2.2** | **13.8** | **-4.2** | **-11.9** |
| *Difference* | *-9.4* | *-33.6* | *+2.4* | *-3.9* |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# 10. Risk Parity: Performance Summary Ending 3/31/2018

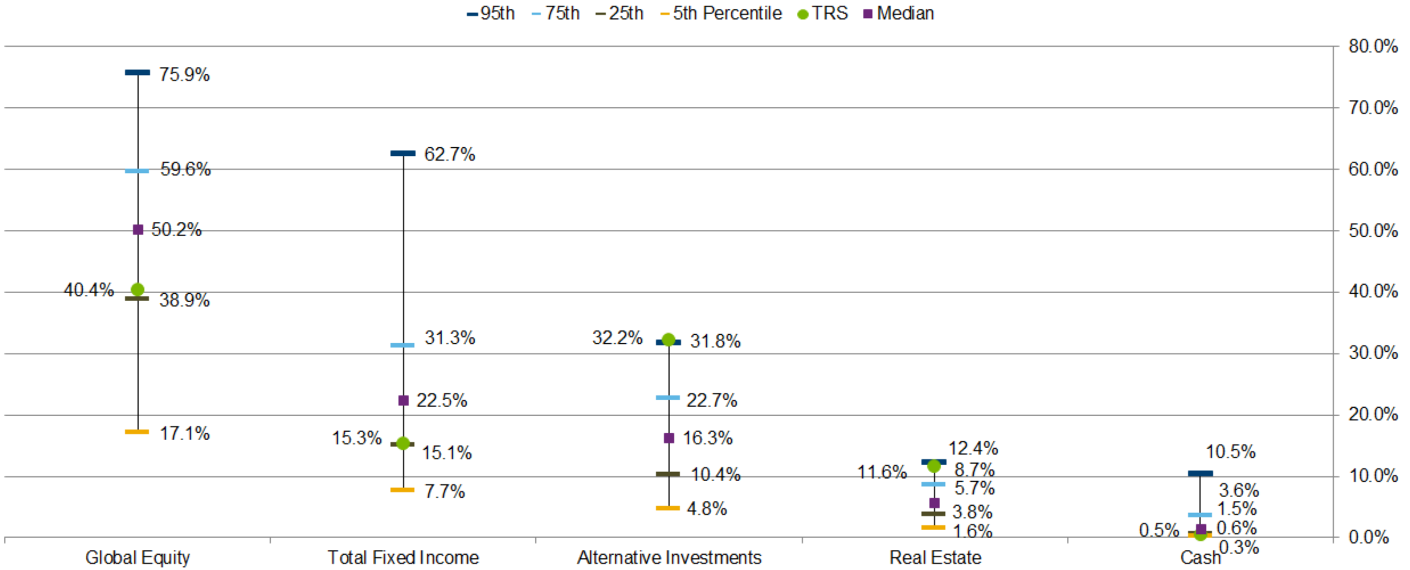
| | First Quarter | One Year | Three Years | Five Years |
|---|---|---|---|---|
| **Total Risk Parity** | **-1.8%** | **9.4%** | **4.8%** | **4.4%** |
| Risk Parity Benchmark | **-1.6%** | **8.7%** | **3.9%** | **4.6%** |
| *Difference* | *-0.2* | *+0.7* | *+0.9* | *-0.2* |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# Appendix – Supplemental Reporting

# TRS Commitment Levels vs. Peers (>$10 Billion) as of 3/31/2018

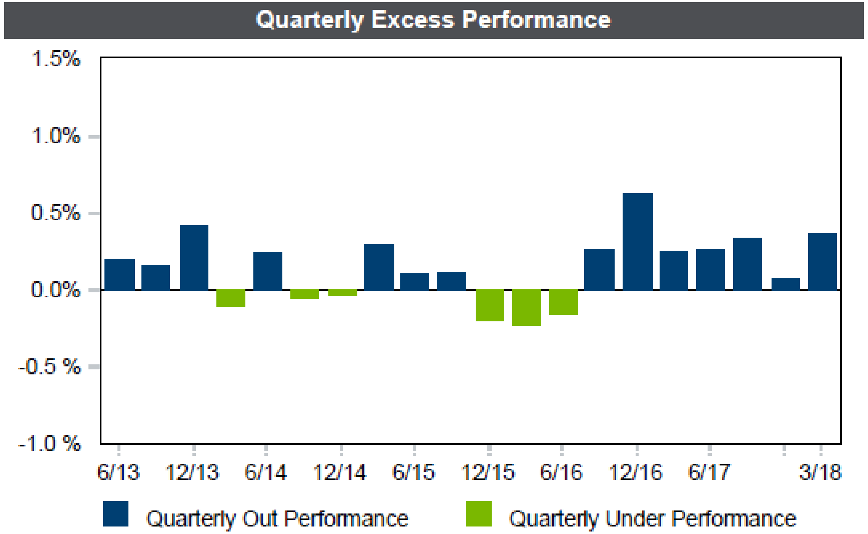
- The chart below depicts the asset allocation of peer public funds with assets greater than $10 billion.
  - The ends of each line represent the 95th and 5th percentile of exposures, the middle light blue and grey lines represent the 25th and 75th percentile of exposures, the purple square represents the median, and the green dot represents TRS exposure.

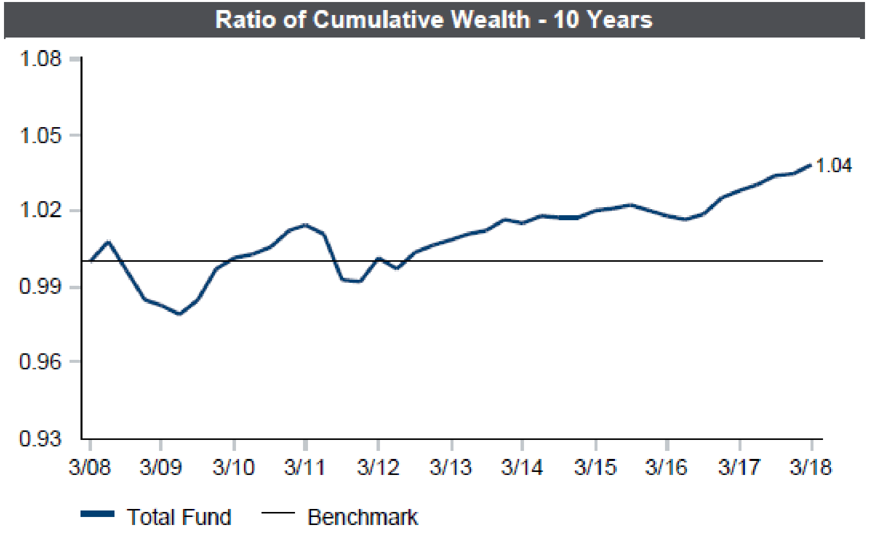



*Note: The Public Plan peer universe had 36 observations for the first quarter 2018.*

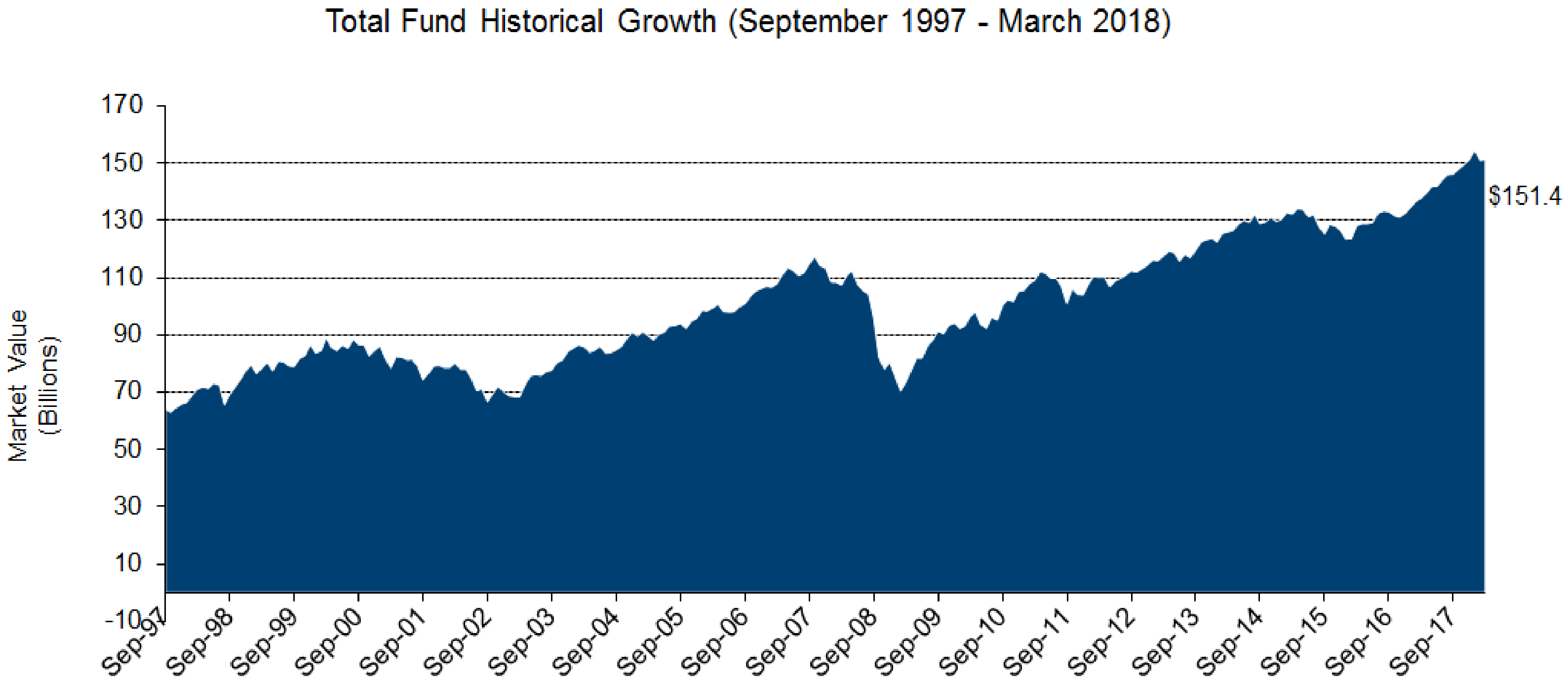
# Historical Excess Performance Ending 3/31/2018

**Quarterly and Cumulative Excess Performance**
**Total Fund vs. Total Fund Benchmark**



# TRS Asset Growth



# External Manager Program: Public Equity Performance as of 3/31/2018

| | Allocation ($ in billions) | First Quarter | One Year | Three Years |
|---|---|---|---|---|
| **EP Total Global Equity** | **$30.7** | **-0.1%** | **15.1%** | **7.9%** |
| EP Global Equity Benchmark | -- | -0.2 | 15.3 | 7.5 |
| *Difference* | -- | *+0.1* | *-0.2* | *+0.4* |
| **EP U.S.A.** | **$6.4** | **-0.2** | **11.1** | **8.1** |
| EP U.S.A. Benchmark | -- | -0.6 | 13.8 | **10.3** |
| *Difference* | -- | *+0.4* | *-2.7* | *-2.2* |
| **EP Non-U.S. Developed** | **$5.4** | **-2.1** | **16.4** | **8.3** |
| MSCI EAFE + Canada Index | -- | -2.0 | 13.9 | 5.3 |
| *Difference* | -- | *-0.1* | *+2.5* | *+3.0* |
| **EP Emerging Markets** | **$7.5** | **1.9** | **24.4** | **10.1** |
| MSCI Emerging Markets Index | -- | 1.4 | 24.9 | 8.8 |
| *Difference* | -- | *+0.5* | *-0.5* | *+1.3* |
| **EP World Equity** | **$5.6** | **-0.6** | **16.3** | **9.0** |
| EP World Equity Benchmark | -- | -0.9 | 15.2 | 8.5 |
| *Difference* | -- | *+0.3* | *+1.1* | *+0.5* |
| **EP Directional Hedge Funds** | **$5.9** | **-0.1** | **5.0** | **2.1** |
| HFRI Fund of Funds Composite Index | -- | 0.3 | 5.6 | 1.9 |
| *Difference* | -- | *-0.4* | *-0.6* | *+0.2* |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# External Manager Program:
# Stable Value/Total Program Performance as of 3/31/2018

| | Allocation ($ in billions) | First Quarter | One Year | Three Years |
|---|---|---|---|---|
| **EP Total Stable Value** | **$6.3** | **2.0%** | **7.5%** | **5.1%** |
| EP Stable Value Benchmark | -- | 0.6 | 3.4 | 1.7 |
| *Difference* | -- | *+1.4* | *+4.1* | *+3.4* |
| **EP Stable Value Hedge Funds** | **$6.3** | **2.0** | **7.6** | **4.9** |
| EP Stable Value Hedge Funds Benchmark | -- | 0.6 | 3.4 | 1.7 |
| *Difference* | -- | *+1.4* | *+4.2* | *+3.2* |
| **Total External Public Program** | **$37.0** | **0.3** | **13.9** | **7.4** |
| EP External Public Benchmark | -- | -0.1 | 13.4 | 6.6 |
| *Difference* | -- | *+0.4* | *+0.5* | *+0.8* |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# Public Strategic Partnership Program (SPN): Performance Summary as of 3/31/2018

The Public SPNs in aggregate outperformed the benchmark during the first quarter and also over the trailing one and three-year periods.

| | Allocation ($ in billions) | First Quarter | One Year | Three Years |
|---|---|---|---|---|
| **Public Strategic Partnership** | **$8.1** | **-0.5%** | **14.1%** | **6.5%** |
| Public SPN Benchmark | -- | **-1.1%** | **11.7%** | **6.3%** |
| *Difference* | -- | *+0.6* | *+2.4* | *+0.2* |
| **Blackrock** | **$2.1** | **0.1%** | **15.0%** | **7.6%** |
| **J.P. Morgan** | **$2.2** | **-1.3%** | **13.8%** | **7.0%** |
| **Neuberger Berman** | **$2.0** | **-0.9%** | **13.9%** | **5.9%** |
| **Morgan Stanley** | **$2.0** | **0.3%** | **13.6%** | **5.4%** |

*Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# Benchmarks

- Total Fund Performance Benchmark – 18.9% MSCI U.S.A. IMI, 13.9% MSCI EAFE plus Canada Index, 9.9% MSCI Emerging Markets Index, 4.0% HFRI FoF Composite Index, 12.5% State Street Private Equity Index (1 quarter lagged), 11.9% Blmb. Barc. Long Term Treasury Index, 4.0% HFRI FoF Conservative Index, 1.0% Citigroup 3 Mo. T-Bill Index, 3.9% Blmb. Barc. U.S. TIPS Index, 11.1% NCREIF ODCE Index (1 quarter lagged), 4.0% Energy and Natural Resources Benchmark, and 5.0% Risk Parity Benchmark

- Global Equity Benchmark – 31.9% MSCI U.S.A. IMI, 23.5% MSCI EAFE plus Canada Index, 16.7% MSCI Emerging Markets Index, 6.8% HFRI FoF Composite Index, and 21.1% State Street Private Equity Index (1 quarter lagged)
  - TF U.S. Equity Benchmark - MSCI U.S.A. Investable Markets Index (IMI)
  - Emerging Markets Equity Benchmark – MSCI Emerging Markets Index
  - Non-US Developed Equity Benchmark– MSCI EAFE + Canada Index
  - Directional Hedge Funds – HFRI Fund of Funds (FoF) Composite Index
  - Private Equity Benchmark - State Street Private Equity Index (1 quarter lagged)

*Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# Benchmarks (cont'd)

- Stable Value Benchmark – 70.4% Blmb. Barc. Long Term Treasury Index, 23.7% HFRI FoF Conservative Index, and 5.9% Citigroup 3 mo. T-Bill.
  - US Treasuries Benchmark – Bloomberg Barclays Long Term Treasury Index
  - Stable Value Hedge Funds – HFRI Fund of Funds (FoF) Conservative Index
  - Other Absolute Return Benchmark - 3 Mo. LIBOR + 2%
  - Cash Benchmark - Citigroup 3 Mo. Treasury Bill Index

- Real Return Benchmark – 58.3% NCREIF ODCE Index, 20.5% Blmb. Barc. U.S. TIPS Index, and 21.1% Energy & Natural Resources Benchmark
  - Real Assets Benchmark – NCREIF ODCE Index (1 quarter lagged)
  - US TIPS Benchmark – Bloomberg Barclays U.S. TIPS Index
  - Energy and Natural Resources Benchmark – 75% Cambridge Associates Natural Resources Index (reweighted) and 25% quarterly Seasonally-Adjusted Consumer Price Index (1 quarter lagged)
  - Commodities Benchmark – Goldman Sachs Commodity Index

*Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.*

# Description of Performance Attribution

- A measure of the source of the deviation of a fund's performance from that of its policy benchmark. Each bar on the attribution graph represents the contribution made by the asset class to the total difference in performance. A positive value for a component indicates a positive contribution to the aggregate relative performance. A negative value indicates a detrimental impact. The magnitude of each component's contribution is a function of (1) the performance of the component relative to its benchmark, and (2) the weight (beginning of period) of the component in the aggregate.
- The individual Asset Class effect, also called **Selection Effect**, is calculated as

  Actual Weight of Asset Class x (Actual Asset Class Return – Asset Class Benchmark Return)
- The bar labeled **Allocation Effect** illustrates the effect that a Total Fund's asset allocation has on its relative performance. Allocation Effect calculation = (Asset Class Benchmark Return –Total Benchmark Return) x (Actual Weight of Asset Class – Target Policy Weight of Asset Class).
- The bar labeled **Other** is a combination of Cash Flow Effect and Benchmark Effect:
  - **Cash Flow Effect** describes the impact of asset movements on the Total Fund results. Cash Flow Effect calculation = (Total Fund Actual Return – Total Fund Policy Return) – Current Selection Effect – Current Allocation Effect
  - **Benchmark Effect** results from the weighted average return of the asset classes' benchmarks being different from the Total Funds' policy benchmark return. Benchmark Effect calculation = Total Fund Policy Return – (Asset Class Benchmark Return x Target Policy Weight of Asset Class)
- **Cumulative Effect**

  Cumulative Effect calculation = Current Effect t *(1+Cumulative Total Fund Actual Return t-1) +

  Cumulative Effect t-1*(1+Total Fund Benchmark Return t)

# Disclaimers and Notes

# Disclaimers and Notes

**Disclaimers:**

- Please review this report and notify Aon Hewitt Investment Consulting (AHIC) with any issues or questions you may have with respect to investment performance or any other matter set forth herein.
- The client portfolio data presented in this report have been obtained from the custodian. AHIC has compared this information to the investment managers' reported returns and believes the information to be accurate. AHIC has not conducted additional audits and cannot warrant its accuracy or completeness. This document is not intended to provide, and shall not be relied upon for, accounting and legal or tax advice.
- Refer to Hedge Fund Research, Inc. www.hedgefundresearch.com for more information on HFR indices

**Notes:**

- The rates of return contained in this report are shown on an after-fees basis unless otherwise noted. They are geometric and time weighted. Returns for periods longer than one year are annualized.
- Universe percentiles are based upon an ordering system in which 1 is the best ranking and 100 is the worst ranking.
- Due to rounding throughout the report, percentage totals displayed may not sum up to 100.0%. Additionally, individual fund totals in dollar terms may not sum up to the plan totals.

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# External Private Markets

Eric Lang, Senior Managing Director
July 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT
MANAGEMENT DIVISION

# Agenda

# Private Markets Overview

## *Executive Summary*

| PORTFOLIO PERFORMANCE[1] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Portfolio | Market Value | % of Trust | 1-Year TWR[3] | 3-Year TWR[3] | 5-Year TWR[3] | 1-Year IRR | 3-Year IRR | 5-Year IRR | SI IRR | Expected Market Return[4] | PL Invested Managers |
| Private Equity | $19,591 | 12.9% | 18.6% | 12.8% | 14.6% | 18.3% | 12.0% | 14.5% | 13.4% | 11.0% | 37 |
| Real Assets | 17,379 | 11.5% | 14.0% | 12.1% | 12.4% | 13.9% | 11.6% | 12.4% | 9.1% | 7.8% | 39 |
| Energy, Natural Resources & Infrastructure[2] | 6,340 | 4.2% | 9.4% | -- | -- | 10.0% | 8.2% | 7.1% | 7.0% | 9.7% | 19 |
| **Total** | **$43,310** | **28.6%** | **15.4%** | **11.8%** | **12.7%** | **15.2%** | **11.4%** | **12.7%** | **11.1%** | **9.5%** | **95** |

| PRINCIPAL INVESTMENTS ("PI") PERFORMANCE[1] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Portfolio | Market Value | % of Portfolio | No. | 1-Year TWR[3] | 3-Year TWR[3] | 5-Year TWR[3] | 1-Year IRR | 3-Year IRR | 5-Year IRR | SI IRR |
| Private Equity | $4,543 | 23.2% | 45 | 23.6% | 13.0% | 17.1% | 23.6% | 13.8% | 16.9% | 18.9% |
| Real Assets | 6,739 | 38.7% | 67 | 16.8% | 14.7% | 14.6% | 17.1% | 15.2% | 15.0% | 17.2% |
| Energy, Natural Resources & Infrastructure | 1,821 | 28.7% | 18 | 12.2% | -- | -- | 12.4% | 12.7% | 19.0% | 17.0% |
| **Total** | **$13,103** | **30.3%** | **130** | **--** | **--** | **--** | **18.6%** | **14.4%** | **16.0%** | **17.6%** |

| RISK IMPACT | | | |
|---|---|---|---|
| | Volatility | | Draw |
| Portfolio | Observed[5] | Risk Proxy[6] | Down[7] |
| S&P 500 | 16.4% | 16.9% | 45.8% |
| Private Equity | 9.2% | 21.6% | 29.9% |
| Real Assets | 9.0% | 21.2% | 41.5% |
| ENRI | 9.8% | 22.5% | 26.1% |

**2017 INVESTMENT ACTIVITY[8]**
NUMBER OF INVESTMENTS

| Portfolio | Funds | PIs | Total |
|---|---|---|---|
| Private Equity | 13 | 6 | 19 |
| Real Assets | 7 | 13 | 20 |
| ENRI | 5 | 4 | 9 |
| **Total** | **25** | **23** | **48** |

**2017 INVESTMENT ACTIVITY[8]**
COMMITTED CAPITAL ($M)

| Portfolio | Funds | PIs | Total |
|---|---|---|---|
| Private Equity | $3,644 | $606 | $4,250 |
| Real Assets | 1,160 | 2,190 | 3,350 |
| ENRI | 1,000 | 650 | 1,650 |
| **Total** | **$5,804** | **$3,446** | **$9,250** |

*[1] State Street based on 12/31/17 valuations*
*[2] ENRI IRR includes combined performance of ENR and Infrastructure since inception (10/28/04). ENRI TWR reflects combined ENRI performance from 9/30/16 to 3/31/18*
*[3] State Street as of 3/31/18*
*[4] Source: Hamilton Lane and the Townsend Group*
*[5] Quarterly observations spanning 10 years ending 3/31/18 (ENRI spans only 12/2013 to 3/2018)*
*[6] Observations spanning 10 years ending 3/31/18*
*[7] S&P 500 drawdown period 9/30/07 to 3/31/09, Private Equity drawdown period 6/30/08 to 6/30/09, Real Assets drawdown period 6/30/08 to 3/31/10 and ENRI drawdown period 3/31/15 to 6/30/16*
*[8] Includes Emerging Managers, represented as one group fund commitment*

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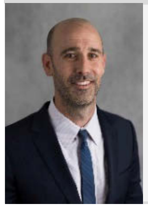
# Private Markets Overview

## *Organizational Structure*

**Private Markets**
***32% of Trust Benchmark***

**Eric Lang**
**Sr. Managing Director**
*BBA, UT Austin*
*MBA, U. of Houston*

**Private Equity**
***13% of Trust Benchmark***



**Neil Randall**
**Managing Director**
*BBA, Texas A&M*
*MS, Texas A&M*

**Real Assets**
***14% of Trust Benchmark***

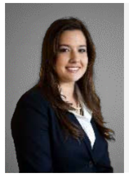
**Grant Walker**
**Sr. Director**
*BBA, Baylor*
*MBA, St. Edwards*

**Energy, Natural Resources, & Infra.**
***5% of Trust Benchmark***

**Carolyn Hansard**
**Director**
*BS, UT Austin*
*MBA, UT Austin*

### TRICOT – TRS LONDON

**Allen MacDonell, CFA**
**Managing Director**
*BBA, University of Georgia*
*MBA, Georgia State*



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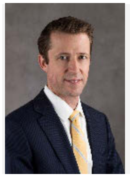
**Investment Manager**
*BA, Texas A&M*

**Justin Wang**
**Sr. Associate**
*BBA, UT Austin*

**Andre Weilenmann**
**Contractor**
*BA, University of Zurich*
*MA, HSG U. of St Gallen*

### PRIVATE MARKETS DATA ANALYTICS AND SUPPORT



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**Barbara Woodard, CPA**
**Sr. Associate**
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**Jeff Stafford**
**Associate**
*BS, Pepperdine University, Canberra*

**Melissa Kleihege**
**Analyst**
*BS, Texas A&M*

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# TRICOT

- Successful rotation of investment professionals between Texas and London office (TRICOT)
- London office staffed with five team members, led by Allen MacDonell
- Built relationships with over 60 Premier List managers
- Began outreach into Continental Europe including over 50 meetings
- Sourced over 130 opportunities across several IMD groups, including:
  - Private Equity
  - Real Assets
  - Special Opportunities
  - Energy, Natural Resources & Infrastructure
  - Public Equity
- Essential in TRS closing six co-investment/direct investments and over 20 sidecar investments
  - Expected net return above 13%
  - Over $10 million in annual fee savings run rate[1]
  - Over $30 million in potential annual carry savings[1]

*[1] Source: TRS IMD (TRICOT Investments 9/1/2015 through 12/31/2017)*

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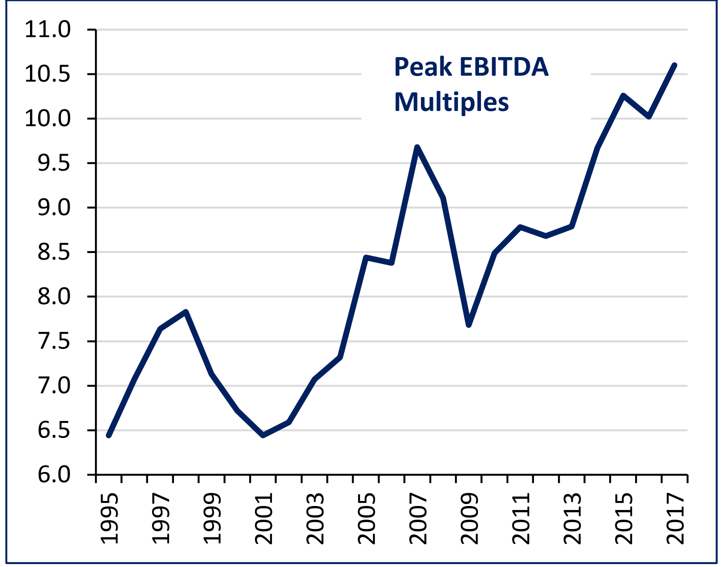
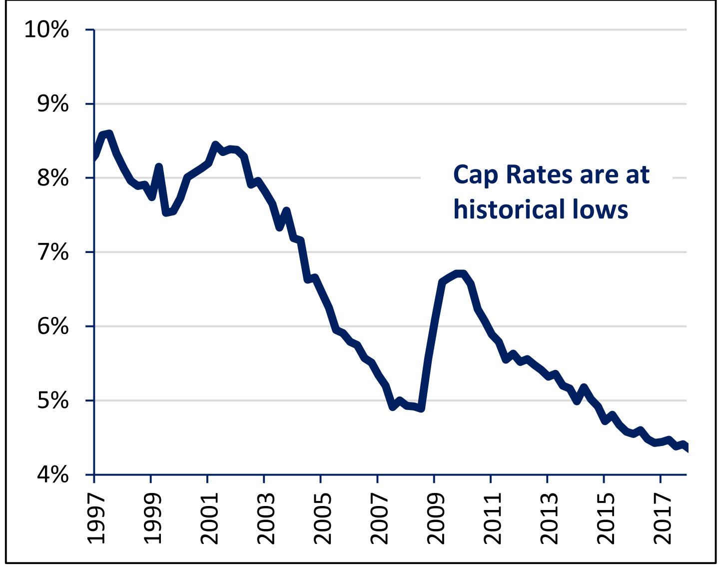
# Private Market Environment

- Private Equity and Real Assets continue to be in high valuation environments with substantial capital inflow while energy markets continue to recover
  - High EBITDA multiples in Private Equity and low cap rates in Real Assets continue to be a challenge
  - Crude oil and natural gas prices have strengthened
  - TRS maintains Valuation Environment reports on an ongoing basis to monitor changes

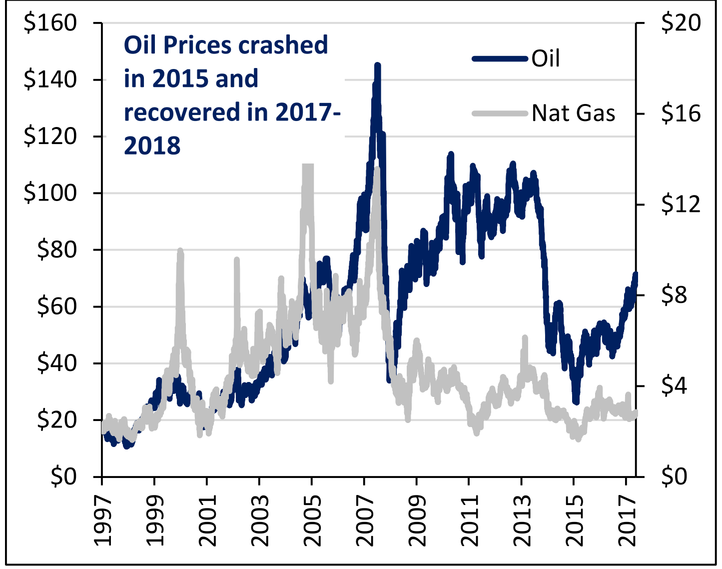
**PRIVATE EQUITY**




**REAL ASSETS**




**ENERGY MARKETS**




*Source: S&P, NCREIF, Bloomberg*

# Building the Fleet

## *Private Markets Cruiser*

- Private Markets is a large part of the "Building the Fleet" initiative
  - Team size is one of the smallest among large plans[1]
  - Private Markets is currently behind Trust allocation targets given strong Trust growth
- Private Markets focus
  - Continue to promote TRS principal investments program as a "Preferred Destination" for co-investment opportunities
  - Reduce external fees while preserving net alpha
  - Develop a Private Markets technology platform
  - Maintain culture as team grows
  - Continue to innovate
- Growing team prudently
  - Private Markets team planned to grow by 27 investment professionals over the next three years
  - Initially hiring junior resources to support team and increase principal investment capabilities
  - Creating a robust data analytics program

[1] *McKinsey & Company peer interviews*

# Management Consultant Update

- Two of the four Management Consultant work streams are focused on Private Markets
  - Private Equity Diagnostic and Design
    - Assess TRS current position/performance
    - Map the competitive environment
    - Establish new strategies to increase Principal Investments
    - Finalize organizational design mapping
  - Real Assets Diagnostic
    - Assess TRS current position/performance
    - Map the competitive environment
  - Diagnostic is complete and design is 90% complete

# Summary

## 2017 ACCOMPLISHMENTS

- Achieved a 15.4% 1-Year TWR for all of Private Markets
- Grew the team:
    - Sr. Investment Manager to lead EPM data analytics
    - Two Investment Managers for ENRI
    - Two Analysts for Real Assets
    - One Admin for ENRI
- Committed approximately $9 billion to 48 investments at IIC
    - $6 billion to 25 Funds
    - $3 billion to 23 Principal Investments

## 2018 PRIORITIES

- Continue Building the Fleet
    - Engage with TRS Management Consultant
    - TRICOT to maintain focus on Principal Investments by increasing manager outreach
- Implement the Emerging Manager select program
- Establish individual group Investment Committees
- Work on process and documents efficiencies
    - Evaluate better use of Premier Lists
- Assess consultant relationships
    - Formulate plan for operational due diligence
- Data Analytics rollout

# Private Equity

Neil Randall, Managing Director
July 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT
MANAGEMENT DIVISION

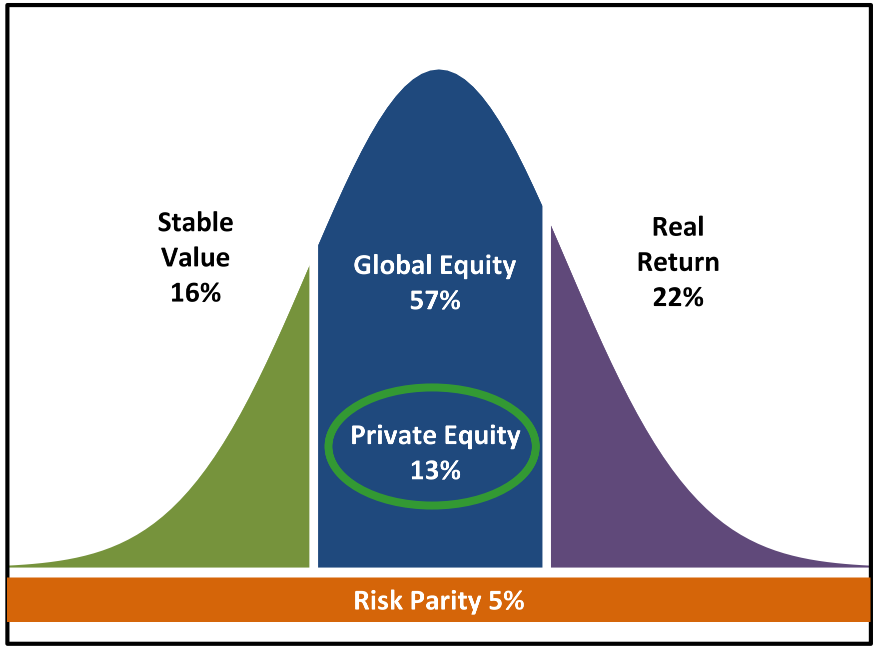
# Agenda

1. Overview
2. Organization
3. Performance
4. Market Conditions
5. Summary
6. Appendix

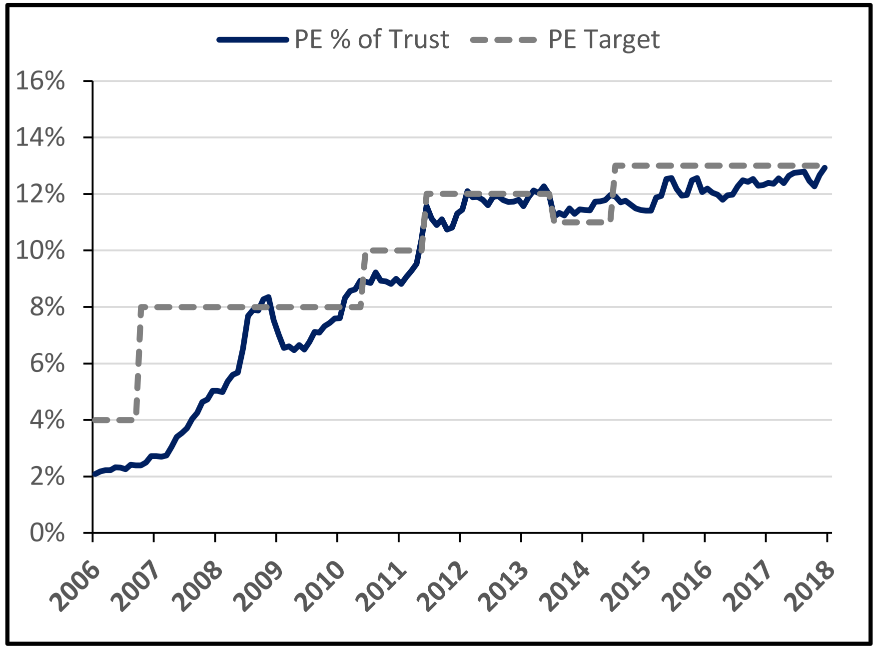
# Overview

## *Private Equity (PE)*

**PE TARGET % OF TRUST**




**HISTORICAL TRUST ALLOCATION[1]**




| THREE YEAR CORRELATION[2] | | |
|---|---|---|
| (0.36) | 0.84 | 0.49 |

| | EOY 2016 | EOY 2017 |
|---|---|---|
| Actual % of Trust | 12.3% | 12.9% |
| Target % of Trust | 13.0% | 13.0% |

[1] *Source: State Street*

[2] *Source: Risk Group (three-year quarterly observations as of 3/31/18)*

# Overview

## *PE Performance*

| PORTFOLIO PERFORMANCE | | | |
|---|---|---|---|
| Asset Class | 1-Year Return | 3-Year Return | 5-Year Return |
| PE IRR[1] | 18.3% | 12.0% | 14.5% |
| PE TWR[2] | 18.6% | 12.8% | 14.6% |
| PE Benchmark[2] | 17.7% | 12.0% | 12.2% |
| PE Excess Return | 0.9% | 0.8% | 2.4% |
| TUCS Peer Comparison | 7th | 13th | 5th |

| PORTFOLIO GROWTH[1] | | | |
|---|---|---|---|
| PE ($ millions) | 1-Year | 3-Year | 5-Year |
| Ending Value | $19,591 | $19,591 | $19,591 |
| *less* Starting Value | 16,989 | 15,777 | 13,326 |
| *less* Contributions | 4,070 | 10,337 | 15,733 |
| *plus* Distributions | 4,556 | 12,373 | 20,061 |
| **Investment Return** | **$3,088** | **$5,850** | **$10,593** |

| FUND AND PRINCIPAL INVESTMENTS PERFORMANCE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Portfolio | Market Value[3] | % of Portfolio | No. | 1-Year TWR | 3-Year TWR | 5-Year TWR | 1-Year IRR | 3-Year IRR | 5-Year IRR | SI IRR |
| Funds | $15,048 | 76.8% | 188 | 17.3% | 12.7% | 14.3% | 16.9% | 11.5% | 14.1% | 13.0% |
| Principal Investments | 4,543 | 23.2% | 45 | 23.6% | 13.0% | 17.1% | 23.6% | 13.8% | 16.9% | 18.9% |
| **Total** | **$19,591** | **100.0%** | **233** | **18.6%** | **12.8%** | **14.6%** | **18.3%** | **12.0%** | **14.5%** | **13.4%** |

| PORTFOLIO STRATEGY SUMMARY | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Style | Target Portfolio Weight | % of Portfolio | | | Expected Market Return[4] | Investment Returns | | |
| | | 12/31/2017 | 12/31/2014 | Change | | 1-Year TWR | 3-Year TWR | SI IRR |
| Buyout | 70.0% | 71.1% | 74.7% | (3.6%) | 11.5% | 21.2% | 14.9% | 14.0% |
| Venture / Growth Equity | 15.0% | 16.7% | 12.1% | 4.6% | 10.0% | 14.4% | 10.1% | 10.3% |
| Credit / Special Situations | 15.0% | 12.2% | 13.2% | (1.0%) | 10.0% | 14.9% | 7.1% | 11.8% |
| **PE TOTAL** | **100.0%** | **100.0%** | **100.0%** | **0.0%** | **11.0%** | **18.6%** | **12.8%** | **13.4%** |

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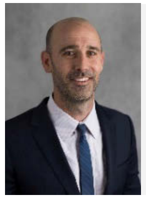
[1] *State Street based on 12/31/17 valuations*
[2] *State Street as of 3/31/18*
[3] *Legal and general portfolio expenses are included in the total IRR aggregate only; TWR calculations exclude currency/cash*
[4] *Source: Hamilton Lane*

# Organization

## *PE Group*



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**Tamara Polewik**
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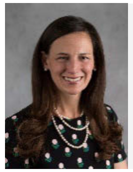

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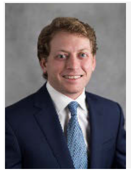

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**Samuel Dobberpuhl**
**Analyst**
*BA, Pepperdine University*

**Elizabeth King**
**Contractor**
*BA, Texas State University*

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**Managing Director**
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*MBA, Georgia State*

**Justin Wang**
**Sr. Associate**
*BBA, UT Austin*

**Andre Weilenmann**
**Contractor**
*BA, University of Zurich*
*MA, HSG U. of St Gallen*

**Advisors and Consultants**
Hamilton Lane (Fund Advisor)
BlackRock (Principal Investments)

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# Organization

*Establishment of Private Equity Investment Committee ("PEIC")*

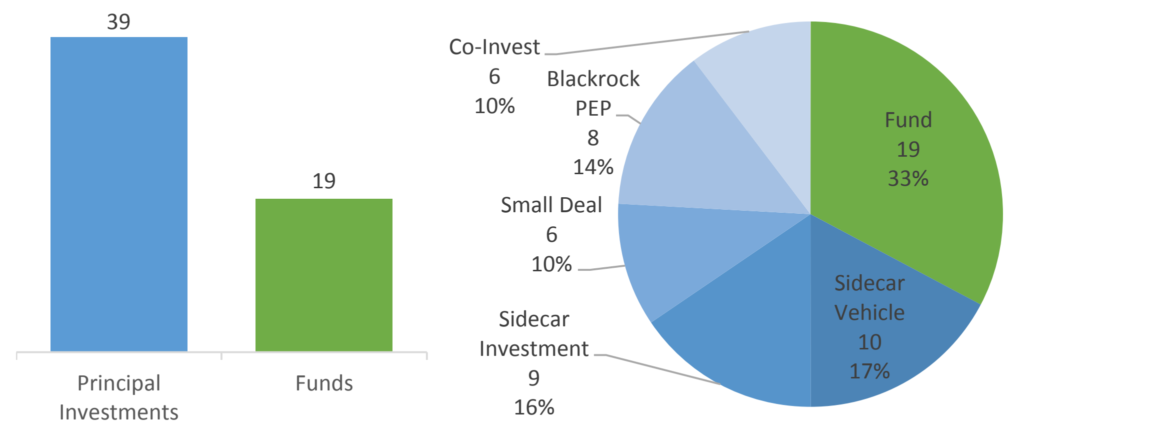
## OVERVIEW

- Purpose
  - Review investments proposed for the PE portfolio
  - Establish a clear, scalable decision-making body at the asset class level
  - Tool for enhancing TRS position as Preferred Destination for Principal Investments
- Member Composition
  - Senior team with an average of 7 years at TRS and 17 years of investment experience
  - All member additions/removals require approval of CIO
- Update
  - In March 2018, IIC authorized PEIC to invest up to $300 million in aggregate into 'Small Deals' alongside Premier List managers
    - As of June 30th, the team had committed ~$150 million in five investments

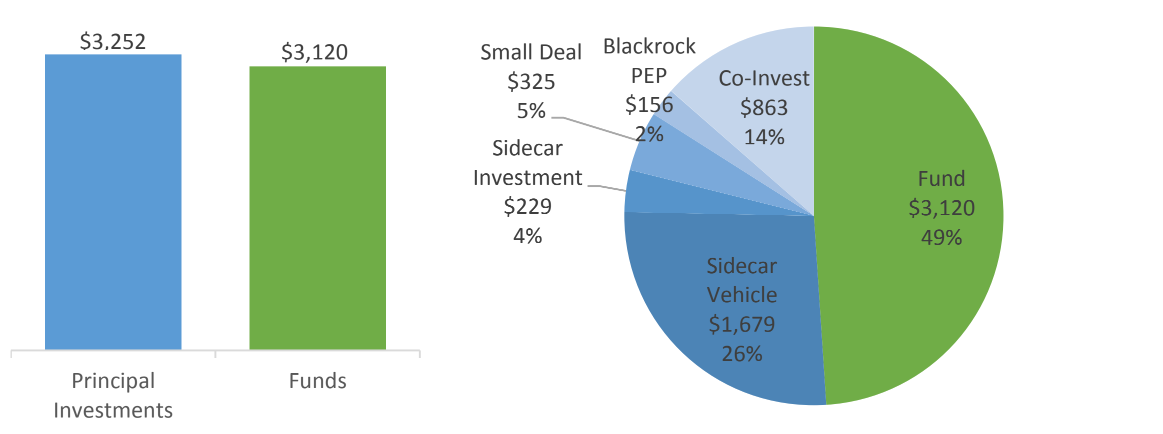
*Source: TRS IMD*

## KEY METRICS (AS OF 6/4/18)

### 2018 YTD Investments Reviewed By Type (Deal Count)




### 2018 YTD Investments Reviewed By Type (Equity Dollars)



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# Performance
## *PE Value Added*

- Private Equity performance relative to Public Markets
- $9.5 billion of value added net of fees
- Since inception alpha versus MSCI ACWI: 542 bps

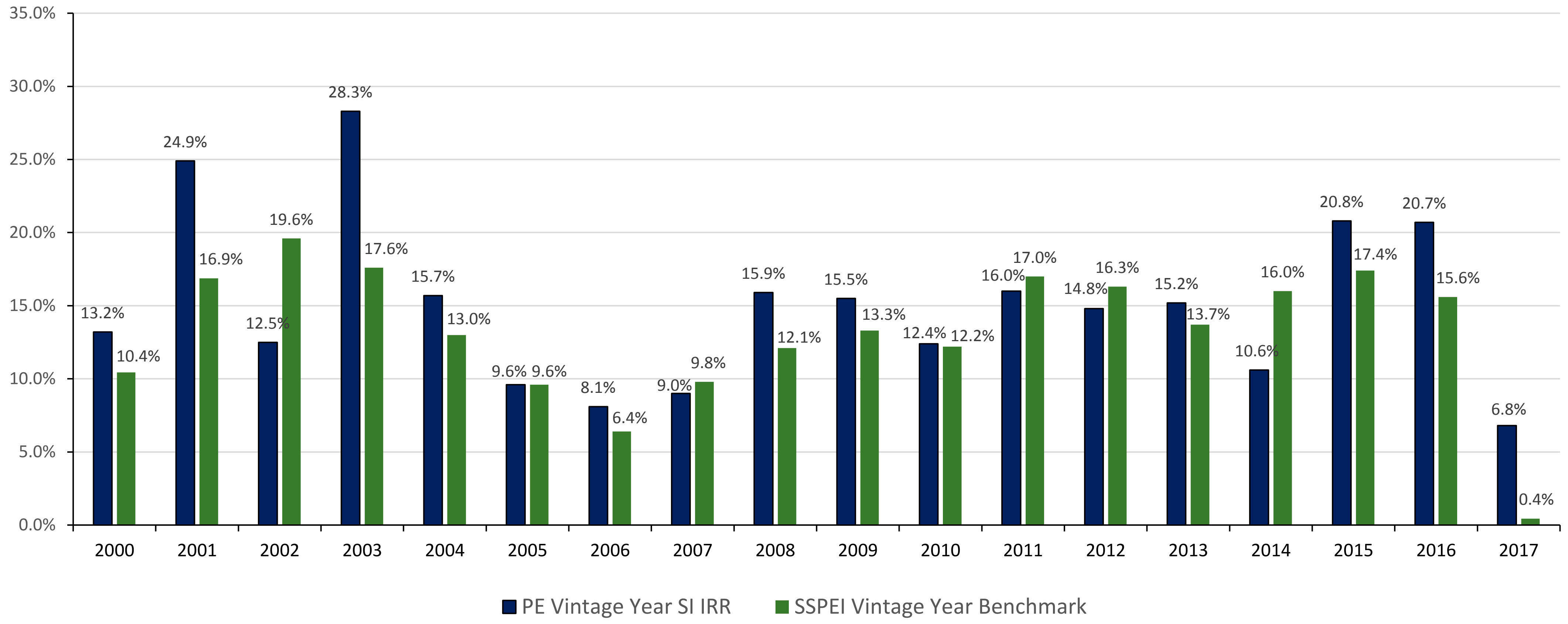

*Source: State Street as of 12/31/17*

*Note: Public Market values calculated by assuming investments were made in the MSCI All World index in the same size and timing as TRS Private Equity cash flows*

# Performance

*TRS Vintage Year Comparison*

## TOTAL PE PORTFOLIO VERSUS SSPEI (2000-2017)




*Source: State Street as of 12/31/17*

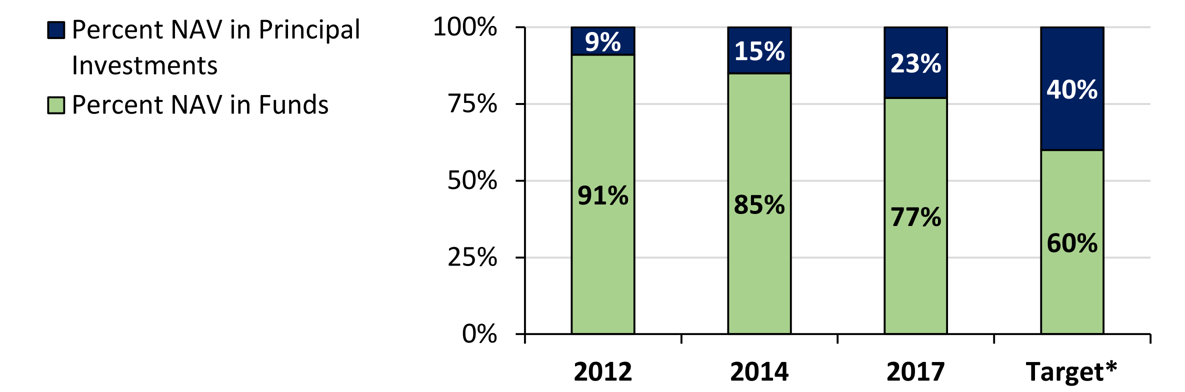
# Performance

## *PE Principal Investments Program Since Inception*

- PE continues to focus on being a Preferred Destination for Principal Investments
- Committed approximately $606 million to 6 Principal Investments in 2017

| PRINCIPAL INVESTMENTS PROGRAM | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Investment** | **No. of Investments** | **Total Commitment** | **Total Funded** | **Total Distributions** | **Net Asset Value** | **SI IRR** | **Investment Multiple** |
| Co-Investments | 26 | $2,319 | $2,084 | $1,128 | $2,322 | 20.8% | 1.7x |
| Direct Investments | 5 | 731 | 730 | 263 | 848 | 13.2% | 1.5x |
| Co-Invest Funds (BlackRock) | 3 | 1,215 | 1,045 | 631 | 940 | 19.7% | 1.5x |
| Sidecar Funds | 11 | 1,408 | 348 | 20 | 434 | 26.3% | 1.3x |
| **TOTAL PRINCIPAL INVESTMENTS** | **45** | **$5,674** | **$4,207** | **$2,042** | **$4,543** | **18.9%** | **1.6x** |

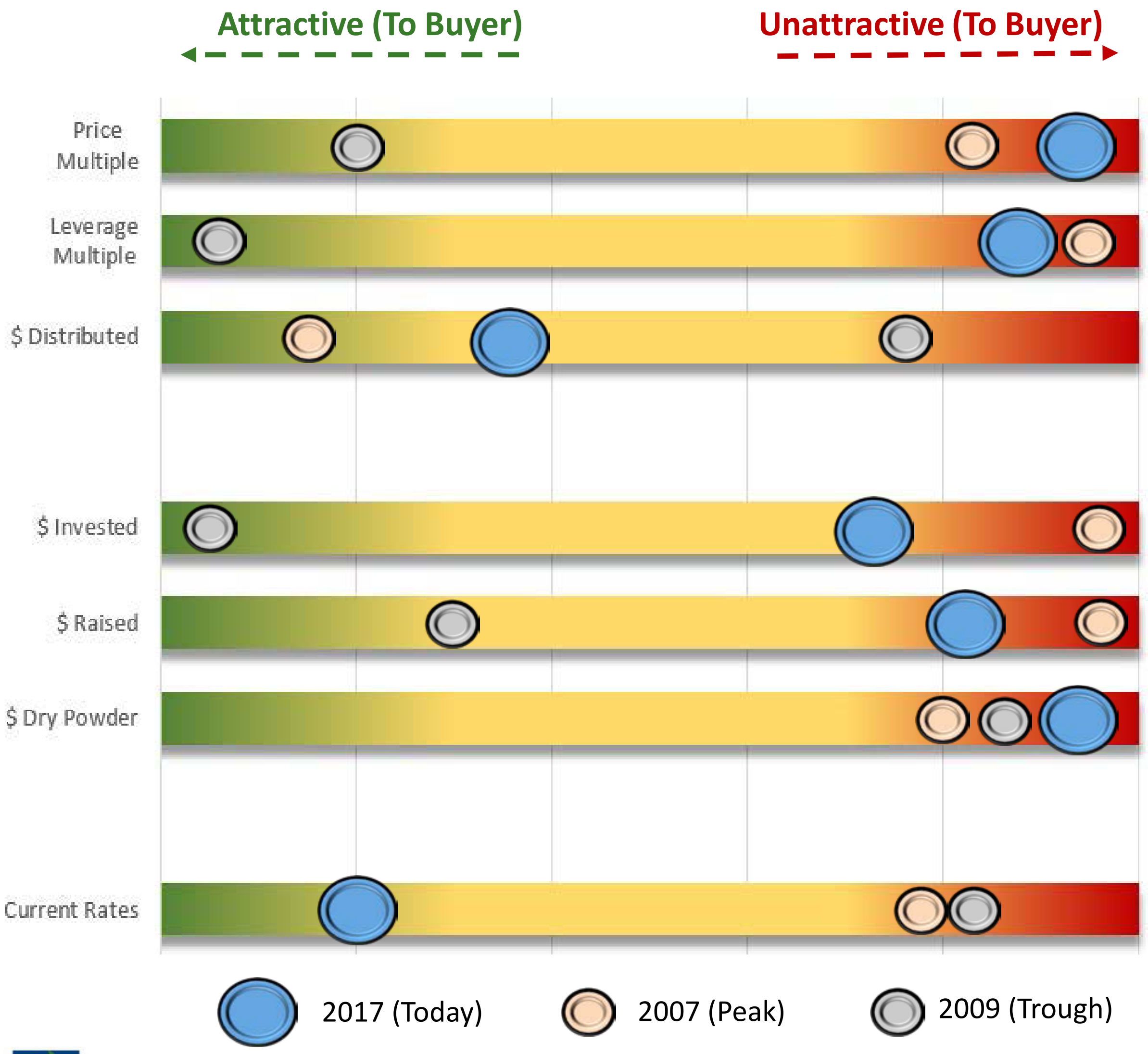
**PRINCIPAL INVESTMENT ALLOCATION OVER TIME**




*Source: State Street as of 12/31/17*
** Long-term target for Principal Investments*

# Market Conditions

*PE*




*Source: Preqin, St. Louis Federal Reserve, Dealogic, S&P LCD, Bloomberg, Credit Suisse*

## What has stayed the same?

- Price and leverage remain historically high
- 2017 Distributions continued at attractive levels

## What metrics are transitioning to Unattractive?

- Dry powder remains at an all-time high
- Fundraising has been steadily increasing

## What to watch?

- Rates increased modestly in 2017 but remain at attractive levels relative to history; rates are more attractive in Europe than the U.S.
- A significant upward trend in rates could have a material impact on future valuations

# Summary
*PE*

| 2017 ACCOMPLISHMENTS | 2018 PRIORITIES |
|---|---|

**2017 ACCOMPLISHMENTS**

- Performance
  - Generated 14.5% 5-year IRR – top decile TUCS performance[1]
  - Added 5-year alpha of 245 basis points[2]
  - Returned 18.3% and 12.0%, respectively for 1- and 3-year periods – top quartile TUCS performance for both periods
- TRICOT Update
  - Successfully transitioned TRICOT team members; European deal flow continues to increase
- Team Update
  - Hired an associate and an analyst
- Allocation
  - Private Equity allocation below long-term target but on track to meet the 13% target by the end of 2018
- Commitments
  - Committed approximately $4.3 billion to 19 investments
    - $3.4 billion to 12 Premier List Funds
    - $606 million to 6 Principal Investments
    - $265 million to Emerging Managers

**2018 PRIORITIES**

- Commit up to $4.5 billion
- Building the Fleet / PE 2.0 Strategic Plan
  - Continued focus on preferred destination
  - Small deals program
  - Expand PE team to support Fleet
- Data Analytics
  - Implement new pipeline tracking and CRM tool
  - Deliver new analytics to support investment process
  - Support ILPA data template
- Establish and implement Private Equity Investment Committee
- Enhance operational due diligence approach

[1]*TUCS as of 3/31/18*
[2]*State Street as of 3/31/18*

# APPENDIX

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# Real Assets

Grant Walker, Senior Director
July 2018

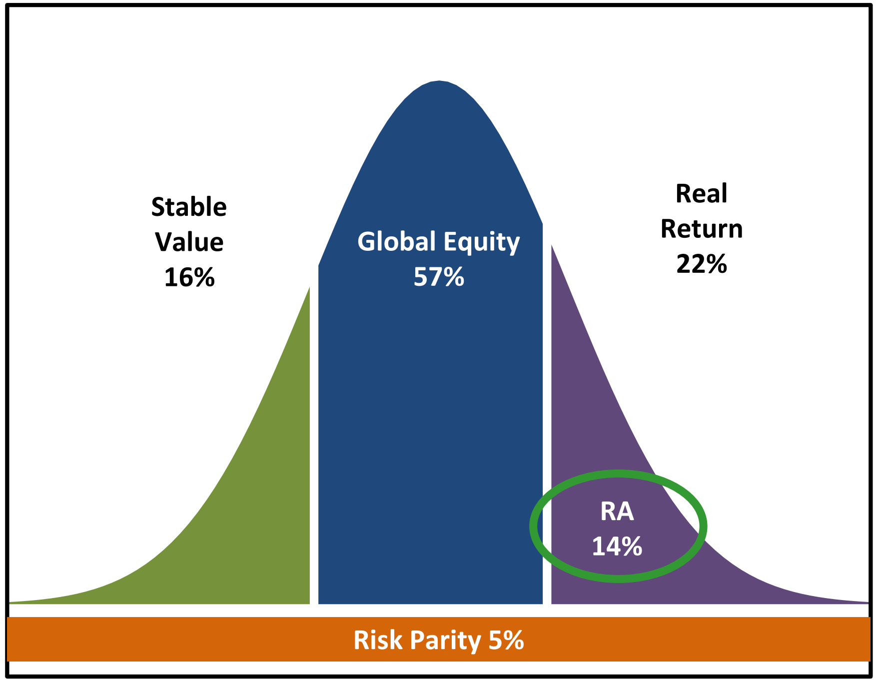
# Agenda

1. Overview
2. Organization
3. Performance
4. Market Conditions
5. Summary
6. Appendix

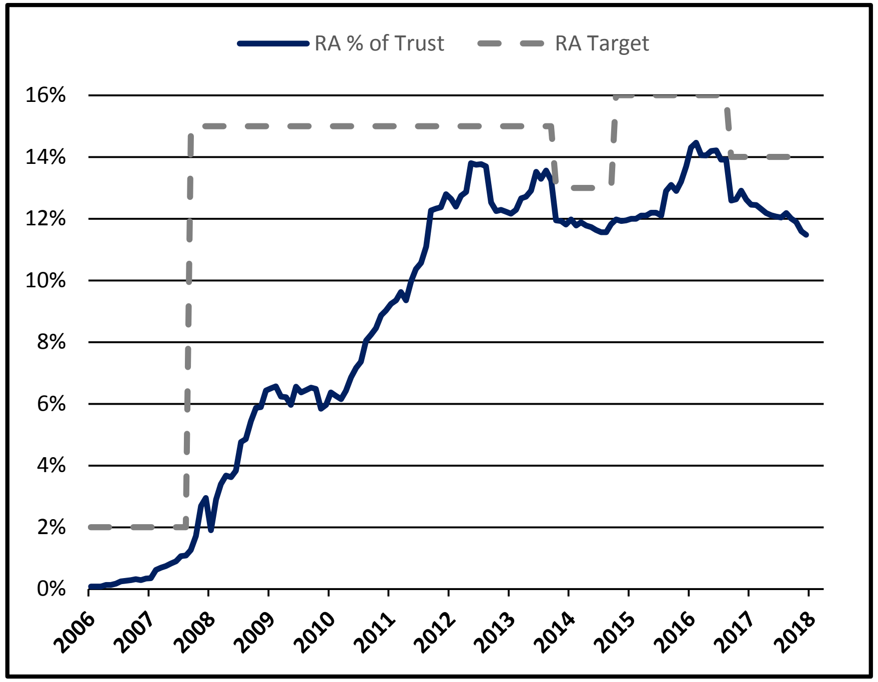
# Overview

*Real Assets (RA)*

## RA TARGET % OF TRUST




## HISTORICAL TRUST ALLOCATION[1]




| THREE YEAR CORRELATION[2] | | |
|---|---|---|
| (0.12) | 0.22 | 0.45 |

| | EOY 2016 | EOY 2017 |
|---|---|---|
| **Actual % of Trust** | 12.5% | 11.5% |
| **Target % of Trust** | 14.0% | 14.0% |

[1]*Source: State Street*
[2]*Source: Risk Group (three-year quarterly observations as of 3/31/18)*

# Overview

## *RA Performance*

| PORTFOLIO PERFORMANCE | | | |
|---|---|---|---|
| Asset Class | 1-Year Return | 3-Year Return | 5-Year Return |
| Real Assets IRR[1] | 13.9% | 11.6% | 12.4% |
| Real Assets TWR[2] | 14.0% | 12.1% | 12.4% |
| Real Assets Benchmark[2] | 6.7% | 9.4% | 10.5% |
| Real Assets Excess Return | 7.3% | 2.7% | 1.9% |
| TUCS Peer Comparison | 8th | 9th | 17th |

| PORTFOLIO GROWTH[1] | | | |
|---|---|---|---|
| RA ($ millions) | 1-Year | 3-Year | 5-Year |
| Ending Value | $17,379 | $17,379 | $17,379 |
| *less* Starting Value | 17,179 | 14,739 | 12,309 |
| *less* Contributions | 3,108 | 10,352 | 15,351 |
| *plus* Distributions | 5,209 | 13,252 | 19,344 |
| **Investment Return** | **$2,301** | **$5,540** | **$9,063** |

| FUND AND PRINCIPAL INVESTMENTS PERFORMANCE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Portfolio | Market Value[3] | % of Portfolio | No. | 1-Year TWR | 3-Year TWR | 5-Year TWR | 1-Year IRR | 3-Year IRR | 5-Year IRR | SI IRR |
| Funds | $10,657 | 61.3% | 141 | 13.0% | 11.1% | 11.7% | 12.5% | 10.2% | 11.5% | 7.1% |
| Principal Investments | 6,739 | 38.7% | 67 | 16.8% | 14.7% | 14.6% | 17.1% | 15.2% | 15.0% | 17.2% |
| **Total** | **$17,379** | **100%** | **208** | **14.0%** | **12.1%** | **12.4%** | **13.9%** | **11.6%** | **12.4%** | **9.1%** |

| PORTFOLIO STRATEGY SUMMARY | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Style | Target Portfolio Weight | RA Portfolio Leverage[4] | % of Portfolio | | | Expected Market Return[5] | Investment Returns | | |
| | | | 12/31/2017 | 12/31/2014 | Change | | 1-Year TWR | 3-Year TWR | SI IRR |
| Core | 35% - 45% | 32.5% | 36.3% | 37.4% | (1.1%) | 6.5% | 10.4% | 12.1% | 10.9% |
| Value Add | 10% - 15% | 44.0% | 14.8% | 10.6% | 4.2% | 7.0% | 20.1% | 14.7% | 7.5% |
| Opportunistic | 30% - 40% | 40.4% | 34.3% | 37.7% | (3.4%) | 10.0% | 17.6% | 11.6% | 7.5% |
| RASS | 10% - 15% | 54.4% | 13.2% | 11.9% | 1.3% | 7.3% | 10.1% | 11.0% | 13.9% |
| **Real Assets Total** | **100%** | **41.1%** | **100%** | **100%** | **0%** | **7.8%** | **14.0%** | **12.1%** | **9.1%** |

[1] *State Street based on 12/31/17 valuations*
[2] *State Street as of 3/31/18*
[3] *Legal, currency hedging and general portfolio expenses are included in the total IRR aggregate only; TWR calculations exclude currency/cash*
[4] *Townsend as of 9/30/17*
[5] *Source: Townsend*

TRS

# Organization

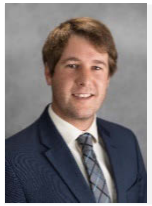
## *RA Group*

**Grant Walker**
**Sr. Director**
*BBA, Baylor*
*MBA, St. Edwards*

**Craig Rochette, CFA, CAIA**
**Sr. Investment Manager**
*BS, University of Arizona*

**Jennifer Wenzel**
**Sr. Investment Manager**
*BBA, UT Austin*

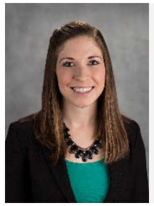
**Joyce Chow**
**Investment Manager**
*BA, Princeton*
*MBA, Wharton*



**Brendan Cooper**
**Investment Manager**
*BA, Carleton College*
*MS, University of Minnesota*

**Matt Halstead**
**Investment Manager**
*BBA, UT Austin*
*MPA, UT Austin*

**Jared Morris, CFA**
**Investment Manager**
*BBA, Texas A&M*
*MS, Texas A&M*



**Malorie Lee**
**Associate**
*BBA, Texas A&M*

**Haley Trainor**
**Sr. Analyst**
*BS, Northwestern*

**Gavin Greenblum**
**Analyst**
*BBA, University of Georgia*

**Luke Luttrell**
**Analyst**
*BBA, Abilene Christian University*
*MBA, Texas Tech University*
*JD, Texas Tech University*

**Gracie Marsh**
**Analyst**
*BA, UC Davis*

### TRICOT (REAL ASSETS)

**Allen MacDonell, CFA**
**Managing Director**
*BBA, University of Georgia*
*MBA, Georgia State*

**Kimberly Carey**
**Investment Manager**
*BA, Texas A&M*

**Andre Weilenmann**
**Contractor**
*BA, University of Zurich*
*MA, HSG U. of St Gallen*

**<u>Advisors and Consultants</u>**
Townsend Group (Fund Advisor)
LaSalle (Principal Investments)

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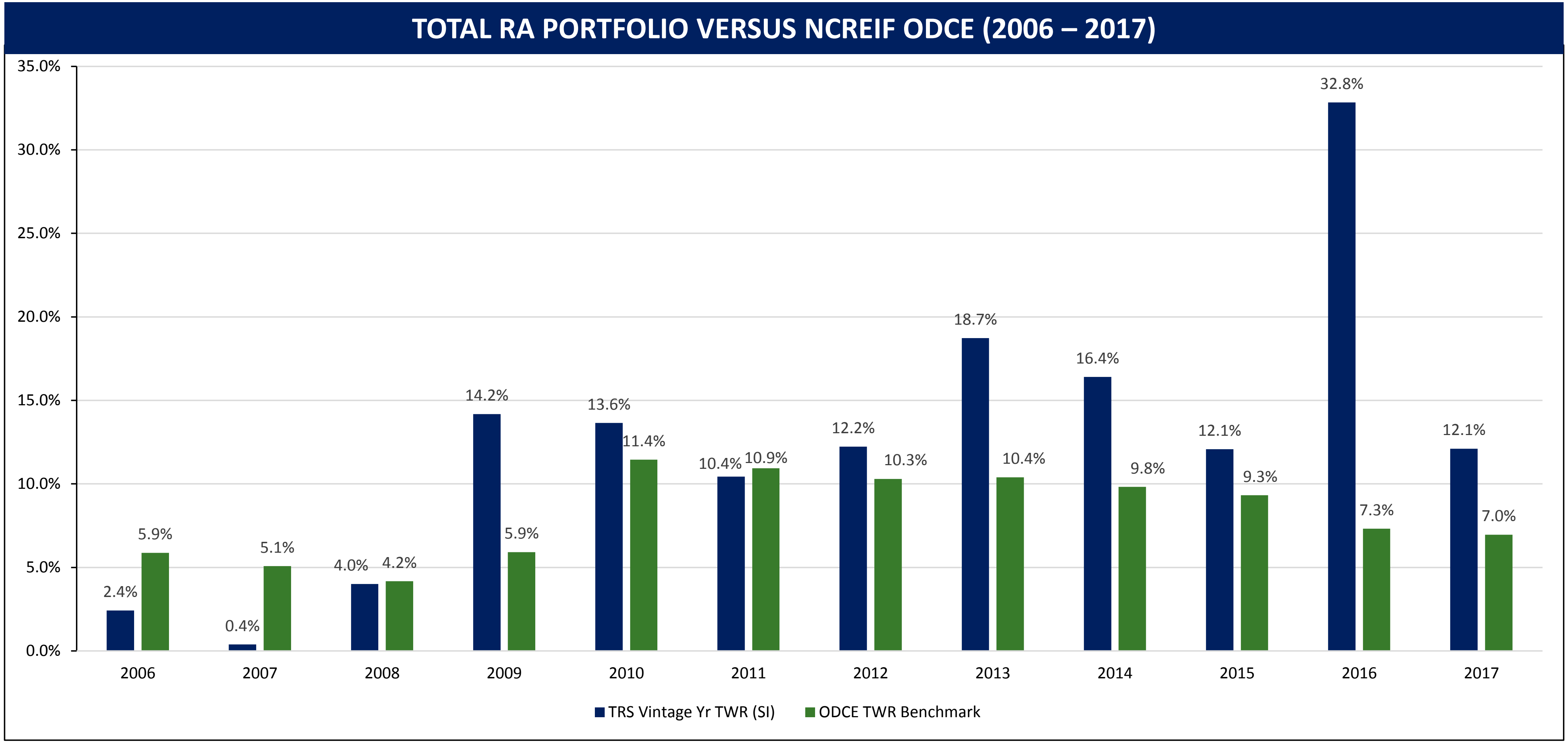
# Performance

## *TRS Vintage Year Comparison*

- Outperformed benchmark in 75% of vintage years since 2006




*Source: State Street as of 12/31/17*

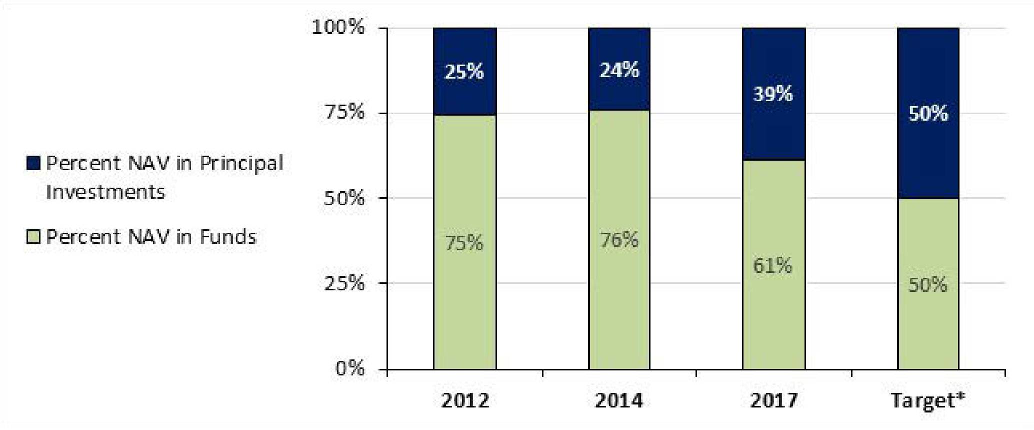
# Performance

## *RA Principal Investments Program Since Inception*

- Real Assets continues to focus on being a Preferred Destination for Principal Investments
- Committed $2.2 billion to 13 Principal Investments in 2017

| PRINCIPAL INVESTMENTS PROGRAM | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Investment** | **No. of Investments** | **Total Commitment** | **Total Funded** | **Total Distributions** | **Net Asset Value** | **SI IRR** | **Investment Multiple** |
| Co-Invest | 17 | $2,007 | $1,664 | $1,163 | $1,195 | 17.9% | 1.4x |
| Direct | 15 | 3,921 | 4,001 | 2,931 | 2,899 | 18.8% | 1.5x |
| Co-Invest Funds (LaSalle) | 3 | 900 | 575 | 570 | 271 | 18.7% | 1.5x |
| Sidecar Funds | 19 | 1,563 | 994 | 680 | 675 | 19.4% | 1.4x |
| Single LP Funds | 13 | 2,741 | 3,572 | 3,140 | 1,700 | 14.7% | 1.4x |
| **TOTAL PRINCIPAL INVESTMENTS** | **67** | **$11,131** | **$10,806** | **$8,484** | **$6,739** | **17.2%** | **1.4x** |

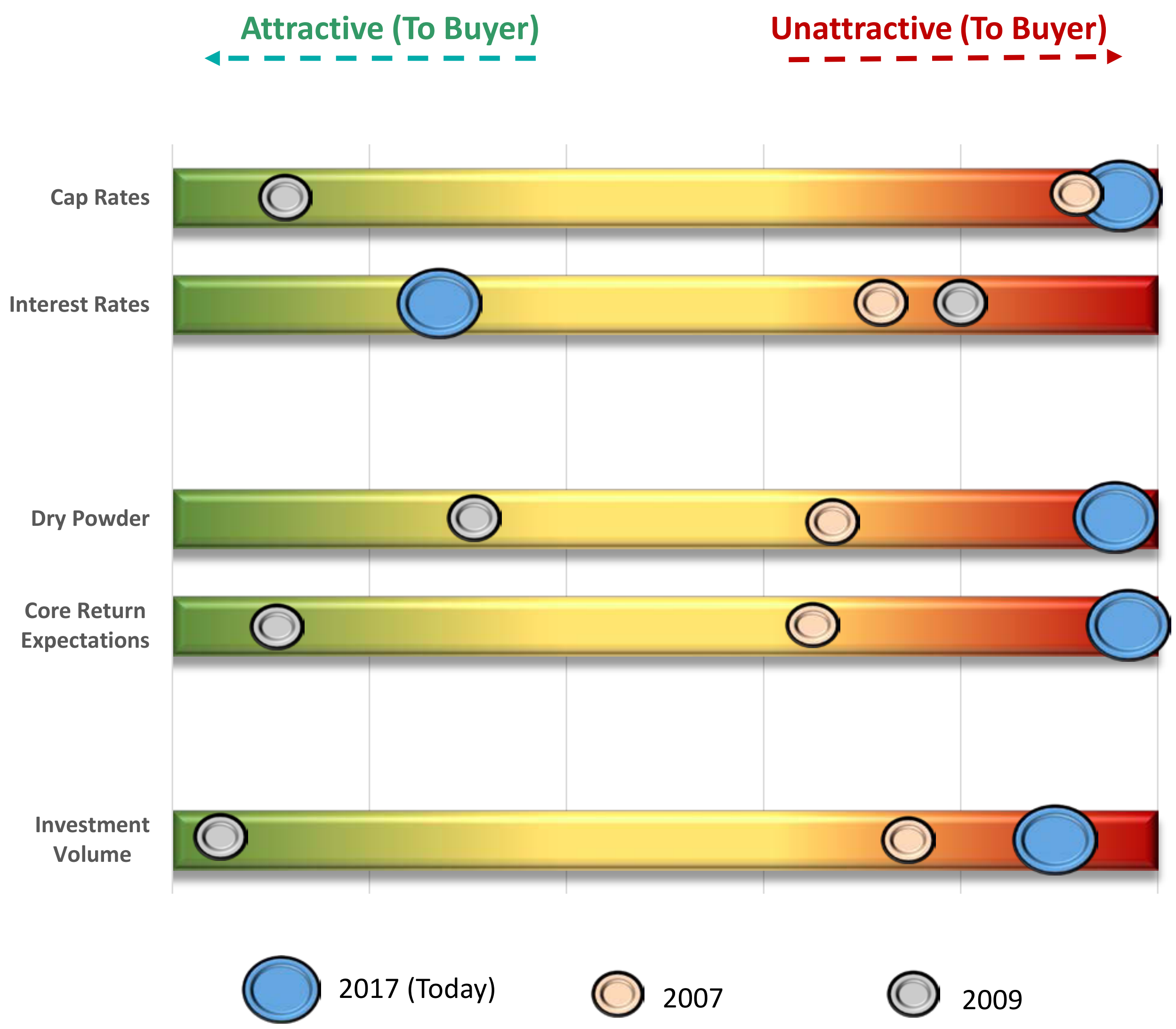
**PRINCIPAL INVESTMENT ALLOCATION OVER TIME**




*Source: State Street as of 12/31/17*
**Long-term target for Principal Investments*

# Market Conditions

*RA*




## What has stayed the same?

- Cap Rates remain historically low
- Interest rates remain low, rising rates expected in the future

## What metrics are transitioning to Unattractive?

- Core return expectations continue to lower in current market conditions
- Fundraising levels (and dry powder) are at record highs

## What to watch?

- A significant upward trend in rates could have a material impact on future valuations

*Source: Preqin, St. Louis Federal Reserve, CMAlert, Real Capital Analytics, Altus, Green Street*

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# Summary

*RA*

## 2017 ACCOMPLISHMENTS

- Performance
  - Generated a 13.9% 1-year IRR and 11.6% 3-year total IRR[1]
  - TRS RA team beating benchmark on 1, 3, and 5 year period[1]
    - 14.0% Time-Weighted 1 year return (8th TUCS)
    - 12.1% Time-Weighted 3 year return (9th TUCS)
    - 12.4% Time-Weighted 5 year return (17th TUCS)
- Team Update
  - Hired two analysts
  - Expanded TRICOT's real estate capabilities with transition of Real Assets Investment Manager to TRICOT office
- Allocation
  - RA below long-term target, but on track to meet the 14% target by 2022
- Commitments
  - Committed $3.4 billion to 20 investments
    - $1.1 billion to 6 Premier List Funds
    - $2.2 billion to 13 Principal Investments
    - $110 million to Emerging Managers

## 2018 PRIORITIES

- Commit approximately $4.7 billion
- Establish Global Partnership with top Premier List managers
- Building the Fleet
  - Continued focus on Principal Investments ("PI") with an increased focus on travel and outreach
  - Continue to be a preferred global destination for attractive investments
  - Continue to build out RA team
- Data analytic capabilities
  - Implement new pipeline tracking and CRM tool
  - Deliver new analytics to support investment process
  - Support ILPA data template
- Establish and implement Real Assets Investment Committee
- Enhance approach to operational due diligence

[1] *State Street as of 3/31/18*

# APPENDIX

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# Energy, Natural Resources & Infrastructure

Carolyn Hansard, Director

July 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT
MANAGEMENT DIVISION

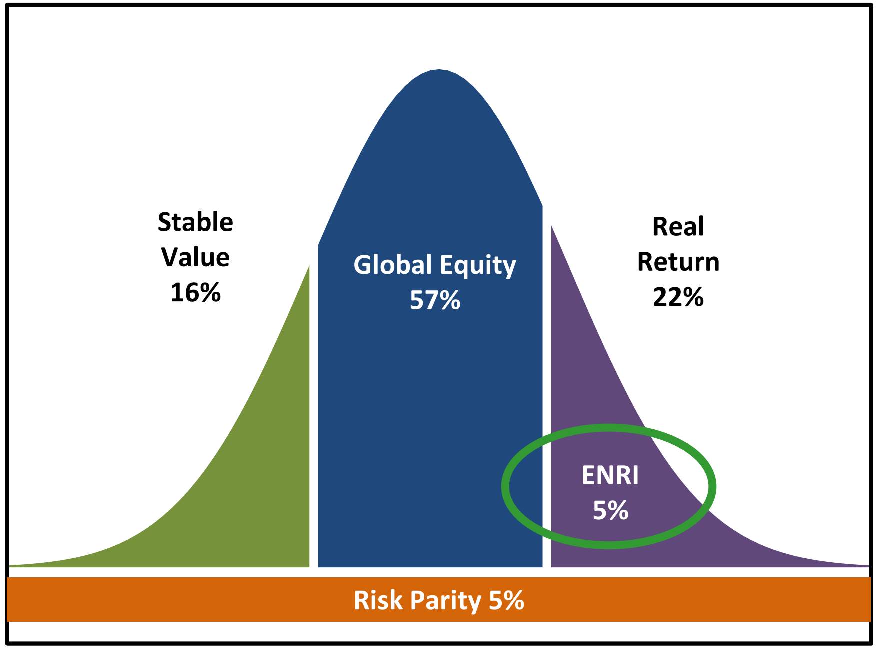
# Agenda

1. Overview
2. Organization
3. Performance
4. Market Conditions
5. Summary
6. Appendix

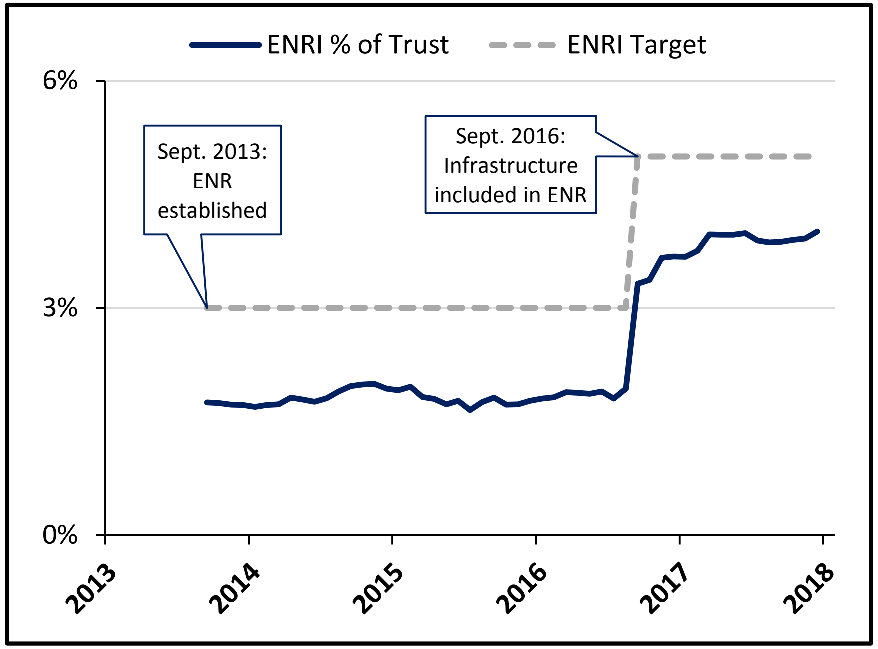
# Overview

## *Energy, Natural Resources & Infrastructure (ENRI)*

### ENRI TARGET % OF TRUST




### HISTORICAL TRUST ALLOCATION[1]




### THREE YEAR CORRELATION[2]

| | | |
|---|---|---|
| **(0.55)** | **0.55** | **0.55** |

| | EOY 2016 | EOY 2017 |
|---|---|---|
| **Actual % of Trust** | 3.8% | 4.2% |
| **Target % of Trust** | 5.0% | 5.0% |

[1] *Source: State Street*
[2] *Source: Risk Group (three-year quarterly observations as of 3/31/18)*

# Overview

## *ENRI Performance*

| PORTFOLIO PERFORMANCE | | | |
|---|---|---|---|
| Asset Class | 1-Year Return | 3-Year Return | 5-Year Return |
| ENRI IRR[1] | 10.0% | 8.2% | 7.1% |
| ENRI TWR[2] | 9.4% | -- | -- |
| ENRI Benchmark[2] | 11.0% | -- | -- |
| ENRI Excess Return | (1.6%) | -- | -- |

| PORTFOLIO GROWTH[1] | | | |
|---|---|---|---|
| ENRI ($ millions) | 1-Year | 3-Year | 5-Year |
| Ending Value | $6,340 | $6,340 | $6,340 |
| *less* Starting Value | 5,287 | 3,612 | 2,670 |
| *less* Contributions | 1,425 | 4,247 | 5,816 |
| *plus* Distributions | 919 | 2,663 | 3,603 |
| **Investment Return** | **$548** | **$1,144** | **$1,458** |

| FUND AND PRINCIPAL INVESTMENTS PERFORMANCE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Portfolio | Market Value[3] | % of Portfolio | No. | 1-Year TWR | 3-Year TWR | 5-Year TWR | 1-Year IRR | 3-Year IRR | 5-Year IRR | SI IRR[4] |
| Funds | $4,519 | 71.3% | 46 | 8.1% | -- | -- | 9.1% | 6.8% | 3.9% | 4.5% |
| Principal Investments | 1,821 | 28.7% | 18 | 12.2% | -- | -- | 12.4% | 12.7% | 19.0% | 17.0% |
| **ENRI TOTAL** | **$6,340** | **100.0%** | **64** | **9.4%** | **--** | **--** | **10.0%** | **8.2%** | **7.1%** | **7.0%** |

| PORTFOLIO STRATEGY SUMMARY | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Style | Target Portfolio Weight | % of Portfolio | | | Expected Market Return[5] | Investment Returns | | |
| | | 12/31/2017 | 12/31/2014 | Change | | 1-Year TWR | 3-Year TWR | SI IRR[4] |
| Energy Diversified | 45.0% | 50.8% | 34.7% | 16.1% | 11.0% | 2.6% | -- | 0.6% |
| Infrastructure | 45.0% | 40.9% | 48.6% | (7.7%) | 9.0% | 14.7% | -- | 11.9% |
| Natural Resources | 10.0% | 8.2% | 16.7% | (8.5%) | 7.0% | 26.5% | -- | 15.6% |
| **ENRI TOTAL** | **100.0%** | **100.0%** | **100.0%** | **0.0%** | **9.7%** | **9.4%** | **--** | **7.0%** |

[1] *State Street based on 12/31/17 valuations (ENRI IRR includes combined historical performance of ENR and Infrastructure)*
[2] *State Street as of 3/31/18 (ENRI TWR reflects combined ENRI performance from 9/30/16 to 3/31/18)*
[3] *Legal and general portfolio expenses are included in the total IRR aggregate only; TWR calculations exclude currency/cash*
[4] *Since Inception IRR reflects performance from fund investments initially transferred to form ENRI portfolio (inception date: 10/28/04)*
[5] *Source: Hamilton Lane*

TRS

# Organization

## *ENRI Group*

**Carolyn Hansard**
**Director**
*BS, UT Austin*
*MBA, UT Austin*

**Mark Cassens**
**Senior Investment Manager**
*BS, UT Austin*
*MBA, UT Austin*

**Eric Chang**
**Investment Manager**
*BA, BBA, UT Austin*

**Cassandra Stevenson**
**Investment Manager**
*BA, Case Western Reserve University*
*MBA, Weatherhead School of Management*

**Emerson Halstead**
**Senior Associate**
*BS, UT Austin*
*MBA, Indiana University Bloomington*
*MA, Harvard*

**Edgar Mayorga**
**Senior Analyst**
*BA, UT Austin*

**Mary Rogers**
**Contractor**
*BA, Southwestern University*
*MBA, Texas State University*

### TRICOT (ENRI)

**Allen MacDonell, CFA**
**Managing Director**
*BBA, University of Georgia*
*MBA, Georgia State*

**Justin Wang**
**Sr. Associate**
*BBA, UT Austin*

**Andre Weilenmann**
**Contractor**
*BA, University of Zurich*
*MA, HSG U. of St Gallen*

**<u>Advisors and Consultants</u>**

Hamilton Lane (Fund Advisor)

Perella Weinberg Partners (Principal Investments)

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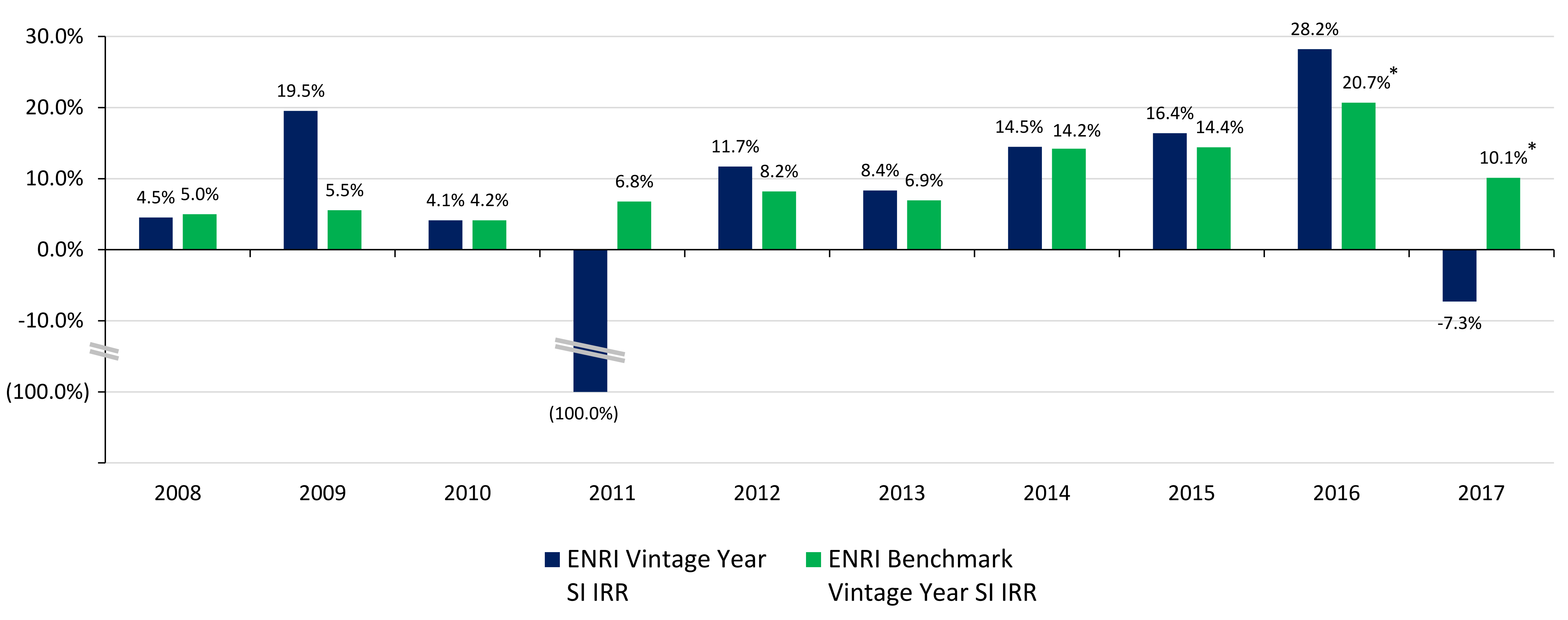
# Performance

## *TRS Vintage Year Comparison*

**TOTAL ENRI PORTFOLIO (2008-2017)**




*Source: State Street, IMD, Cambridge Associates, BLS*

** Benchmark performance for vintage years 2016 and 2017 reflect the Cambridge Associates Natural Resources Index only, Cambridge Associates Infrastructure Index performance for years 2016 and 2017 unavailable due to limited sample set*

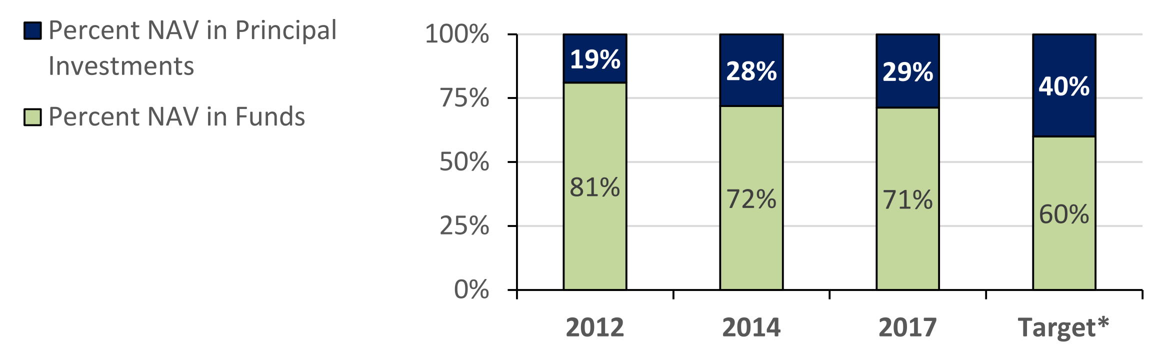
# Performance

## *ENRI Principal Investments Program*

- ENRI continues to focus on being a Preferred Destination for Principal Investments
- Committed approximately $650 million to 4 Principal Investments in 2017

| PRINCIPAL INVESTMENTS PROGRAM SINCE INCEPTION | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Investment** | **No. of Investments** | **Total Commitment** | **Total Funded** | **Total Distributions** | **Net Asset Value** | **SI IRR** | **Investment Multiple** |
| Co-Investments | 8 | $1,288 | $693 | $394 | $598 | 16.7% | 1.4x |
| Direct Investments | 1 | 400 | 400 | 312 | 496 | 16.1% | 2.0x |
| Co-Invest Funds | 2 | 300 | 230 | 60 | 181 | 3.0% | 1.1x |
| Sidecar Funds | 6 | 508 | 289 | 223 | 220 | 44.0% | 1.5x |
| Single LP Funds | 1 | 700 | 330 | 49 | 326 | 11.0% | 1.1x |
| **TOTAL PRINCIPAL INVESTMENTS** | **18** | **$3,196** | **$1,942** | **$1,038** | **$1,821** | **17.0%** | **1.5x** |

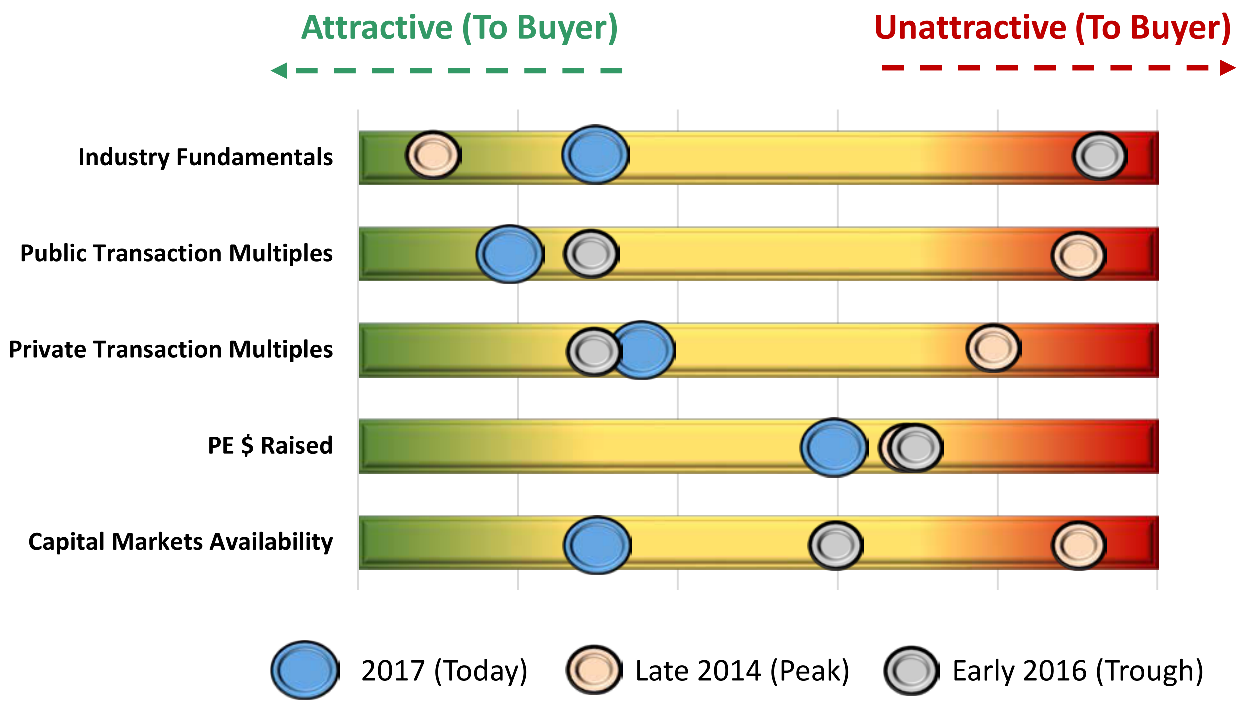
**PRINCIPAL INVESTMENT ALLOCATION OVER TIME**




*Source: State Street as of 12/31/17*
** Long-term target for Principal Investments*

# Market Conditions

*ENRI*




## ENERGY

- WTI crude prices in $65-70 range, crude inventories continue to decline
- US is producing a record ~10,000 bbl/d of crude oil (vs. ~9,500 bbl/d at 2015 peak)
- Public companies are maintaining discipline by focusing capital on "core" assets and divesting of "non-core" acreage
- However, public investors are complacent about upside risks thus creating opportunities for investors to buy at attractive multiples
- Private investors are focused on best assets and pricing reflects current industry fundamentals
- Global unlisted Natural Resources funds raised a total of $74 billion in 2017 (vs. $71 billion in 2016) and have significant dry powder
- Capital markets remain closed for all but the best companies

*Source: Preqin, EIA*

# Summary

*ENRI*

## 2017 ACCOMPLISHMENTS

- Performance
  - Overall, generated a 10.0% 1-year IRR and 8.2% 3-year IRR[1]
  - Principal Investments returned 12.4% and 12.7%, for 1- and 3-year IRR periods, respectively[1]
- Team Update
  - Hired two Investment Managers
- Allocation
  - ENRI allocation below long-term target but on track to meet the 5% target by the end of 2018
- Commitments
  - Committed approximately $1.7 billion to 9 investments
    - $1,000 million to 5 Premier List manager funds
    - $650 million to 4 Principal Investments

## 2018 PRIORITIES

- Commit approximately $2.0 billion
- Building the Fleet
  - Continue to be a preferred global destination for attractive investments
  - Maintain focus on Principal Investments by increasing GP outreach and usage of sidecar vehicles
  - Continue to build out ENRI team
- Data Analytics
  - Implement new pipeline tracking and CRM tool
  - Deliver new analytics to support investment process
  - Support ILPA data template
- Establish ENRI Investment Committee
- Enhance approach to operational due diligence
- Monitor and act on cyclical energy investment opportunities

[1] *Source: State Street as of 12/31/17*

# APPENDIX

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# Preview of Proposed Modifications to Investment Policy

Katy Hoffman, Chief of Staff
James Nield, Chief Risk Officer

July 2018

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INVESTMENT
MANAGEMENT DIVISION

# Introduction

- This presentation summarizes proposed modifications to the Investment Policy Statement
  - Per practice we review investment policy at least every two years and last review was in 2016
- Proposed modifications are presented today for discussion to the Investment Committee
- Policy Chair to review proposed changes to Investment Policy Statement language
- A formal proposal that will require approval will be presented to the Policy Committee in September 2018 which will then consider recommending the proposed changes to the Board for approval

# Potential Modifications

| Modification # | Proposed Modification |
|---|---|
| 1 | **Update Advisor and Consultant definitions and remove prudence investment letter requirement** |
| 2 | **Improve leverage reporting and clarify usage** |
| 3 | **Establish permanent emerging manager allocation target and update emerging manager definition** |
| 4 | **Clarify rebalance authority for public and private markets and grant authority to Chief Risk Officer** |
| 5 | Update language to align with legislative changes |
| 6 | Update language to align with organizational changes in public markets |
| 7 | Update Appendix F (Existing G), External Board Representations, to align with practice and improve oversight |
| 8 | Update Placement Agent Policy and Questionnaire |
| 9 | Update Risk Parity benchmark |
| 10 | Clarify and clean up IPS to improve document readability and clarity such as to changing Real Assets to Real Estate |

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# Modification 1

*Update Advisor and Consultant definitions and remove prudence investment letter requirement*

## Proposal

- Define Advisors as advisors to the Board (currently AON and Dr. Brown)
  - Modify Advisor scope of work to focus on Board related responsibilities
- Define Consultant definition as advisors to the IMD engaged to provide investment diligence, analysis or advice
- Remove requirement for a prudence letter on external opportunities presented to the IIC

## Rationale

- Improved efficiency, reduction in potential conflicts and cost savings

## Background Information

- IMD has developed capabilities in-house to perform investment due diligence on funds and principal investments
- Operational due diligence will be extended to cover Private Market managers
- Consultants provide additional diligence support on principal investments and investment services
- Many consultants also manage investments themselves and it is becoming more difficult to mitigate potential conflicts

# Modification 1

*Circumstances that warrant a prudence letter*

- It is expected that in the vast majority of instances that a prudence letter is not a necessary form of risk control
  - That said IMD and Aon believe that the following factors warrant an external prudence letter:

| Qualitative Factors | Quantitative Factors |
| --- | --- |
| • Any Board member or CIO may request a prudence letter for any reason including, but not limited to,<br>○ A heightened perceived risk<br>○ A new investment strategy or asset class | • Any private investment in excess of manager allocation limits noted in Appendix B of the IPS<br>• Principle transactions over 0.25% that are <u>not</u> affiliated with existing TRS partners |

**Periodic Review:** IMD's "Texas Way" investment manager underwriting process will continue to be reviewed with the Board annually and the Board's Advisor(s) will continue to have full access to IMD's due diligence

# Modification 2

*Improve leverage reporting and clarify usage*

## Proposal

- Define “Asset Allocation leverage” and “Strategy leverage” in policy
- Clarify ability to deviate from current practice of backing “Asset Allocation leverage” with cash
- Update asset allocation table

## Rationale

- This modification will more clearly report any existing leverage and bring us in line with peers
- Enable TRS to fully capture intended benefit of any “Asset Allocation leverage”

## Background Information

- This modification has a minor impact at this time as no change to SAA is being made
  - However, asset allocation leverage will be evaluated as part of the 2019 SAA study
- Strategy leverage, which includes Hedge Funds and Risk Parity, would continue to be reported separately in the semi-annual Risk Board report
- Asset Allocation leverage is expected to be less than 1% (as of June 2018)

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# Modification 2

*Asset Allocation and Strategy Leverage Definitions*

## Asset Allocation Leverage

- Asset Allocation refers to leverage <u>across</u> policy asset classes
  - Investment exposure greater than 100% to the asset classes listed in the policy asset allocation table would be shown as asset allocation leverage
- An example of asset allocation leverage is:
  - Leverage from public strategic partners as they have the ability to use leverage across policy asset classes

## Strategy Leverage

- Strategy leverage refers to leverage <u>within</u> an asset class (policy line item) mandate
  - Strategy leverage is leverage used to achieve similar return-risk characteristics as the benchmark
- An example of strategy leverage is:
  - Risk Parity - This is an asset class mandate and leverage is used to achieve similar return-risk characteristics as the benchmark. Leverage used in Risk Parity would not be reflected as asset allocation leverage, whether managed internally or externally

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# Modification 2

## *Proposed modification to Asset Allocation table*

| Asset Class | Benchmark | Bloomberg Ticker | Minimum Range[1,2] | Maximum Range[1,2] | Target[2] |
|---|---|---|---|---|---|
| **Global Equity:** | | | | | |
| USA | MSCI USA Investible Market | MIMUUSAG | 13% | 23% | 18% |
| Non-US Developed | MSCI EAFE and Canada | NDDUEC | 8% | 18% | 13% |
| Emerging Markets | MSCI EM | NDUEEGF | 4% | 14% | 9% |
| Directional Hedge Funds | HFRI Fund of Funds Composite | HFRIFOF | 0% | 10% | 4% |
| *Total Public Equity* | *Target-weighted Blend* | | *39%* | *49%* | *44%* |
| Private Equity | Customized State Street Private Equity Index – lagged one quarter[3] | | 8% | 18% | 13% |
| ***Total Global Equity*** | ***Target-weighted Blend*** | | **50%** | **64%** | **57%** |
| **Stable Value:** | | | | | |
| US Treasuries[4] | Barclays Capital (BarCap) Long Treasury Index | LUTLTRUU | 0% | 20% | 11% |
| Absolute Return (Including Credit Sensitive Investments)[5] | 3 Month LIBOR + 2% | USC0TR03 (plus 2%) | 0% | 20% | 0% |
| Stable Value Hedge Funds | HFRI Fund of Funds Conservative | HFRIFOFC | 0% | 10% | 4% |
| ~~Cash~~ | ~~Citigroup 90-day US Treasury~~ | ~~SBMMTB3~~ | ~~0%~~ | ~~5%~~ | ~~1%~~ |
| ***Total Stable Value*** | ***Target-weighted Blend*** | | ***11%*** | ***21%*** | ***~~16%~~ 15%*** |
| **Real Return:** | | | | | |
| Global Inflation Linked Bonds | BarCap US Treasury TIPS index | LBUTTRUU | 0% | 8% | 3% |
| Real ~~Assets~~ Estate | NCREIF ODCE – lagged one quarter | | 9% | 19% | 14% |
| Energy, Natural Resources and Infrastructure | 40% Cambridge Associates Natural Resources/40% Cambridge Associates Infrastructure/ 20% quarterly Consumer Price Index – lagged one quarter | CPI (for CPI) | 0% | 10% | 5% |
| Commodities | Goldman Sachs Commodity Index | SPGCCITR | 0% | 5% | 0% |
| ***Total Real Return*** | ***Target-weighted Blend*** | | ***17%*** | ***27%*** | ***22%*** |
| **Risk Parity:** | | | | | |
| Risk Parity | Risk Parity Benchmark[6] | | **0%** | **10%** | **5%** |
| ***INVESTMENT EXPOSURE*** | | | | ***110%*** | ***99%*** |
| **Asset Allocation Leverage:** | | | | | |
| Cash | Citigroup 90-day US Treasury | SBMMTB3 | 0% | 5% | 1% |
| Asset Allocation Leverage[6] | | | | | 0% |
| ***Net Asset Allocation Leverage:*** | | | | | ***1%*** |
| ***TOTAL FUND*** | ***Target-weighted Blend*** | | | | ***100%*** |

Cash line item moved to "Asset Allocation Leverage" section

"Investment Exposure" total added to show non-cash investments

Added "Net Asset Allocation Leverage" section which nets cash with asset allocation leverage

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# Modification 2

## *How would asset allocation report look with leverage?*

| Asset Class | Benchmark | Bloomberg Ticker | Minimum Range[1,2] | Maximum Range[1,2] | Target[2] | Interim Target | Actual | O/(U) Target |
|---|---|---|---|---|---|---|---|---|
| US Treasuries[4] | Barclays Capital (BarCap) Long Treasury Index | LUTLTRUU | 0% | 20% | 11% | 11.00% | 12.25% | 1.25% |
| ***INVESTMENT EXPOSURE*** | | | | *110%* | *99%* | ***99.00%*** | ***100.25%*** | ***1.25%*** |
| **Asset Allocation Leverage:** | | | | | | | | |
| Cash | Citigroup 90-day US Treasury | SBMMTB3 | 0% | 5% | 1% | 1.00% | 1.00% | 0.00% |
| Asset Allocation Leverage[6] | | | | | 0% | | -1.25% | -1.25% |
| ***Net Asset Allocation Leverage:*** | | | | | *1%* | ***1.00%*** | ***-0.25%*** | ***-1.25%*** |
| ***TOTAL FUND*** | ***Target-weighted Blend*** | | | | ***100%*** | ***100.00%*** | ***100.00%*** | ***0.00%*** |

- In the hypothetical example above, we have asset allocation leverage from US Treasuries
- In this example, we would report
  - Investment exposure of 100.25%
    - 99% target exposure + 1.25% additional exposure from US Treasuries
  - Asset allocation leverage of -1.25%[1]
    - 100% - (Investment exposure of 100.25% + Cash of 1.00%)
  - Net asset allocation leverage of -0.25%
    - 1.00% in Cash + (-1.25% in Asset Allocation Leverage)

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# Modification 2

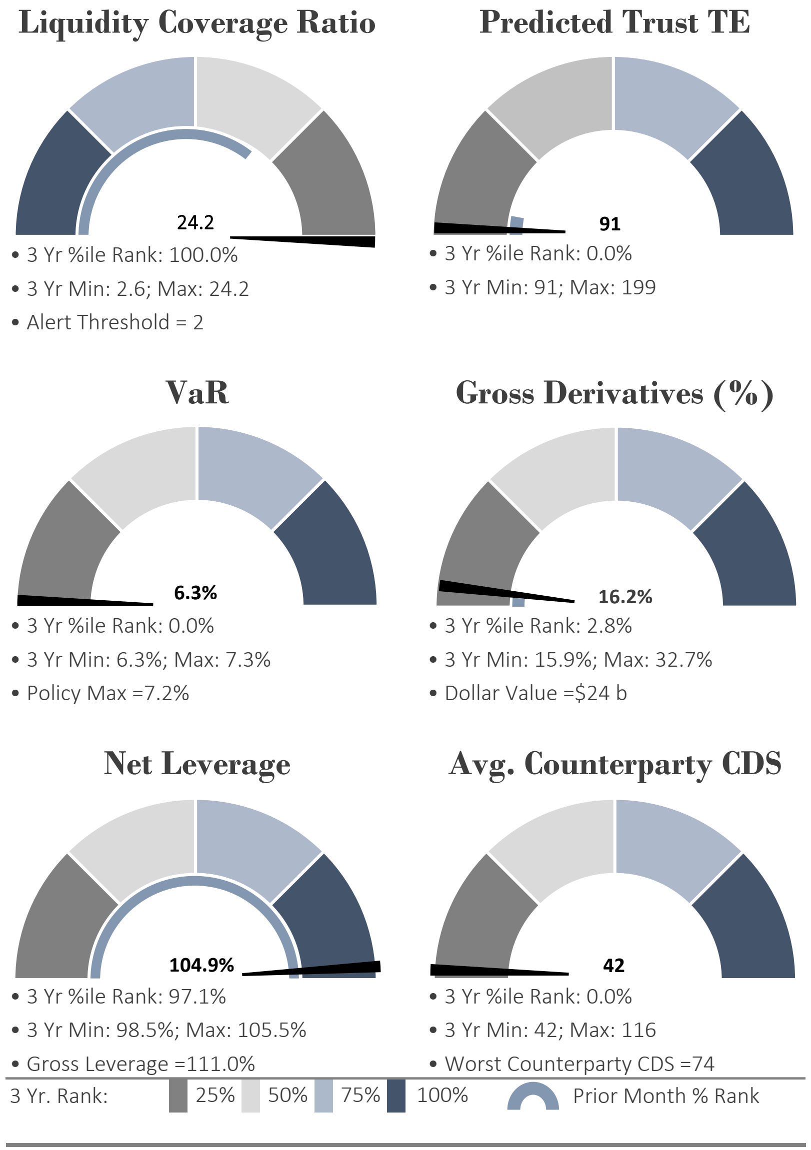
## *Leverage Risk Controls include...*

### Policy Limits

- Tracking error
- Value at Risk (VaR)
- Asset allocation bands
- Counterparty credit requirements

### Internal Controls

- Liquidity stress tests
- Liquidity coverage ratio
- Derivative reports
- Drawdown scenarios
- Counterparty exposure reports



# Modification 3

*Establish permanent allocation target for emerging manager program and update emerging manager definition*

## Proposal

- Change target allocation for emerging manager program from current fixed amount to 1.1% of the Trust to enable emerging manager program to grow with the Trust
- Increase the Asset Under Management (AUM) definition of an emerging manager from $2 billion to $3 billion

## Rationale

- By targeting a percentage of Trust, the emerging manager program size will stay in line with Trust growth
- Provides flexibility to allocate capital to a broader set of emerging managers
- Allows TRS to allocate to managers in later stage of program but who are not ready for TRS Premier List

## Background Information

- Allocation target is consistent with capital plan presented at the February Board meeting
- Current process is to document when TRS allocates to an emerging manager who has exceeded $2 Billion in AUM

# Modification 4

*Clarify rebalance authority for public and private markets*

## Proposal

- Rename authority from "Rebalance Authority" to "Additional Allocation Authority" and add phrase "increasing allocations" to clarify
- Include CRO and Head of Public Markets to list of titles allowed to use authority

## Rationale

- Clarify that the authority allows for additions to previously approved IIC investments
- Ability to efficiently allocate to external managers and investments is needed to manage Trust asset allocation and to remain competitive for private market principal transactions
- Risk management team manages IIC approved investments that at time require allocation changes

## Background Information

- Use of this authority is reported to the IIC monthly and quarterly to the Board in the transparency report
- Current internal guidelines limits Private Market usage to \$100mm well under the IPS limit of 2%
- Authority is subject to all other IPS limits such as asset allocation bands and manager limits in Appendix B

# Modification 5

*Update language to align with legislative changes*

## Proposals

- Update to reflect legislative changes to statutory investment restrictions relating to Sudan, Iran, designated terrorist organizations, and companies that boycott Israel
- Update to remove the legislatively repealed "sunset date" of TRS authority to use external managers
- Update in light of legislative reformulation of investment authority relating to derivatives, including repeal of "sunset date" on authority

## Rationale

- Reflect legislative changes

# Modification 6

*Update language to align with organizational changes in public markets*

## Proposals

- Remove references to “Internal” and “External” Public Market portfolios unless a specific provision clearly applies only to one
- Remove requirement for CIO to set specific “Internal” and “External” allocations
- Update tracking error table

## Rationale

- CIO has direct control of every internal and external portfolio; no need to pre-specify proportions
- Public Markets is now a unified portfolio
- “Global Best Ideas” portfolio no longer exists

## Background Information

- As a result of the Global Equity Best Practices project, the Public Markets team manages asset class portfolios using a dynamic mix of internal and external strategies.
- Suggested policy changes remove redundancy and promote similar treatment of the two strategies

# Modification 6 – *Continued*

## *Update language to align with organizational changes in public markets*

- The proposed tracking error neutral targets will apply at the asset class level, without regard to the tracking error of individual strategies, whether internal or external.
  - Tracking error is a measure of the difference between a strategy's performance and that of the benchmark. Higher tracking error means less similar to the benchmark
  - Less important than the tracking error of an individual component is how the strategies combine at the asset class level – a high tracking error strategy may actually reduce the overall tracking error of the portfolio

| Asset Class | Neutral Tracking Error (bp) | Maximum Tracking Error (bp) |
|---|---|---|
| USA | 300 | |
| Non-US Developed | 300 | |
| Emerging Markets | 300 | |
| World Equity | 300 | |
| Stable Value Hedge Funds | 400 | |
| Directional Hedge Funds | 400 | |
| Global Inflation Linked | | 200 |
| **Total Public Fund** | **100** | **300** |

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# Modification 7

*Update Appendix G, External Board Representations, to align with practice and improve oversight*

## Proposal

- Require that a TRS employee representing TRS on a Board must comply with TRS policies, procedures and training requirements
- Establish recusal determinations for potential conflicts of interest reside with Executive Director in consultation with Chief Compliance Officer (CCO) and General Counsel (GC)

## Rationale

- Creating policies and a training program is a best practice
- Conflict determination currently resides Executive Director
- Recusal requires a legal determination

## Background Information

- Board participation of our private holdings improves our investment oversight and monitoring ability

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# Modification 8

*Update language in Placement Agent Policy & Questionnaire*

## Proposal

- Shorten and rename to "Investment Integrity Policy"
- Clarify policy scope:
  1. TRS contracted services are outside scope
  2. "Fund or Manager Party" includes issuers such as private companies, but not underwriters, and an underwriting discount is not a "Placement Fee"
  3. "Texas Candidate or Elected Official" does not include local officials or candidates, judicial office holders or candidates, or federal office holders or candidates
  4. Disclosure is required even if TRS is not burdened by a Placement Fee
- Require that questionnaire responses must be received before authorization of the investment, instead of "as early as reasonably possible"
- Incorporate clarifications into questionnaire (Existing IPS Appendix F)

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# Modification 8 – *Continued*

## *Update language in Placement Agent Policy & Questionnaire*

### Rationale

- Shorter name will ease reference and better reflect the policy's purpose
- Clarifications needed to address frequent questions from respondents:
    1. If TRS engages an agent directly, the agent will be contractually bound to the TRS Code of Ethics for Contractors and required to disclose conflicts of interest
    2. It has not been sufficiently clear that the policy applies to private company and similar issuers of securities in private placements, where placement agents may well be involved. At the same time, including underwriters added an unnecessary layer of disclosure requirements to a reasonably transparent underwriting process regulated by the SEC
    3. Respondents have consistently asked whether "Texas Candidate or Elected Official" includes local, judicial, or federal offices in the state. This clarification will avoid those questions
    4. It was not clear that disclosure and reporting of Placement Fees is required even when TRS will not be burdened by a Placement Fee
- The prior "as early as reasonably possible" in 12.4 was vague. Requiring delivery before authorization will clarify the timing requirement

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# Modification 9

*Modify Risk Parity benchmark and align review process to be consistent with other IPS benchmarks*

## Proposal

- Modify Risk Parity benchmark to "Hedge Fund Research Risk Parity Vol 10 Institutional" index
  - Remove requirement that benchmark needs to be reviewed each year (consistent with all other benchmarks)

## Rationale

- Hedge Fund Research introduced the benchmark in August of 2017 – making this the first published Risk Parity index comprised of manager returns
- Proposed benchmark is now constructed and managed by a dedicated index firm

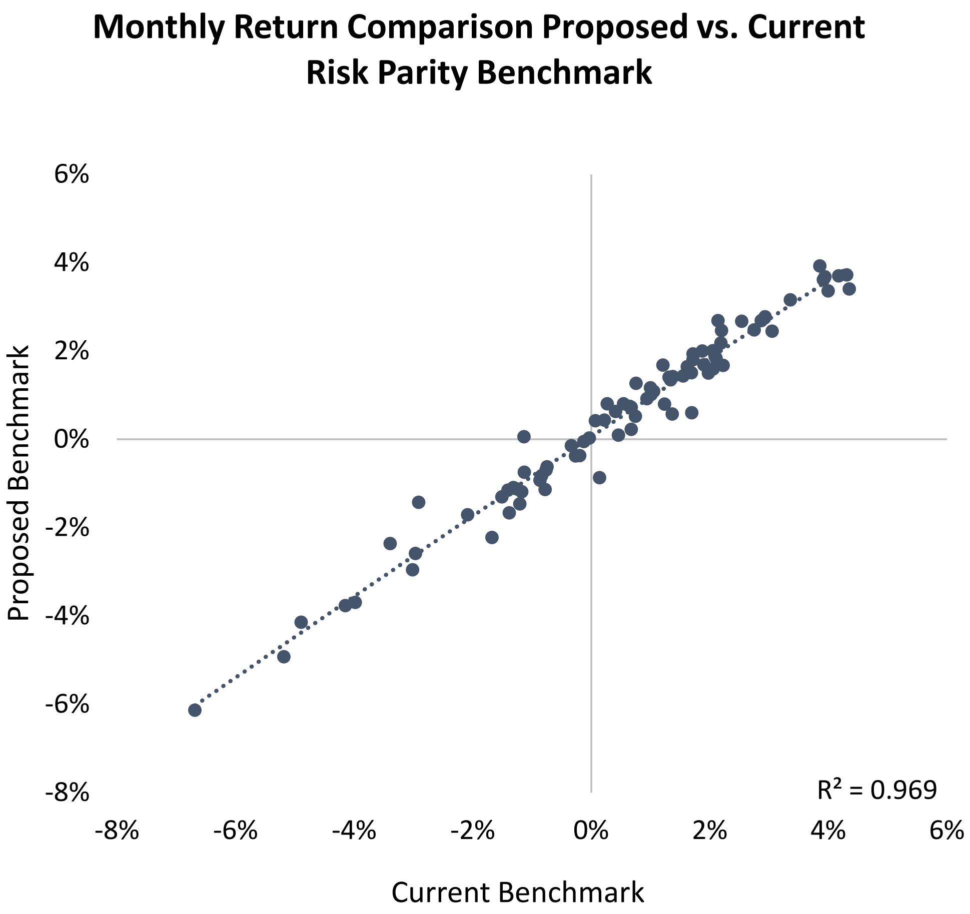
## Background Information

- The Risk Parity asset class previously lacked a professionally managed benchmark
- Accordingly, TRS created a custom benchmark – this is no longer necessary
- Current TRS benchmark is a custom blend of two external managers

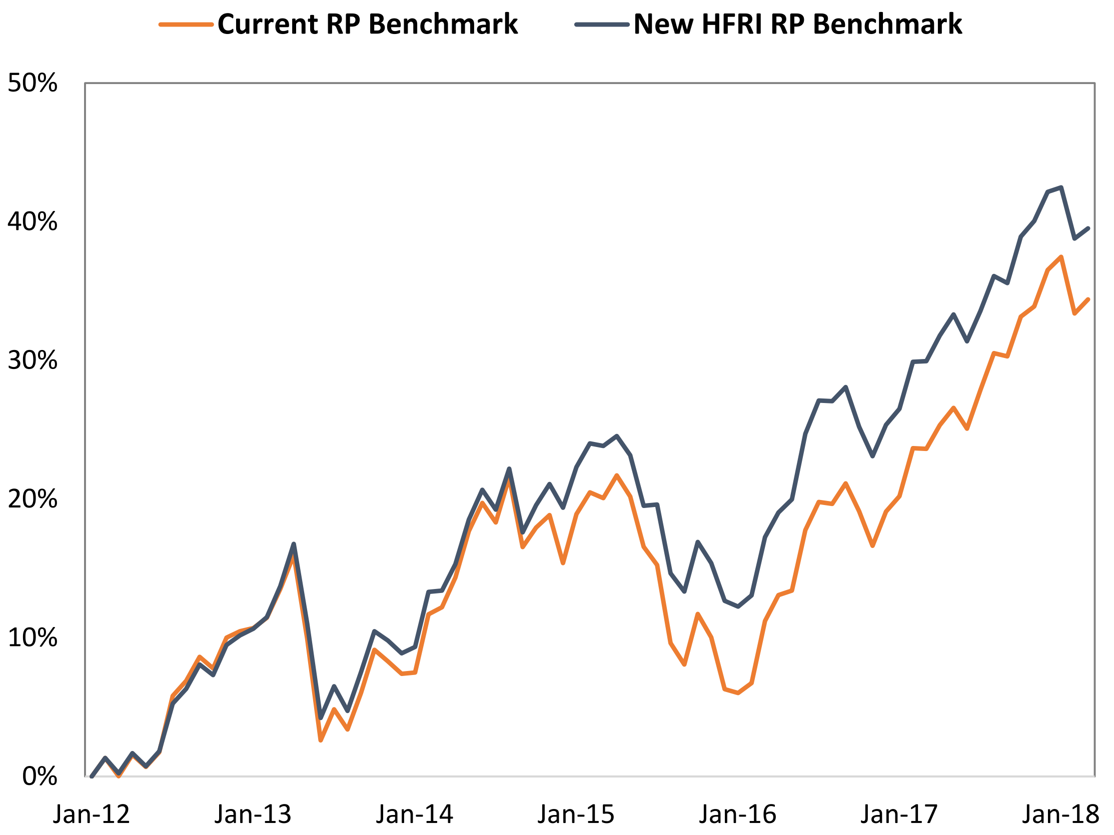
# Modification 9

*Proposed benchmark performs in line with current benchmark*

- Proposed and current benchmarks are highly correlated




- Proposed benchmark has outperformed current benchmark by 64 bp annually since 2012



# Singapore Proposal

Jerry Albright, Chief Investment Officer

July 2018

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MANAGEMENT DIVISION

# Agenda

I. London TRICOT Recap

II. Why Asia?

III. Why Singapore?

IV. Singapore Plan

# London TRICOT Recap

- Launched in 2015, TRICOT has been a success
  - The purpose of TRS in London was to increase our exposure to and better facilitate private markets deal flow, and in particular, increase the amount of available direct-/co-investment exposure.  Since inception of TRICOT:
    - 50% increase in private markets opportunities
    - $18 billion in transactions reviewed
    - Projected of over $10 million in management fees run rate savings and over $30 million in carry savings[1]
  - In addition to the measurable goals, TRS has benefitted in other ways:
    - The IMD is more knowledgeable about European/UK markets, making us better investors
    - Global participation has been good for the Texas brand

*TRICOT - 14 Curzon Street, London*

[1] *Source: TRS IMD. TRICOT Investments 09/1/15 through 12/31/2017.*

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# Why Asia?

- TRS already has substantial investment (circa $22 billion) in Asia
- TRS IMD sees increasingly attractive investment opportunities across the region:
  - **Key Markets** – Asia-Pacific is quickly growing in share for both private assets and public markets
  - **Credibility** – Having Asia-Pacific coverage will provide stronger contact and credibility to develop deeper and stronger investment partnerships
  - **Commitment** – Establishing local Asian coverage proves TRS's deep commitment to engagement in Asian markets required to participate in the active markets, particularly "club deals," co-investments, and direct investments
  - **Cultural Impact** – Creating strong partnerships will benefit with TRS immersed in the markets and cultures of Asia
- Investing in Asia from Texas creates challenges, which are mitigated by TRS "boots on the ground":
  - On-site due diligence involves 20+ hour flights each way
  - Reduce investment risks by TRS analysis and coverage via "boots on the ground"
  - Cultural barriers will be mitigated as TRS builds tenure, and further by incremental staffing of regional/local talent with experience in key cultures and languages in the region

# Why Singapore?

- Singapore and Hong Kong were both potential choices:
  - Singapore is "only one flight away" from substantially all investments in the entire Asia-Pacific Region (China, India, Australia):
    - Hong Kong (four hour flight from Singapore) is closer to mainland China, but Singapore has better access to the rest of the region
    - The entire region could be serviced from Singapore without necessity of more local offices
  - Singapore is culturally much easier for expats from Texas to assimilate
  - TRS has been offered support in the venture by the Monetary Authority of Singapore in the form of grants and incentives
  - Cost of living and doing business is substantially cheaper in Singapore than Hong Kong
  - There is a strong network of TRS Peers in Singapore:
    - Canadians – CDPQ (Caisse de dépôt et placement du Québec); OMERS (Ontario Municipal Employees Retirement System)
    - Asian – KIC (Korean Investment Corporation); National Pension Service of Korea; State Administration of Foreign Exchange (SAFE) of China
    - Local – GIC (Government of Singapore Investment Corporation); Temasek (Sovereign wealth fund of Singapore)

# Singapore Plan

- Determine what asset types would best be managed from Singapore
  - Public Equity and/or Private Markets
- Continue to engage with Monetary Authority of Singapore (MAS)
- Refine budget and staffing requirements
- Present Board with an update in Summer of 2019


# Advisor Review

Katy Hoffman, Chief of Staff

July 2018

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MANAGEMENT DIVISION

# Introduction

- Advisor contracts will expire on August 31, 2018
- At the April Board Meeting, IMD was instructed to provide the following:
  - Competitive review of AON and IMD recommendation for Advisor selection
  - Recommendation for other consultant contracts (Albourne, Townsend and Hamilton Lane)
  - Proposed Investment Policy Statement (IPS) changes to align with these recommendations

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# APPENDIX

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