CLIMATE POLICY INITIATIVE

Mobilising low-cost institutional investment in renewable energy

Major barriers and solutions to overcome them

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August 2017

The ROCKEFELLER FOUNDATION

A CPI Report

Acknowledgements

We would like to thank the investment industry professionals and other specialists for their valuable contribution to this study.

We thank CPI staff members Felicity Carus, Andrew Goggins, Gaia Stigliani, Muhammed Anwar and Will Steggals for their editorial and analytic contributions to this study.

The Rockefeller Foundation's Zero Gap Initiative provided the financial support for the analysis carried out in this project. The findings of the report are those of the authors, and do not necessarily reflect the views of the Rockefeller Foundation.

Descriptors

Sector	Renewables, electricity
Region	North America, European Union
Keywords	Renewables, institutional investors, pension funds, insurance
Related CPI Reports	Beyond YieldCos Mobilising low-cost institutional investment in renewable energy: Structuring the Clean Energy Investment Trust (CEIT) The Challenge of Institutional Investment in Renewable Energy

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About CPI

Climate Policy Initiative is a team of analysts and advisors that works to improve the most important energy and land use policies around the world, with a particular focus on finance. An independent organization supported in part by a grant from the Open Society Foundations, CPI works in places that provide the most potential for policy impact including Brazil, China, Europe, India, Indonesia and the United States.

Our work helps nations grow while addressing increasingly scarce resources and climate risk. This is a complex challenge in which policy plays a critical role

Executive summary

Since the financial crisis in 2008, interest in matching the predictable long-term liabilities of institutional investors with the low-risk cashflows from infrastructure projects has been steadily growing. However, making this natural match has been a struggle for all but the most sophisticated institutions, in part due to regulatory changes and a dearth of the specialist skills required to assess such investments. This has resulted in an impasse, with politicians urging investors to invest (or castigating them for not investing) in sorely needed infrastructure and investors blaming politicians for not producing a pipeline of well-structured projects.

In 2013, Climate Policy Initiative (CPI) published the results of a study into this issue (*The Challenge of Institutional Investment in Renewable Energy)*, which identified the barriers holding back investors from direct investment in the renewable energy sector.

Our analysis showed that the combination of these factors was **restricting the potential direct investment in renewable energy project debt and equity to less than 1% of total assets under management at institutions globally.**

We found that financial innovation – the creation of new investment vehicles that could allocate risks more efficiently to those best placed to manage them – could address many of these barriers, and in so doing, help to **lower the cost of wind and solar plants by 20%.**

Since that report was published, we have seen some financial innovation in the renewable space, with the emergence of green bonds and the growth-focused US YieldCo. However, none of these innovations have succeeded in sustainably addressing the barriers to investment we identified at sufficient scale to bring down the cost of capital.

In *Beyond YieldCos* (June 2016), the first paper in our series on *Mobilising Institutional Investment in Renewable Energy,* we outlined a new financial vehicle – the Clean Energy Investment Trust (CEIT) – designed from the ground-up to address many of these barriers (see Table ES1), building on recent experience with growth-focused US YieldCos.

Table ES-1: How a CEIT can mitigate barriers to direct institutional investment in renewables

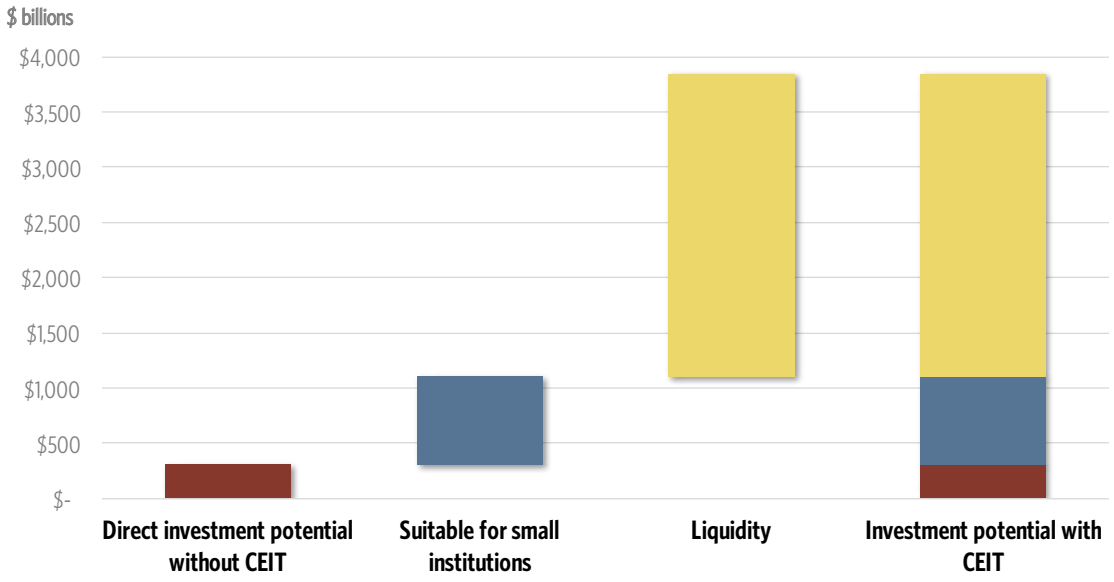
Why don't institutions invest in infrastructure?	Can a Clean Energy Investment Trust help solve these barriers and if so, how?
Illiquidity	**Yes** – by listing the share or bond. Though this does not guarantee trading volume, the availability of research and daily pricing will be sufficient for most institutions
Lack of internal resource to undertake due diligence	**Partly** – many institutions will be too constrained to be able to assess a renewable energy opportunity, but many will be helped by outsourcing asset due diligence to the CEIT manager
Unsuitability of investment structures and vehicles	**Yes** – through designing instruments that better meet institutional objectives
Not persuaded by risk/return or diversification properties	**Indirectly** – by providing confidential project data to partners, such as EDHEC Infrastructure Institute-Singapore to support a common source of historic performance data
Track record of external manager	**Partly** – will need to partner with or hire investment personnel with a track record to originate and structure the assets
High fees	**Yes** – lack of growth incentive will mean a lower fee Investment manager
Financial regulatory barriers	**Partly** – need to design products for specific markets, taking into account specifics of regulatory framework.
Energy market regulatory barriers	**No**

While the liquidity and yield focus of the YieldCo was well aligned with investor needs, we found that the emphasis on growth – though providing an initial boost in value for developers – turned the low-risk cashflows of a portfolio of infrastructure assets into a high-risk bet on the growth of the renewables sector. To avoid this problem, the CEIT must shed some of the growth-linked risks of US YieldCos and focus instead on the needs of investors more interested in long-term cashflow stability (regardless of the point in the macroeconomic cycle) than return enhancement. **This means that the CEIT must be a yield-focused, low-fee, publicly tradeable, closed-end investment vehicle.**

In this work, we develop the CEIT proposal further by updating our analysis of the barriers to institutional investment and assessing the potential for the CEIT to address them. **Our analysis has shown that a CEIT could increase the potential for institutional direct investment in renewable energy assets thirteen-fold from $305 billion to nearly $4 trillion.** This increase in investment supply should be sufficient to sustainably bring down the cost of capital for renewables to meet the needs of even a rapid transition to clean energy.

In order to realize this potential, the CEIT must be designed based on an understanding of the investment processes and objectives of different potential institutional investor groups. Our analysis shows that the CEIT should be particularly attractive for investors with "liability-driven investment" strategies, which split their asset portfolios into those dedicated to meeting long-term liabilities as they fall due and those seeking to enhance returns. As discussed in a companion

Figure ES-2: CEIT could increase potential institutional investment by a factor of thirteen



Source: CPI analysis

paper, *Structuring the Clean Energy Investment Trust* (the *Structuring* paper), the CEIT can be designed to provide similar if not better liability-hedging characteristics than the principal instrument currently used for the purpose, the investment-grade corporate bond (see figure 3).

The core investors for CEITs are likely to be larger public-sector pension funds with some experience in direct investment in real assets, looking for suitable liquid investment vehicles to take advantage of the liability-hedging benefits of renewables.

More sophisticated investors with existing direct investment portfolios are more likely to be a source of assets for the first few CEITs. Smaller, less sophisticated investors will likely wait until the CEIT market matures before investing.

Finally, we note that meeting the regulatory requirements of specific investors may require deviation from optimal CEIT design for liability-hedging. For example, while the CEIT is designed to have a cashflow profile akin to that of an investment-grade bond, the question of whether the CEIT should be structured as a bond or as unlevered equity may depend on the interpretation of Europe's Solvency II regulation for insurance companies. These and other specific regulatory challenges are likely to shape the specific structures employed by CEITs, as discussed in greater detail in our *Structuring* paper.

Table ES-3: CEITs can be attractive liability-hedging instruments, particularly for larger pension funds at first, but eventually even for smaller institutions

	ASSET RISKS		LIABILITY RISKS		
	Predictability of cashflows	Returns	Interest rate risk (risk free and spread risk)	Liability matching	Inflation risk
Clean Energy Investment Trust	Same as investment-grade bonds	Between investment-grade and high-yield bonds	Yes, longer durations could be available	Long-term cashflows with a more flexible profile	Depends on support scheme
Cash	Very high	Very low, in many cases, negative	N/A	On-demand	Poor
Investment grade bonds	High	Higher than cash, but negative in many cases	Yes, although duration usually shorter than liabilities	Long maturities available but standardised set of cashflows	Usually fixed rate, so poor
Derivatives	Depends on swap counterparty risk	Depends on structure	Can be much more flexible, but expensive	Long-term derivatives are expensive but can provide bespoke cover	Can be much more flexible, but expensive
High yield bonds	Lower than investment-grade bonds/higher default risk	Higher than investment-grade bonds, but lower than equity	Yes, although duration shorter than investment-grade bonds	Very few high-yield bonds with maturities longer than 10 years	Usually fixed rate, so poor
Equities	Lower than fixed income	Higher than fixed income	Poor	Very long investments, but uncertain cashflows	Varies, but imperfect as a matching tool

Contents

1. Introduction

Over the last decade, governments across the developed world have sought to promote economic growth through fiscal stimulus, including spending on infrastructure projects. However, with banks required to reduce debt levels in the wake of the financial crisis and government cuts to spending, politicians have turned to institutional investors – in particular, pension funds and insurance companies – to fill the capital gap.

As a result, billions of dollars of capital were committed to new equity and debt funds focusing on the infrastructure sector. However, despite large-scale policy efforts to stimulate the supply of projects, such as the Juncker Plan in the European Union, much of this capital has remained on the sidelines, "dry powder" waiting to be deployed into a limited supply of well-structured, low-risk assets.

In 2013, Climate Policy Initiative published a study (*The Challenge of Institutional Investment in Renewable Energy)* exploring the apparent impasse between policymakers and institutional investors. The study found that restrictions on investment designed to reduce the risk of institutions being unable to meet their liabilities (eg, on investment in illiquid assets; on concentrating in any single sector) capped the maximum potential OECD institutional investment in renewable energy projects at $259bn, less than 1% of assets under management. In practice, institutional issues, such as the cost of a direct investment team and the inflexibility of many investment mandates, were restricting investment volumes to only a fraction of that potential.

Since that first report, there have been large investments by pension funds and insurance companies across infrastructure sectors with a range of risk profiles, from low-risk German solar to higher risk UK offshore wind and Iberian toll roads. However, despite the headlines, the overall picture has not changed significantly.

Our analysis shows that while the maximum direct investment potential rose 19% to $305bn, the share of total assets under management (AuM) that it represents has remained static. Of this, only a fraction of this potential has been realized.

The key barriers to investment remain pervasive. Furthermore, the key actors have little incentive to change their practices to design products better suited for those investors. If the investment potential is going to be realized, financial innovation will be required to eliminate these barriers.

We find that a new investment vehicle that is closed-ended, publicly tradeable, low risk and low fee could expand the potential for institutional investment in renewable energy by a factor of 13.

As part of a year-long series of papers on *Mobilising Low-Cost Institutional Investment in Renewable Energy* supported by the Rockefeller Foundation, we have worked with investors and developers to understand which elements of existing investment opportunities they valued and which they considered undesirable. The first paper (*Beyond YieldCos),* published in June 2016, explained how recent innovations in financing models, such as the YieldCo in the US, failed because they had been designed to satisfy the objectives not of their investors, but of developers and utilities who were using the instrument to monetize their development pipeline. The paper also outlined our vision for an alternative, the Clean Energy Investment Trust or CEIT.

In the second half of 2016, we worked with a group of investors to turn this idea into a detailed design. The starting point was to re-examine the barriers to direct investment we identified in 2013. We then assessed the extent to which those barriers would prevent the same investors from investing in the CEIT and whether we could design it to attract a broader range of investors. Our findings from this investigation are the subject of this report. The conclusions set out in the paper are the culmination of six months of research, including formal interviews, ongoing conversations and discussions following presentations of our early findings at conferences in the US, Europe and UK.

In Section 2, we review how the potential for institutional investment in renewable energy projects has changed since our 2013 project, and assess progress in relation to the main barriers to direct investment.

In Section 3, we examine how new pooled investment vehicles can be designed to eliminate the principal barriers, eg, fund size and institutional issues such as investment process and tolerance for illiquidity risk.

We also assess why it is important to design the CEIT for investors interested in liability-matching and examine how to ensure that the CEIT is as attractive to those investors as alternatives, such as investment-grade bonds.

Finally, we conclude by discussing how some of the external barriers will influence investor demand for CEITs and have an impact on the design of the vehicles.

2. Institutional investment in renewable energy remains constrained

In 2013, we estimated that because of barriers, such as liquidity and institutional size, only $259bn (less than 1%) of the $70trn total OECD institutional assets would be available for direct investments in renewable energy.

When we re-did the analysis three years' later, we found that the position had hardly changed (still less than 1% of total assets). This means that while there has been much talk about increasing interest from institutional investors in infrastructure, little has changed.

This is because the same barriers exist as in 2013: access to these investments is still largely restricted to the 150+ institutions large enough to afford the cost of managing a direct investment team, allowing them to capture an illiquidity premium and charge high fees for third-party asset management services.

A catalyst will be required to trigger a step-change in potential by removing the barriers that are holding back most institutional investors, in particular, public pension funds and small insurance companies.

In 2013, we published a study, *The Challenge of Institutional Investment in Renewable Energy*, which surveyed the potential for institutional investors to invest in renewable energy companies and wind and solar generation projects. The study also analyzed the institutional, legal, regulatory and policy barriers hindering this investment potential from being realized and quantified the potential future impact of overcoming some of these barriers on the cost of financing projects in future.

In 2013, based on data available at that time from 2010, **we estimated that, of total institutional investor assets under management in OECD countries of just over $70tn, only $259bn was potentially available for direct equity and debt investment in renewable projects**. This is due to a variety of constraints on investors, including:

(a) The objectives of a given investor including the duration of its liabilities;

(b) Size – if the investment is large enough to justify the cost of building a direct investment team;

(c) Ability to invest in illiquid assets; and

(d) Constraints imposed by the objective not to focus a portfolio too much on a given industry sector (diversification).

Since that first report was published, the absolute level of direct investment in renewable assets has increased significantly in developed markets, mainly via allocations to third-party infrastructure funds. However, a review of the latest data (showing the picture as at the end of 2013) shows that the share of renewables as a proportion of all investment has not changed significantly. This means that new strategies will be required to enable this broader range of investors to participate"

Since that first report was published, the level of direct investment in renewable energy infrastructure in developed markets has increased significantly, along with allocations to third-party infrastructure funds. However, a review of the latest data (as at the end of 2013) shows that the picture has not changed enough to affect the cost of capital, and that new strategies will be required to unlock that still-significant investment potential.

2.1 Direct institutional investment potential barely changed from 2010 to 2013

We estimate that the total assets owned by OECD institutional investors have risen by 36% to over $96trn between 2010 and 2013. Of that, the assets under management (AuM) controlled by investors with long-term investment obligations has risen by nearly 14%.

As at the end of 2013, 39% of long-term investor AuM was held by life insurance companies (2010: 38%), with a further 28% (2010: 32%) owned by defined benefit and state pension funds and sovereign wealth funds.

Table 1: Institutional investor assets under management (billions of dollars)

INVESTOR GROUP	INVESTOR TYPE	OECD AuM ($BN) 2010	2013	CHANGE (%)
Insurance companies	Life and composite	17,360	19,884	14.5
	Non-life	3,456	3,970	14.9
	Reinsurance	1,199	1,463	22.0
	Total	22,015	25,317	15.0
Pension funds	Defined benefit & hybrid	11,813	11,231	-4.9
	Defined contribution	7,397	10,215	38.1
	Sovereign	2,127	2,331	9.6
	Total	21,337	23,777	11.4
Foundations & endowments		1,500	1,500	-
Sovereign wealth funds		587	1,099	87.2
Investment managers		28,679	42,638	48.7
Non-fund pension assets	Social security reserves in risk-free assets	2,721	2,873	5.6
	Book reserves	237	468	97.5
	Insurance contracts	3,497	8,500	143.1
	Other assets (eg, IRAs)	5,139	7,477	45.5
	Total	11,594	19,319	
Total including double counting		85,713	113,650	32.6%
Estimated double counting		-15,000	-17,217	
Total excluding double counting		70,713	96,433	36.3%
Total driven by long-term institutional obligations		**45,439**	**51,693**	**13.8**

Sources: OECD statistics. Our report published in 2013 is derived from 2010 OECD data; and our 2016 reported year uses OECD data from 2013.

Based on the latest data, we estimate that $305bn of long-term investor AuM would potentially be available for direct investment in renewable energy projects. This is 20% more than the $257bn as at the end of 2010 that we estimated in our last report. This represents 0.6% of total long-term investor AuM – exactly the same as at the end of 2010.

This implies that the principal constraints for institutional investors at the time of the last survey have persisted. As a result, investments remain well short of the estimated annual $1trn needed globally for a rapid transition to a clean grid, and therefore short of what would be needed to sustainably reduce the cost of financing such a transition.

Table 2: Constraints on direct investment potential 2010 vs 2013

CONSTRAINT	ASSETS ($BN) 2010	2013
OECD investors with long-term liabilities	**45,439**	**51,693**
Barrier 1 (strategy): Remove investors with short-term investment strategy	-10,980	-13,275
Barrier 2 (size): Remove investors with AuM < $50bn	-8,760	-7,929
Barrier 3: Institutional issues, including restriction on illiquid assets	-23,132	-27,440
Barrier 4: Restriction on portfolio concentrations in particular sectors	-2,310	-2,744
Potential direct investment in renewable energy projects	**257**	**305**

Source: CPI analysis.

2.2 Institutions increased their targets for infrastructure, but didn't meet them

The conclusion that investment potential has not changed significantly in recent years could appear at odds with the apparent "wall of capital" seeking to invest in "infrastructure" that has become a regular topic for discussion on investor conference panels and in trade and mainstream press articles.

The interviews we have undertaken as part of this project have borne out the increased enthusiasm of insurance companies and pension funds for the sector to the extent that many have increased their strategic or target asset allocation to infrastructure or created a specific infrastructure mandate for the first time. At the same time, according to the OECD Large Pension Funds 2015 Survey[1], most funds with a target allocation to infrastructure reported an actual allocation of just over half of the target level.

We can draw two conclusions from these dynamics:

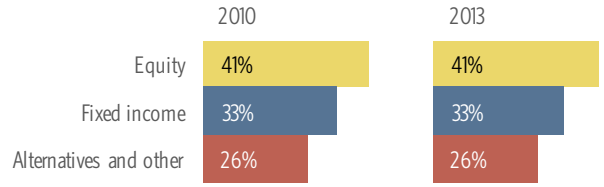
1. While institutional investor investment **potential** in renewable energy infrastructure has not changed materially, many more investors have **set targets to increase their infrastructure allocations.**
2. Achieving this target allocation has been more difficult – both because of a lack of suitable assets and because **existing investment vehicles are not ideally suited to meet the requirements of institutional investors.**

Indeed, as illustrated in figure 1, a trend for both pension funds and insurance companies is a reduction in the proportion of assets allocated to "alternatives". In most cases this category will include illiquid infrastructure funds, which are the most common way for institutional investors to invest in the sector.

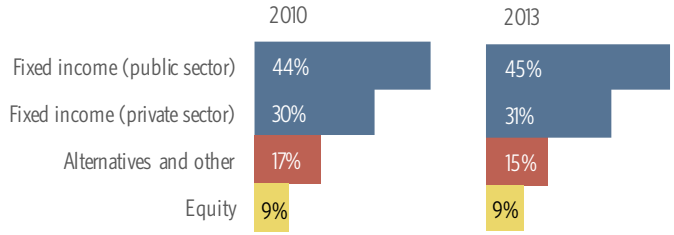
The reduction in that alternatives bucket and the increase in the proportion allocated to fixed income assets has come about even as fixed income yields have collapsed. This is the result of increasingly stringent financial regulation in the insurance sector and an increasing trend towards de-risking strategies in defined benefit pension funds as they seek to protect against rapidly rising funding deficits.

Figure 1: Asset allocation in 2010 and 2013

OECD pension funds



OECD life insurance companies



Source: OECD statistics

2.3 Previously identified barriers remain the principal constraints

Why has the maximum direct investment potential for these institutional investors not changed materially, and why haven't investors been able to achieve the enhanced targets they have set?

Our analysis shows that the investment innovations introduced since our last analysis have not been sufficiently successful to eliminate the principal barriers that we identified at that time.

In 2013, we identified and categorized the principal constraints on institutional investors. Some were unintended consequences from the design of energy policy and financial regulation. Others – such as restrictions on illiquid assets - were the result of sound risk management practice or a corporate strategy based on reasonable commercial objectives.

In table 3, we summarize the results of interviews with investors over the last 12 months regarding their level of interest in renewables and the main barriers they face to direct investment, grouping institutional investors into four categories with similar interests and facing similar barriers.

1 http://www.oecd.org/daf/fin/private-pensions/2015-Large-Pension-Funds-Survey.pdf

Table 3: Summary of investor groups and attitude towards renewable energy investment

INVESTOR GROUP	INTEREST IN RENEWABLES	MAIN BARRIERS TO DIRECT INVESTMENT
1. Very sophisticated eg, large insurance companies and corporate pension funds	(Significant) experience in direct investing in wind and solar projects	Finding the right projects to deliver either a target cashflow stream or target return
2. Broader in-house investment capacity but strict mandate restrictions eg, public sector/state-owned pension funds	Signatory to UN Principles for Responsible Investment (UNPRI) and with a clear commitment to managing climate risk. Experience of investing in funds and direct investment in other real asset sectors	Illiquidity and institution size are the principal constraints against direct investment. Group is split between those seeking liability-driven investment (LDI) benefits and those who are return-seeking. Mandate may be very prescriptive
3. Limited in-house investment capacity eg, mid-sized corporate pension fund, small and mid-sized life insurance companies	Allocating small mandates to renewable private equity funds promising high levered returns in low-risk projects. However, generally not content with offering of those funds.	Illiquidity and institution size are the principal constraints against direct investment. Reliant on (conservative) investment consultants for advice on more esoteric fund choice. New investment approach subject to significant internal reputational risk
4. Little in-house investment capacity eg, small pension fund	Actively learning about the sector as part of a range of "alternatives" but no investments yet	Illiquidity and institution size are the principal constraints against direct investment. Lack of in-house capacity and inability to value benefits of liability-driven investment (LDI) strategy

For most institutions, the cost of building and maintaining a direct team is still not worth the potential benefits on offer from direct investment in illiquid assets, let alone specifically in renewable energy projects. The number of institutions in the first category of sufficient size (AuM > $50bn) operating in OECD countries is small, with no more than 60 pension and sovereign wealth funds and 100 insurance companies controlling a total of nearly $30trn.

Even within this first group, only a handful have taken steps to build up expertise in renewable energy direct investment as many have been held back by other institutional barriers, for example, a reluctance to pay the salaries commanded by investment staff. Others (in particular, pension funds) may not even have the systems/capabilities to understand the potential portfolio-level benefits that such investments could provide.

Those that have entered the market with conviction (such as USS, Aviva and M&G) have decades of experience of investment in other types of "real assets" – in particular, real estate and public-private partnerships (PPPs). This group has used sector-specific expertise to their competitive advantage both to source investments for their own account and leveraging this to build market-leading infrastructure investment teams charging premium fees to third-party investors.

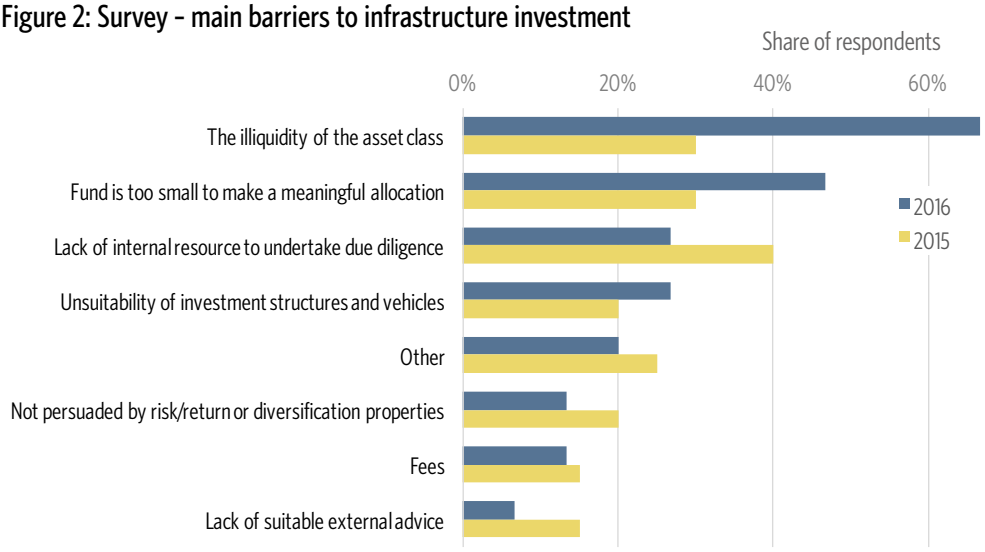
Critical to this competitive advantage is the ability to capture risk premia (either relating to illiquidity or arbitrage) for assets where the implied cost of capital in the market valuation is higher than their own. **It is therefore in the interests of those investors that these barriers persist, preventing larger volumes of low-cost institutional investment from competing and bringing down expected returns.**

For the rest of the investor base (the latter three categories of investors), our interviews and a series of recent investor surveys show anecdotal evidence that the principal barriers identified in 2013 remain in place. **The interviews (as well as the results from a survey by *Investment & Pensions Europe* magazine copied in figure 2) identified liquidity and fund size as the principal reasons why investors might not invest in infrastructure.**

The survey also points to inadequate investment design as a key barrier to investors seeking to fulfil their potential. While the investments on offer may be a poor fit, the continued oversubscription in new infrastructure fundraisings means that asset managers have few incentives to innovate. This and the structural asymmetry of information between asset owners and asset managers is effectively blocking institutional investors from fulfilling their potential in renewable energy.

So, while "pooled" investment vehicles could eliminate the barriers relating to fund size and lack of in-house specialist skills, in practice, what is needed is a party with different incentives to design a new vehicle starting from a more detailed understanding of investors' heterogeneous objectives when investing in infrastructure.

Figure 2: Survey – main barriers to infrastructure investment



Source: Investment and Pensions Europe. IPE Real Assets Institutional Infrastructure Survey 2016. Investors were asked why they were not active in infrastructure. Liquidity was the biggest factor, with 66.7% of investors citing it as a reason, more than double the proportion last year.

3. New investment vehicles can engage a broader pool of investors

A new, listed investment vehicle – the Clean Energy Investment Trust (CEIT) – with low fees, pooled transaction costs and outsourced asset due diligence could address liquidity and size constraints to investment.

As a result, the CEIT could expand the potential for institutional investment in renewable projects nearly 13-fold from $305bn to $3.8trn.

A CEIT designed for liability hedging, providing long-term stable cashflows, is generally a better match for most investor objectives than one focused on return-seeking.

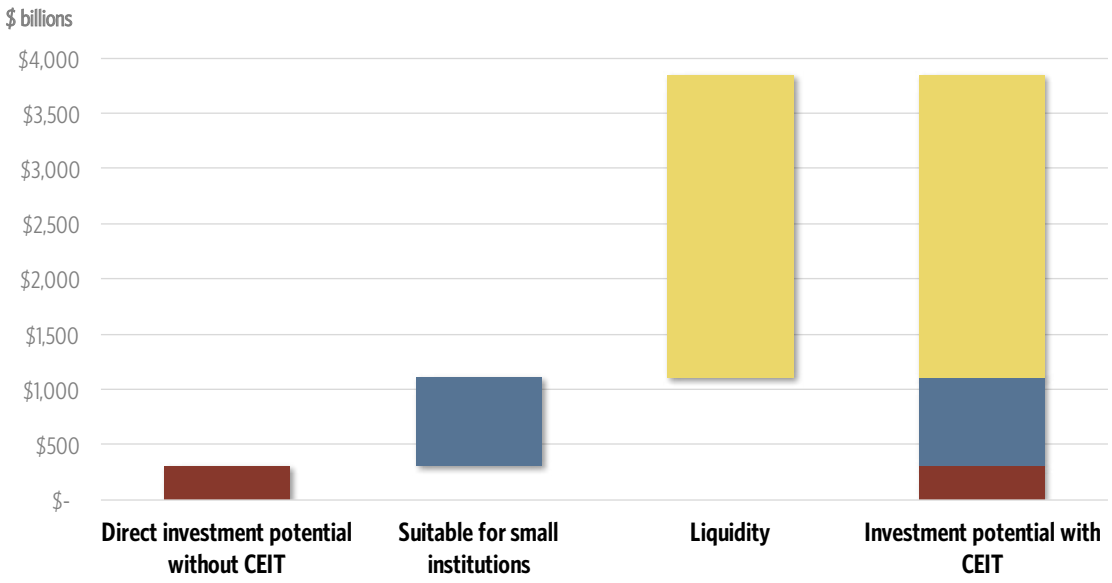
A CEIT can offer equivalent or better liability-matching benefits than other investments used for that purpose (investment-grade bonds) while offering a higher return.

Institutions with experience of direct investment in other real asset sectors such as large public pension funds will likely be the initial core CEIT investors

A new financial vehicle – the Clean Energy Investment Trust or CEIT – should be designed considering the objectives of, and barriers faced by, the last three investor groups identified in the previous section, ie, those not capable of making direct investments. The design should focus on the constraints which bite deepest and which affect a broad range of investor types: **fund size** and issues to do with **investment processes and organizational structure**, including tolerance for **illiquidity**.

Our analysis has shown that a CEIT could increase the potential institutional investment in renewable energy assets thirteen-fold from $305 billion to nearly $4 trillion. This increase in investment supply should be sufficient to sustainably bring down the cost of capital for renewables to meet the needs of even a rapid transition to clean energy.

Figure 3: CEIT could increase potential institutional investment thirteen-fold



Source: CPI analysis

The CEIT (see Table 6) will therefore need to be **a) pooled; b) listed/liquid; c) seen to be a source of liability-hedging, rather than return-seeking and d) relatively attractive compared with more familiar liability-hedging assets.** Investors will also need to be convinced that the size of the opportunity is worth spending time analyzing.

Table 4: How a CEIT could eliminate barriers to direct investment

Why don't institutions invest in infrastructure?	Can a Clean Energy Investment Trust help solve these barriers and if so, how?
Illiquidity	**Yes** – by listing the share or bond. Though this does not guarantee trading volume, the availability of research and daily pricing will be sufficient for most institutions
Lack of internal resource to undertake due diligence	**Partly** – many institutions will be too constrained to be able to assess a renewable energy opportunity, but many will be helped by outsourcing asset due diligence to the CEIT manager
Unsuitability of investment structures and vehicles	**Yes** – through designing instruments that better meet institutional objectives
Not persuaded by risk/return or diversification properties	**Indirectly** – by providing confidential project data to partners, such as EDHEC Infrastructure Institute-Singapore, to support a common source of historic performance data
Track record of external manager	**Partly** – will need to partner with or hire investment personnel with a track record to originate and structure the assets
High fees	**Yes** – lack of growth incentive will mean a lower fee Investment manager
Financial regulatory barriers	**Partly** – need to design products for specific markets, taking into account specifics of regulatory framework.
Energy market regulatory barriers	**No**

3.1 The CEIT should be a pooled, listed vehicle designed for liability hedging

The fund size constraint can be eliminated by most pooled investment vehicles, which reduce risk to the investor by outsourcing the cost of an investment team and pooling due diligence and other transaction costs.

This holds for existing pooled investment offerings, such as private equity funds and YieldCos and would hold for new pooled vehicles, such as the Clean Energy Investment Trust that we are proposing.

However, despite the elimination of the size constraint, the proliferation of private equity funds and YieldCos has not significantly increased institutional investment potential over the last few years.

There are two principal reasons for this: 1) private infrastructure fund investments are subject to strict asset allocation limits on "alternatives" in general and illiquid alternatives in particular; and 2) existing investment offerings do not compare particularly well with the non-renewable alternatives that they are competing against (private equity for infrastructure funds and listed equity for YieldCos).

A new investment vehicle is unlikely by itself to break down the institutional structures resulting in these barriers but it could sidestep them provided that:

(a) The new investment is structured in such a way as to fall outside the constraints of typical investment buckets, **ie, it must not be seen as "illiquid" or similar to typical "alternatives" investments**

(b) Managers should be able to demonstrate when marketing to investors that the instrument compares well with more familiar alternatives. **In this case, we envisage that the CEIT will compete against other liability-hedging instruments, such as investment-grade bonds.**

3.1.1 OVERCOMING THE ILLIQUIDITY CONSTRAINT

Illiquidity – ie, the risk that owners are not able to sell an asset quickly and at a predictable price – is a material one for insurance companies and regulated pension funds (such as corporate pension funds), whose primary obligation is to pay their policyholders when a claim is made.

Regulators, trustees and investment committees in most firms we have surveyed either prohibit investing in illiquid assets or limit the allowed holdings of the assets. This is because investment in illiquid assets

requires a different set of skills and the potential risk of making a bad investment decision can be higher if you cannot cut your losses when it becomes clear that a certain investment is a bad one.

One way of getting around the constraint on illiquid assets and the reticence to invest in novel products could be to work with institutions to help them try to change their mandates. However, for some, this could require a change in organizational structure or even an Act of Parliament. The institution-specific nature of mandate restrictions means that, by itself, this strategy is unlikely to achieve significant short-term impact.

A new publicly tradeable investment vehicle is more likely to have a greater impact over a shorter timeframe at lower cost.

Financial markets use a range of metrics to measure liquidity, including trading volume and bid-ask spread, which can vary very significantly between asset classes (most equities are typically more liquid by this definition than most fixed income securities). It is very difficult to predict *ex ante* how a new investment vehicle might perform compared with these metrics, as it will also depend on the size of the vehicle and whether it is included in any benchmark indices.

However, our research suggested that the definition of "liquidity" embedded in most mandate barriers is rarely a detailed one. A significant number consider a public listing to be a proxy for liquidity, as you can typically receive a daily market price and investment research for a listed security.

Thus, in order to overcome the liquidity constraint for most of these investors, a new investment vehicle would be considered "liquid" if quoted on public markets, even if its pricing reflects an "illiquidity premium" as would likely be the case if most investors expect to hold the security to maturity.

3.1.2 CONVINCING INVESTORS OF THE BENEFITS OF INFRASTRUCTURE AS A MEANS OF HEDGING LONG-TERM LIABILITIES

Most institutional investors remain participants in the traditional model of asset owner/asset manager relations, which has become established over the last few decades. This has seen asset management outsourced to external asset managers, advised by external investment consultants. This sees the role of in-house institutional staff relegated to the level of a procurer of investment services with strategy set and agreed with trustees based on a series of simple principles regarding portfolio construction, fiduciary duty and the prudent person principle.

While the model has had many benefits in the professionalization of the asset management industry, **the result has been that many asset owners and their trustees no longer have the skills or information to challenge the existing industry structure** despite a general frustration about lackluster active manager performance over the last decade relative to the level of fees charged.

The pervasiveness of current models of measuring asset manager performance – often based around the return achieved relative to a given benchmark – is particularly problematic. This is because:

The small size of most renewables investments mean that they have rarely been included in any public security benchmarks.

The model ignores the fact that such an approach to asset management has often resulted in assets whose performance has not been well correlated with the value of long-term liabilities.

This mismatch has thus been a contributor to the growth of unsustainable funding deficits in the pension industry.

By contrast, funding and solvency challenges have been much less prevalent in the insurance industry and in regulated pension funds. In the US, solvency regulation has forced funds to adopt a detailed approach to asset and liability modelling (ALM) since the late 1970s. In Europe, the recently implemented Solvency II framework encourages insurance companies to adopt detailed ALM processes in return for the ability to hold lower amounts of capital.

In both cases, an investment strategy based around ALM (otherwise known as a "liability-driven investment" or LDI strategy) can enable an institution to reduce its cost of capital by ring-fencing a separate "matching" portfolio, which will be held to maturity rather than traded and does not have to be marked to market.

Although not within the scope of most solvency regulation, in recent years, many defined benefit pension funds, have started to take more of an interest in risk management in general and liability-driven investment in particular. This has happened for a variety of reasons, including poor investment performance, the ageing of the workforce and the

strained balance sheets of public and private sector sponsors. In fact, UK-based assets in such defensive strategies have nearly doubled since the beginning of the decade.[2]

The literature on the "defensive", "liability-hedging" or "debt-like" properties of many infrastructure assets has grown significantly in recent years and we noted in the companion paper in this series *Beyond YieldCos* that contracted wind and solar assets have similar characteristics – they have long lives, their cashflows are not well correlated with the wider market (low beta) and often offer inflation protection.

A new, listed pooled investment vehicle which is structured to have a risk profile closer to debt than high-beta equity should in theory be an attractive proposition for those with liability-driven investment strategies. If they are convinced that the investment has similar features to an investment-grade bond (see our *Structuring* paper), over time, institutional fixed income teams could be able to manage these investments alongside the existing liability-matching portfolio.

Once a market has become established and investment consultants are familiar with the new concept, the potential investor base could be widened to include institutions who do not have a liability-driven investment strategy but are merely seeking a higher-yielding alternative to fixed income.

3.2 The CEIT can be a competitive liability-hedging instrument

Potential to invest will not translate into actual investment if an opportunity does not compare favorably with investments with similar characteristics.

The CEIT can only be successful if it is attractive to investors seeking to match long-term liabilities. This means that it must be seen by investors to provide cashflows, which are low-risk like other instruments used for liability-matching, such as investment-grade bonds.

Research published by the EDHEC Infrastructure Institute-Singapore provides ample evidence of potential appetite for such an instrument. Of the most attractive characteristics for institutions of infrastructure investment, risk-reducing characteristics are most important (and return-seeking characteristics, least important) for investors who have traditionally implemented liability-driven investment strategies. Sovereign wealth funds, the category with perhaps the most heterogeneous set of investment objectives, have the highest appetite for infrastructure as a source of return enhancement, while insurers have some of the lowest.

Figure 4 illustrates how, compared with private equity and YieldCo investments, the CEIT should provide a better match for the characteristics tested in the EDHEC study.

Figure 4: How CEITs and private equity meet investor objectives

	Clen Energy Investment Trust	US YieldCo	Private equity
Additional risk premia	✓	✓ ✓	✓ ✓ ✓
Diversification (low beta)	✓ ✓ ✓	✓ ✓	✓
Duration	✓ ✓	✓ ✓	✓ ✓
Inflation-hedging	✓	✓	✓
Low fees	✓ ✓ ✓	✓	✓
Liquidity	✓ ✓	✓ ✓	✓
Transparency	✓ ✓ ✓	✓ ✓	✓

Source: CPI Analysis

A CEIT should be a low-risk, long-term option and structured in such a way as to meet any regulatory requirements for inclusion in a liability matching portfolio.

As summarized in table 5, we have designed the CEIT by taking investor objectives into account so that it compares favourably with other comparable investments.

Predictable cashflows and a premium return

The CEIT would be an unlevered equity vehicle offering investors access to the underlying economics of operating wind and solar projects, while outsourcing asset due diligence to specialists and pooling transaction costs. In this, it has similarities to US YieldCos and master limited partnerships (MLPs).

However, as set out in the *Structuring* paper, we intend to use a range of measures to de-risk the cashflows so that the level of confidence in receiving the equity base case is akin to that of an investment-grade bond. At the same time, the use of an unlevered equity vehicle will enable the structurer to retain some flexibility. In Europe, unless national regulators regard the CEIT as a matching asset under Solvency II, it may need to be

2 KPMG review of Liability-Driven Investment (2015)

constructed as a debt vehicle, in which case we would seek to market it as an investment-grade bond.

A CEIT will pay (slightly more than) the market price for an asset and return substantially all the net cashflows from the asset over its life. Our analysis in the *Structuring* paper shows that the effective internal rate of return (IRR) or yield to maturity of the early vehicles could be more than 200 basis points higher than a Baa-rated investment-grade project bond, although this premium will gradually disappear as eventually competition for assets between CEITs will push purchase prices up and returns down.

Higher cash yield, shorter modified duration and similar maturities

The return profile from our CEIT will be closer to that of an amortising project bond than that of a vanilla corporate bond. Offering a steady, declining cash return over a period of up to 20 years, the CEIT will pay the return **of** capital as well as the return **on** capital from the first semester, as opposed to a vanilla corporate bond that returns the principal at maturity.

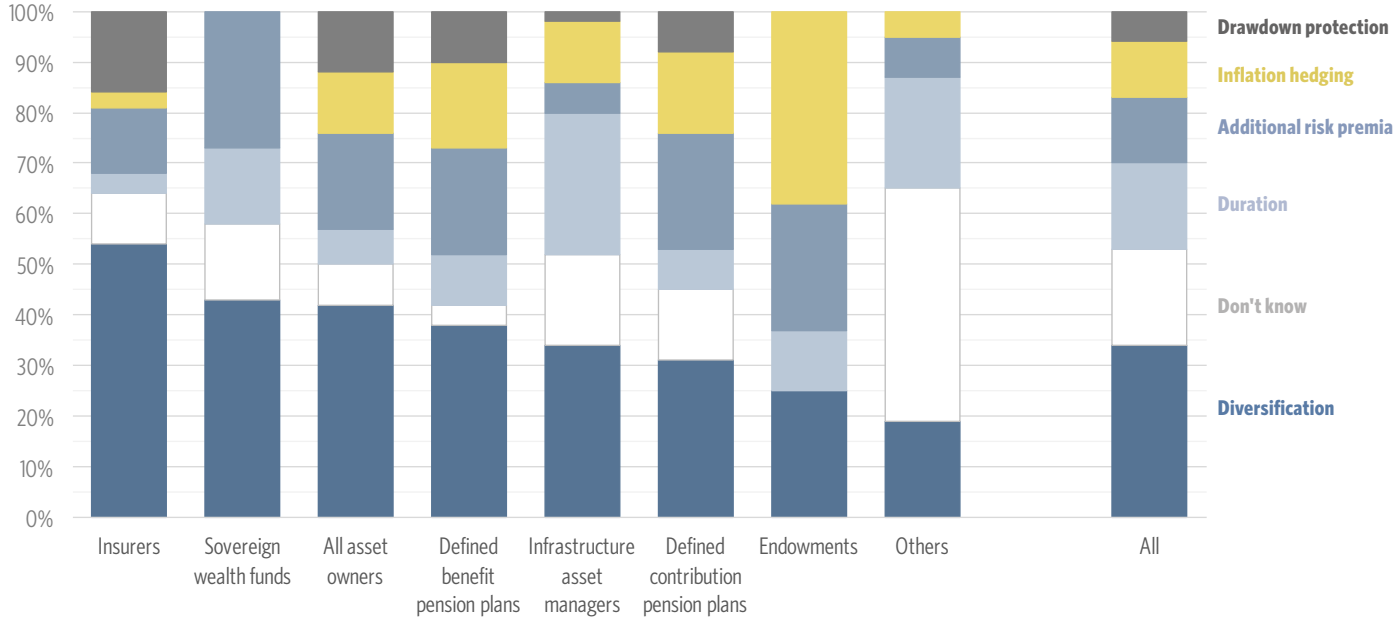
As we analyze in greater detail in the *Structuring* paper, the make-up of the asset portfolio will be influenced by investor views in relation to the desired cashflow profile and duration. We expect that investors will take differing approaches depending on their liability profiles. For example, for a pension fund starting to payout more than its contributions, a higher upfront cash yield may make the CEIT relatively attractive compared to an investment-grade bond with a similar maturity date.

Depending on its liability profile, an investor could prefer the CEIT to a vanilla corporate bond with a similar maturity date due to its shorter modified duration (ie, the expected change in value in response to interest rates). We reviewed the FactSet database of long-dated sterling-denominated bonds and found that the weighted-average duration was closer to 15 years than the 10 years we envisage for a 20-year CEIT.

As modified duration is a measure of the sensitivity of an asset's value to interest rate risk, in theory, a manager might prefer a shorter duration bond for a low risk portfolio. However, pension funds often seek to increase the duration of their asset portfolio to offset the interest rate risk in the longer-duration liability book and reduce exposure to that risk on a net basis.

Figure 5: Infrastructure appeals to different categories of investor for different reasons

What do you believe is the most interesting or unique aspect of infrastructure investing?



Source: EDHEC Infrastructure Institute-Singapore

For insurance companies and other companies whose regulators allow liability-matching assets to be held at book value, rather than mark-to-market, they may be agnostic as they will not be affected by the risk. They may thus be willing to accept lower duration-matching capacity for a certain stream of predictable cash payments if it provides a better match to liabilities.

Table 5: Comparison of CEITs vs other liability-hedging instruments

	ASSET RISKS		LIABILITY RISKS		
	Predictability of cashflows	Returns	Interest rate risk (risk free and spread risk)	Liability matching	Inflation risk
Clean Energy Investment Trust	Same as investment-grade bonds	Between investment-grade and high-yield bonds	Yes, longer durations could be available	Long-term cashflows with a more flexible profile	Depends on support scheme
Cash	Very high	Very low, in many cases, negative	N/A	On-demand	Poor
Investment grade bonds	High	Higher than cash, but negative in many cases	Yes, although duration usully shorter than liabilities	Long maturities available but standardised set of cashflows	Usually fixed rate, so poor
Derivatives	Depends on swap counterparty risk	Depends on structure	Can be much more flexible, but expensive	Long-term derivatives are expensive but can provide bespoke cover	Can be much more flexible, but expensive
High yield bonds	Lower than investment-grade bonds/higher default risk	Higher than investment-grade bonds, but lower than equity	Yes, although duration shorter than investment-grade bonds	Very few high yield bonds with maturities longer than 10 years	Usually fixed rate, so poor
Equities	Lower than fixed income	Higher than fixed income	Poor	Very long investments but uncertain cashflows	Varies - but imperfect as a matching tool

Source: CPI analysis

3.3 Large public pension funds will likely be the initial core investors in CEITs

Unlike the barriers that the CEIT can help to overcome, the development of the CEIT market by itself is unlikely to have an impact on the processes employed by different groups of investors. Rather, those structuring CEITs will need to draw on knowledge of the increasingly wide range of investment objectives and processes to identify a target set of investors, which in turn will influence the design of the CEIT.

The initial CEITs should be designed with the needs of their likely long-term buy-and-hold owners in mind, even if these investors may not make up a large proportion of the investor base for the first CEIT.

But the greatest impact over time of the CEIT will come by unlocking the capital of investors that lack the in-house expertise for direct investment in renewable energy assets. The earliest CEIT may require yield enhancements to satisfy the demands of the very sophisticated initial investors, but as the product establishes a track record, its core benefits - low-risk, low-fees, diversification and transparency - will attract a broader group of participants and eliminate the need for a premium.

The CEIT will not by itself redress the balance between the major parties in the fund management industry, but it will challenge the prevailing high fee model by providing an attractive risk-return profile at relatively low costs. The smallest institutions are likely, therefore, to gain access to CEITs after the class gains sufficient maturity and scale to be included in commonly marketed third-party investment products.

In summary, our core target investors for CEITs in the near-term are likely to be the more sophisticated public pension funds in the second group – particularly those seeking liability matching portfolios but unable to access renewable assets due to liquidity restrictions – with more sophisticated insurance companies providing some of the CEIT assets. We expect that as the CEIT market matures and scales, it will also help unlock investment from smaller, less sophisticated investors.

Table 6: Potential participation of different investor groups

INVESTOR GROUP	INVESTMENT PROCESS	POTENTIAL PARTICIPATION IN CEIT
1. Very sophisticated	Significant experience of direct investment in infrastructure, including renewables	Less likely to be long-term holders of the CEIT but significant in the short-term
2. Broader in-house investment capacity but strict mandate restrictions	Significant experience in some "alternatives" sectors – most likely including real estate and some infrastructure. However, have processes/mandate barriers making investment in new products difficult	Significant in the short- and long-term, although some may miss out on the first vehicles if it takes time to amend restrictive investment mandates.
3. Limited in-house investment capacity	In-house asset management capability for "vanilla" equity and fixed income products tracking indices but limited capability to assess "alternatives" or new product opportunities	Less likely in short-term, unless CEITs become part of an index or unless the institution has a "green" mandate. Otherwise subject to conservatism of investment consultants.
4. Little in-house investment capacity	Very little in-house asset management capability	Not in the short term, but significant in the longer-term, through third-party managers

Source: CPI analysis

Investor group 1

The most sophisticated investors don't need the CEIT for renewables, but the first CEITs could allow them to profit from and diversify their direct investment portfolios

Many large insurance companies and corporate pension funds already have access to these assets at market prices. Many of them may have environmental, sustainability, and governance (ESG) mandates that have driven them to set up specific green bond allocations. They may be keen to invest primarily for the CEIT's green characteristics.

However, many more may have shorter-term objectives including a) using the CEIT as an exit vehicle for assets they already have direct investments in; b) seeking to benefit from any yield premium required for a successful listing of the first vehicles by buying shares and then selling them at a profit to less specialist investors a few years later when the concept has become more mainstream and the yield has reduced. As a result, these investors may be important sources of assets for the first CEITs.

Investor group 2

Sophisticated investors with mandate barriers to direct investment in renewables are a significant short and long-term target for CEIT investment

A more sustainable source of capital for CEITs comes from the public-sector or state-owned pension funds for whom the primary value in the investment would more likely be the long-term liability matching benefits.

However, while these institutions are able to recognize the potential benefits of renewables investment, they are often stymied by overly prescriptive or rigid mandates – particularly limits on illiquid holdings.

The CEIT is built to unlock this class of investors, and the question about their potential to investment in the market in significant volumes is one of when, rather than if.

In practice, however, not all of these institutions will be able to invest immediately in CEITs. In institutions where senior investment staff have little discretion to make decisions on new products, the decision to invest in a CEIT may require a change in mandate, process or Act of Parliament. Amongst other things, managers will need to convince their internal stakeholders that a) an investment in the CEIT could meet its objectives as a matching asset; b) that it offers potential advantages over other types of matching asset; and that c) the overall size of the opportunity is worth spending time analysing. Many institutions will only be able to make this case after multiple CEITs establish an investment track record. Future participation at scale for any given investor may therefore be more likely be as one element within a broader strategic shift in investment philosophy – perhaps in response to climate change or in changing the investment strategy to focus less on asset class silos and more on cross-asset class investment risk "factors".

Investor group 3

Less sophisticated investors with appetite for only vanilla debt or equity products are likely to benefit from CEITs in the long-term

Mid-sized corporate pension funds and life insurance companies with less in-house capacity to analyze infrastructure or other real asset opportunities are less likely to be implementing liability-driven investment strategies or to recognize the potential benefit of CEITs as a method of diversifying a portfolio across asset classes.

Investment staff within this group often have less discretion to make investment decisions than more sophisticated investors, as investment mandates require them to use the advice of investment consultants and to focus on passively rather than actively managed funds, such as index trackers.

In the short-term, creating CEITs so that they are large enough to enter major indices is the key to attracting this group as investment consultants are unlikely to recommend a new product without a track record. In the longer term, this group could be significant potential investors provided that the market develops a track record and investment consultants become literate in the model.

Investor group 4

The smallest institutions will likely access CEITs through investment managers as the market matures

Small pension funds and other investors with limited staff and little direct investment capacity in-house are affected by many of the same internal process barriers as investor group 3. These firms have been molded by the traditional model of institutional investment, asset management outsourced to external asset managers, advised by external investment consultants. This sees the role of in-house institutional staff relegated to the level of a procurer of investment services with strategy set and agreed with trustees based on a series of simple principles regarding portfolio construction, fiduciary duty and the prudent person principle.

The question of whether third party asset management (in particular for actively managed assets/ funds, such as infrastructure) is worth the money being charged is a regular topic of investment conferences and articles in the financial press. However, the pooling of investment expertise in an increasingly consolidating fund management industry means that many asset owners and their trustees may not have the skills or information to challenge the existing industry relations.

4. Conclusion

A sustainable reduction in the cost of capital for renewable energy projects will take a multi-pronged approach, which could herald a range of broader changes to institutional investor/asset manager relations across a range of timescales.

The most effective catalyst will depend on the market. In many developing markets, the key to reducing costs of capital may involve instruments, such as cheap currency hedging facilities, which open up access to cheaper non-domestic capital or may simply involve improving the transparency of a given renewable energy regulatory framework.

These solutions are less relevant in the more stable regulatory (if not political) environments in the large developed markets that this study has been focused on (the USA, the UK and the Eurozone). The depth, liquidity and sophistication of capital markets in these areas make these potentially powerful agents for change.

We have shown in previous analyses how financial innovation can be that catalyst. Though the high-growth US YieldCo model ultimately failed, the initially huge appetite for investment in SunEdison and its Terraform Power and Terraform Global YieldCos illustrates that a new model can broaden and deepen the pool of low-cost capital available to finance renewable energy projects.

The Clean Energy Investment Trust could have a similarly transformative impact on the renewable energy sector. As with direct investments in wind and solar projects, the likely investors in CEITs will change over time, starting with the most sophisticated investors, before becoming mainstream. However, if investors can be convinced of the CEIT's debt-like properties, its impact on lowering the cost of renewable energy finance will not only be material, but sustainable.

As discussed in greater detail in the *Structuring* paper, the **development of a sustainable CEIT market in the US could enable a 15-17% reduction in the cost of electricity for wind** (note 1). Our analysis shows that purchasing generation from new wind would be cheaper than continuing to operate an additional 30.5GW of (mostly) coal plants across the US. That is, electricity customers could save money while reducing CO_2 emissions by 154.5 million tons – equivalent to taking 28.2 million cars off the road (note 2). As a result, we believe that the development of a CEIT market could provide policymakers, regulators, and businesses the confidence to substantially accelerate the pace of the transition to a clean electric grid.

Note 1: We have assumed continued use of the full $23/MWh production tax credit (PTC) for projects in the next four years, monetized with tax equity financing. While tax equity financing is in place over the next four years, the potential impact of the CEIT capital cost reductions on the overall cost of electricity is reduced from 15%-17% down to roughly 10%.

Note 2: Recent estimates (see Chadbourne & Parke's *Cost of Capital 2017* webinar) suggest that between 30-70GW of wind projects across the US over the next four years have secured turbine contracts that will enable them to access the full PTC.