



FINANCING FOR INFRASTRUCTURE

NATIONAL INFRASTRUCTURE COMMISSION

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**BACKGROUND EVIDENCE: REVIEW OF THE UK INFRASTRUCTURE FINANCING
MARKET**

FINAL REPORT

Submitted by:

Cambridge Economic Policy Associates Ltd (CEPA)



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LIST OF ACRONYMS

Bid Weighted Cost of Capital (BCCC)	Macquarie European Infrastructure Funds (MEIF)
Cambridge Economic Policy Associates (CEPA)	National Grid Electricity Transmission
Capital asset pricing model (CAPM)	National Infrastructure Commission (NIC)
Civil Aviation Authority (CAA)	Offshore Transmission (OFTO)
Competitively Appointed Transmission Owners (CATO)	Ontario Municipal Employees Retirement System (OMERS)
Contract for Difference (CfD)	Operation, maintenance and repair (OMR)
Department for Transport (DfT)	Pensions Infrastructure Platform (PIP)
European Investment Bank (EIB)	Private Finance Initiative (PFI)
Greater Manchester Pension Fund (GMPF)	Private Finance 2 initiative (PF2)
Green Investment Bank (GIB)	Public Private Partnership (PPP)
High-Speed 2 (HS2)	Rail Development Group (RDG)
Infrastructure Journal database (IJ Global)	Regulatory Asset Base (RAB)
Intercity Express Programme (IEP)	Regulatory Capital Value (RCV)
Japanese Bank for International Cooperation (JBIC)	Renewable Obligation Certificates (ROCs)
Final Investment Decision enabling for Renewables (FIDeR)	Retail Price Index (RPI)
German Development Bank (KfW)	Rolling Stock Operating Company (ROSCO)
Greater London Authority (GLA)	Sovereign Wealth Fund (SWF)
Great Western Mainline (GWML)	Thames Tideway Tunnel (TTT)
Heathrow Airport Limited (HAL)	The Greater Manchester & London Infrastructure Pension Fund (GLIL)
Her Majesty's Treasury (HMT)	Train operating companies (TOCs)
Infrastructure Provider (IP)	Transmission Network Use of System (TNUoS)
London Pension Fund Authority (LPFA)	Tender Revenue Stream (TRS)
Local Loop Unbundling (LLU)	UK Guarantees Scheme (UKGS)
Low Carbon Contracts Company (LCCC)	Weighted Adjusted Cost of Capital (WACC)

1. INTRODUCTION

Cambridge Economic Policy Associates (CEPA) has been appointed by the National Infrastructure Commission (NIC) to undertake research into the strategic financing choices made by the private sector when investing in infrastructure projects in the UK and the role that public funding and financing interventions can play in facilitating greater private investment. This report provides an overview of the UK infrastructure market over the past ten years.

1.1. Purpose of the assignment

The aim of this project is to provide the NIC with research that is suitable for publication and which examines a range of issues related to the provision of private finance for infrastructure projects to support the development of the National Infrastructure Assessment. The first part of the study reviews trends in the provision of private finance to infrastructure investments in the UK over the last ten years – with a particular focus on new-build infrastructure projects; large-scale expansion projects; and investments in existing assets that require considerable financing for ongoing maintenance. In the second part of the study we interrogated the evidence-base to address some of the key strategic questions facing the UK, such as:

- Considering the extent to which the evidence supports the contention that there are insufficient ‘investable’ projects that match the requirements of institutional investors.
- Examining the key variables and considerations that determine whether a project requires some form of government support to be investable and bankable.
- Identifying and then assessing the value for money of the main government support mechanisms that can be used to assist an infrastructure project to attract private finance. This will include reviewing the approaches that have been used in other countries and will take account of the devolution agenda in the UK.
- Infrastructure projects (which include greenfield, expansions, and or significant investment for ongoing maintenance) of a reasonable scale.

1.2. Scope of the work

The study is focused on the following:

- UK infrastructure projects in the transport, energy, water & wastewater, digital communications, solid waste and flood risk management sectors and relevant international comparators for these sectors (defined as the economic infrastructure sectors throughout report).

- Projects that have or are seeking to attract private finance, either alone or in combination with public funding and / or financing. The work does not consider projects that rely solely on public finance.

1.3. Objectives of this report

The report provides:

- An analysis of trends in the provision of private finance to UK infrastructure investments over the last ten years. This focuses on trends in the provision of finance to new-build infrastructure projects; large-scale expansion projects; and investments in existing assets that require considerable financing for ongoing maintenance.
- A review of the sources of finance for UK economic infrastructure projects, focusing on the role that institutional investors have played within the market.
- Case studies of a number of large UK infrastructure projects that have reached financial close in recent years. The aim of the case studies is to identify the factors that have been key in enabling the projects to attract private investors with a particular emphasis on the nature of the policy support mechanisms that have been used.
- International case studies that provide an analysis of the different examples of support mechanisms that have been used internationally.

The aim of the analysis is to determine the extent to which there is evidence to support the contention that there is a lack of bankable infrastructure projects in the market that suit the needs of the institutional investors specifically; and also to define the nature of the support mechanisms that can/ have been used by policy makers to enable infrastructure projects to reach financial close.

1.4. Structure of the report

The report contains the following sections:

- Section 2 of the report presents an overview of the trends in the provision of private finance for UK infrastructure projects over the last ten-years.
- Section 3 examines the role played in the market by the different sources of finance.
- Section 4 presents case studies on a sample of the large UK infrastructure projects that have been received support from different government support mechanisms.
- Section 5 presents a summary of a sample of case studies to demonstrate how governments around the world have made use of different mechanisms to support the implementation of infrastructure projects.

- Section 6 sets out the conclusions emerging from the analysis.

Annex A and B include further details of the UK and international case studies reviewed respectively, while Annex C includes a bibliography.

2. RECENT TRENDS IN THE PROVISION OF FINANCE FOR UK INFRASTRUCTURE PROJECTS

This section provides an overview of recent trends in the provision of private finance for UK infrastructure projects. It reviews evidence on the number of transactions, size and sector split, relying on evidence available in the public domain obtained through desk-based research.

2.1. Sources of information and approach

To complete the analysis we have made use of the following sources of information:

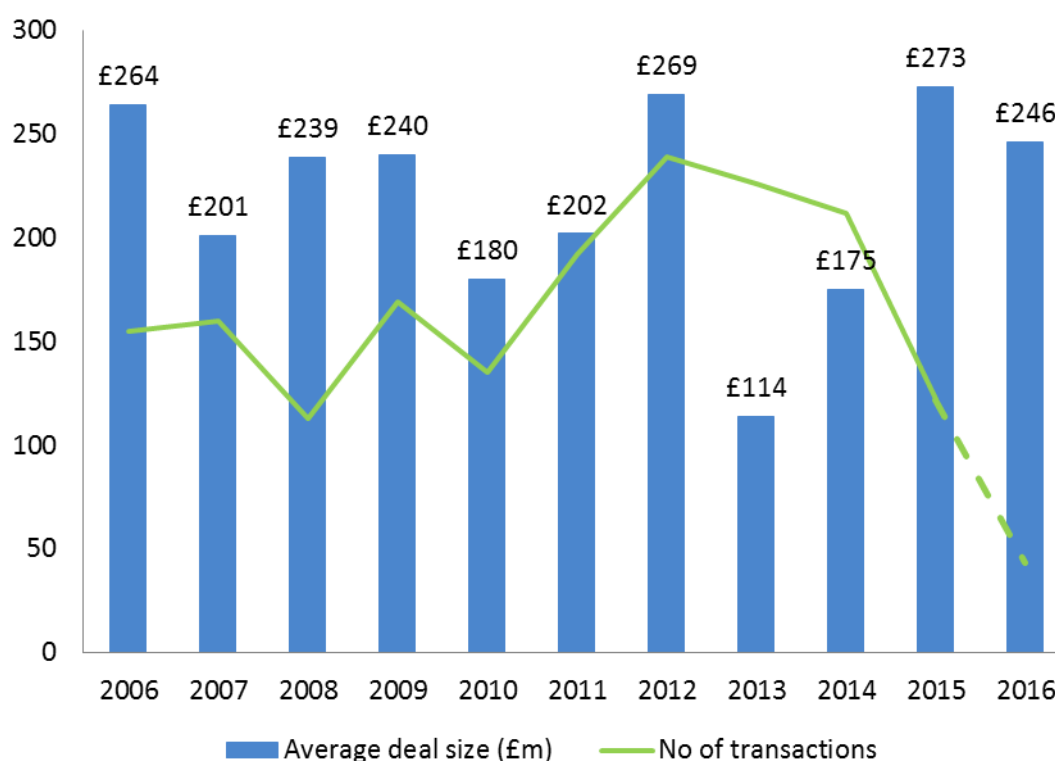
- the Infrastructure Journal database (IJ Global) was used to access data on transactions that have been completed in the focus infrastructure sectors;
- the Preqin infrastructure database and their publications that draw on information in their database;
- a rapid literature review to identify relevant reports on the topic; and
- our own analysis of relevant projects developed as part of other CEPA work and / or our own involvement in those projects.

2.2. Overview of trends in the UK infrastructure market

A review of the projects that have reached financial close suggests that the UK market for infrastructure projects has been broadly stable over the past ten years – both the number and average size of transactions achieved in 2015 is comparable to ten years ago.

While both the number of projects reaching close and average deal size have varied significantly across the years there is no evidence to suggest that over the ten-year period there has been a significant fall in the number or size of projects accessing finance since the financial crisis.

Figure 2.1: UK infrastructure projects to reach financial close, £m (2016 1st quarter only)¹



Source: Preqin infrastructure database

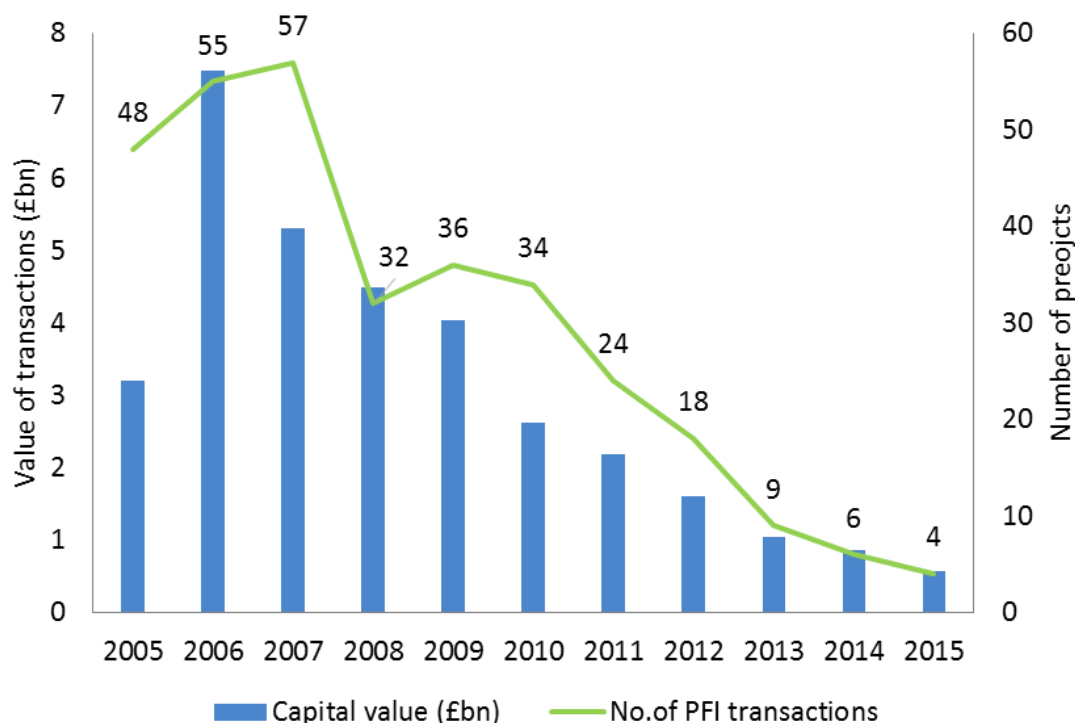
Behind this high-level trend there have been some important changes to the type of projects that have been successful in attracting finance; in particular the decline of the market for Private Finance Initiative (PFI) projects and the growth in the number of renewable energy transactions that have reached close.

2.2.1. Decline of the PFI market

One of the important trends to note over the last ten years is the decline in the use of the PFI model, as shown in Figure 2.2 below. Back in 2006 and 2007 there were over fifty transactions each year, with over £5bn in transaction value in both years. By 2015 just four PFI projects reached close with a transaction value of approx. £0.6bn, despite the introduction of the Private Finance 2 initiative (PF2). According to the data the low level of new PFI deals is expected to continue in the future, with only £1bn of PFI projects in the procurement pipeline as of March 2016.

¹ Note the chart includes all projects to reach financial close including social infrastructure projects and those that have relied on public financing.

Figure 2.2: UK PFI projects to reach financial close (£bn)



Source: HM Treasury, PFI summary data

Although in the immediate aftermath of the financial crisis we understand that the banking sector faced financing constraints, over the latter half of the decade under consideration, the fall in PFI transactions can largely be attributed to two factors. First, the use of PFI became less attractive due to changes in accounting rules regarding PFI projects and concerns around value for money. Second, fiscal consolidation resulted in reduced government spending on social infrastructure and the phasing out of PFI credits that were previously available to government departments and local authorities.

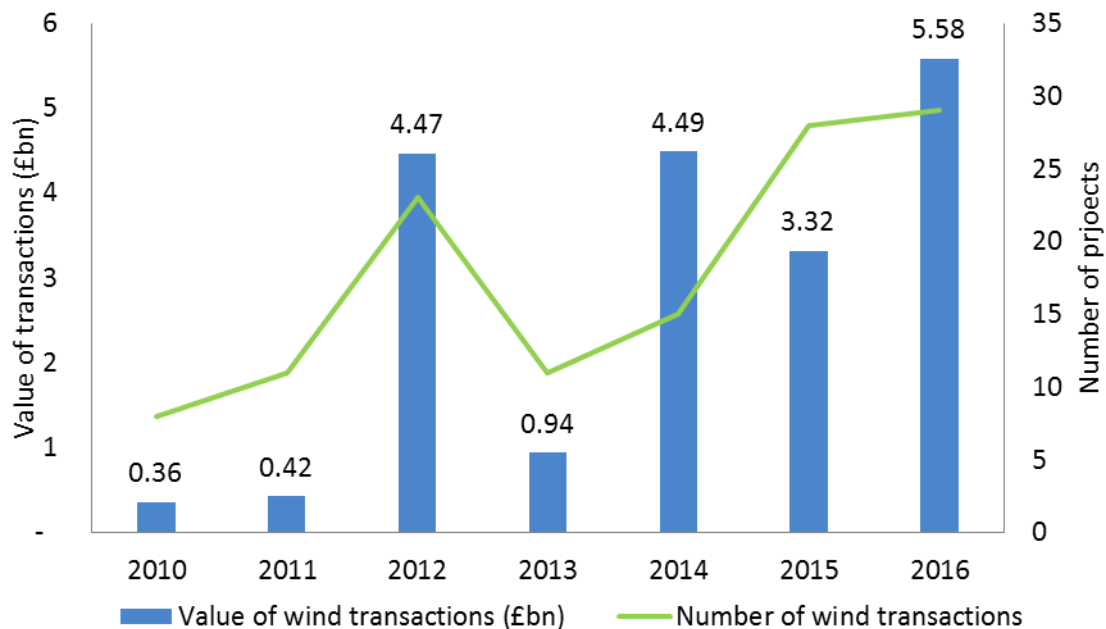
This may have meant that the market has had to develop bespoke deal structures for each new project, which can be inherently more expensive and time consuming and creates more uncertainty around the nature of the risks for individual transactions for potential investors. As we discuss below, to some extent this may have been compensated for by the emergence of sector level programmes, in particular in the renewables sector – but obviously not every sector can/ has been in a position to develop a programme that brings a group of investment opportunities to market.

2.2.2. Emergence of renewable projects

One of the other main trends from an overview of the UK infrastructure market is the large number of transactions in the renewables sector (particularly wind-related projects), which may have helped to fill the gap in the market following the decline in the volume of PFI transactions.

The figure below shows that the number and value of renewable energy wind transactions reaching financial close has increased significantly since 2010. A large driver of the increase in the number of transactions has been the introduction of the Offshore Wind transmission arrangements We examine this in more detail in Section 4 and a case study is provided in Annex A.

Figure 2.3: UK renewable wind deals reaching financial close 2010 to 2016 (£bn)



Source: IJ Global database, CEPA analysis

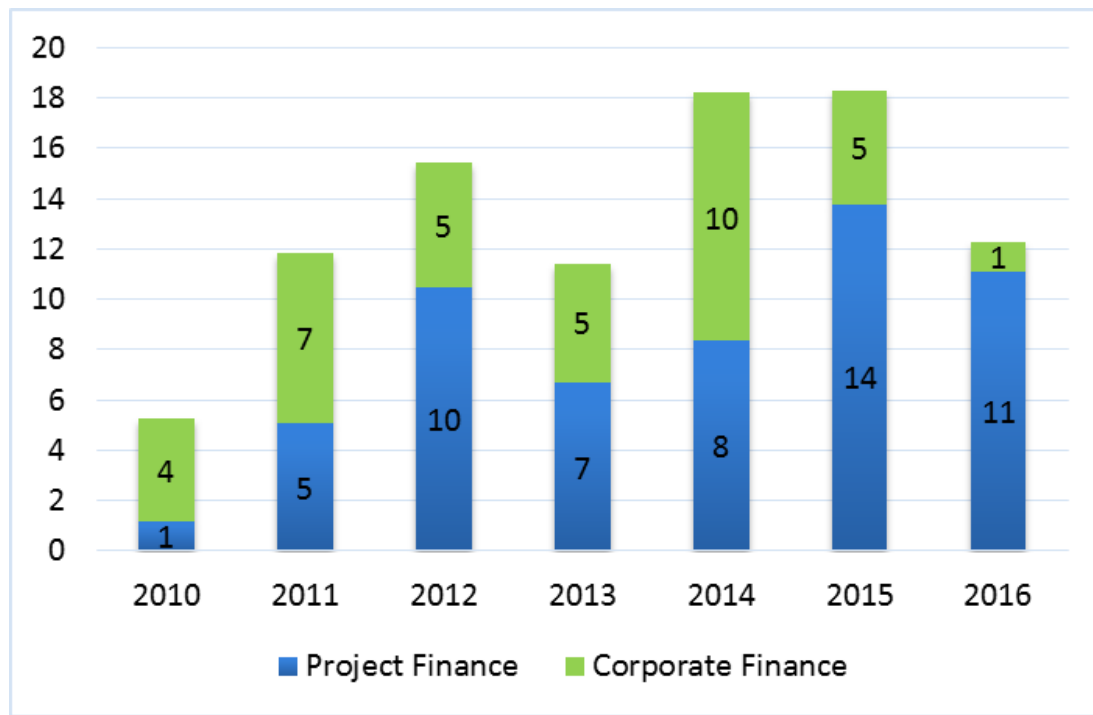
2.3. Trends in the UK Economic infrastructure sectors

Looking specifically at NIC's target infrastructure sectors, the available evidence suggests that recent years have seen an increase in the number and size of projects that have been successful in accessing private finance to reach financial close.

The figure below shows in 2010 a total of just over £5bn of finance was attracted for the economic infrastructure sectors through both project finance and corporate finance. This

increased to over £18bn in 2014 and 2015; while 2016 may not reach the transaction value of the last few years it could still be close to £15bn.

Figure 2.4: Total size of deals reaching close in the Economic infrastructure sectors 2010 – 2016 (£bn)²

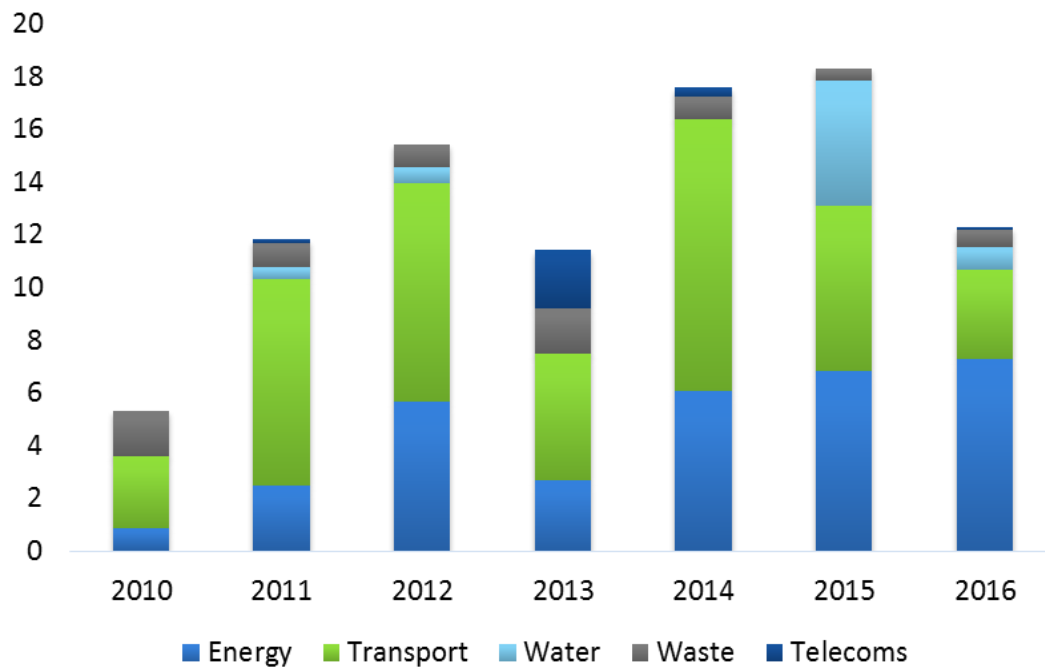


Source: IJ Global database, CEPA analysis

Figure 2.5 shows that the majority of financing has been provided to the energy and transport sectors in recent years, each receiving 35% and 47% of financing over the period respectively. Since 2014, finance for energy sector projects has been relatively stable, while finance for transport has gradually reduced, presumably because fewer opportunities have been brought to market as projects such as Thameslink and the Intercity Express Programme (IEP) have reached financial close.

² 2016 data is until end October 2016.

Figure 2.5: Value of deals reaching financial close in the economic infrastructure sectors by sector (£bn)



Source: IJ Global Database; CEPA analysis

Transport sector projects have tended to be of higher value relative to other sectors, with an average transaction size of £727m, compared to £469m for telecoms, £473m for water, £212m for waste and £132m for energy.

In terms of sources of finance, Figure 2.6Figure 2.7 shows that the vast majority of investment has come from debt providers, with particularly large increases in debt investment in 2014 and 2015.

Figure 2.6: Sources of finance for UK infrastructure projects and gearing



Source: IJ Global Database; CEPA analysis

As the figure shows, the flow of equity has remained relatively stable over the period analysed, while high levels of gearing were possible during years where overall investment was higher (i.e. post 2010).

2.4. Review of a sample of UK economic infrastructure transactions

In addition to analysing the high level trends we have carried out a detailed review of different samples (large projects with a value of over £650m, medium-sized projects over £100m to £650m and different types of project greenfield vs. brownfield etc.) to obtain a better understanding of projects structures and the key sources of financing for these projects. Within this, we also analysed the extent to which different types of investment attracts different sources of finance.

2.4.1. Large infrastructure projects

We reviewed the sources of finance for economic infrastructure transactions with a value of over £650m that have reached financial close since 2010 according to the IJ Global database. In total we found 35 transactions that met this criteria. They had an aggregate value of over £50bn and cut across each of the main infrastructure sectors.

These large projects had average gearing of around 80% - if four projects that relied exclusively on equity are removed the gearing was over 90%. Of the 35 transactions considered, 18 were refinancing projects and the other 17 were primary financing transactions. The 17 large primary financing transactions included: nine renewable projects, of which seven were offshore wind generation projects; two transactions related to Thames Tideway Tunnel (TTT); four rail projects - IEP Phase I and II, Thameslink and the Angel trains rolling stock; the Mersey Gateway and the London Gateway Port project.

Primary financings

An examination of these transactions shows that all of them involved the use some form of financial support mechanism, whether through the provision of debt or equity from a bilateral or multilateral development bank, the use of a UK government guarantee and/or another mechanism/ programme such as the Contract for Difference (discussed in more detail in Section 4). For instance:

- Seven of the projects benefited from the provision of debt from the European Investment Bank (EIB), which provided over £2bn of loans/ facilities to the transactions.
- The Green Investment Bank (GIB) had an equity investment in four of the offshore wind projects.
- A number of development banks, in particular, KfW and The Japanese Bank for International Cooperation (JBIC) have been active in providing debt across at least nine of the transactions.
- The IEP and TTT both benefited from policy support arrangements, whilst the Mersey Gateway has a full UK guarantee (all three projects are discussed in more detail in Section 4 and Annex A).

Alongside the provision of finance through the various support mechanisms the transactions have also attracted of long-term commercial bank debt (with tenors of up to 29 years and 6 months in the case of IEP). The banks have tended to club together into groups of over 10, with each of them typically providing combined loans/ credit facilities of around £100m to £200m.

Refinancing transactions

The other 18 projects involved the refinancing of previously completed transactions. The majority of these transactions were either in the rail (8) or airports (5) sectors. One interesting feature of the transactions is that eight of them involved the use of commercial bond offerings either alone or alongside commercial bank debt. In total around £5bn of debt was raised in the form of commercial bonds. A review of the these transactions shows that they were able

to achieve credit ratings of either BBB or BBB+ from the rating agencies (investment grade). According to the evidence that we have reviewed a number of the transactions were oversubscribed.

2.4.2. Medium infrastructure projects

We also reviewed medium size infrastructure projects in the IJ Global database that have reached financial close after 2010 - transactions valued between £100m and £650m. A total of 99 transactions were included in this category with a total value of over £30bn.³ Of the 99 transactions, 50% were refinancing whereas 41% were primary financing transactions. As with larger transactions, the majority of financing has been sourced from debt providers, accounting for 82% of all finance provided to the projects.

Primary financing

Of the 47 medium sized projects that received primary financing, 19 of these were waste-to-energy transactions, six were road sector projects and four were biomass plants, suggesting a relatively different mix from the larger primary financing projects over the period.

The majority of waste-to-energy transactions refer to municipal waste treatment and management projects that have been delivered through a PFI/PPP arrangement. These projects are structured under a standard PFI arrangement whereby local councils are paid a unitary fee for the delivery of waste treatment and energy recovery services. Key lenders to these projects have included commercial banks such as Lloyds, HSBC, Credit Agricole Group and Sumitomo Mitsui Banking Corporation.

As with the waste-to-energy-projects, the roads sector projects were also delivered using the standard PFI/PPP models, and have also been able to attract a considerable amount of commercial investment. In addition to commercial bank lending directly to projects, some of these road sector investments have also issued bonds as part of their financing. For example, the Aberdeen Western Peripheral Route and Balmedie-Tipperty Road project was able to secure £194m of bond investment from Allianz, while the Central Scotland Motorway Network raised £175m through the issuance of a commercial bond.

Refinancing transactions

The airports sector has formed the largest sub-sector of recent medium sized transactions, representing 12 of 43 of transactions that reached financial close over the period. Refinancings

³ Note that five projects that were included in the search results have been excluded from the analysis due to operations being undertaken for these projects taking place outside the UK or were outside the scope of the study.

over the period took place at several major UK airports, including Gatwick, Manchester, Bristol, Edinburgh and Newcastle, with BAA also refinancing large parts of its debt portfolio. With the exception of the Manchester and BAA transactions, all have been undertaken on a project finance basis, and attracted a range of institutional and private sector investment.

2.4.3. Analysis by type of project

We have also taken a sample of projects that reached financial close between 2010 and 2016 from the IJ Global database to analyse how financing varies by different types of transaction (greenfield, brownfield expansions and operation, maintenance and repair (OMR)). Our sample includes two transactions from each sub-sector for each year, with the exception of wind and other renewables, which include three transactions in years with a large number of transactions, in order to provide a more representative sample.⁴

Summary information for the types of projects included in our sample are provided below.

Table 2.1: Information for sample projects 2010-16

	Greenfield	Brownfield	OMR
Number of projects	63	14	5
Key sub-sectors (# of projects)	Wind (15) Waste/waste-to-energy (12) Biofuels (9) Other renewables (9) Rail (6)	Airports, Ports, Rail, Road (2 each)	Roads (3)
Total transaction value (£bn)	23	4.1	1.2
Average debt: equity ratio	69%	81%	93%
Commercial loan finance (% of debt finance)	61%	48%	50%
Bond finance (% of debt finance)	2%	27%	35%
Other debt finance	35%	24%	12%
Average bond tenor	21	27	8.5

Source: IJGlobal (2016); CEPA analysis.

As Table 2.1 shows, significantly more projects in our sample were greenfield, with transaction values totalling £23bn compared to £4.1bn for brownfield and £1.2bn for OMR.

⁴ The sub-sectors for the sampling include airports, ports, rail, roads, water, telecoms, energy (which includes transmission and distribution and non-renewable electricity generation), biofuels, waste-to-energy (including general waste), wind and other renewables

The greenfield projects in the sample mostly consisted of energy sector projects, while brownfield and OMR projects were mainly in the transport sector. The brownfield and OMR projects were able to achieve significantly higher levels of gearing compared to greenfield projects, suggesting that the perceived riskiness of greenfield projects meant that they required higher levels of equity finance. Further, both brownfield and OMR projects have been able to obtain higher proportions of their debt finance through bonds compared to greenfield projects, with bonds accounting for only 2% of debt financing for greenfield projects compared to 27% for brownfield and 35% for OMR. The debt finance for greenfield projects was largely sourced from commercial loans and loans from development banks, including EIB and GIB. Further information details about these institutions are provided in Section 3.4.1 .

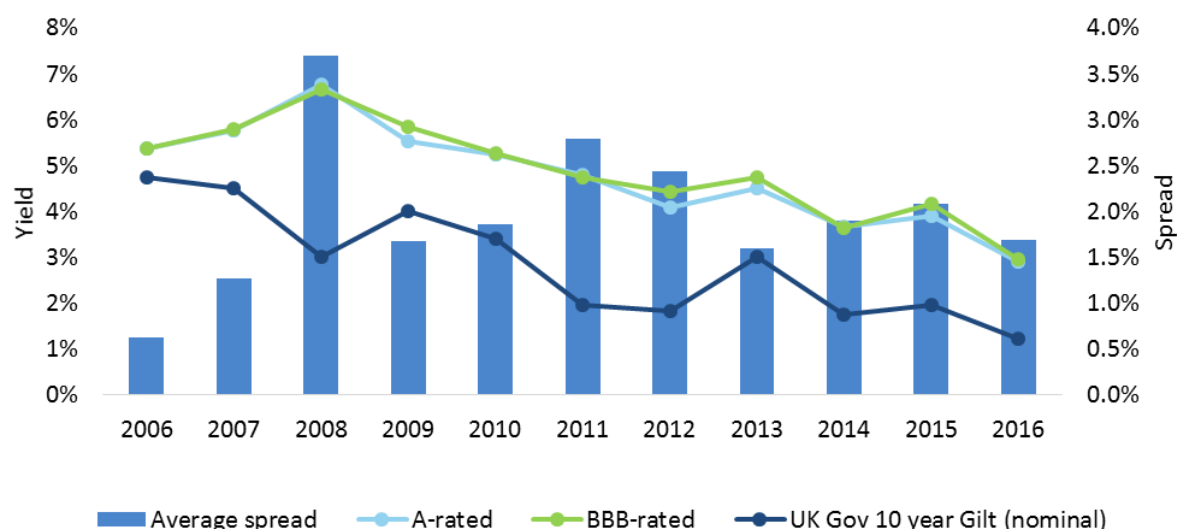
2.5. Pricing of finance

The yields on infrastructure debt and equity look to have fallen in recent years, although with this debt margins have increased

Based on an analysis of the Markit iBoxx Infrastructure A and BBB-rated bond indices, yields on infrastructure bonds have reduced over the last ten years, particularly after 2008.⁵ While there has been divergence in some years (particularly in 2008 and 2011/12), the fall in infrastructure bond yields has been broadly in line with UK government gilts, as shown by the changes in the spread between the average yields for A and BBB-rated bonds and government gilts. The trends in yields and spreads are shown Figure 2.7 below.

⁵ The Markit iBoxx Infrastructure indices include public bonds issued by companies whose activities are primarily focused in energy, transport, telecoms and utilities.

Figure 2.7: Yields and average spread on Markit iBoxx Infrastructure Bond indices relative to yields on UK Government nominal gilts



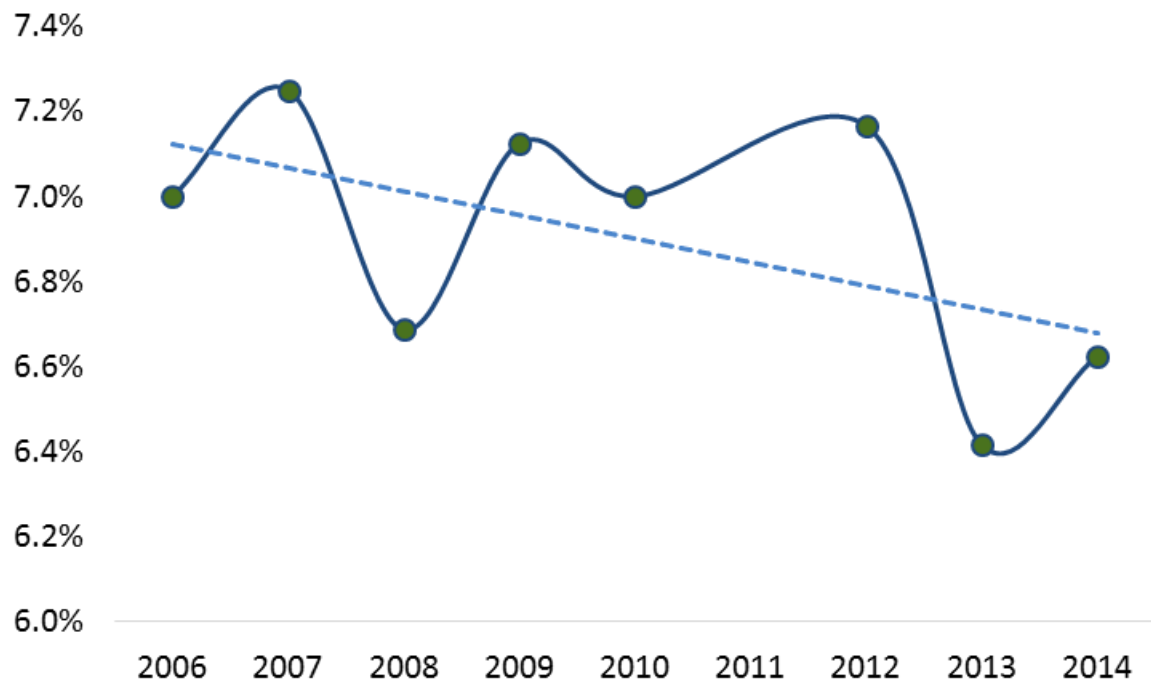
Source; Markit iBoxx; Bloomberg; CEPA analysis.

As the figure shows, these yields have fallen to lower levels than before the crisis, although spreads have remained above pre-crisis levels and have remained relatively stable since 2013. A possible explanation for this may be that institutional investors have been searching for high yields in relatively safe investments that were previously attainable when investing in government-backed debt. For example Markit iBoxx Infrastructure indices include bonds issued by a number of regulated infrastructure companies, including transmission and distribution companies, Heathrow and Gatwick airports and water and sewerage companies that many investors perceive as relatively safe investments due to these companies having large balance sheets and operate in stable regulatory environments.

While it is more difficult to observe changes in the actual cost of equity over time, UK regulatory determinations over the period suggest that these have also fallen, although to a lesser extent than debt. For example, the average implied market returns suggested from regulatory determinations in energy, water and transport have shown a gradual fall since 2006.⁶ These are set out in Figure 2.8 below. The dark blue line and green dots refers to the average implied returns from regulatory determinations, while the dashed line is the trend-line.

⁶ The implied market return is calculated by adding together the allowed risk-free rate and the equity risk premium (ERP) estimated as part of the regulatory determinations. Note that the allowed cost of equity in regulatory determinations has not been used as this is driven by different equity beta (volatility of given assets relative to the wider market) and gearing (proportion of debt relative to total company financing) assumptions. These differences mean that it is not possible to fully compare the cost of equity between determinations in different sectors.

Figure 2.8: Average implied market returns for UK regulatory determinations 2006-14



Source: CEPA analysis of regulatory determinations.

Note that no data is included for 2011 given that no regulatory determinations were made in this year for the given sample.

As the figure shows, regulatory determinations allowed for relatively higher returns to be made during the financial crisis and the immediate years following it, while more recent determinations, with lower equity risk premia, such as the PR14 price control in the water and sewerage sector and Ofgem's ED1 determination in electricity distribution, will have driven down realised equity internal rates of return. Evidence from the TTT transaction also suggests that investors are willing to accept relatively lower equity returns. For example, CEPA's recent analysis suggested an implied real post-tax cost of equity for TTT of 2.7%-5.2%.⁷ TTT in particular, which was determined on the weighted average cost of capital bid (BWACC), as well as the price paid for 51% of National Grid's gas distribution assets, are both indicative of intense competition for utility-like infrastructure and the consequent lower yields that are acceptable to the largely institutional investors in the asset class.

⁷ CEPA (2015), *Thames Tideway Tunnel – Cost of Capital Briefing Note*.

2.6. International comparisons

One other thing to consider with this analysis is how well the UK compares to other economies in attracting private finance for the economic infrastructure sectors. This is difficult if not impossible to do because it is not possible to compare like with like, for instance, because of differences in the extent to which private sector financing can be used to finance infrastructure in certain comparator countries.

In the World Economic Forum's Global Competitiveness Index the UK is ranked 9th overall in the infrastructure pillar (6th for the electricity and telephony infrastructure and 13th for the transport infrastructure measure). However, this measure is focused on the quality of existing infrastructure and does not seek to measure the extent to which infrastructure sectors are able to attract private finance.

The table below summarises some high-level data for the extent of infrastructure financing for the economic infrastructure sectors for the period 2010 to 2016. The table shows that the UK has been far more active in both deal value and volume for infrastructure projects that have attracted private finance than Germany, France and Canada. Again it is important to note that this is not a like for like comparison because the opportunity set is different across the countries, but it does suggest that overall the UK is well advanced in opening its infrastructure sectors for private finance and for attracting private finance to support deal completion.

Table 2.2: Comparison of deals reaching financial close in economic infrastructure sectors 2010 - 2016

	UK	Germany	France	Australia	Canada
No. of transactions	565	163	306	295	301
Total deal value (£m)	136,074	39,051	69,765	49,699	143,228
Average deal value (£m)	258	260	239	173	489
Average tenor	9.8	10.5	11.5	4.6	12
Debt/ equity ratio	71:29	74:26	73:27	69:31	80:20

Source: IJ Global database

2.7. Summary of initial findings from high-level review

This section presents findings of our research into the recent trends in the provision of private infrastructure finance to the economic infrastructure sectors over the last ten-years. At this stage of the project the work has relied primarily on the existing data and reports.

The key trends observed are as follows:

- Whilst there has been some considerable variation between different years, overall transactions values and volumes are currently at a similar level now as they were ten years ago.
- Behind this high-level trend important changes in the market have included the decline in the use of PFIs as a model to structure financial transactions, which to some extent has been compensated for by the growth in the number of transactions in the renewable energy sector.
- Based on an analysis of the Markit iBoxx infrastructure bond indices and implied market returns suggested from recent regulatory determinations, yields on infrastructure debt and the cost of equity have fallen in recent years reflecting intense competition for utility-like infrastructure.
- Based on an initial analysis the UK has been more active in completing infrastructure transactions that have reached financial close than a range of comparator countries.

3. RECENT TRENDS IN THE SOURCES OF FINANCE FOR UK INFRASTRUCTURE

This section focuses on recent trends in the different sources of finance for UK infrastructure. We have reviewed information on the activities of institutional investors – focusing on pension funds; specialist infrastructure funds; Sovereign Wealth Funds (SWFs) commercial and development banks. The section concludes by presenting analysis of completed UK infrastructure finance transactions to determine if there are any trends in the type of projects that have been targeted by the different investor classes – type of project, size, type of investment provided etc.

3.1. Pension funds

Pension funds regularly receive attention as being a possible additional source of finance for UK infrastructure projects. This is because the general characteristics of infrastructure assets: offering long-term, steady yield with limited correlation with other asset classes, are a fit with the long-term liabilities that pension funds face. In addition, infrastructure assets that are linked to inflation can hedge pension funds against the inflation risks that they face.

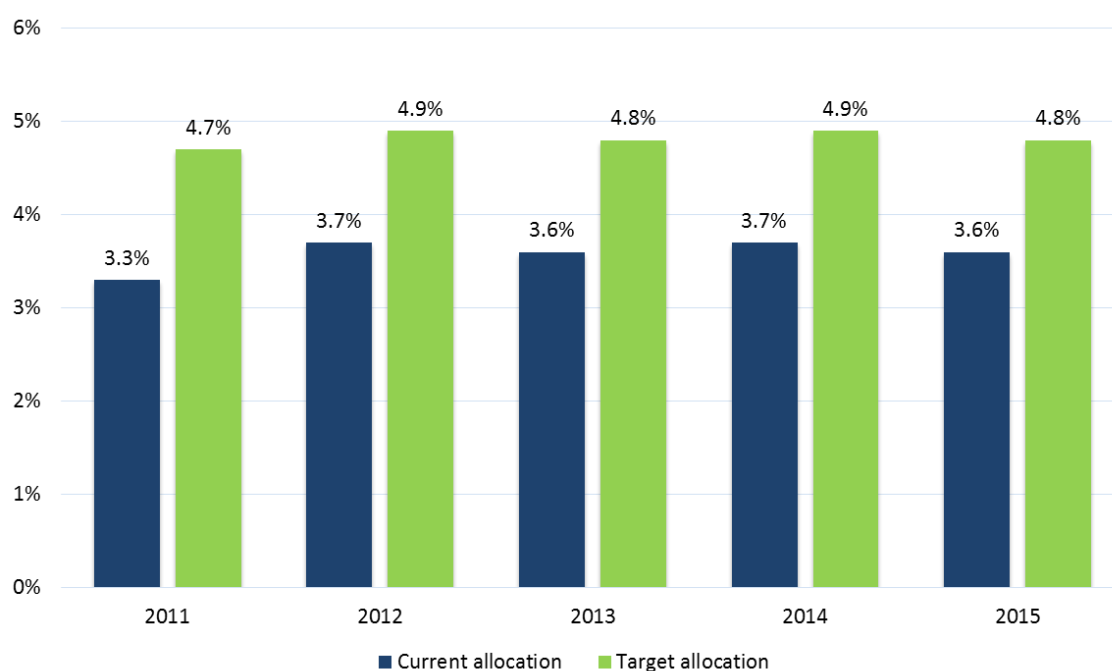
Not all pension funds are the same; some, particularly the Defined Benefit pension schemes are largely closed to new members and have outgoings in excess of contribution payments and a greater need for a running yield, which make it more difficult for them to invest in greenfield infrastructure. In the case of some DC schemes, a widely held view is that daily pricing requirements and the associated need to accommodate daily liquidity inhibit investment in illiquid assets such as infrastructure. However, depending on the nature of their respective portfolios and on the risks implied by individual transactions, in principal infrastructure assets should represent an attractive investment opportunity for pension funds.

Overall, the UK is acknowledged as lagging behind some international comparators, such as Canada in attracting pension fund investment into infrastructure. Three of the world's largest pension fund investors in infrastructure are Canadian: Ontario Municipal Employees Retirement System (OMERS); CPP Investment Board and the Ontario Teachers' Pension Plan. Further it is estimated that around 127 UK-based pension funds, many of them local government schemes, managing as much as £4.6 trillion in assets are not currently investing in infrastructure.⁸ Our initial analysis suggests that although the overall pool of UK funds is large, the scale of each and the overall number of funds creates fragmentation which limits the scale of the deals that these investors can access and has led some to focus in investing via other managed funds rather than directly.

⁸ Justin Beardon (2015). The drive for more UK-based pension funds investing in infrastructure.

A review of the data suggests that there may be scope to increase UK pension funds' investment in infrastructure, though potentially not by as much as is often assumed. Figure 3.1 below shows that on average pension funds are allocating on average 3.6% of their assets to infrastructure compared to a target allocation of 4.8% and that investment and target allocations have been quite stable in recent years.

Figure 3.1: UK-based pension funds' average and target allocations to all infrastructure



Source: Preqin Infrastructure Online

The figure suggests that there remains scope for pension funds to increase their investment in infrastructure to meet their target allocations. It is worth noting that compared to some of the funds in Canada there is also a question as to whether funds should be seeking to target higher allocations. According to Preqin Infrastructure Online the leading institutional investors tend to target on average around 6.9% of their investment allocations to infrastructure (for 2015), which is higher than the UK pension funds tend to target – in our discussions with investors it became clear that there is, at least, a perception that all DC fund investments have to be priced daily, since most DC plan members have the option of receiving up to date valuations of their accounts. In addition, there is an associated view that such funds need to accommodate daily liquidity, enabling immediate trading of assets, thus inhibiting investment in infrastructure.

Some of the most sophisticated institutional investors such as OMERS target 25% of investment to infrastructure assets, the scope for increasing pension fund investment is potentially huge. However, OMERS set up Borealis to manage investments on its behalf (and

for other institutions); it has now become one of the world's leading infrastructure investors. It is also notable that the pension fund market in Canada is rather more consolidated than the UK market.

However, for comparison the Greater Manchester Pension Fund (GMPF) currently has a target infrastructure allocation of 4%, which it is not currently achieving. Preqin's database as of June 2015 shows that experienced UK investors such as Prudential M&G and Legal & General Group have a current allocation to infrastructure of just 2.9% and 0.5% respectively.

In its review of the top 100 global institutional investors in infrastructure, Preqin found some important differences in the route to market utilised by larger infrastructure investors and more inexperienced institutional investors.⁹ Whilst both groups make use of unlisted infrastructure funds to access infrastructure investments, 71% of the top 100 institutional investors make use of direct investment whilst only 29% of the smaller funds target this approach – this figure is estimated to be around 19% for UK-based institutional investors. This difference is ascribed to their smaller scale and lack of in-house expertise .

A simple back of the envelop analysis suggests that, based on the estimate that UK pension funds have approx. £4.6 trillion assets under management, if UK pension funds were to increase their asset allocation to infrastructure to meet the current target allocations this would imply an additional £55bn being made available for infrastructure investment. Further, if UK funds were to achieve allocations of 6.9% in line with leading institutional infrastructure investors this would imply over £150bn being available for investment in infrastructure.

Pension funds have an increasing range of routes to market

Whilst all pension funds can invest in the UK-listed equity of, for example, utilities such as National Grid and BT, those seeking a higher allocation to infrastructure often obtain exposure through an intermediary. There are broadly three types of entity operating in the market: *asset managers*, *specialist infrastructure investors* and *investment platforms* shared by DB pension schemes.

Active players in the asset management market are typically subsidiaries of large financial services, pensions and insurance firms. Examples include M&G, subsidiary of multinational insurance firm Prudential, and Aviva Investors. These asset managers are focused on investing the pension and insurance assets of their parent group, but are also able to manage investments on behalf of other institutional customers, which gives them sufficient scale to employ in-house infrastructure teams.

⁹ Preqin (2015). The top 100 investors in infrastructure.

Some asset managers have a subsidiaries dedicated to specialist infrastructure investment, such as Infracapital which is the European infrastructure division of M&G. They will typically go to market directly to source deals. Some managers also manage funds which are generally structured as limited partnerships (LP) and are typically focused on long term equity investment in regulated, or long term contracted availability-based structures (e.g. PFI and OFTOs), such interests being acquired either in primary or secondary markets.

Some funds are also open to debt investment. This offers investors exposure to infrastructure assets via the fund's returns. The liquidity of their investment in the fund is usually determined by the rights conferred by the partnership agreement.

Figure 3.2 illustrates the route to market offered by asset managers.

Figure 3.2 Exposure to infrastructure via asset managers

Asset Managers (Pensions and Insurance)						
Parent	Prudential		Legal & General	Standard Life	Aviva	
Investment manager	M&G Investment Management Limited		Legal & General Investment Management Limited	Standard Life Investments	Aviva Investors Global Services Limited	
Infrastructure vehicle	Direct investment in debt assets	Infracapital (equity-side)		SL Capital Partners LLP		
Exposure		Funds	Direct	Direct	Direct	Funds
Funds and underlying investments	>£45bn infrastructure debt in public and private markets	Innisfree M&G PPP Fund LP (£225m)	£7bn in direct investments e.g. £400m long-term debt investment in DP World	Direct investments include: Great Northern rolling stock (£94m) East Anglia (£50m)	Direct investments into select projects	Aviva Investors REaLM Infrastructure Fund
		Infracapital Partners LP (£908m)				European Secondary Infrastructure Credit Fund
		Infracapital Partners II LP (£1bn)				Aviva Investors UK Solar PV Investment Fund

Third party funds provide other investors the chance to invest in infrastructure indirectly without having to develop the specialist – and expensive – in-house expertise required to invest in projects directly. However, the costs of such intermediation has incentivised the setting up of collective platforms such as the new Pension Infrastructure Platform (PiP) and others discussed below. This approach is illustrated in figure 3.3.

Figure 3.3 Exposure to infrastructure via shared investment platforms

DB Pension Schemes			
Parent	Various DB schemes	London Pension Fund Authority	Greater Manchester Pension Fund
Investment manager	Pensions Infrastructure Platform (PiP)	GMPF & LPFA Infrastructure LLP (GLIL)	
Infrastructure vehicle			
Exposure	Direct	Direct	
Funds and underlying investments	Multi-Strategy Infrastructure Fund Internally managed by PiP and c£120m direct investments in renewable energy sector	Joint venture in unlisted equity £500m of direct investments including: ·49.9% stake in Clyde Wind Farm ·Great Northern rolling stock ·East Anglia rolling stock	
	Externally managed investments include: Aviva Investors UK Solar PV Investment Fund and £360m equity investment in TTT via Dalmore		
	Notes: Investors in the Pensions Infrastructure Platform include a mixture of public and private pension schemes.		

3.1.1. London Pension Fund Authority and Manchester Pension Fund Joint Venture

The LPFA, which is a £4.6bn pension fund and the GMPF, which has over £17bn in assets under management formed a £500m infrastructure investment joint venture in 2015 - the GMPF & LPFA Infrastructure LLP (GLIL).

This new venture has already completed two transactions in the renewable energy sector. For instance, it purchased a stake in Clyde wind farm from Scottish and Southern (SSE) and has an option to invest in additional turbines that SSE constructs. It is also active in railway rolling stock transactions e.g. the £600m financing of Stadler trains for the Abellio East Anglia

franchise. This transaction was led by Rock Rail¹⁰ and SL Capital (part of Standard Life Investments) with additional co-investment equity provided by GLIL. It is noteworthy that these rail transactions have been led by Rock Rail which provided the sector and specific transaction knowledge that pension funds sometimes lack and which limits their ability to invest directly.

The GMPF has announced recently that it is in the process of expanding the GLIL to include West Yorkshire, Merseyside and Lancashire County Council to increase commitments to over £1bn. This development is part of ongoing efforts by government to work with local pension schemes to pool their assets in order to improve their ability to invest in infrastructure assets. Local Government Pension Schemes and Project Pool.

LGPS Pooling initiative

This government led initiative aims to combine assets into six pools (though this could potentially be up to eight pools) with a minimum size of £25bn. As part of this programme the LGPS formed a Joint Working Group to help determine next steps, its report was published in January 2016.¹¹ Much of the benefit from pooling assets is expected to come from cost savings achieved by reducing the expenditure on fees to external fund managers.

According to the Working Group's report at present the eighty-nine LGPS invest about £1 out of every £100 in infrastructure, compared to £1 to £2 by pension funds internationally and around £5 per £100 by larger funds. One of the aims of establishing these pooled infrastructure funds is to enable schemes to make infrastructure investments more accessible for local schemes by permitting a level of investment that is closer to the that provided by the larger funds. The initiative has an ambition to get LGPS to invest on average 5% of their allocations in infrastructure.

It is not immediately clear how the establishment of the pooled funds will on its own be sufficient to increase the ability of the LGPS to invest in infrastructure. The feedback that we have received from consultations suggests that at best the pooling of LGPS will take some time to feed through into significant increases in the provision of direct infrastructure finance. The consultations suggest that GLIL has found that it is very time consuming and resource intensive to build up the expertise required to invest directly in infrastructure deals. It is unclear that the other pooled funds will find it attractive to commit so much, particularly given that there are so many indirect routes to market. An additional constraint that LGPS face is the difficulty in aligning the different guidelines that they have in place from their trustees.

¹⁰ <http://www.rockinfrastructure.com/about>

¹¹ Joint Working Group of Local Authorities (2016). Findings of Project Pool.

To address primarily the issues around scale and resources the Working Group report suggests that it might be necessary to establish a National Infrastructure platform, which would be accessible to all of the LGPS pools. This platform is, we understand, still under development but one obvious issue is the extent to which it would complement the existing Pensions Infrastructure Platform (PiP).

3.2. Specialist infrastructure funds

Specialist investors can offer any or a combination of:

- managing LP funds aimed at institutional investors, for example Dalmore Capital;
- investing their own funds (or those of their owners) alongside institutional clients, for example Rock Infrastructure;
- operating infrastructure investment companies listed on a public exchange. Examples of these include International Public Partnerships (advised by Amber Infrastructure Group) and HICL Infrastructure (advised by InfraRed Capital Partners).

Specialist investors usually manage a portfolio of operational assets but will also look to add value and generate higher returns by investing in the development and construction phases of projects, and are open to exiting such investments at a premium. Figure 3.4 illustrates the approach offered by the specialist infrastructure investors.

Figure 3.4 Exposure to infrastructure via specialist infrastructure investors

Specialist Infrastructure Investors				
Investment manager	Amber Infrastructure Limited	InfraRed Capital Partners Limited		Dalmore Capital Limited
Infrastructure vehicle	International Public Partnerships (FTSE 250 listing)	HICL Infrastructure Ltd (FTSE 250 listing)	The Renewables Infrastructure Group Ltd (FTSE 250 listing)	
Exposure	Direct	Direct	Direct	Funds
Funds and underlying investments	Listed investment company with direct equity investments in a portfolio of economic & social infrastructure	£2.2bn debt and equity investments in a range of public & social infrastructure	£45m of investments across a portfolio of operational onshore wind and	Dalmore Capital Fund LP (£249m)

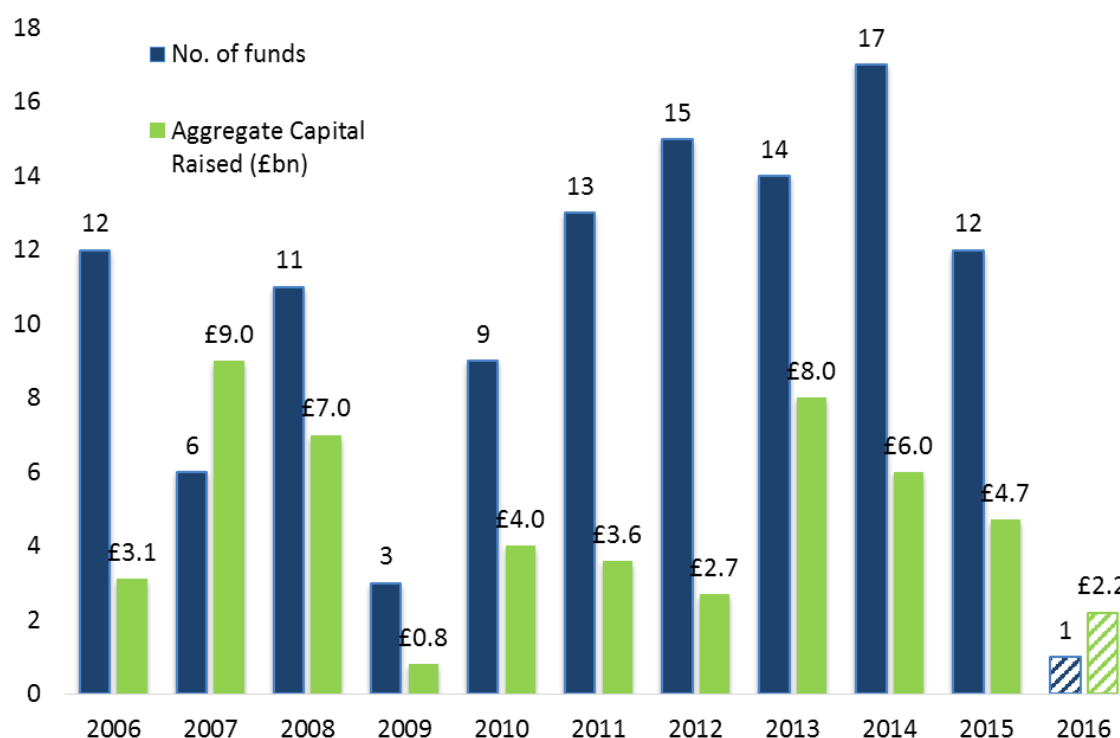
	assets, including: Various OFTOs Thames Tideway Tunnel Angel Trains	assets, including: A13 Thames Gateway PFI M80 motorway (50%) M1-A1 link road (30%) Connect UK (33%)	solar energy generation assets (focus on wholly owned equity investments).	Dalmore Infrastructure Investment LP (£440m equity investment in TTT)
				PPP Equity PiP LP (£534m)
Notes: Specialist infrastructure investors are able to accept more development and construction risk. Portfolios will contain a balance of operational assets and those still in the development/construction phases. They manage funds on behalf of a range of investors. For example, the type of investors involved in Dalmore's funds include private pension funds (>40% of fund), public pension funds (20-25% of fund), fund managers and insurers (5-15% of fund).				

According to Preqin's database, infrastructure funds that have the ability to invest in UK infrastructure projects have been able to raise approx. £150bn in 2016 so far. Suggesting that there is a large potential source of finance for UK projects, though noting that much of that capital can be allocated to other project opportunities in Europe and other global locations.

The unlisted UK-based infrastructure market accounts for around 49% of the total capital raised for all European-based infrastructure funds.¹² A number of the UK-based funds have a focus on investments outside of the UK. The evidence shown in Figure 3.5 below that apart from the immediate aftermath of the financial crisis there has not been any significant drop-off in the ability of UK-based funds to raise capital – though we have not been able to review the price of their offerings.

¹² Preqin infrastructure database.

Figure 3.5: UK-based unlisted infrastructure fundraising, year of financial close (2016 is to end April)



Source: Preqin infrastructure database

The biggest UK-based funds that are focused on the UK/ Europe are managed by such as Macquarie and Arcus infrastructure partners, we discuss briefly some of their activity below.

3.2.1. Macquarie European Infrastructure Funds

Macquarie is currently managing the Macquarie European Infrastructure Funds (MEIF), which are a series of, initially, 10-year wholesale investment funds that focus on infrastructure investments across Europe. The fund has received investment mainly from pension funds and other institutional investors – in total the four MEIF have gained over £12bn of investment since the first fund was established in 2004.¹³

The MEIF IV reached financial close in May 2013. It was successful in raising over £3bn equivalent of funds in an oversubscribed offering. The fund targets investment in core infrastructure sectors that are essential to consumers, linked to inflation and provide sustainable and predictable cashflows over the long-term. The MEIF IV has made a series of investments across Europe including in AGS Airports (operator of Aberdeen, Glasgow and Southampton Airports) in the UK.¹⁴ The fund acquired AGS Airports from Heathrow Airport

¹³ <https://www.macquarie.co.uk/mgl/uk/meif/meif-1>

¹⁴ Information sourced from IJ Global database.

Holdings in 2014 in a 50/50 partnership with Ferrovial for a total value of just over £1bn, as part of the transaction seven banks provided £625m of bank debt. The finance was in part used to facilitate £100m in expansion projects such as terminal enhancements.

3.2.2. Arcus infrastructure partners

Arcus is a specialist independent fund manager specialising in European infrastructure projects. It has made a number of investments on behalf of its investors in the UK and in other European countries. It has completed a number of transactions in the UK infrastructure sectors, including for instance a £595m refinancing of Forth Ports in 2013, of which half was financed via bank debt.¹⁵ Forth Ports owns and operates seven Scottish ports and Tilbury port on the river Thames, the refinancing will be used to help support general expansion work on the ports.

3.3. Sovereign Wealth Funds

Sovereign Wealth Funds (SWF) are investment funds that are owned by a government and typically funded by foreign exchange and reserve assets. These assets typically come from revenue gained from exporting depletable natural resources such as oil. SWFs are quite distinct compared to other types of institutional investors. They can have longer-term investment horizons, and in general lack short-term liabilities. As a result they can have less stringent liquidity requirements, making investments in more illiquid asset classes more of a possibility.

According to Preqin (2015) there are just over seventy SWFs in operation across the world with over £4 trillion under management – 55% of the funds invest in the economic infrastructure sectors; real estate and infrastructure are thought to be the most favoured asset classes by SWFs.

The UK does not have a specific SWF, and in many cases such as the recently created Ireland Strategic Investment Fund, the investment mandate of SWFs restricts them to invest in domestic projects to support national development. However some of the funds can invest in foreign countries.

Our review of completed infrastructure transactions presented in Section 3.5 below suggests that SWFs have played a small role in the UK infrastructure finance market to date, their main role, in terms of the provision of direct financing, has been to take long-term equity positions within corporates such as Gatwick Airport (Future Fund for Australia and the Abu Dhabi Investment Authority) and Angel Trains (Abu Dhabi Investment Authority).

¹⁵ Information sourced from the IJ Global database.

3.4. Banking institutions

3.4.1. Commercial banks

Over the last ten-years the disappearance of the changes to liquidity regulation as a result of Basel III as a result of the financial crisis are commonly cited as having played a role in limiting the ability of banks to provide long-term debt. However we have not seen any specific data to suggest that there are any specific liquidity constraints that have prevented commercial banks from supporting infrastructure investment, and the consultations that we have had as part of work that we have been doing for the Rail Development Group (RDG) suggests that this finding is in-line with stakeholders' view of the market.

According to studies there is a difference in banks' approach to the market depending on where they are headquartered.¹⁶ For instance, Japanese banks, as well as some German and French banks have shown more interest in providing long-term debt. In the case of the Japanese banks this is said to be due to the willingness of Japanese deposit holders to hold their assets for longer, reducing their asset-liability management risks, whilst European banks report that they had received support from domestic development banks or had de-leveraged successfully.

In contrast British-based banks have potentially shown less willingness to hold long-term debt, preferring to act as a financial advisor offering shorter-term finance to cover the early-stage construction risks faced by infrastructure projects. Once the asset becomes operational and less risky they sell on their asset to institutional investors.

There is also a suggestion that individual banks have a preference for smaller deals (less than £200m), less risky PPP deals and existing brownfield assets that have an existing revenue stream. A number of recent transactions that we have reviewed have involved multiple commercial banks providing smaller loans, so it is perhaps not clear from the desk-research that individual banks' preference for smaller deals has limited the availability of finance for larger investments.

3.4.2. The role of the development finance institutions

As shown by the analysis in Section 2.4 the bilateral and multilateral development finance institutions have played a significant role in providing debt to infrastructure investments in the UK. Two of the key players in the market have been the EIB and the GIB. These institutions can play an important role in creating confidence in a transaction amongst potential private sector investors.

¹⁶ BBA (2015). Financing the UK's infrastructure needs.

EIB

Between 2011 and 2015 EIB has invested over £35bn in UK infrastructure (including social infrastructure); in 2015 invested over £10bn in UK infrastructure, which was the largest amount that it has invested in any country in a single year. It has been involved across a range of sectors, with 24% of its investments going to energy, 22% in transport and 21% in water in 2015. EIB has supported some of the larger more complex projects such as TTT, the Intercity Expressway and Thameslink. While the EIB has been involved in a number of transactions, this does not necessarily mean that they would not have reached financial close without its involvement. EIB can play an important role in providing confidence to other lenders to a project. However, it can also provide cheaper credit than commercial debt providers, as such there can be questions about the extent to which EIB is truly catalytic or whether its role is largely one of reducing the cost of finance faced by projects (and as a result either reducing user charges and / or boosting equity returns). Whether EIB financing will still be available in a post-Brexit world depends upon its nature. On the assumption that it would not be, in the absence of a UK development finance counterpart, or the wider deployment of the UKGS, *at a minimum* the cost of finance for a typical project will be higher than it would have been with EIB participation.

GIB

The GIB has committed funds of £3.8bn to provide debt and equity to investments involving new technologies in environmentally friendly sectors where the risk profile means that the market would otherwise not be able to support. As of October 2016 the GIB has invested in 85 green infrastructure projects and seven funds committing £2.7bn to transactions worth £11.1bn.

While GIB's role in the sectors it has invested in has been commended, many have called into question whether it will be able to maintain its catalytic role after its privatisation. For example, while its focus on green investments is written into law, it will be interesting to see whether such investments will be focused on mobilising investment into technologies and/or sectors where other investors are less familiar with or more on established technologies/sectors with a track record of strong returns.

3.5. Review of a sample of transactions

We have taken some samples of the economic infrastructure transactions to have reached financial close since 2010 to analysis in more detail the way in which different sources of finance have been invested. This includes reviewing the transactions of selected institutional investors and analysing the samples of large and medium-sized transactions discussed in

Section 3.5. The aim of the subsection is to identify the main trends in the type of finance provided by different investor classes.

3.5.1. Sample of institutional investor transactions

We reviewed all the transactions to reach financial close for a sample of the most active institutional investors to assess whether there are any specific patterns in their investments.

The sample includes:

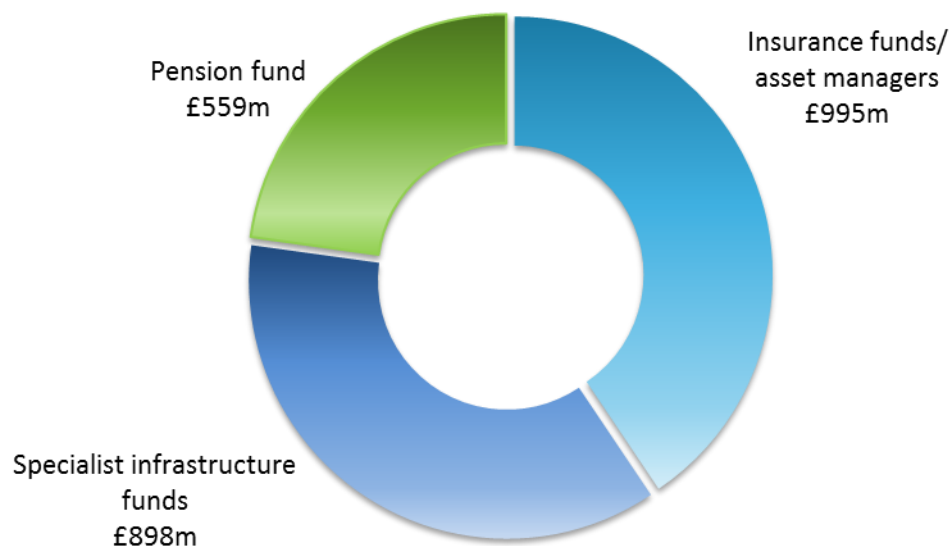
- Insurance funds – Aviva, Allianz, M&G, Legal and General.
- Pension Funds – the University Superannuation Scheme, the GLIL, the Pensions Infrastructure Platform, John Lewis Pension Fund, BT Pension Fund, the West Yorkshire and the Strathclyde Pension Fund.
- Infrastructure funds – Borealis, Hastings; Macquarie, Infracapital, Dalmore Capital.
- Sovereign Wealth Funds – China Investment Corporation, Abu Dhabi Investment Authority, Australia Future Fund and GIC.

According to the IJ Global database we found that since 2010 there have been 20 separate transactions in which the investors in our sample have invested directly into the economic infrastructure sectors. Overall, total direct investment was approx. £2.5bn.

Out of the 20 completed investments 14 were in the energy sector (13 renewable projects, one nuclear) 4 were transport and 2 were in the water and wastewater sectors. The average investment size was around £154m, though the investments ranged from just £6.5m to over £400m.

Figure 3.6 below shows which of the different groups of investor have invested the most in the sample. As might be expected the insurance funds and specialist infrastructure funds carried out significantly more direct investment than the pension funds included in the sample.

Figure 3.6: Source of investment by type of institutional investor (£m)



Source: IJ Global, CEPA analysis

The pension fund investment came from the GLIL and one University Superannuation Scheme (USS) investment. They completed equity investments into investment grade rated operational assets; for instance the USS acquired 8.65% of Heathrow Airport Holdings, which is A- rated, in a £391.1m investment. Whilst GLIL acquired 49.9% of Clyde wind farm from Scottish and Southern Energy as part of a £355m investment.

Some of the pension funds in our sample have not carried out any direct investment and instead access the market through intermediaries e.g. Strathclyde Pension Fund invests through the PIP, made a £27.5m investment into Aberdeen UK and also invested £30m into an onshore wind fund and £50m into the GIB Offshore wind fund. The corporate pension funds in our sample such as BT currently invest in infrastructure through an infrastructure fund. According to their 2015 annual report in 2015 they invested an additional £1.1bn in Hermes in the form of inflation-linked UK infrastructure assets.

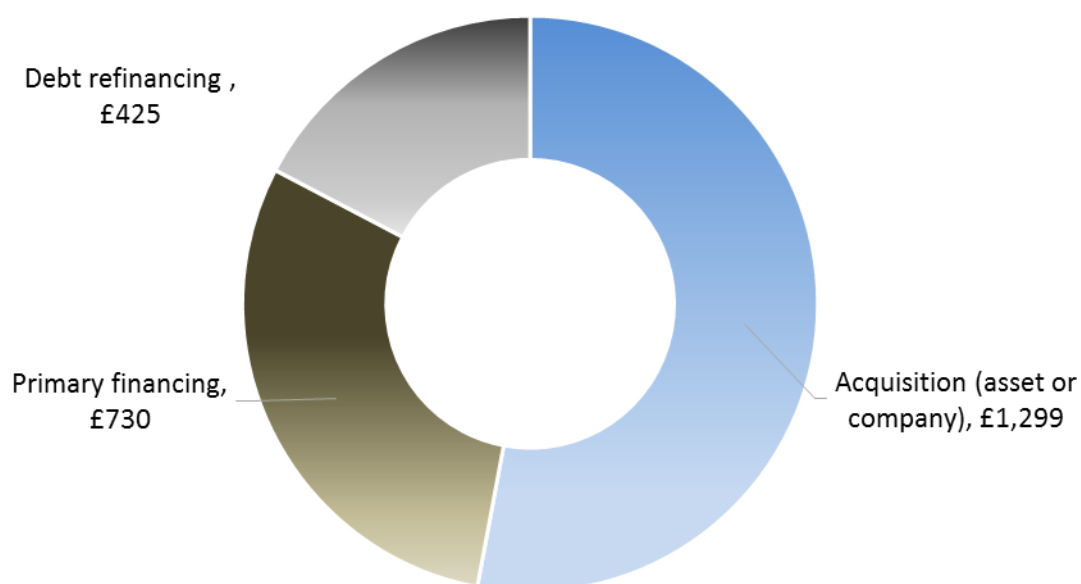
The Sovereign Wealth Funds in our sample made no direct investment in economic infrastructure in the period under consideration according to the database – the ones that we have reviewed have long-term equity positions in UK corporates, such as the Abi Dhabi Investment Authority and Australia Future Fund ownership position in Gatwick Airport.

In terms of the type of investment made, the data shows that most of the investment, £1.8bn of the total £2.5bn was in the form of equity. Of this £1.8bn around £1.3bn was equity investment to acquire a performing asset and the remainder for new projects such as Allianz's

equity investment in TTT. The majority of the debt provided was in the form of debt refinancing.

Overall, the analysis suggests that the investors in our sample have invested in existing assets with a track-record of performance rather than greenfield projects; for instance 11 of the 13 renewable transactions in the sample involved either refinancing or the acquisition of existing renewable assets.

Figure 3.7: Type of investment by institutional investors (£m)



Source: IJ Global, CEPA analysis

Aviva was the most active individual institution in the sample. It alone had carried out seven of the transactions and invested over £650m. All the other institutions in the sample had only invested in one or two projects. For instance, Allianz only completed one UK transaction in our sample, Thames Tideway, it was the largest individual investment

We briefly profile how Aviva and Allianz have accessed the infrastructure finance market.

Aviva

Aviva carries out its investments in infrastructure through Aviva Investors. Aviva Investors has a dedicated team of infrastructure finance experts that have expertise in renewables, transport and social infrastructure sectors. The infrastructure finance specialists are supported by in-house legal, tax and finance expertise.

Overall they manage in excess of £5bn of infrastructure assets on behalf of its clients. They are involved in both unleveraged debt and in providing long-term debt through primary and secondary loans to infrastructure assets with a proven technology that have the potential to deliver low volatility and long-term income streams.

Allianz Group

Allianz is an a global financial services firm, its core business is insurance and asset management. Allianz Capital Partners is the in-house manager of alternative investments for the Group. It has around £13.6bn of assets under management across, private equity renewables and infrastructure (renewables and infrastructure account for just over £6bn).

It has an infrastructure team of fifteen individuals and has invested over £6bn globally since 2013. They have an office in London and have carried out investment in the UK, but also target investment opportunities around the world.

In their infrastructure portfolio their strategy is to seek long-term investment opportunities that offer yield, rather than seeking to make returns through exits. They focus on assets that are supported by regulated or contracted revenues – or at least have a strong market position. Allianz target brownfield assets with an operational track-record but consider greenfield projects (such as TTT) on a selective basis, they are willing to take construction risk in the right circumstances but not development risk.

As well as their equity investment in TTT, in the UK they also have an equity stake in Porterbrook – a rolling stock leasing company; and an ownership stake in Colchester Garrison a new facility for the UK Ministry of Defence.

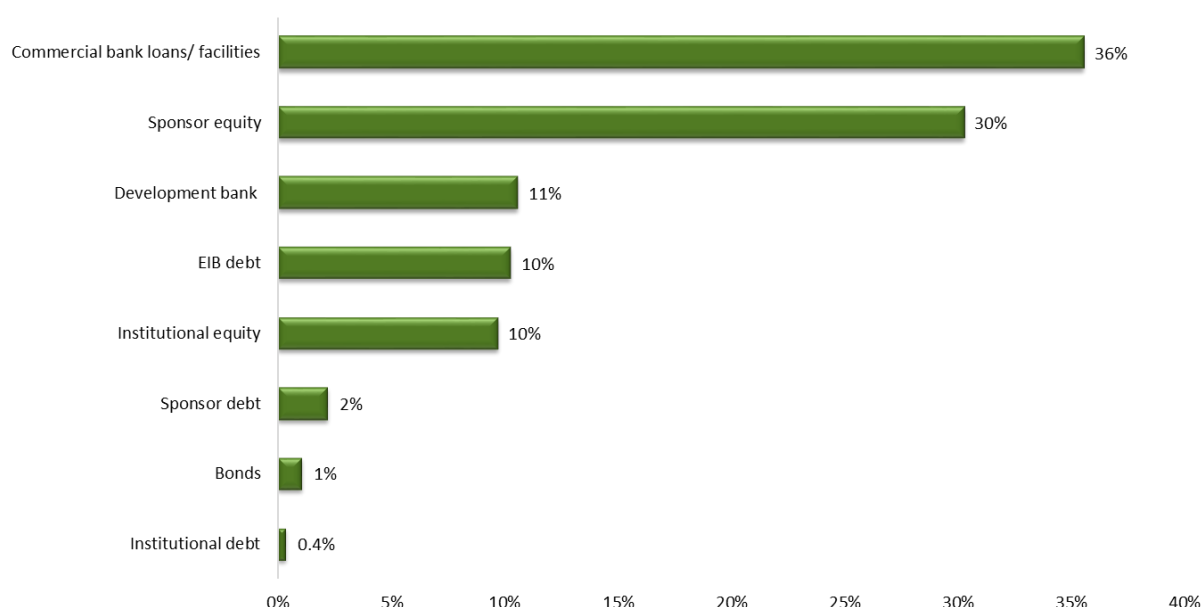
In their renewables portfolio Allianz has invested in over 70 projects mainly in Europe and a few in the USA. They target projects in the approx. £40m to £215m range and invest mainly in onshore wind farms and solar parks on a long-term buy and hold strategy.

3.5.2. Review of the large projects

We carried out a more detailed review of the sources of finance for the 17 large primary financing transactions to reach close since 2010.¹⁷ Figure 3.8 below shows that the largest sources of finance were commercial bank loans and sponsor equity (equity injected by project developers) which jointly accounted for around 66% of the investment.

¹⁷ For analytical purposes our sample included all transactions over £650m in value.

Figure 3.8: Sources of finance for large infrastructure transactions^{18,19}



Source: IJ Global, CEPA analysis

A range of different banks have been involved in providing debt to the different transactions. As mentioned in Section 3.4 the transactions have involved the banks clubbing together into groups with as many as 15 of them providing a portion of the debt. According to the database the banks have been willing and able to provide long tenors – 35 years in the case of TTT and close to 30 years for the IEP. Though we understand that the expectation is that this long-dated debt will create an opportunity for institutional investors to refinance the debt in the future.

A mix of different institutions were involved in providing equity to the transactions. In some of the cases, e.g. Veolia's Staffordshire Waste PFI project, the finance was provided wholly on-balance sheet by the corporate entity. Whilst other projects involved the provision of equity (alongside debt and other investment) by the eventual project owner/ operator of the infrastructure such as the role played by Hitachi in the IEP.

According to the database Institutional investors (pension funds, insurance funds, infrastructure funds) have played a limited role, providing 10% of the investment (just under £2.6bn mainly in the form of equity), of which half was for the TTT project. A range of different

¹⁸ Definition of categories in chart: Institutional investor: pension fund, infrastructure fund, insurer/ asset manager, sovereign wealth fund. Sponsor equity: provision of equity by non-institutional investor. Development bank: DFI such as KfW or the development bank of Japan.

¹⁹ In one of the transactions the EIB provided an equity investment over £100m

investors were involved in the different transactions including: Allianz, P.K.A. Group, the Dutch Infrastructure Fund, and the Copenhagen Infrastructure Partners.

3.5.3. In terms of ‘multi-lateral debt’ the EIB has played an important role in a number of projects. EIB provided a loan in six of the seven transactions involving sponsor equity, discussed in Section 3.4.1

Over the last ten-years the disappearance of the changes to liquidity regulation as a result of Basel III as a result of the financial crisis are commonly cited as having played a role in limiting the ability of banks to provide long-term debt. However we have not seen any specific data to suggest that there are any specific liquidity constraints that have prevented commercial banks from supporting infrastructure investment, and the consultations that we have had as part of work that we have been doing for the Rail Development Group (RDG) suggests that this finding is in-line with stakeholders’ view of the market.

According to studies there is a difference in banks’ approach to the market depending on where they are headquartered. For instance, Japanese banks, as well as some German and French banks have shown more interest in providing long-term debt. In the case of the Japanese banks this is said to be due to the willingness of Japanese deposit holders to hold their assets for longer, reducing their asset-liability management risks, whilst European banks report that they had received support from domestic development banks or had de-leveraged successfully.

In contrast British-based banks have potentially shown less willingness to hold long-term debt, preferring to act as a financial advisor offering shorter-term finance to cover the early-stage construction risks faced by infrastructure projects. Once the asset becomes operational and less risky they sell on their asset to institutional investors.

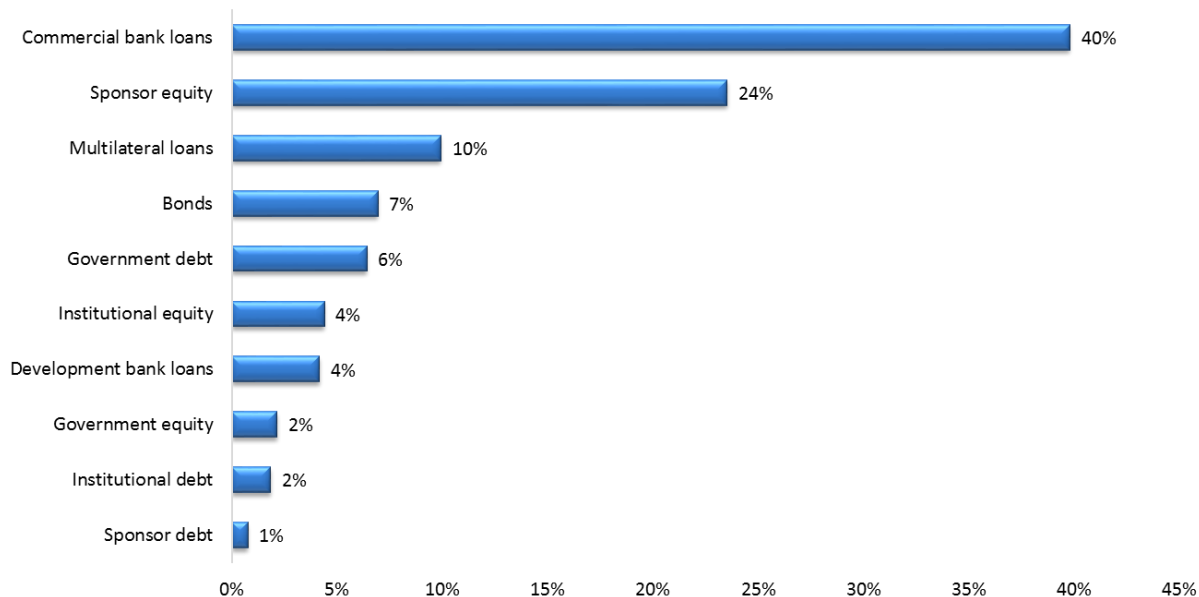
There is also a suggestion that individual banks have a preference for smaller deals (less than £200m), less risky PPP deals and existing brownfield assets that have an existing revenue stream. A number of recent transactions that we have reviewed have involved multiple commercial banks providing smaller loans, so it is perhaps not clear from the desk-research that individual banks’ preference for smaller deals has limited the availability of finance for larger investments.

The role of the development finance institutions they all benefited from some form of support mechanism alongside the EIB investment such as the use of the Contract for Difference mechanism. KfW (the German development bank) was also active across a number of the projects. It provided debt to four of the large offshore wind projects, the Mersey Gateway and the London Gateway Port projects.

3.5.4. Review of the medium projects

We carried out the same review of the 47 medium-sized primary financing transactions (£100m-£650m) which have reached financial close since 2010. Figure 3.9 below tells a similar story to the larger projects in that the principal sources of finance were commercial bank loans and sponsor equity, with a slightly greater bias towards commercial bank loans which may reflect the slightly lower risk profile implied by the medium-sized compared to large projects.

Figure 3.9: Sources of finance for medium-sized infrastructure transactions



Source: IJ Global, CEPA analysis

Although a range of banks have been involved in providing debt, the syndicates tended to be smaller (typically fewer than 6 banks depending on the size of the deal) with a select group of banks involved in a number of deals. Lloyds, Bank of Tokyo Mitsubishi and Sumitomo Mitsui Banking Corporation were involved in 8, 9 and 13 of the 47 transactions respectively.

The equity story is broadly similar to the larger projects, with a mix of different institutions involved. A small number of transactions were financed on balance sheet through a corporate entity, for example the Leeds Waste Treatment PFI (Veolia) and Ormonde Offshore Wind Farm (Vattenfall), but the majority were project financed with equity provided by the sponsors.

Institutional investors played a limited role across debt and equity solutions, providing a combined 6% of the total financing requirement, but an interesting development is the equity participation of UK-based institutional investors Standard Life and GLIL in two rolling stock transactions alongside Rock Infrastructure. Bond financing appears to play a slightly more important role than in the sample of larger transactions, providing 7% of the total financing

requirement, but this was mainly due to sizeable private placements in the Aberdeen Bypass PPP and East Anglia rolling stock transactions.

The EIB provided a similar 10% of the total financing requirement but development banks such as KfW and EKF (the Danish export credit agency) played less significant roles, providing just 4% of the total financing requirement, despite being involved across 7 of the transactions.

Government support for the medium-sized transactions included more significant equity and debt contributions, totalling a combined 8% of the total financing requirement. The principal mechanism for this was the Green Investment Bank which had involvement in a number of green energy transactions (e.g. Derbyshire waste-to-energy plant PPP, Tilbury biomass plant), and the frequency of renewable energy transactions in the sample is probably related to the significant government contribution towards the financing requirement.

3.6. Summary of findings

This section presents an analysis of the main sources of finance for infrastructure projects to identify the main trends over the last ten-years. This has relied mainly on desk-based research and a review of data available in the public domain. The main findings are as follows:

- The evidence suggests that there is further scope for UK-based institutional investors, particularly pension funds, to allocate more of their investments in the infrastructure sector. The main issues found in the research suggest that progress has been held back by a lack of sector-level expertise combined with a lack of scale (mainly for UK pension funds). The pension pooling initiative is making some progress with bringing together the LGPS to address the scale issue, but more needs to be done. There is also a perception that DC schemes are limited in their ability to access infrastructure assets by the daily pricing and associated need for liquidity placed on them. This has the potential to hamper the growth in pension fund investment in infrastructure and is particularly so because of the growth DC schemes means they are likely to make up an increasing share of the UK's pensions savings over time. It is not clear exactly why these perceptions exist and further work needs to be done to understand the options for addressing this issue.
- A review of a sample of investors' transactions since 2010 suggests that institutional investors have mainly (in terms of deal volume) targeted smaller social infrastructure projects that offer stable, inflation-linked returns, but there is some evidence that they have stated to show interest in some of the larger more complex deals e.g. TTT and have also provided finance to some of the wind farm projects.
- The evidence on infrastructure funds and commercial banks suggests that the UK still has a relatively deep and diverse pool of capital that is available to provide finance for

infrastructure projects. The UK remains one of the world's largest markets for unlisted infrastructure funds and we haven't seen any specific data to suggest that there are any specific liquidity constraints that have prevented commercial banks from supporting infrastructure investment. For the commercial banks there is evidence that they prefer smaller (less than £200m), less risky PPP deals and existing brownfield assets that have an existing revenue stream. However, our review of recent transactions suggests that multiple banks have been willing to club together to provide debt for larger infrastructure projects.

3.7. Review of private sector risk mitigation instruments

While the public sector has supported UK infrastructure projects with risk mitigation support, a range of private insurance and other contingent finance products are also available to infrastructure investors. These are summarised in Table 3.1 and discussed in more detail below.

Table 3.1: Private sector risk mitigation instruments

Risk	Instrument	Description
Market	Contract design – availability payments	Availability payments used when infrastructure assets do not offer a direct and/or predictable revenue stream. Revenues are paid by the contracting authority to the project company, as opposed to the project company receiving revenues through user charges.
	Contract design – offtake contracts	Contract outlines that a project company supplies output at a given price, which helps to reduce revenue uncertainties. Contracts include power purchase agreements (PPAs) and bulk water purchase agreements.
	Forwards and futures	Contracts that specify the amount that will be paid for a given asset at a future date. Forward and future contracts can be used to help mitigate against a range risks, but particularly movements in, say, electricity wholesale costs.
Liquidity	Letters of credit (L/C)	L/Cs are provided by banks to ensure that a seller receives timely payments for goods and services. L/Cs are particularly useful when buyers face liquidity issues.
Technical	Warranties from vendors	Type of guarantee provided to purchasers of goods to cover potential defects. Warranties are particularly useful for goods where the technology is relatively new and/or unproven.

Risk	Instrument	Description
	Insurance	Insurance cover can be provided in the event of unlikely but adverse events occurring that significantly impact a project, such as the impact of weather or other factors outside the project's control.
General credit	Monoline guarantees	Guarantee (also commonly referred to as credit wraps) given to issuers of debt instruments that provide protection against default on principal and interest repayments in return for a guarantee fee. Important for improving the credit rating of bonds issued by entities provided that the monoline company maintains a strong credit rating, which in turn can help lower debt costs.
	Credit default swaps (CDSs)	These are derivative instruments in which, for a fee, risk is sold to a third party. As such a holder of project debt can hedge its position by purchasing a CDS, either as protection or as part of a trading strategy. The pricing of the CDS will change according to the credit rating of the purchaser, thus a deterioration in credit quality will lead to an increase in the fee paid to the provider of the CDS contract. CDS contracts can be bought without the purchaser being exposed to the risk of an underlying asset, whereas purchasers of monoline guarantees need to have underlying risk exposure. ²⁰
Financial market risks	Interest rate swaps	Interest rate swaps allow for projects to swap the rates paid on a project from floating to fixed rates (or vice versa), which can help stabilise debt repayments on projects.
	Forwards and futures	Forwards and futures can also be used to mitigate a range of financial market risk including pricing risk associated with project bonds and exchange rate risks where foreign currency financing is used.

Source: OECD (2015).

²⁰ In order for monoline companies to be able to participate in the CDS market, many set up special purpose vehicles (known as transformers), to issue CDS contracts. These CDS contracts are in turn guaranteed by the monoline provider, meaning that this provider is distanced from the underlying asset by the transformer. Without the transformer in place, the monoline companies would have to provide a guarantee directly to the underlying asset, as opposed to issuing a CDS.

As the table shows, a number of risk mitigation instruments are available to overcome project risks, although some instruments are used significantly more than others in infrastructure transactions. For example, contract design plays a fundamental role in efficiently allocating risks between different parties, and can be important for ensuring that other mitigation instruments are not needed. The decision to use private sector risk mitigation instruments should be carefully considered in the context of individual projects, given the different requirements that they pose.

With all instruments, it is important to distinguish between whether risk mitigation is being provided as a guarantee or as insurance. Guarantees can be called upon as soon as a pre-determined event takes place, such as non-payment of a given obligation, while insurance-type instruments require some form of evaluation of a claim before any pay-outs can be made. Given that payments made through guarantee instruments are more immediate, these are generally preferred to insurance policies, which can be more difficult for those holding the policies to receive pay-outs.

3.7.1. Contract design

The design and nature of contracts in infrastructure transactions is vital for efficiently allocating specific project risks. If designed appropriately, contracts can ensure that projects risks are allocated so that other risk mitigating instruments are not required. Contracts help clarify who is responsible for bearing each of the project's risks and what is required from each party within the transaction. The project finance model itself is important for ensuring that sponsors have limited liabilities on infrastructure projects insofar that when using such arrangements the project does not expose their wider businesses to the specific risks within the project.

As shown in the table, a number of market risks can be mitigated through appropriate contract design. For example, availability-based contracts are an important way of limiting the extent to which project sponsors and lenders are exposed to potential demand risk on projects, or for providing a revenue stream when demand for an asset is indirect. Such contracts have traditionally used on PFI transactions, which have largely consisted of social infrastructure projects where it has been more difficult to charge user fees. These contracts have also been used in economic infrastructure sectors, including OFTOs in the UK, where payments are linked to the assets being available for use for a target percentage of the available time. Institutional investors tend to favour these arrangements over projects where revenues are susceptible to fluctuations, given that they provide more certain and stable revenue streams and in turn more certainty that projects will be able to meet their payment obligations so long as the operator, whom effectively manages the performance risk is seen as being highly

competent. However, given that the public sector (or customer) assumes demand risk, the degree of true risk transfer is limited.

Offtake contracts are more common for projects that produce specific outputs, such as electricity generation facilities. These contracts allow the project company to supply specified levels of output at an agreed price which helps to reduce future revenue uncertainties. Having an offtake contract in place significantly improves the project's bankability, and investors and lenders will analyse these contracts before providing finance.

3.7.2. Letters of credit (L/C)

L/Cs are important for protecting private sector parties against liquidity constraints faced by counterparties. For example, if a buyer is unable to make payment for services at a given time, the L/C issuing bank will make the payment on behalf of the seller. Banks will require a pledge of security or cash as collateral for providing this cover, and will also charge a fee for providing the service which is typically proportionate to the size of the L/C. L/Cs are particularly useful when buyers do not have a track record of making payments of the size or nature of those associated with infrastructure projects. This may include local authorities with limited experience of making payments associated with specific infrastructure assets.

3.7.3. Mitigation against technical risks

Technical risk mitigation is particularly important for projects where the technologies are relatively new and/or lenders and investors do not have prior knowledge or experience of such technologies. Sectors where this has been particularly prevalent include offshore wind and waste-to-energy facilities where lenders and investors have required comfort from suppliers of the technologies via warranties in case there are some technical defects with the capital equipment being provided.

More generally, projects seek insurance against certain low probability but adverse events that affect the operational ability of the project, such as adverse weather events or weather-related production risks. Adverse weather effects such as flooding or hurricanes are usually covered by insurance that covers force majeure events. Insurance can also be provided to cover certain construction and operational risks.

3.7.4. Credit risk mitigation – Monoline guarantees and credit default swaps (CDSs)

Monoline guarantees were one of the most widely used risk mitigation instruments used in UK infrastructure projects prior to the financial crisis. Monoline guarantees provide bond holders with full and irrevocable guarantees on principal and interest payments, essentially making the provider of the guarantee liable for payments in the event of default. Given their diversified risk and the historically strong track record of guarantees not being called,

monoline providers often had AAA credit ratings, which in turn significantly lowered the cost of debt on projects. In return, monoline providers received a fee from issuers. The UK's PFI market extensively used monoline providers during the 1990s and 2000s. For example, between 1998 and 2010 all PFI bonds issued also include a monoline guarantee, and from 1996 to 2009 52% of all PFI projects over £200m were bond-financed.²¹

Given their exposure to asset-backed securities (ABS) and collatorised debt obligations (CDOs) that included significant sub-prime debt, monoline providers had to pay large amounts of liabilities on the insurances they had issued, which in turn resulted in many ratings agencies lowering monoline providers to junk status. As a result, many of the major monoline companies went out of business. This in turn adversely impacted the pricing of infrastructure bonds that were covered by these insurers, given that institutional investors no longer wanted to hold on to such low-rated assets, and as a result bond financing was largely replaced by bank finance for infrastructure transactions. However, these insurers are slowly returning to the market.

Derivative instruments can be also useful for hedging some credit risks on infrastructure projects and can help create secondary markets, given their tradability. For example, like monoline guarantees, credit default swaps (CDSs) can help shift the risk of default from lenders to a project to a separate party, who will require a fee in return for bearing such risk. As previously mentioned, the pricing of a CDS will change with the credit rating of the purchaser, meaning that if the market perceptions change for a project this will be reflected in the price of a CDS.

While both monoline guarantees and CDSs provide mitigation against credit risk there are some key differences. For example, monoline guarantees can only be purchased if the buyer has an interest in the covered obligations or will suffer a financial loss in the absence of such cover. On the other hand, historically a CDS could be purchased by an entity without a vested financial interest in the underlying asset being covered (known as a naked CDS), leaving these assets open to speculation or short selling.²²

3.7.5. Financial risk mitigation – Interest rate swaps, forwards and futures

Interest rate swaps are also used on infrastructure transactions to help mitigate against fluctuations in interest rate payments. For example, the majority of bonds and loans used to finance infrastructure projects are have floating interest payments, which means that issuers are not able to forecasts what these will be with complete accuracy. By purchasing an interest rate swap, these floating interest payments can be swapped for fixed rates in order to provide

²¹ European PPP Expertise Centre (EPEC)(2010), "Capital markets in PPP financing: Where are we going?"

²² Although since 2012 EU Regulation on short selling has banned naked CDSs for sovereign credit.

more stability in payments. Such swaps are particularly attractive in the current low interest environment as these can be locked in for a considerable period of time, although purchasers of such swaps will need to pay some form of premium for this certainty.

Forward and futures contracts can also be important for hedging against specific risks, including commodity (e.g power) and financial market risks. This may include exchange rate fluctuations if a projects currency is different from the main currency used on lenders' and investors' balance sheets. Forward contracts play a particularly important role in electricity markets, where spot prices can be highly volatile and therefore such contracts can help participants manage risk effectively. Forward and futures contracts differ in their level of flexibility. For example, forward contracts are non-tradable but can be catered to a wide range of transactions. On the other hand, futures contracts are tradable and therefore much more liquid assets, but are much more standardised than forward contracts and therefore cannot be catered to the specific underlying asset. In addition, futures contracts have some protection against defaults on the contracts as daily gains and losses on the contracts are converted into actual cash gains and losses, which are moved to the relevant counterparties each day via a clearing house (this is known as mark to market payments), whereas forward contracts do not have this type of protection.

While derivatives can help to mitigate against some of the risks outlined above, they can also create counterparty risks themselves. In addition, the premiums required on certain derivatives may result in their price being so high that potential purchasers are better off bearing these risks themselves.

4. CASE STUDIES ON UK INFRASTRUCTURE PROJECTS

This section summarises case studies developed for several key infrastructure projects and regimes in the UK. The full case studies are presented in Annex A.

The case studies include:

- UK energy sector regimes both in generation and transmission;
- TTT;
- investments in railway rolling stock and light rail extensions, including IEP and the Northern Line;
- road sector projects, which include the M25 widening and the Mersey Gateway bridge;
- Heathrow Terminal 5 development;
- Pevensey Bay sea defences; and
- broadband network investments.

In addition to these project/ investment specific case studies we have also reviewed how bond finance has been raised to support infrastructure investment in the UK regulated infrastructure sectors.

Our case studies focus mainly on large and/ or complex infrastructure projects that have required some form of policy intervention to attract private finance. We have in part focused on these projects because our analysis of the different sources of finance suggests that the large and complex projects are the ones that tend to be less attractive to institutional investors, funds and commercial banks. Therefore, it is possible that policy makers will have to provide support to some of the projects in the pipeline.

This analysis helps to draw out the key lessons from previous attempts to support large and complex projects to reach financial close.

4.1. Summary of support instruments provided

In the case studies reviewed, the nature of support has varied from the use of regulatory mechanisms to the provision of full UK government guarantees. Table 4.1 below provides details of the different mechanisms applied, focusing on the nature of the implied risk transfer and emerging views on the benefits and drawbacks of such mechanisms.

Table 4.1: Summary of support instruments for case studies

Case studies	Description of regime/project	Nature of policy intervention	Risks mitigated	Benefits and drawbacks of support
Contracts for Difference (CfDs)	Contracts for low carbon generators that allows them to obtain fixed prices for the electricity supplied (in real terms).	• Design of bespoke regulatory regime. • Contractual counterparty (via Low Carbon Contracts Company (LCCC)).	Fixed price in real terms mitigates generators from inflation and (partial) pricing risk.	Projects have benefited from certainty on their prices, which are contracted. However, the use of CfDs has raised some value-for-money concerns for the impact on consumers (prior to competing the subsidy)
Offshore Transmission regime (OFTO)	Offshore transmission assets are competitively tendered, winning bidders own the rights to operate and maintain assets for a fixed revenue (in real terms) over 25 years.	• Design of regulatory regime, including the fixing of OFTO revenues (in real terms). • Competitive procurement	OFTOs protected against a range of project risks, including design, planning and construction risk.	Risks are allocated across appropriate parties, although specific risks to OFTO are relatively limited.
Cap and floor regime	Regulatory regime for new interconnectors in which allowed revenues (in real terms) can fluctuate within an upper (cap) and lower (floor) bound.	• Design and regulation of cap and floor regime.	Demand and inflation risk.	Extends regulatory precedent to a previously merchant market.
TTT	A new separate entity – Infrastructure Provider (IP) – formed to limit Thames' exposure. In addition a bespoke regulatory regime was put in place alongside government support package.	• IP regulated by Ofwat under Regulatory Asset Base approach. • Prefunding of assets in construction • Mechanisms to cover against low probability, high impact construction risks.	Some mitigation against construction risk. Revenues to set by Ofwat, providing some security to investors.	Risks have been allocated sufficiently to ensure that the overall financing costs of the project are limited. However, many have questioned whether the government's support for the project was too extensive.

Case studies	Description of regime/project	Nature of policy intervention	Risks mitigated	Benefits and drawbacks of support
IEP	PPP programme to replace existing rolling stock with electrified trains. DfT guarantees are in place to provide certainty that the trains will be leased when available.	Guarantee of stock being leased (DfT).	Payments made depending on availability of the trains. Investors are protected from Network Rail/ demand risk.	The public sector took on risks that the private sector was not willing to bear, although some key risks were transferred (such as planning, subject to it becoming a condition precedent for financial close).
Northern Line extension	3.2km extension of London Underground's Northern line from Kennington to Battersea. The project is using a novel funding mechanisms whereby developer contributions and incremental business rates are used to pay for the construction. Project developed by the Greater London Authority (GLA), which issued a commercial bond guaranteed by the UKGS.	UK government guarantee - 50 year £750m standby refinancing facility in place.	Guarantee gives investors more certainty about credit worthiness of investment.	The government's guarantee to the project has enabled GLA to raise debt through issuance of some innovative bonds. The design-build contract is also structured so that the private party will only be paid at certain construction milestones. However, the private sector does not have any ownership in this project, therefore risks are relatively limited.
M25 widening	Widening of sections of the M25, refurbishment of the A1(M) Hatfield Tunnel and O&M of M25 and Dartford crossings. Government agreed to commit £500m of debt on commercial terms, signalling to private lenders that the Government was committed to the deal.	- Government agreed to provide credit to the project to attract private finance. This commitment attracted private investors, subsequently government finance was not needed. - Unitary charge payments.	Provision of the unitary fee meant that risks were limited to the availability of the road rather than any demand risks.	Government willingness to commit to the project allowed private finance to be mobilised during financial crisis when availability of private finance was more limited.

Case studies	Description of regime/project	Nature of policy intervention	Risks mitigated	Benefits and drawbacks of support
Mersey Gateway	Construction and operation of new toll bridge. The project's capital costs included a mix of public sector grants and private finance.	• Availability payments (Halton Council, with guarantee from Treasury under the UK Guarantee scheme). • Guarantee to commercial bonds. • Capital grant (DfT).	Revenue risks protected through the availability payments structure. Provision of a government guarantee provided security to investors.	Enabled small local authority to raise large amounts of finance that would otherwise not have been possible, although risk transfer limited to availability of road and construction risk (i.e. payments are not made until the bridge is constructed).
Heathrow Terminal 5	£4.3bn construction of Heathrow Terminal 5. Heathrow Airport Limited (HAL) was provided with pre-funding for the project during the construction period.	• Asymmetric trigger mechanism in place. HAL received pre-funding for meeting construction milestones, with penalties in place if timeframe not met.	Some protection from demand risks provided through pre-funding.	Pre-funding mitigated cash flow problems and provided comfort to investors. But opposition from airlines and concerns about incentives – penalties for not meeting triggers not large enough to incentivise delivery.
Broadband investment	Government in process of establishing the UK Digital Infrastructure Investment Fund. The fund will work to increase access to commercial finance to investments to develop UK's ultrafast broadband network.	• Establishment of new Fund with government committing £400m to the fund, which they expect to match with private sector commitments.	Not clear at this stage.	The design of the fund is still in development but presumably the aim is to try to leverage private investment in an area where it could be perceived that there is potential for technology, construction and demand risk.

Source: CEPA analysis

As the table shows, projects have benefited from extensive and wide ranging public sector support. Investments in the energy sector have been secured through the development of regulatory regimes that have helped limit the risks associated with investments. For example, both the Contracts for Difference (CfD) and OFTO regimes help stabilise revenue flows over long periods, which in turn allow investors to more accurately forecast what the revenues from the assets will be. On the other hand, many of the transport sector projects reviewed included either implicit or explicit UK government guarantees where it has not been possible to give investors similar certainty in the form of a regulated asset.

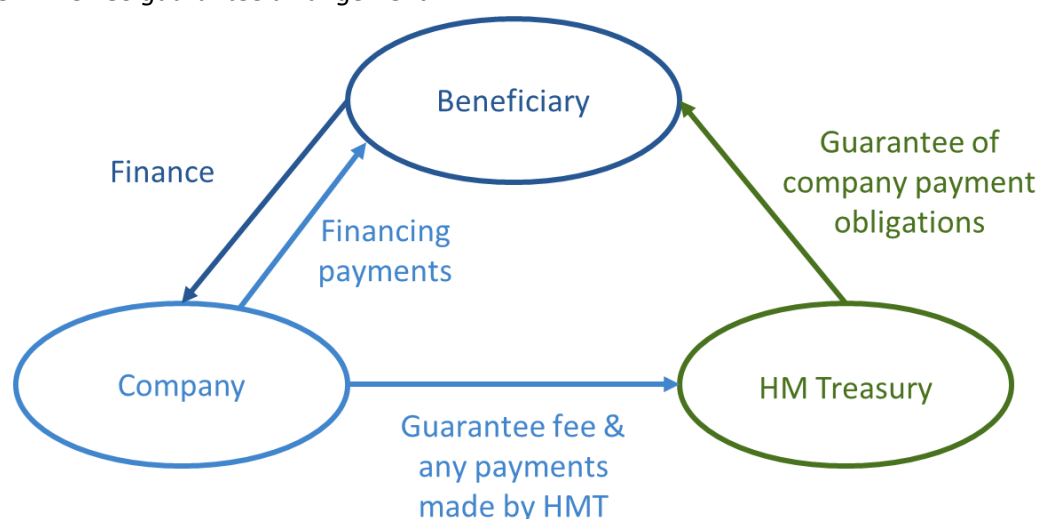
Further details of the support instruments are provided in the sub-sections below.

4.2. Nature of contingent government support

The case studies demonstrated that while full credit guarantees have often been used, there is evidence of the government also using guarantees to cover specific project risks.

Financial guarantees as part of the UK Guarantees Scheme (UKGS) were first made available from 2013, with the government announcing that £40bn of contingent support would be made available to energy, transport, housing and social infrastructure sectors. Under UKGS, projects can apply for unconditional and irrevocable guarantees of principal and interest in favour of a lender to/investor in a UK infrastructure project and on behalf of borrower/issuers of debt, who pay a guarantee fee on commercial terms to the government (specifically HM Treasury (HMT)). Borrowers are also required to indemnify the government for any payments made as part of the guarantee, meaning that the borrower is still ultimately responsible for payments to lenders/investors. A summary of arrangements under UKGS guarantees is provided in the figure below.

Figure 4.1: UKGS guarantee arrangement



Source: Allen & Overy; CEPA.

As the above figure shows, the beneficiary of a guarantee is the provider of the debt or equity in the project, while payments are made by the project company themselves, which benefits

from the UK government's credit rating. This risk transfer means that investors in the project can price their investments covered by the guarantee at rates that reflect investing in UK government, helping to lower the project's cost of capital.

Examples of case study projects that have received direct support under UKGS include the Northern Line extension and Mersey Gateway. For the Northern Line extension, the UKGS support was provided in the form of a £750m refinancing facility, which can be used if the Greater London Authority (GLA) is unable to meet debt repayments. On the other hand, the Mersey Gateway guarantee has been used to provide full credit cover for £260m of commercial bonds issued a part of the project, while the government has also fully guaranteed availability payments for the project. For both of these projects, the government guarantees have enabled large sums of private sector finance to be raised at a cost that would otherwise not have been possible.

Guarantees provided under UKGS have been designed to be simple and are specifically focused on lowering project financing costs. This differs from the government support package that has been provided to the TTT project, which has been provided to cover distinct project risks. Examples of the agreements signed by the government on TTT include to provide equity injections in the event of cost overruns, insurance cover for low probability events that could not be covered from insurance companies due to their size and uniqueness to the project and a temporary liquidity facility in the event of changes in financial markets that limit the availability of finance (as was the case for the M25 widening project). However, a full credit guarantee has not been provided to the project, meaning that investors are still exposed to some key risks (including some of the construction risk).

The case studies show that the nature of government contingent support has varied from general credit cover under UKGS to support covering specific risks, as shown under the TTT and the availability payment cover as part of the Mersey Gateway project. While UKGS guarantees allow beneficiaries to price investments with relative ease, adopting a more tailored approach allows for some risks to remain fully with private parties, therefore limiting public sector liabilities. What is clear from the case studies is that the public sector is likely to need a tailored approach when determine the nature of the contingent support being provided. For example, full credit cover may be needed when the private sector is exposed to greenfield risks and regulatory cover is not present, while still maintaining specific cover for large or high risks that are unique to given projects.

4.3. Role of regulators

The case studies also highlight the important role that regulators have played in securing investments whilst also providing value for consumers. This is evident from Ofgem's development of regulatory regimes in the electricity sector, which have helped to successfully mobilise private sector investment.

For example, the OFTO regime has been designed to ensure that only controllable risks are borne by the OFTO, whereas a range of regulatory mechanisms have been used to protect investors from uncontrollable risks through adjustments to its Tender Revenue Stream (TRS). This includes adjustments to reflect market interest rates, additional capacity investments, revenue corrections, cost pass-through and an exceptional events mechanism. The TRS received by OFTOs is fixed (in real terms), therefore unlike other regulatory regimes OFTO licences do not require price reviews over their 20 year period.

Like OFTOs, CfDs have been designed to offer investors relatively stable revenue streams. Under CfD arrangements, generators receive a fixed price for supplying electricity. This differs from payments received under the Renewable Obligation Certificates (ROCs), under which generators received an additional amount for the energy they supplied over wholesale market prices.

Another benefit of the CfD arrangement is that payments form part of legally binding contracts, whereas ROC payments are determined by the number of ROCs made available, which can be subject to changes in policy.

Both the OFTO and CfD arrangements provide investors with more certainty about the revenues that will be generated over the life of the licence/contract, making them a more attractive investment option.

Regulators have also built on established regulatory precedent for helping to attract investment into the sector. For example, allowed revenues under the cap and floor regime for interconnectors are determined using a “building block” approach. This approach has been adopted in other forms of utility regulation that investors understand and have previously invested in. In addition, TTT will be subject to its own price control once operational, and will be regulated in a similar way to other companies in the sector.

The case studies also provide examples of how regulators have allowed companies to pre-fund large scale projects. For example, the Civil Aviation Authority (CAA) allowed Heathrow Airport Limited (HAL) to increase its regulatory asset base (RAB) during the construction period of Terminal 5, which in turn meant that it could charge higher landing fees before it was operational. While this faced opposition from the airlines, it allowed HAL to reduce cash flow mismatches and increase its revenue profile to a level that was sufficient to attract investors. In order to incentivise HAL to complete the project on time, increases in the RAB during the construction period were also accompanied by regulatory triggers, which penalised HAL if construction milestones were met. HAL was also provided with an uplift to its cost of capital as a result of the Terminal 5 project.

However a problem with the approach is that the provision of pre-funding can create disincentives for the scheme developer to complete the project on time. In the case of Terminal 5 specific triggers were put in place such that HAL received increases in the RAB when it achieved project milestones at prescribed timelines. If it did not meet these triggers

it faced a penalty; however the size of the penalty was not sufficient to limit incentives for delaying construction.

A similar pre-funding approach was adopted by Ofwat as part of the TTT project, where Thames Water has already been able to increase consumer bills to help pay for the project's construction costs.

4.4. Importance of competitive procurement

Several of the case studies highlighted that implementing a competitive procurement process can help attract private sector finance at relatively low costs and in turn improve value for money. Examples of where this occurred include:

- CfDs – The competitive round of issuing contracts was able to secure contract prices that were considerably lower than those allocated without a competitive procedure being undertaken (see Annex A case study for further details).
- OFTOs – Recent analysis has suggested that the latest OFTO tender rounds have saved between c.£680m and c.£1.1bn in present value terms at 2014/15 prices to date, compared to the counterfactuals of wind farm developers owning the assets and counterfactuals where the assets form part of onshore transmission companies' price control revenues.²³
- The TTT project – The tendering of the Infrastructure Provider (IP) for the TTT project resulted in a Bid Weighted Average Cost of Capital (BWACC) of 2.497%, which is considerably lower than allowed WACCs provided in regulated industries and for a more risky greenfield asset.²⁴
- Mersey Gateway – The competitive dialogue process has been praised for improving some of the projects design elements and saving an estimated £250m.²⁵
- IEP: The tendering of the IEP rolling stock was undertaken by DfT as opposed to train operating companies (TOCs) directly leasing stock from Rolling Stock Operating Companies (ROSCOs), which allowed a range of firms to bid in the process. This new approach to procurement has been credited with introducing innovative designs whilst also significantly reducing costs.²⁶

Ofgem is also looking to use competitive tender processes to increase competition in the onshore transmission sector as part of the developing CATO regime.

²³ CEPA (2016), Evaluation of OFTO Tender Round 2 and 3 benefits.

²⁴ CEPA (2015), Thames Tideway Tunnel – Cost of Capital.

²⁵ <http://www.merseygateway.co.uk/about-the-mersey-gateway-project/funding-of-the-mersey-gateway-project/>

²⁶ Foster (2010), A review of the Intercity Express Programme.

In the next phase of the assignment we can try to explore some of these case studies in more detail through the consultations in order to understand more about the role that different types of government support have played in enabling the projects to reach financial close.

5. INTERNATIONAL CASE STUDIES

In addition to UK case studies, we have also reviewed a number of interesting examples of infrastructure projects that have received private finance internationally. These projects have been selected to highlight examples in which different government support mechanisms have been used to support the provision of private finance to infrastructure.

5.1. Overview of case studies

Table 5.1 below summarises the international case studies and provides details of interesting lessons that can be drawn from them and possibly applied to the UK market. Further details of each project are provided in Annex B.

Table 5.1: Summary of international case studies

Project name	Description	Private finance details	Public sector support	Key lessons
Gemini Offshore Wind Farm, Netherlands	- Two greenfield windfarms - Largest project finance transaction in offshore wind at financial close.	- Equity consortium led by green energy developer - Majority of senior debt sourced from commercial banks - Mezzanine facility	15 year CfD guaranteeing fixed prices. - Local government-owned utility company as off-taker 26% of project debt finance provided by EIB - Export credit facility guaranteed some of the debt.	- EPC and turbine contracts in place before raising finance - Limited number of contracts reduced potential issues between different parties - Backing of main equity provider with large balance sheet and management expertise - Stable and transparent government policy - EIB and export credit was helpful in mobilising commercial lending
Meerwind Offshore Wind Farm, Germany	288MW wind farm - First European project to be operated by a private equity investor (as opposed to utility) - First windfarm built under KfW's approx. £6bn renewables financing programme	- Project equity - Some of the initial debt finance - Bond facilities that were issued as part of the refinancing of the project - Credit facilities	51% of debt finance provided by KfW at financial close - Feed-in tariff regime offers certainty of prices until 2027, followed by optional price floor from 2028-34 - Export credit provided by EKF, the Dutch export credit agency (ECA)	- Important role played by KfW in providing initial financing and then recycling capital during the later stages of the project, which was provided without EIB support - Construction risk effectively managed through an availability guarantee provided by Siemens, which was supported by EKF
Logan Motorway Enhancement, Australia	- Upgrade and expansion of highways and interchanges in Queensland, Australia - Entirely financed by private sector operator of toll roads - Project originated by concessionaire through Market Led Proposals (MLP) framework	Fully privately financed	- Contracting of concessionaire - Development of MLP framework - Providing necessary consents.	- Large brownfield toll road projects can be financed entirely by the private sector under certain conditions - Acceptability of user charging on roads crucial - Close engagement of the public and private sector through the MLP framework

Project name	Description	Private finance details	Public sector support	Key lessons
A7 Bordesholm-Hamburg Motorway PPP, Germany	- Widening of 65km of the A7 motorway to six lanes 30 year DBFMO contract, with transfer of construction, availability and performance risk	Majority of equity and debt finance provided by institutional investors	- EIB and KfW invested in the commercial bond issued. - EIB supported the project through its Project Bond Credit Enhancement Scheme	- EIB support helped raised the credit rating of the capital market instruments by 1 and a half notches to A3 (Moody's) - Early engagement with the market allowed the project to be structured in a way that enabled bond financing in Germany's greenfield road sector for the first time
WestConnex Road (Phase 2), Australia	- Upgrading of existing interchange and extension of motorway - Initial traffic risk taken by New South Wales Government	30% of debt finance - Planned sale of concession once operational and traffic volumes established	- Grant finance provided by federal and state government - Concessional loan provided by Australian government to bridge financing during construction.	Sale of the assets built during initial phases will allow the government to recycle the capital to fund future phases, once traffic volumes have been demonstrated
South Atlantic High Speed Rail (HSR), France	303km construction of new high speed line 50 year concession contract, where construction and traffic risk have been transferred	- Nearly 75% of equity finance - Uncovered (c.£385m) and covered (c.£660m) debt finance	€3bn of grants provided by French Government, local authorities and the EU. €1bn grant from state-owned rail company SNCF 25% equity via French state-owned CDC Infrastructure, guaranteed SNCF 25% of senior debt via CDC - EIB loan covering 20% of all debt, with two thirds of this guaranteed by state - Guarantee of c.£660m of commercial debt	- Extensive public sector support likely to be required for financing major high speed rail schemes - Government guarantees were important in lowering the cost of private debt finance, with the unsecured debt being priced at 155bps higher than secured debt, stepping up to 255bps difference

Source: CEPA

5.2. Key design features

The international case studies included a number of key design features that enabled a significant amount of risk to be transferred to private parties.

For example, the Logan Motorway Enhancement project in Australia involves the private party taking traffic risk, given that revenues are determined by tolls. This project involves upgrading and extending a number of highways in Queensland, where user-charging has generally been accepted as a means of funding major roads. Another interesting feature of this project is the Market-led Proposals (MLP) framework under which it was developed. This framework allows for private sector entities to propose to the government potential projects or services to meet a community need in return for being able to provide the infrastructure or service without the projects being bid via a competitive tender. Proposals are assessed on a value for money basis whereby private entities must demonstrate the benefit of engaging with them exclusively rather than allowing projects to be competitively tendered.

The South Atlantic High Speed Rail PPP in France also provides an interesting example of how traffic risk can be transferred to private parties. For this project, the private concessionaire will receive the majority of its payments from reservation fees made by train operating companies (TOCs), for reserving slots to run trains along the line, with state-owned SNCF purchasing all the slots on the line initially.

The Meerwind project in Germany provides an interesting example of transferring construction risk to EPC contractors. This was achieved through an availability guarantee provided by Siemens (with a guarantee also provided by EKF, the Dutch Export Credit Agency). This was the first time the company had supplied turbines on this basis, and shows how contractual arrangements can help to allocate risks appropriately.

5.3. Public sector support mechanisms

A number of the support mechanisms provided in international case studies are similar to those that are used in the UK. For example, the Gemini Wind Farm in the Netherlands benefited from a CfD mechanism similar to that used in the UK. However, in Germany, the Meerwind Offshore Wind Farm project provides an interesting example of a transitional payment mechanism being used for renewable projects that is different from the UK. For example, this project will benefit from a guaranteed payment for this first 13 years of operation. For the following six years, a guaranteed price floor will be available, and after this the project will be subject to market prices. This is likely to limit the extent to which public sector subsidies will be needed to support the project.

The Meerwind project has also benefited from an interesting financial arrangement, whereby KfW, the German state-owned development bank, provided the majority of the initial debt

finance for the project at financial close (alongside commercial bank finance) as part of its €5bn loan programme for offshore wind projects. Once the project had commenced operations in 2014, the project was refinanced through the issue of bonds, which may have not been possible at financial close in 2011 due to the downturn in financial markets. This provides an interesting example of how private sector finance can be attracted onto projects once project risks are relatively limited.

The Australian government also plans to recycle its capital as part of the WestConnex Road expansions in New South Wales. The project is split into three phases – the first phase will involve the expansion and widening of one section of the road, the second will involve widening and extending another section of the road and the third phase will involve constructing a motorway tunnel with three lanes between the first two phases and will link sections of the road together. The capital expenditure in the first phase will be paid for by government grants. Our case study has focused on the second phase of the road, where a combination of government grants, government concessional loans and commercial loans will finance construction. Once operational and traffic levels are established, the first two phases will be sold to the private sector and the proceeds of the sales will be used to fund the final phase of the project. This is a useful example of how government can mobilise private finance in order to raise funds for projects that may not otherwise be possible.

Some of the larger projects reviewed required extensive levels of public sector support. This includes the high speed rail (HSR) line between Tours and Bordeaux in France, where a combination of government, state-owned financial institutions and the country's public sector rail company provided support including grants, debt finance and guarantees to both EIB and commercial finance. As with the Meerwind project in Germany, financial close was reached in 2011, which was a difficult time to obtain euro-denominated finance and explains why such extensive support was needed. Having said this, a large amount of private debt and equity was also provided to the project. Of the €7.8bn total project cost, €1.6bn was financed through commercial debt, with €1.1bn guaranteed by the government. Because of this support, the guaranteed debt was priced at a significantly lower rate than the unsecured debt, which was provided by the same institutions and at the same tenors, highlighting how public sector contingent support can improve overall value for money.

6. CONCLUSIONS AND EMERGING FINDINGS

Sections 2, 3, 4 and 5 of this report respectively look at: the recent trends in the provision of finance in the UK infrastructure market; the trends in the sources of finance (institutional investors, funds and banks); a selection of UK case studies on large complex infrastructure transactions; and Section 6 looks at the international case studies. The key emerging findings from the work are set out below. Conclusions presented below are considered in more detail in the main findings report that draws out the overall findings that we have made from this assignment.

Recent evidence that volume of transactions has returned to pre-financial crisis levels

Whilst there has been some considerable variation across different years, overall transactions values and volumes are currently at a similar level now as they were ten years ago. However, underling this trend it is important to note that there has been a significant decline in the use of the PFI model to fund (mainly social) infrastructure projects. This has in part been compensated for in terms of volumes by the growth in the number of renewable energy projects. What has been interesting has been the way in which the flow of opportunities created in the energy sector alongside the development of a regulatory regime to bring them to market has created a lot of investor appetite for transactions that might otherwise have been seen as being quite risky.

The European Investment Bank (EIB) has been involved across a number of transactions

The European Investment Bank (EIB) has also been particularly active on large primary financing transactions that were reviewed. For example, of the 17 projects reviewed, EIB provided financing in seven of these transactions totalling over £2bn.

While the EIB has been involved in a number of transactions, this does not necessarily mean that they would not have reached financial close without its involvement. EIB can play an important role in providing confidence to other lenders to a project. However, it can also provide cheaper credit than commercial debt providers, as such there can be questions about the extent to which EIB is truly catalytic or whether it might also be crowding out private capital due to its low pricing.

Institutional investors and banks may have a preference for simple, repeatable transactions

Further, our review of the sources of finance for infrastructure suggest that institutional investors and commercial banks have a preference for less complex deals, that have known project structures (and therefore well-understood risks) that have the potential to provide them with a regular flow of opportunities. The last point is important to investors, because it

requires investment for them to build up the sector expertise that they need to understand the risks posed by transactions – and thus be in a position to close a transaction. If investors believe that the opportunities in a sector are likely to be limited to a few, unique, opportunities they will not invest the resources needed to build up sector expertise.

We reviewed the recent transactions of some of the UK's biggest institutional investors. This sample shows that the majority of their activity has been in small social infrastructure projects; however, there is also some evidence that institutional investors have begun to invest in some of the more complex deals such as Allianz's investment in TTT and the GLIL investment in the renewables sector. These more sophisticated institutional investors have built up their own expertise – in the case of Allianz, it has reportedly developed a team of individuals drawing on previous monoline insurance teams.

Our initial consultations with investors back up the findings from the research. Consultees suggested that they have less interest in one-off complex opportunities as it will involve them incurring large up-front costs which they cannot recover from future deals. As their experience in a sector grows a published pipeline become less important as they become more confident in their ability to work with key sector counterparty/ies. They also see it as important that deals are structured sensibly and aligned to this they want to work with a counterparty that they have confidence in and see as an intelligent client.

Potential for pension funds to invest more in infrastructure?

The emerging evidence suggests that there is still some scope for pension funds, to invest more in infrastructure in the UK. The data shows that both target and actual allocations to infrastructure by pension funds are both below comparator economies.

The evidence suggests that this is partly a question of the scale, primarily an issue for the LGPS (which is partly being addressed by the Pooling Initiative); but is potentially mainly caused by the lack of experience that some pension funds have in investing in infrastructure assets.

Whilst capital may be readily available at the moment, this may not always be the case. In the context of this, it is therefore worth exploring ways in which DC, as well as DB schemes, might be able to access more illiquid infrastructure investments more readily, enabling them to benefit from the illiquidity premia that exist in such markets.

The perception that DC schemes are limited in their ability to access infrastructure assets by the liquidity requirements placed on them has the potential to hamper the growth in pension fund investment in infrastructure. This is particularly so because of the growth DC schemes means they are likely to make up an increasing share of the UK's pensions savings over time. It is not clear exactly why these perceptions exist and further work needs to be done to understand the options for addressing this issue.

Use of funding and financing support mechanisms for UK and international case studies

The case studies completed for both the UK and for international infrastructure projects review how different support mechanisms have been used to facilitate infrastructure transactions to reach financial close.

One of the most important features of the UK infrastructure finance market has been the success of the economic regulation model in facilitating a significant amount of infrastructure investment by providing investors with a stable framework that they understand and in which they have confidence. In recent years, particularly the role that Ofgem has played in extending its regulatory model to develop and then implement programmes that have facilitated considerable investment in the renewables sector.

Fundamentally the different support mechanisms can be grouped under funding (such as the use of the CfD, the OFTO model and the provision of grants as was the case for the South Atlantic High Speed Rail (HSR), France) and financing interventions (such as the use of the UK guarantees and the EIB's bond credit enhancement mechanism).

One of the findings to come out of the consultations and research on the use of support mechanisms is that the support is generally needed on transactions that are complex and present investors with a unique set of risks that they do not understand/ have limited experience of managing. As a result there is no real defined set of rules that can be used to guide the use of government intervention across different transactions; instead government needs to be flexible and make use of support mechanisms that are tailored to the nature of the risks implied by each transaction taking account of the demand of different investor classes.

ANNEX A UK INFRASTRUCTURE PROJECT CASE STUDIES

This annex includes a number of examples of both regimes that have been established to help attract private sector finance and case studies where a significant amount of private finance has been provided.

A.1. Contracts for Difference (CfDs)

CfDs were introduced into the UK electricity sector as a mechanism to increase low carbon generation and help meet both UK and EU targets on renewable energy production. Under the regime, generators agree long-term contracts to supply energy at a “strike price”. If the wholesale market price is below the strike price, the generator receives the difference from the contract counterparty, whereas if prices are above the strike price the generator pays the difference to the counterparty.

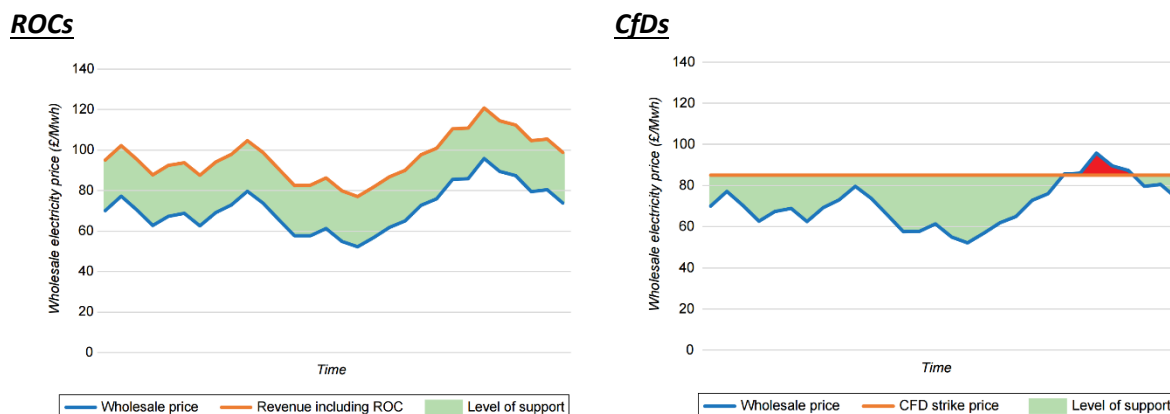
CfDs will replace Renewable Obligation Certificates (ROCs), which will not be available for new generators after 2017 (although support under the scheme will still be paid until 2037). ROCs were introduced in 2002 and are purchased by electricity suppliers from accredited generators. Suppliers who do not hold a sufficient amount of ROCs are required to pay an equivalent amount into a buy-out fund, which is used to help recover the administration cost of the scheme (with surplus then redistributed to suppliers in proportion to the ROCs they produced in meeting their individual obligation). A comparison of the two schemes is provided below.

Table A.1: ROC and CfD comparison

Area	ROCs	CfDs
Payments from scheme	Top-up payment provided in addition to the wholesale price received by generators.	Strike price provided to generators, which does not vary with wholesale prices.
Counterparty	Electricity suppliers	Low Carbon Contracts Company (LCCC) Ltd
Estimated annual cost (2020/21)	£4bn	£2.5bn
Arrangement	Obligatory arrangement	Private contract

Source: CMA (2016); Ofgem (2016); CEPA analysis.

Figure A.1: ROC and CfD payments



Source: CMA (2016). Note that numbers included are indicative.

Because prices received by generators under CfD's do not vary (in real terms) with wholesale markets, revenue streams received under this mechanism are more stable relative to ROCs. As a result of this, financing costs for generators who enter into CfDs should be able to secure financing at lower costs relative to the ROC scheme. An additional benefit of the CfD scheme is that payments are set out in contracts, whereas payments under ROCs are based on the amount issued by the government, therefore can result in less payments to generators if fewer ROCs are issued as a result of changes in policy.

Another difference between ROCs and CfDs are that under a CfD arrangement, generators and suppliers undertake transactions via intermediary entities. This includes the Low Carbon Contracts Company (LCCC), who is responsible for signing, managing and monitoring CfD contracts, while payments are made via EMR Settlement Ltd. National Grid also plays an important role in the implementation of CfDs, acting as the delivery body who is responsible for assessing generators' eligibility of CfD applicants, managing the CfD allocation processes, advising the government on the appropriate strike price that should be set and provides the LCCC with information required to offer CfDs.

Under current legislation, CfDs can be allocated to renewable generators via two different routes.

First, the government can hold allocation rounds in which it allocates a certain amount of budget to CfDs, and projects compete with each other to secure support from CfDs via sealed bids. The amount of support available is divided between different pots (established technologies, less established technologies and biomass conversion). The government also sets an Administration Strike Price (ASP) for each technology, which acts as a maximum price that developers can include in their bid for obtaining a CfD, although it is assumed that prices received will be lower than this.

Second, in exceptional circumstances, the government can also direct the LCCC to award a CfD directly to a generator without running a competitive bidding process.

The first awards of CfD contracts took place via a non-competitive allocation, where eight CfD contracts were awarded to generators with a combined capacity of 4.5GW in May 2014 (called the Final Investment Decision enabling for Renewables (FIDeR). This early award of CfD contracts was provided to prevent lower levels of investment taking place during the phasing out of ROCs and the introduction of CfDs. On the other hand, competitive allocation of CfDs first took place in January and February 2015, with 27 renewable generation projects being allocated, comprising 2.1GW of capacity, and a second round of competitive bidding is expected to take place in April 2017. Further details of both of these rounds is provided in Table A.2 below.

Table A.2: CfD allocations to date

Round	Contracts awarded	Total capacity	Weighted average strike price (£/MWh) ²⁷	Estimated support 2020/21 (£m) ²⁸
FIDeR	8	4.5GW	£133.72	£1.1bn
Competitive Round 1	27	2.1GW	£101.95	£315m

Source: CMA (2016); NAO (2014); CEPA analysis.

The majority of projects that have been awarded CfDs have yet to reach financial close, particularly those that were awarded CfDs as part of the Round 1 competition. Examples of FIDeR projects that have reached financial close include offshore wind farms such as the 402MW Dudgeon and 588MW Beatrice, each with total costs of £1.5bn and £2.6bn respectively. Both projects include major financing from commercial lenders, in addition to financing from EIB and state-owned energy companies such as Statoil and DONG Energy. Private sector investment in the FIDeR projects are expected to total around £12bn, indicating the huge level of interest in these projects.

While extensive private sector investment has been attracted to FIDeR projects, the nature in which the CfDs were awarded have come under heavy criticism. For example, the National Audit Office (NAO) estimated that these early contracts committed up to £16.6bn, or 58% of the funds available for renewable CfDs up to 2020-21, and questioned whether committing such a large proportion of funds provided value for money (VfM), given that this will result in less funding being available for future projects. In addition, the NAO noted that the ASPs that were awarded to the projects (which were set by the Department of Energy and Climate

²⁷ The weighted average strike price has been calculated by dividing the MW capacity of a given power plant by the total capacity of projects receiving CfD payments, multiplying this by the individual strike price and then taking the sum of these values for all the plants. Figures are in 2012 prices.

²⁸ Estimated amount of support is calculated in 2012 prices.

Change (DECC), now the Department of Business, Energy and Industrial Strategy) may have been set higher than the level needed to attract investment. As shown in Table A.2 the weighted average strike price under FIDeR was significantly higher than those provided as part of the first competitive round for CfDs. According to the CMA, had the strike price for the FIDeR round been at similar levels to those awarded under the competitive procurement round, the level of support for projects would have been approximately £250m-£310m a year lower, 1% of average annual energy bills over the 15 year length of the contracts.²⁹ While these numbers should be taken as indicative, they do highlight the importance of structuring regimes in an appropriate manner that both attracts private investment whilst ensuring VfM for consumers, who will ultimately pay for these costs via higher energy bills. According to the CMA, CfD payments are expected to increase steadily over the course of the contracts, and will make up approximately 5% of domestic electricity bills by 2020/21 and 12% by 2030.

A.2. OFTO regime

Since 2009, Ofgem and the UK Government have appointed separate OFTOs to own and operate offshore electricity transmission assets in Great Britain under long-term OFTO licences. OFTO assets link offshore generation (wind farms) to the onshore network.

Each OFTO is entitled to a stable, 20-year, Retail Price Index (RPI) inflation-linked revenue stream - the Tender Revenue Stream (TRS) - in return for operating, maintaining and decommissioning the transmission assets. The TRS includes an incentive mechanism that rewards or penalises OFTOs when the availability of the transmission infrastructure exceeds or falls short of a target level (usually 98%).

Licences are allocated via a competitive tender process. Bidders were initially asked to propose their yearly TRS requirements and to demonstrate their ability to fulfil the licence conditions. From TR3, bidders were also able to propose a proportion of the TRS to be paid nominally, with the remainder increasing by RPI each year.

A.2.1. Why are offshore transmission assets attractive to institutional investors?

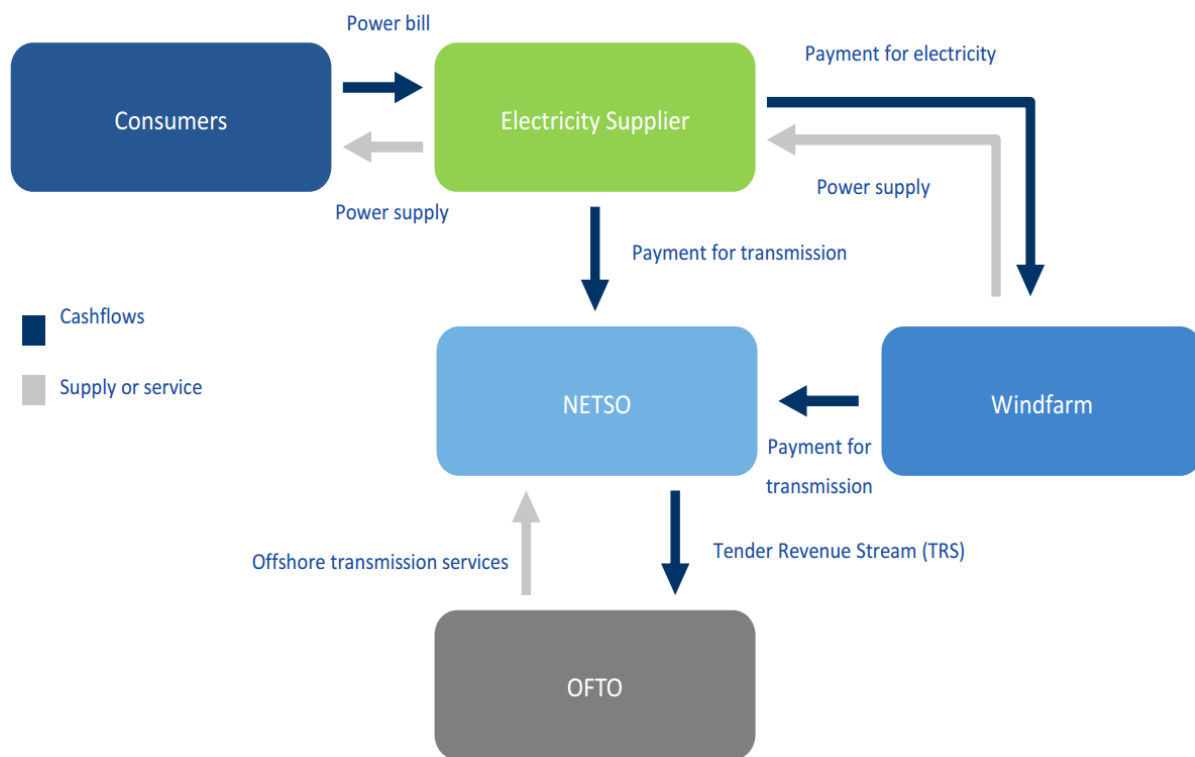
While investments in OFTOs are not risk-free, relatively few risks are borne directly by the OFTO and most of those risks are relatively small and/or can be passed on to third parties (depending on the investor's risk appetite). Instead, risks are controlled by the regulatory regime which aims to expose OFTOs to those risks that they are in a position to control (i.e. operational costs), but otherwise to protect against uncontrollable risks through a range of mechanisms that adjust the TRS in given circumstances:

²⁹ p.248, CMA (2016), Energy Market Investigation – Final Report.

- **Market rate adjustment.** The TRS is adjusted to reflect changes in market interest rates between the date of the bidder's submission and Financial Close.
- **Cost Pass Through.** The TRS is automatically adjusted for changes to a set of pre-specified costs such as licence fees, Crown Estate lease costs, network rates and for legislative changes impacting decommissioning requirements.
- **Additional Capacity Investment Adjustment.** The TRS is adjusted to reflect any additional capex required to deliver additional capacity at the request of a generator. The OFTO also has the right to refuse to undertake additional capex exceeding 20% of the Final Transfer Value.
- **Revenue Correction Factor.** OFTO revenues are adjusted to reflect any over- or under-recovery of revenue in the previous year.
- **Force Majeure.** Significant unforeseen events impacting OFTO's ability to deliver against its obligations are protected against through an Income Adjusting Event clause in licences.
- **Exceptional Events Mechanism.** The Exceptional Events Mechanism provides protection against penalties under the availability incentive mechanism for events beyond the OFTO's reasonable control.
- **No price reviews.** Unlike many other regulatory regimes, OFTO licences do not require a price review as the TRS is fixed for the whole 20-year period.

Importantly, OFTOs receive the TRS from the National Electricity Transmission System Operator (currently National Grid Electricity Transmission) rather than the offshore generator - reducing payment risk. National Grid recovers these costs from generators and suppliers as part of its Transmission Network Use of System (TNUoS) Charges, so the TRS is effectively underwritten by the consumer. The figure below shows a simplified illustration of cashflows and services behind the OFTO regime.

Figure A.2: Payment and service arrangements for offshore transmission



Source: KPMG³⁰

OFTO investments tend to enjoy good credit ratings on account of their low risk profile, well established regulatory regime, the simplicity of availability-based incentive mechanisms, and the underlying nature of the assets (i.e. operational, post-construction). Rating agencies have tended to score OFTO assets around BBB+, which can be improved through letters of credit such as the EIB's Project Bonds Credit Enhancement product. They have therefore attracted substantial interest from institutional investors without the need for direct government intervention.

A.2.2. Interest from institutional investors

Licence bidders have typically been consortia of infrastructure investment funds backed by 19/20 year term loans from banks or the EIB, or financed through bond issuance - some with a letter of credit from the EIB. Institutional investors have engaged with the OFTO regime during tender rounds 1-3 in the following ways:

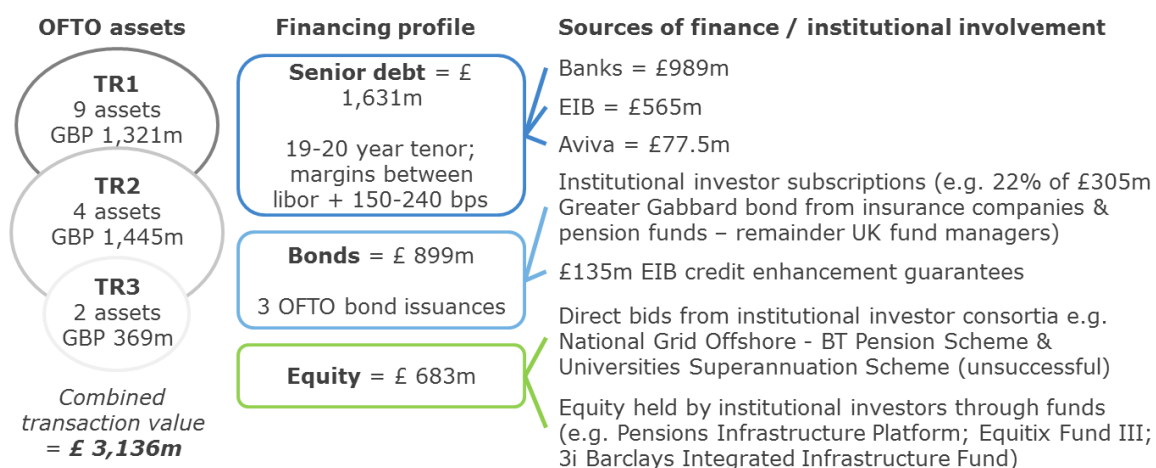
- **Direct bidding.** Tender rounds 1 and 2 attracted several unsuccessful bids from National Grid Offshore - a consortium of Britel Fund Trustees (as custodian of the BT Pension Scheme) and the Universities Superannuation Scheme.

³⁰ KPMG (2014): Offshore Transmission: An Investor Perspective – Update Report.

- **Direct equity purchase.** In November 2015 Macquarie sold its 50% stake in the West of Duddon Sands offshore transmission link to the Pensions Infrastructure Platform (PIP) equity fund (a venture formed by 5 UK pension funds and managed by Dalmore Capital).
- **Bond purchase.** Institutional investors have taken up a proportion of the bonds issued for the purchase of Greater Gabbard, West of Duddon Sands, and Gwynt y Môr. 22% of the £305m Greater Gabbard bond was taken up by (mostly UK-based) insurance companies and pension funds, while the rest were bought by UK fund managers.
- **Loan provision.** Aviva provided a £77.5m 19-year term loan for the purchase of Westernmost Rough offshore transmission link. Pricing details were not disclosed. This is the only insurance company to have provided a loan directly to an OFTO.
- **Bidder institutional fundraising.** Institutional investors have been making funds available to OFTO licence bidders indirectly through low-risk infrastructure funds. For example, Equitix raised £500m from institutional investors in 2013 for Equitix Fund III which now owns equity shares in Humber Gateway, West of Duddon Sands, and Thanet offshore transmission links. In 2014 Macquarie followed suit with the launch of the £829m Macquarie Infrastructure Debt Fund (UK Inflation Linked), including contributions from the UBS Pension Fund, RAC (2003) Pension Scheme, SAL Pension Fund, Marks and Spencer Pension Trust, Land Rover Pension Plan, Jaguar Pension Plan, Royal Insurance Group Pension Scheme and Syngenta UK Pension Fund. Macquarie have been fundraising for a second round in 2016 - targeting UK pension schemes looking to invest a minimum of £10m.

The figure below summarises financing arrangements for the fifteen OFTO licences that have been awarded under tender rounds 1-3, highlighting institutional investor engagement where possible. Tender Round 4 (Burbo Bank Extension) has not yet been awarded.

Figure A.3: OFTO financing in tender rounds 1-3



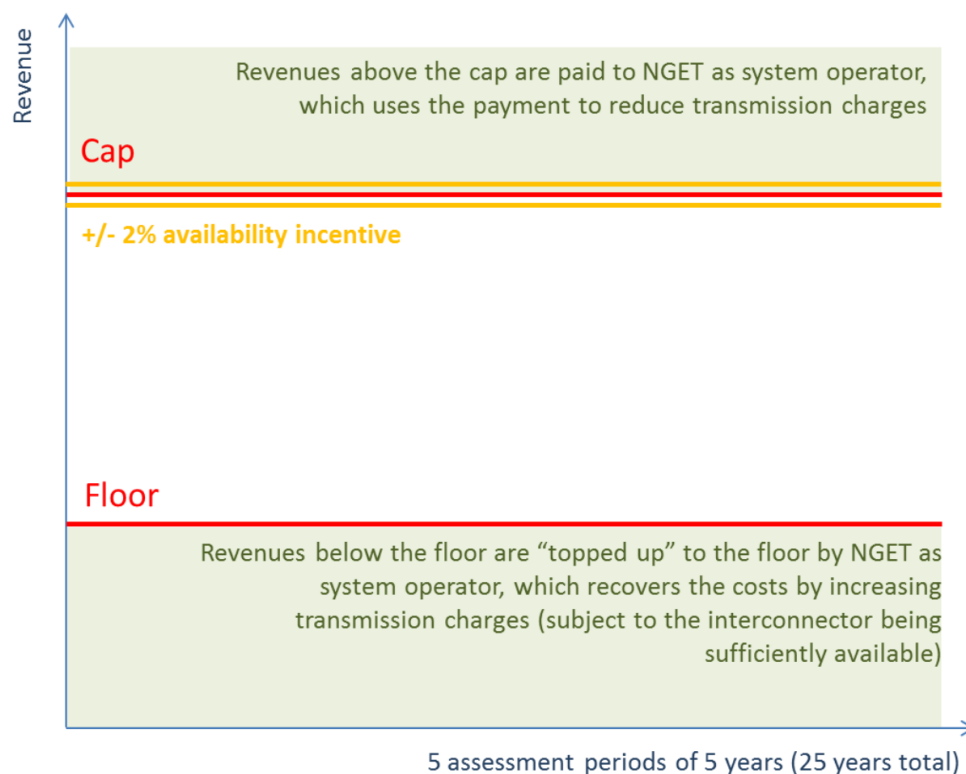
Source: InfraNews

A.3. Cap and floor regime for interconnectors

Prior to 2011, electricity interconnector investment followed a merchant structure with limited regulation. Revenues from these interconnectors were fully determined by the level of demand and supply in different markets and prevailing prices. These investments were dependent on receiving exemptions regarding third party access to the network. Such exemptions proved increasingly difficult to obtain. In addition, European legislation requires that interconnector capacity must be allocated via market-based methods (such as auctions). After extensive consultations over two years, Ofgem outlined initial plans for a cap and floor regime in 2011 for the proposed 1GW interconnector between Belgium and the UK (referred to as the NEMO interconnector).

The cap and floor regime sets a maximum (cap) and minimum (floor) level to the levels of revenue that can be obtained by interconnector developers, who obtain their revenues through congestion charges, which are based on the price differentials between markets. The width between the cap and floor is designed so that the benefits provided by the interconnector and develop projects in a way that maximises these benefits, whilst ensuring that costs are incurred efficiently. An illustration of the cap and floor regime is provided in the figure below.

Figure A.4: Cap and floor regime illustration



Source: Ofgem (2016).

The regime is a cost-based regime, in which the cap and floor are determined by applying financial parameters to the efficient costs of developing and operating an interconnector. These cap and floor levels are calculated using a similar “building blocks” approach that is used in network regulation, whereby revenues are set based on capex, opex, decommissioning costs, tax and allowed returns. The main difference between the cap and floor revenues are derived from the return allowances set for the interconnector:

- For the cap, allowed returns are calculated as equity returns using a capital asset pricing model (CAPM) approach, which are based on a risk-free rate (namely 10 year UK index-linked zero coupon government bonds) and an equity risk premium, which is calculated using the latest average market returns in the UK as calculated by Dimson, Marsh and Staunton (DMS) since 1900. The equity beta, which is currently set at 1.25, is based on Ofgem’s assessment of the risk at the cap.
- For the floor, allowed returns are calculated on cost of debt. These are based on the 20 day trailing average of iBoxx’s 10+ year indices of BBB and A non-financial bonds. The average of these returns are then taken and are converted into real terms using expected inflation, as derived from taking the difference between 10 year zero coupon nominal and index-linked UK Government bonds.

The difference between allowed revenues under the cap and floor also means that tax allowances are calculated separately.

The cap and floor levels are set before the operation of the interconnectors and remain fixed for the 25 years of the regime (with reassessment periods every five years), unless specific re-openers are triggered. Should revenues from the interconnector fall below the floor during this period, the interconnector will be “topped-up” to the floor by National Grid Electricity Transmission, the system operator, who will recover these costs through increased transmission charges to transmission users.³¹ While the cap limits the amount of revenue that can be made, actual revenues generated by flows on the interconnector are not limited, and any revenue above the cap is paid by the interconnector to NGET, which in turn will reduce charges for transmission users. The cap can be adjusted annually by up to +/- 2% if interconnector availability exceeds or falls short of a target availability level, and changes are made one-for-one with the amount of percentage points the interconnector exceeds its availability target.

It should be noted that interconnectors are able to seek exemptions to the regime, and under this arrangement developers would face the full upside and downside of investments. Under these circumstances, developers would apply for exemption from certain aspects of European Legislation in order to increase the safeguards for the business case of their investment. In relation to this, Ofgem has noted that developers can seek exemptions for how the floor is set if project finance is to be used for projects. For example, rather than using an indexed-based approach to calculating the allowed returns at the floor, developers may be able to base returns on actual debt costs, provided that they can demonstrate that the project structure being used provides value for consumers in the form of accessing a broader pool of capital.

These fixed bounds allow developers to secure relatively stable returns that are based on regulatory precedent, and allows investors to have a clear idea of what future revenue streams will be and therefore lowers the overall risks of the projects. This method of setting the cap also ensures that end customers are protected from excessive returns, thus increasing overall value for money.

Following the development of the NEMO interconnector regime, Ofgem rolled out an overall regime for interconnectors in August 2014, which allowed interconnector developers to submit applications that would allow them to qualify under the cap and floor regime during application windows ran by Ofgem.

The NEMO project was granted a cap and floor regime in December 2014. Ofgem also allowed other projects to apply for a cap and floor regime when it rolled out its overall regime in 2014, which granted cap and floor regimes in principle to five projects by 2015. A second window

³¹ This is only paid if the interconnector has been sufficiently available over the given time period.

was also opened between May and October 2016. The current interconnectors in the pipeline are expected to allow an additional 6.3GW of capacity to be accessed by the GB electricity network.

A.4. Thames Tideway Tunnel (TTT)

Thames Tideway Tunnel (TTT)	
Project summary To help tackle the 39 million tonnes of untreated sewage that overflows into the River Thames every year, a 25km long, 65 metres deep super sewer is being added to London's existing sewerage system. In conjunction with other investment programmes being undertaken by Thames Water, TTT will help ensure the UK meets the EU's Urban Waste Water Treatment Directive, which in 2012 the European Court of Justice declared that the UK was required to comply with the judgement that it was in breach of this directive as soon as possible. The project was initially to be delivered by Thames Water as part of its capex programme. However, the scale of the project relative to the company's regulatory asset base (RAB) and the financial risks associated with this, Thames was able to negotiate that a large amount of the work be delivered by a separate company or Infrastructure Provider (IP). The IP will be responsible for designing, financing, constructing, owning and maintaining the project. Once operational, the IP will be subject to its own price control by Ofwat, which will regulate the entity in a similar fashion to other companies in the sector but with some alterations due to the construction risks associated with the project, which follows the project being designated a Special Infrastructure Project. Establishing a special purpose vehicle for the project has enabled Thames Water to transfer a considerable amount of project risk, although it was responsible for obtaining planning consent, land acquisition and will collect bills to fund the project. The IP is responsible for over £3bn of financing for the project,³² while Thames Water will contribute to the remainder of the project's £4.2bn project cost, making it the largest single investment in the UK water sector in history. In addition, the government is providing a comprehensive support package to limit a number of risks being taken by private investors in the IP. The project has received a considerable amount of attention due to its complex structure and its ability to attract a considerable amount of interest from institutional investors. In addition, the bespoke government support package could provide important lessons for future public sector support to infrastructure financing going forward.	
Status: Construction	Project type: Greenfield
Total project cost: £4.2 billion³³	Debt-Equity Ratio: 44:56
Key dates Pre-launch: September 2011 Financial close: August 2015 Tender launch: June 2014 COD: 2024 (expected)	

³² IJGlobal (2015), Thames Tideway Tunnel, UK.

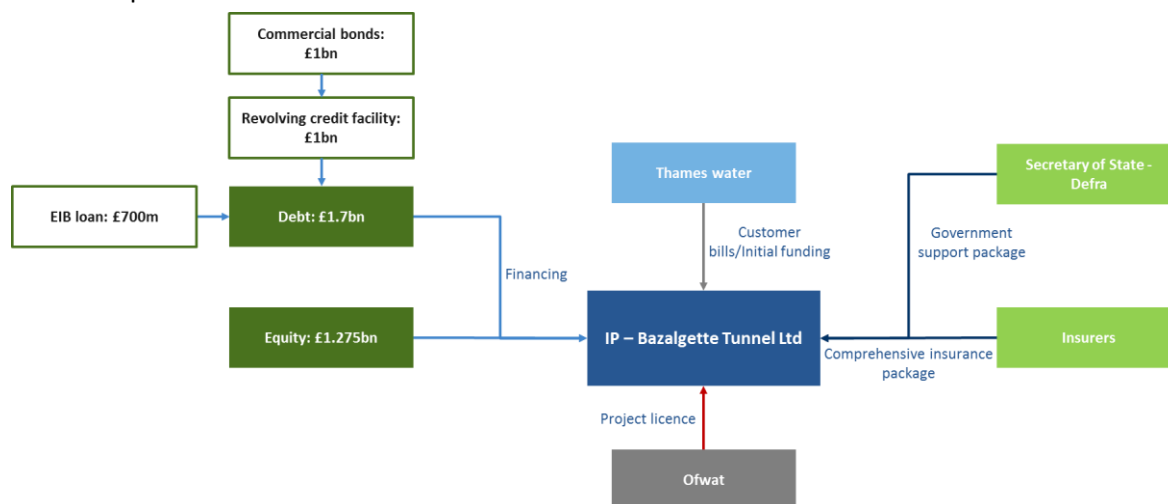
³³ Cost in 2011 prices.

Thames Tideway Tunnel (TTT)

Preferred bidder: July 2015

Summary of finance being provided

The figure below provides a summary of the project's financial structure, outlining the funding, financing, contingent support and the responsibility of regulatory oversight. Further details of these are provided in the sections below.



Equity – £1.275bn

The equity investment for this project is being provided by the owners of the SPV Bazalgette Tunnel Ltd, which comprises institutional investors Amber Infrastructure-managed fund International Public Partnerships (INPP) (15.99% ownership of IP), Dalmore Capital Partners (33.76%), Allianz Capital Partners (34.26%), Dutch Infrastructure Fund (10.66%) and Swiss Life (5.33%). This equity largely comes from UK pension funds, covering 1.7m UK pensioners or a quarter of the UK's 25 largest pension funds.

Debt – £1.7bn

Debt instruments being used on the project include:

- A **£1bn ten year senior revolving credit facility** being provided by a consortium of commercial banks, all of which are lending equal amounts.³⁴ This features pricing at 85bps over Libor, rising in two step-ups to 115bps, with a 35bps commitment fee.³⁵ The facility will be used to bridge short-term capital requirements. Public bond issuances will repay drawdowns when market conditions are favourable. In June 2016, **£100m worth of bonds were issued** to help refinance current and future debt obligations under the revolving facility, which were purchased by UK insurer Pension Investment Corporation.³⁶ These bonds were priced at par to RPI and have a fixed credit spread, yielding 180bps over UK-indexed linked gilts. Half of the bonds will mature in 2048 and

³⁴ The lenders to the project include Credit Agricole Group, Mitsubishi UFJ Financial Group, Santander, Royal Bank of Canada and Lloyds Banking Group.

³⁵ IJGlobal (2016), Thames Tideway Tunnel.

³⁶ InfraNews (2016), Thames Tideway Bond Investor Revealed.

Thames Tideway Tunnel (TTT)

the other half in 2054. The bonds will be listed on the London Stock Exchange (LSE) with deferred purchase dates of June 2020 and June 2021.³⁷

- A **£700m senior secure loan** provided by EIB, with a door-to-door tenor of 35 years. The loan can be drawn in a fixed or floating format, but the pricing, although not publicly disclosed, is expected to be linked to RPI, matching the fact that Tideway's regulatory capital value (RCV) is linked to RPI. The loan will be drawn on incrementally over the construction period until 2023, and will amortise up to maturity.³⁸

These debt instruments have allowed the IP to benefit from a very low bid weighted average cost of capital (BWACC) of 2.497%, which is fixed until the price review for TTT after construction.³⁹

Public sector support

During the development of the project, the government recognised the need for private finance to be brought into the project but believed that some risks needed to be mitigated against to attract finance at a reasonable cost.⁴⁰ To cover these risks, the government has entered into the following agreements with the IP:⁴¹

- **Supplemental Compensation Agreement:** This provides insurance cover in respect of losses suffered in excess of the insurance policy limit of the IP and in respect of claims that would have been covered under unavailable insurance. This was provided due to the limited capacity of the insurance market to provide cover for certain low-probability events that could be catastrophic to the project.
- **Market Disruption Facility:** This is a temporary liquidity facility that will be provided to the project should it not be possible to obtain sufficient debt from the capital markets due to an economic or political "market disruption event".
- **Contingent Equity Support Agreement:** Although the project has an obligation to raise sufficient finance to complete the project, existing shareholders are not obliged to provide additional finance in the event of significant cost overruns. Instead, the government will inject sufficient equity to enable the project to reach completion (subject to the right to elect to discontinue the project – see Discontinuation Agreement below).
- **Discontinuation Agreement:** When certain, prescribed events occur (which are not included as part of other agreements), the Secretary of State will be entitled to elect to discontinue the provision of the support package and pay compensation to the debt and equity providers. This is required in order to avoid potentially unlimited liabilities.
- **Special Administration Offer Agreement:** Under this agreement, the Secretary of State will either make an offer for the equity and debt instruments issued by the IP or discontinue the provision of the support package in accordance with the Discontinuation Agreement, should the IP remain in special administration for more

³⁷ Ibid.

³⁸ Ibid.

³⁹ CEPA (2015), Thames Tideway Tunnel – Cost of Capital.

⁴⁰ House of Commons (2011), Written Ministerial Statements, Thursday 3rd November 2011.

⁴¹ Anhurst (2016), UK Infrastructure: Innovations in government support.

Thames Tideway Tunnel (TTT)

than 18 months. Special administration applies when water and/or sewerage undertakers and certain qualifying licensed water suppliers become insolvent or fail to carry out their statutory duties.

- **Shareholders Direct Agreement:** Should the government inject equity into the project, it will become a shareholder in the project. This will create a contractual link between the Secretary of State and the private sector, and provides a framework for government involvement in the project when it is in a distressed situation.

These agreements are part of legally binding contracts governed by the law of England and Wales. The support package will be provided during the construction but will expire on completion and acceptance, subject to the Secretary of State's right to discontinue the project, or early expiry of the package in accordance with its terms. The above support package differs from government support for other specific projects in that it has been designed specifically to cater for key risks that required some form of mitigation in order to attract private sector investment, as opposed to providing a full credit guarantee. Despite the full credit guarantee not being provided, the comprehensive nature of the support has enabled financing costs to be significantly lower had the support not been in place.

Funding arrangements

The project is being funded by Thames Water customers through their bills. Bills have already increased by £13 a year to pay for TTT-related costs, and will eventually rise to no more than £25 per year (before inflation). This is significantly lower than the £70-£80 initially envisaged, thanks to access to cheaper finance and efficiency savings.⁴²

Project development process

In 2000, the Thames Tideway Strategic Study Group (TTSSG) was commissioned to investigate the impact of sewage discharges into the River Thames, which resulted in the development of options of how to best tackle the problem. The findings from the TTSSG study were published in 2005 and outlined key strategic objectives and identified that the screening, storage or treatment at the point of discharge would meet all the objectives (protect ecology, reduce aesthetic pollution and protect the health of water users). Implementing this solution involved three separate activities:

1. Construction of a deep storage and conveyance tunnel, which is known as the Lee Tunnel. The total cost of the tunnel was £685m and was completed in April 2016.⁴³ Rather than requiring separate financing, the project was part of Thames Water's standard capex programme.
2. Modernisation of London's five major treatment works, which aimed at increasing the capacity of the volume of sewage that could be treated. This began in the summer of 2010, and once completed is expected to be cost £675m and will be part of Thames Water own capex programme.⁴⁴
3. The TTT project.

After extensive consultations with industry stakeholders and government, a detailed planning application was submitted in February 2013, and approval was provided by the Secretary of State

⁴² <https://www.tideway.london/about-us/our-delivery-partners/>

⁴³ <https://www.ice.org.uk/news/lee-tunnels-wins-top-award-at-engineering-awards>

⁴⁴ <http://www.ukconstructionmedia.co.uk/sectors/thames-water-creating-cleaner-healthier-river-thames/>

Thames Tideway Tunnel (TTT)

in September 2014. After the planning submission, Thames Water also began initiating the tenders for the construction works at three sites (Eastern, Central and Western sections), although the IP will be responsible for managing these contracts during the construction period.

The IP tender was undertaken by Thames from June 2014, following the project being designated as a SIP by Ofwat. While specific information on the tender process is limited, one of the main areas that bids were evaluated on was their BWACC, indicating that the cost of finance was a key determinant in selecting the preferred bidder. A number of parties showed interest in the project, however only two consortia submitted final bids. Because the three construction contracts had already been determined, the bidders were able to have a clear view of what construction costs would be, which informed their submissions.

The Bazalgette consortium were selected as the preferred bidder after a competitive tender in July 2015, and following Ofwat's licence issue the project reached financial close in August 2015.

Although the project was successful in reaching financial close, it has been subject to some criticism. Particular areas of concern have been the costs of the project and whether it delivers VfM for both consumers and taxpayers, with many arguing that a simpler solution such as improved water management could have lowered the level of sewage being released into the Thames for a much lower cost.⁴⁵ Critics also noted that the extensive government support package meant that the taxpayer could be required to pay out substantial costs should the project be exposed to costs overruns, which many believed should be borne entirely by investors. Because of this, some industry experts felt that it would have been more beneficial for the government to finance the project on its own balance sheet, which would have meant financing costs would have been even lower.⁴⁶

Post-financial close

Preliminary works have begun on the project and sources suggest that these are running as scheduled.

Lessons learned

Key lessons from the project include:

- Bespoke government support packages can be important for ensuring the private sector is willing to invest in complex infrastructure transactions, as opposed to providing full credit guarantees.
- Project structure is important in ensuring that risks are allocated to the appropriate party and that VfM is achieved.
- Drawing on established regulatory regimes can help to address financeability concerns of investors.
- Large infrastructure projects going forward are likely to require public sector support if they are to attract private finance.

Sources

- Anhurst (2016), UK Infrastructure: Innovations in government support.

⁴⁵ <http://utilityweek.co.uk/news/thames-tideway-tunnel-an-expensive-folly-critics-claim/1241072>

⁴⁶ Financial Times (2015), Critics decry costs of London's £4.2bn 'super sewer'.

Thames Tideway Tunnel (TTT)

- CEPA (2015), Thames Tideway Tunnel – Cost of Capital.
- Financial Times (2015), Critics decry costs of London's £4.2bn 'super sewer'.
- House of Commons (2011), Written Ministerial Statements, Thursday 3rd November 2011.
- <https://www.ice.org.uk/news/lee-tunnels-wins-top-award-at-engineering-awards>
- IJGlobal (2015), Thames Tideway Tunnel, UK.
- IJGlobal (2016), Thames Tideway Tunnel.
- InfraNews (2016), Thames Tideway Bond Investor Revealed.
- <https://www.tideway.london/about-us/our-delivery-partners/>
- <http://www.ukconstructionmedia.co.uk/sectors/thames-water-creating-cleaner-healthier-river-thames/>
- <http://utilityweek.co.uk/news/thames-tideway-tunnel-an-expensive-folly-critics-claim/1241072>

A.5. Intercity Express Programme (IEP)

Intercity Express Programme (IEP)

Project summary

The aim of this project is to replace an ageing rolling stock fleet with high speed trains, which a new collection of more environmentally friendly and accessible, faster and greater capacity trains, and is the largest UK rolling stock project to date. The trains are being procured directly by the Department for Transport (DfT), as oppose to the train operating companies (TOCs) undertaking procurement via a ROSCO, and was separated into two PPP contracts:

- Initial contract for the Great Western Mainline (GWML) fleet, comprised of 57 trains (369 carriages) and three new/refurbished depots in Bristol, Swansea, and London Paddington.
- Second contract for the East Coast Main Line (ECML) fleet, comprised of 35 trains (227 carriages), and a new depot in Doncaster. In the original Phase 2 deal, there was an option for 30 additional 9-car electric trains which the government announced in 2013 that they would take up.

The contract is with Agility Trains, a consortium made up of Hitachi Rail Europe and John Laing Investments and is of a design-build-finance-maintain (DBFM) nature, although there is no payment for trains until they are delivered into service. Hitachi is also unable to access the project finance loans until the trains are in service and has to carry the cost of development and train build on its own balance sheet until the trains are available providing an incentive to stay on programme. This was done to reduce the finance element of the cost of the bid. Once accepted for service the trains are provided on a day to day basis under a performance regime that means Agility Trains only receives pay for when the trains are available, in suitable condition, and performance payments are set at a level which provides significant incentive. Separate TOC

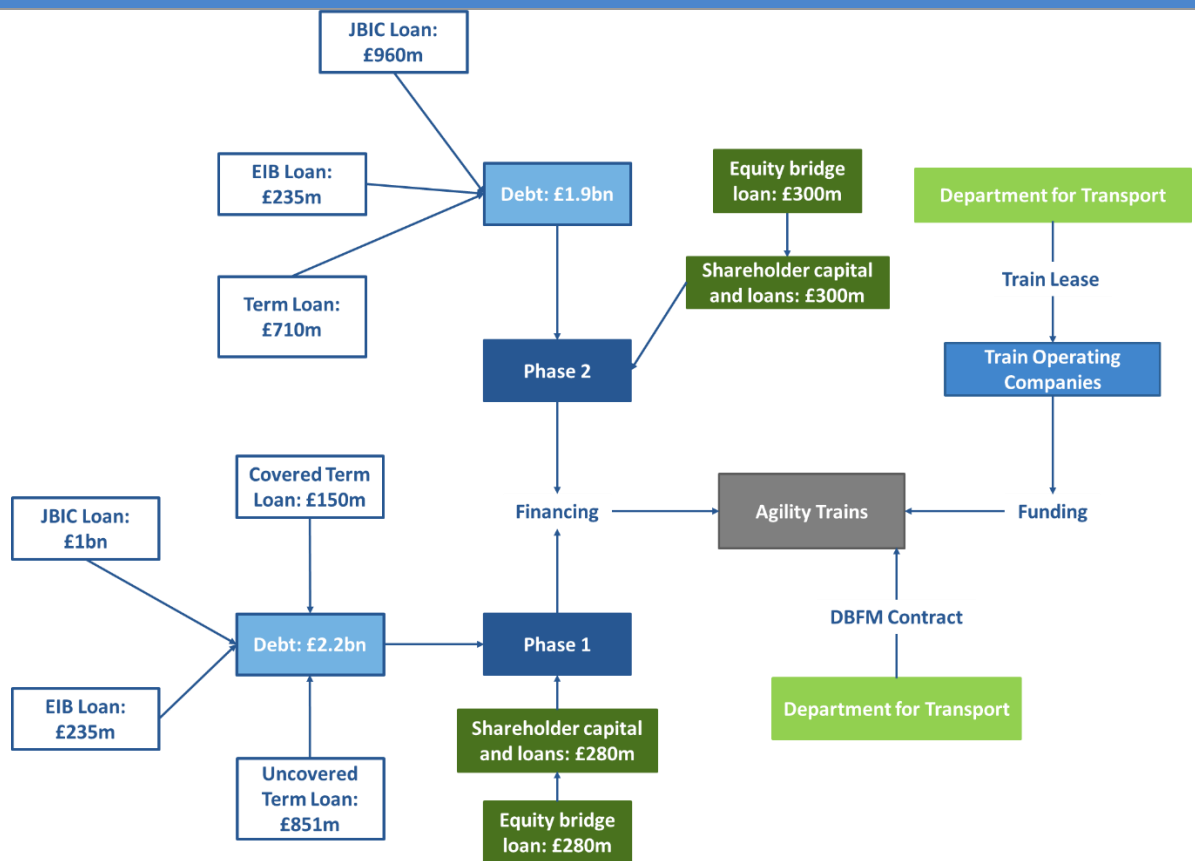
Intercity Express Programme (IEP)

contracts are still in place, whereby they are required to operate services via their franchising agreement.

With regards to risk, the delivery risk (cost and time) surrounding the trains and depots is with Agility Trains and is seen as a key benefit of PPP contracts. Unusually some planning risk was taken by Agility, in relation to the depots, but on the basis that they would only proceed to financial close with appropriate consents in place. Agility Trains also take performance risk, seen as another advantage of the PPP approach. The DfT guarantees that trains will be leased for 27.5 years out of the 32 year concession, and intends to require new franchisees to use the new trains. Therefore if there is any gap between operators the Government is at risk of having to make lease payments as operator of last resort. The infrastructure upgrades required to run the trains will be delivered by Network Rail. DfT is therefore at risk if Network Rail fails to deliver these infrastructure upgrades, although there is some extent of risk share in the agreements with Hitachi. The risk of not delivering the infrastructure upgrades appears as a large risk in the project, despite the contractual protections against delays arising from the works.

Status: Construction	Project type: Brownfield
Total project cost: <i>Phase 1:</i> £2.5bn <i>Phase 2:</i> £2.2bn <i>Total:</i> £4.7bn	Debt-Equity Ratio: <i>Phase 1</i> – 88:12 <i>Phase 2</i> – 86:14
Key Dates Pre-launch: 2005 Tender launch: March 2007 Preferred bidder: February 2009	Financial close: <i>Phase 1</i> - 25 th July 2012 <i>Phase 2</i> – 15 th April 2014 COD: N/A
Summary of finance being provided	

Intercity Express Programme (IEP)



Equity

Phase 1 – £280m mix of share capital and shareholder loans, which are deferred and supported by an Equity Bridge Loan. The equity split is 70% Hitachi Rail Europe and 30% John Laing Investments.

Phase 2 - £300m of share capital and shareholder loans, which is also supported by an equity bridge facility which is provided by a number of the senior lenders. The equity split for Phase 2 is the same as Phase 1.

Debt

Phase 1: £2.2bn senior debt funding, which is long-term and coterminous with the maturity of the concession of 29.5 years (maturing at the end of 2041), with the following split:

- £1bn facility provided solely by the Japan Bank for International Cooperation;
- £235m facility provided solely by the European Investment Bank (EIB) with a 29.5 year tenor;
- £150m NEXI covered commercial bank facility, provided by a group made up of: Bank of Tokyo-Mitsubishi UFJ, Sumitomo Mitsui Trust Holdings, Sumitomo Mitsui Banking Corporation, HSBC, Lloyds Banking Group, Mizuho Financial Group, Mitsubishi UFJ Trust and Banking, and the Development Bank of Japan;
- £850m uncovered commercial bank facility, provided by the same group as NEXI.

Intercity Express Programme (IEP)

Phase 1 was refinanced in 2015, at Libor+125bp. The lending group remained the same but with HSBC being replaced by The Norinchukin Bank.

Phase 2: This phase involves **£1.9bn** debt, made up of:

- £235m EIB long-term loan
- £960m JBIC loan
- £711m 8-year loan at Libor+200bp (HSBC, Lloyds Banking Group, Mizuho Financial Group, Sumitomo Mitsui Banking Corporation, Sumitomo Mitsui Trust Holdings, Credit Agricole Group, Societe Generale, Mitsubishi UFJ Trust and Banking, Mitsubishi UFJ Financial Group, Development Bank of Japan).

Mezzanine

The equity bridge loan of £280m for Phase 1 and £300m for Phase 2 are provided by the same group of lenders providing the debt finance for each phase (excluding Lloyds for Phase 1).⁴⁷

Funding arrangements

This project is paid for by the relevant TOCs which lease the trains, who in turn have contracts with DfT. The marginal funder is the DfT.

Project development process

This project was initiated by the UK government in 2005, and subsequently became an integral part of its overall strategy for rolling stock. DfT was seeking new entrants to the market, greater flexibility in rolling stock procurement and wanted to include performance risk in the contracts. The procurement was also transformational in the type of train it was looking to buy and so Government's role seemed more natural.

The procurement was structured so that bidders had to provide committed equity and a 'structuring bank group' which initially provided commitment letters (but not committed funding) in order to develop the financing package and documentation, and to provide a strong basis for a debt funding competition post preferred bidder.

The project was split into two contracts, due to the scale of the debt funding commitment which even before the credit crunch was considered a significant size relative to market capacity. However, this worsened as the financial markets started to deteriorate in the run up to the financial crisis of autumn of 2008. A funding competition was harder to achieve in light of many banks exiting the project finance market. The Japanese banks were less affected by the financial crises and Hitachi was able to utilise the hiatus created by the Foster Review to gain access to funds from the Japanese Bank for International Cooperation. The scale of its commitment, £1.1bn in the GWML contract alone, was instrumental in giving other lenders confidence. The lenders were predominantly, but not exclusively, Japanese, which was a function of both Hitachi's role and the market at that time.

⁴⁷ Note that the mezzanine finance is not included in the total project costs to avoid double counting with the equity finance.

Intercity Express Programme (IEP)

Despite Agility Trains being announced preferred bidder in 2009, they weren't awarded the contract until 2012, as in 2010 the Government paused the project to allow the Foster Review to take place. The Foster Review was commissioned by the then Secretary of State for Transport "to review the value for money of IEP, reflecting all the latest information and the Government's commitment to electrification of the Great Western Main Line" and "to assess the credibility and value for money of any alternatives which meet the Programme's key value for money objectives." This was partly required as the procurement was quite controversial in the rail industry throughout, despite extensive consultation.

In addition, the financial crisis meant the funding element of the process took much longer to close than previously anticipated. The combination of these delayed the contract award and financial close of the two contracts by three years. These delays inevitably impacted the benefits of the project and increased the costs to the DfT, including the cost of commissioning the 2010 review.

The Government included an option to require a refinancing of the programme, with the Government set to benefit from any such refinancing. The subsequent refinancing of Phase 1 in 2015 saved the Government £60m reflecting that market conditions had improved.

Post-financial close

The overall contract value has increased – to £5.8bn – due to the £1.2bn procurement of 270 additional carriages for ECML (DfT decision in July 2013).

Train development is broadly on schedule but significant delays to the GWML electrification means that they cannot be brought into service as planned. Agility is insulated from the impact of this – DfT will pay for train delivery as per the current schedule.

Lessons learned

Key lessons learned from the project include:

- PPP can be used in rail but projects need to be of a certain scale and type (discrete projects or where the interface is capable of being managed by a strong entity is possible).
- In PPP there is a trade-off between certainty of delivery and flexibility e.g. to change the spec. Ideally projects need to be well described and the spec. clear before the contracts are let.
- The PPP models allows procurers to pass delivery risk and to impose whole life approach where developers also have to maintain and make available the assets that they deliver in the construction phase.
- As developers are assuming these risks they are averse to change. In this case adding new equipment to depots and use of shared depots has been difficult because the developer want to be assured that maintenance processes will not be disrupted by others.

Intercity Express Programme (IEP)

- Risks which are difficult to manage e.g. planning can be assumed by developers but only in limited circumstances. In this case planning risk was taken but became a condition precedent to financial close.
- Interfaces with Network Rail need to be improved. At this stage developers are unlikely to assume risks relating to Network Rail delivering infrastructure requirements. Some suggest that large scale projects could be managed outside of Network Rail with organisations like Crossrail cited as a more appropriate vehicle for project management.
- Where there are interfaces/ or a degree of reliance on Network Rail developers want to believe that there are effective controls in place.
- Maintaining flexibility with regard to cost of finance can result in project savings and improve value-for-money.

Whilst IEP was challenging to structure, procure and close, if you look at the evolution of the rolling stock market in terms of train manufacturers' competition and range of finance provision, it has played a significant role in transforming the market.

Sources

- DfT (undated presentation) "Intercity Rail Travel", available [here](#)
- DfT and The Rt Hon Patrick McLoughlin MP (Jul 2013) "Press release: Government gives green light for more state-of-the-art intercity trains", available [here](#)
- DfT and The Rt Hon Patrick McLoughlin MP (Jul 2013) "Written statement to Parliament: Intercity Express Programme", available [here](#)
- NAO (Jul 2014) "Procuring new trains", available [here](#)
- Sir Andrew Foster (June 2010) "A Review of the Intercity Express Programme", available [here](#)
- <https://ijglobal.com/data/project/15322>

A.6. Northern Line Extension

Northern Line Extension (NLE)

Project summary

The London Underground Northern line extension (NLE) of the Charing Cross Branch involves a 3.2 kilometre extension from Kennington to Battersea. This £1bn project also involves two new stations, at Nine Elms and Battersea Power Station, which are due to be completed in 2020 and will serve new developments such as the US Embassy and the redevelopment of the New Covent Garden Market. The project is part of a wider regeneration scheme for the Vauxhall, Nine Elms and Battersea areas, where up to 25,000 jobs and 20,000 new homes will be created. It also reduces pressure on Vauxhall station and provides relief to the existing Northern line south of Kennington. In 2014 TfL awarded a six-year design-build contract to Ferrovial Agroman & Laing O'Rourke (FLO).

Northern Line Extension (NLE)

The Greater London Authority (GLA) is borrowing £1bn to finance the project, this coming through a mix of public and private sector finance. TfL is covering the cost risk during construction. In the event that the Power Station is not built, developers still have to pay the developers' contributions but the GLA will lose the incremental business rates income (IBRI). Legal guarantees also exist to prevent developers from converting commercial buildings to residential, resulting in a loss of IBRI for the GLA.

Ultimately, the repayment of the loan is implicitly guaranteed by the government. GLA has the possibility to add an extra 5 years to the 25 year period of the Enterprise Zone, and also refinance its debt via the Public Works Loans Board (PWL) £750m 50-year refinancing facility. This facility is backed by an Infrastructure UK guarantee, making the project an interesting example of how the UK Government is helping to leverage private sector financing. Although the GLA is the public body borrowing, these protections are a form of government guarantee to the project.

Status: Construction	Project type: Greenfield
Total project cost: £1bn	Debt-Equity Ratio: 100:0

Key dates

Pre-launch: May 2010

Financial close: 13th May 2015

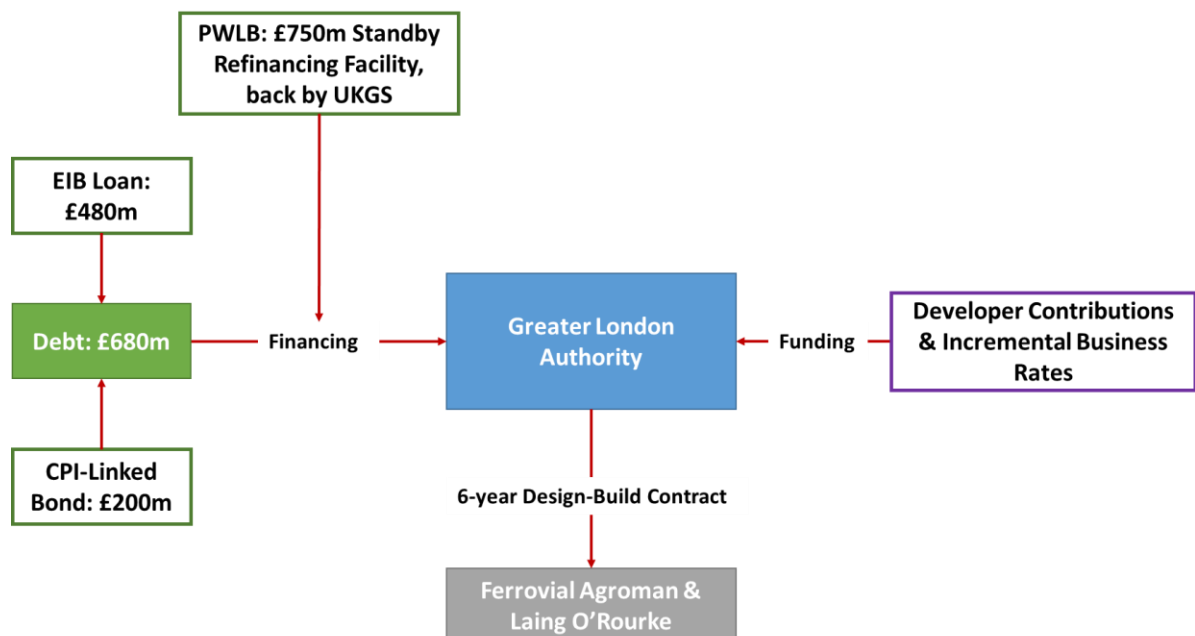
Tender launch: 9th December 2013

COD: 2020 (scheduled)

Preferred bidder: July 2014

Summary of finance being provided

The figure below provides a summary of the project's financial structure. Further details of these are provided in the sections below.



Debt – £680m

The debt instruments being used on the project are:

Northern Line Extension (NLE)

- **£480m** coming from a European Investment Bank (EIB) long-term loan
- **£200m** coming from an indexed-link bond issued by the GLA, the first ever CPI linked sterling bond issuance in the UK. The maturity is 2040 and the average life is 23.6 years.

Public Sector Support

Financing of the project is being undertaken by the public sector, via the support of the GLA and the PWLB. The PWLB, an arm of HM Treasury, has provided a 50-year £750m standby refinancing facility to the GLA, under the UK Guarantees scheme for infrastructure. This gives the GLA the ability to borrow from the Treasury if it cannot meet its debt repayments. If this is used, the Treasury would become a senior unsecured creditor for the GLA.

The treasury is charging a 0.1% availability fee on the full £750 million, and a 0.4% coverage fee on the amount borrowed. If the facility is used, the GLA is required to pay the Treasury 0.4% annual interest above the PWLB interest, which is 60bp above gilt.

Funding Arrangements

Whilst the financing will be undertaken by the public sector, the £1bn project is fully privately funded by developers and businesses – through local authorities. Repayment of the loan is via developer contributions in the Vauxhall, Nine Elms and Battersea Opportunity Area (VNEB OA) and incremental business rates generated by the new Enterprise Zone in the area. The incremental business rates take advantage of the increase in property value in the VNEB OA that is delivered as a consequence of the NLE. Funds are collected by the local authority through a local tax levied on an enterprise area established in the locality. This approach is known as tax increment financing and is being used for the first time for a major infrastructure project in the UK.

Project development process

The Northern Line extension is being carried out as part of the London Underground Major Regeneration Scheme, which aims to increase annual Tube journeys from 1 billion to 1.5 billion by 2020. Tender documents for the project were issued on the 9th of December 2013 and were submitted by the bidders on the 17th of March 2014. Following this, evaluation of tenders occurred in three stages:

Stage 1 - Initial review, checking for thoroughness and the completion of the submitted tenders.

Stage 2 - Detailed appraisal, the results being used to select two tenderers to proceed to the final evaluation stage.

Stage 3 - Negotiation stage, for the resolution of all outstanding issues in relation to the tender submissions received.

After Stage 3 FLO, the preferred bidder, was identified. A public review to contemplate the Transport and Works Act Order (TWAO) application to extend the Northern line ran from the 19th of November to the 20th of December 2013 and was conducted by an independent Examiner. The project reached financial close on the 13th of May 2015, and construction began in 2016. The extension is timetabled to finish and open for operation in 2020.

Post-financial close

There have been several sections of the project which are not running to schedule:

Northern Line Extension (NLE)

- The project is currently facing construction problem due to change in architecture of the new Battersea Power Station site. TfL is facing cost overrun.
- The start of the main tunnel drive has been pushed back by six months.
- The start of the two 650 tonne Tunnel Boring Machines drives has now been delayed to early 2017 instead of starting in summer 2016, when the Battersea crossover box is due to be finished to launch tunnelling.

Despite these however, FLO have reported that they are still on track to complete the project in 2020, as originally planned.

Lessons learned

Key lessons from the project include:

- The innovative and unique funding scheme of this project results in the infrastructure being paid for by those in the private sector who will benefit from it.
- The provision of the Government guarantee allows for lower financing costs, whilst their repayment is fully funded by the private sector.
- This funding scheme is however, untested and potentially risky as it relies on the predicted influx of commerce and promise of higher tax revenues from new businesses in the district, which are not certain.
- This tax increment financing scheme is probably less applicable in other parts of the UK where land value and value growth is lower/less predictable than in London.

Sources

- <https://ijglobal.com/data/transaction/33178/london-underground-northern-line-extension-2015>
- <https://tfl.gov.uk/travel-information/improvements-and-projects/northern-line-extension#on-this-page-2>
- <http://www.eib.org/infocentre/press/releases/all/2015/2015-022-european-investment-bank-agrees-gbp-480m-backing-for-northern-line-extension.htm>
- <http://content.tfl.gov.uk/nle-leaflet.pdf>
- <http://content.tfl.gov.uk/nle-decision-letter-new.pdf>
- <http://content.tfl.gov.uk/nle-inspectors-report.pdf>
- <http://content.tfl.gov.uk/nl-factsheet-i-web.pdf>
- <http://www.railwaygazette.com/news/urban/single-view/view/northern-line-extension-breaks-ground.html>
- <http://www.railway-technology.com/features/featurepay-as-you-grow-funding-proposed-northern-line-extension/>
- http://www.wandsworth.gov.uk/news/article/13115/tube_on_its_way_to_battersea_a_s_work_starts_on_northern_line_extension
- <https://next.ft.com/content/fcda4910-9f64-11e2-b4b6-00144feabdc0>

Northern Line Extension (NLE)

- http://www.persona.uk.com/nle/B-Core_docs/D/NLE_D1.pdf
- <http://www.constructionenquirer.com/2016/04/05/northern-line-extension-tunnel-drive-delayed-over-6-months/>
- <https://tfl.gov.uk/travel-information/improvements-and-projects/northern-line-extension>
- <https://tfl.gov.uk/info-for/media/press-releases/2014/august/lu-awards-contract-to-build-northern-line-extensi>

A.7. M25 Widening

M25 Widening

Project summary

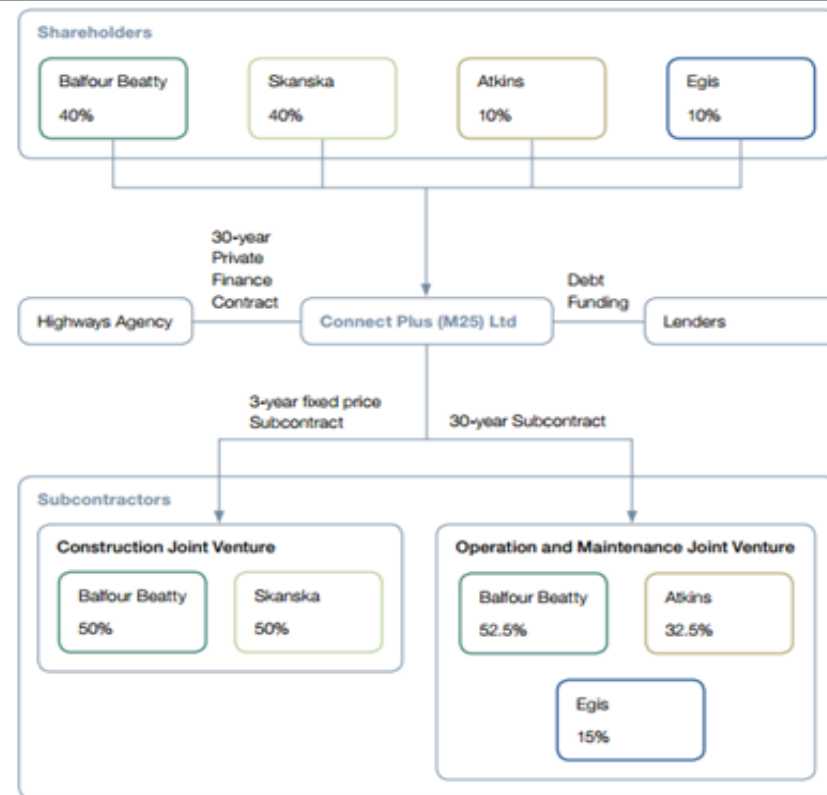
This M25 greenfield project was identified as a solution by Highways England to the high levels of congestion and poor journey time reliability on what was thought to be Europe's most congested road. Highways England signed a 30 year contract with Connect Plus (consortium of Balfour Beatty, Skanska, Atkins and Egis) to undertake the above work. The PFI DBFO contract was awarded in May 2009 and its scope included the widening of the M25 between junctions 16-23 and 27-30 to four lanes, as well as the refurbishment of the A1(M) Hatfield Tunnel and operation and maintenance of the M25 and Dartford Crossing for 30 years.

Once appointed preferred bidder, Connect Plus sought private financing for the deal, unfortunately this coincided with the financial crisis, a period which saw numerous banks exit the market and those that remained became incredibly reluctant to lend to long-term risky projects. This put pressure on Highways England, who were on a strict schedule to complete the widening and refurbishment work before the commencement of the London 2012 Olympic Games.

To help the project secure finance Government agreed to commit £500m of senior debt on commercial terms, signalling to private lenders that the Government was committed to closing the deal. Consequentially an influx of private finance occurred, thus meaning the Government's offer was no longer required. Connect Plus successfully negotiated acceptable terms with the lenders and enabled the project to reach financial close in May 2009. The scheme was opened to traffic on schedule in May 2012.

Status: Operation	Key dates: Project Announcement: April 2004 Preferred bidder: July 2008 Financial close: 20 th May 2009 COD: April 2013
Total project cost: £1.316bn	
Debt-Equity Ratio: 85:15	
Summary of finance being provided:	

M25 Widening



Source: NAO

Equity – £200m

The main project sponsors, Connect Plus Consortium, provided £200 million equity:

- Balfour Beatty – 40%
- Skanska – 40%
- Atkins – 10%
- Egis – 10%

Debt – £1.1bn

The debt measures used include £956 million of senior debt provided by 16 commercial banks and a separate £160 million facility from the EIB.

- Barclays Capital - hedging bank - £65 million
- HSBC - hedging bank - £65 million
- Lloyds TSB - hedging bank - £65 million
- Bank of Tokyo-Mitsubishi UFJ - £65 million
- BayernLB - £65 million
- BBVA - £65 million
- Calyon - £65 million

M25 Widening

- Dexia - £65 million
- KfW - £65 million
- RBS - £65 million
- SMBC - £65 million
- Société Générale - £65 million
- WestLB - £65 million
- NAB - £43.5 million
- Helaba - £36 million
- Natixis - £30 million
- EIB - £160 million (multilateral support)

Funding arrangements

The unitary fee being provided to the project is being funded through the DfT's budget.

Project development process

The tendering of the contract was initially carried out in 2007, just prior to the onset of the financial crisis. Therefore, the bids submitted by tenderers were on pre-credit crunch terms. Following a retendering process to clarify bids and a review by the Highways Agency and its advisers, the Connect Plus consortium, comprising Belfour Beatty, Skanska, Egis and Atkins, was selected as the preferred bidder in mid-2008.

After being appointed the preferred bidder, Connect Plus sought financing for the deal from private lenders. However, this coincided with a large fall in the availability of bank credit for PFI deals. As a result, it was clear that Connect Plus would not be able to raise the finance required to pay for the £1bn of capital investment. In response to this, the DfT, working closely with the Highways Agency and HM Treasury, agreed to commit £500m worth of senior debt to the project on commercial terms. This signalled to lenders that the government was committed to the deal reaching close, and as a result triggered the necessary lenders to finance the project without the need for the government to provide any of the senior debt. As a result, Connect Plus was able to negotiate suitable terms with lenders and reach financial close in May 2009.

Post-financial close

N/A

Lessons learned

Once the project reached financial close, it was delivered within its required completion period and achieve the objectives set out in the scheme on conception. The main lesson drawn from the project was that the Government has considerable influence in situations when commercial lenders are hesitant.

This project provides an example of the UK Guarantees Scheme for Infrastructure, which transfers the risk to the public sector through the provision of unconditional financial guarantees to UK infrastructure lenders. This scheme was conceived shortly after the M25 project reached completion, aiming to address the harsh financial conditions faced by the infrastructure industry post-financial crash.

M25 Widening

Sources

- <http://gmhplanning.co.uk/wp-content/uploads/2012/07/09-ConnectPlus-Chris-Richardson.pdf?8af1b3>
- <http://www.pfie.com/m25-lessons-and-challenges/21073479.fullarticle>
- <http://www.publications.parliament.uk/pa/cm201011/cmselect/cmpubacc/651/651.pdf>
- <http://www.nao.org.uk/wp-content/uploads/2010/11/1011566.pdf>
- https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/448746/POPE_M25_J27-30_OYA_Final.pdf
- <https://ijglobal.com/articles/56051/m25-full-financial-close-details>

A.8. Mersey Gateway

Mersey Gateway

Project summary

The Mersey Gateway is a DBFO road bridge project that relieves pressure on the aging Silver Jubilee Bridge (SJB), between Widnes and Runcorn in the North West of England, by providing a second crossing of the Mersey. The current river crossing is carrying ten times more traffic than it was designed to accommodate and operability is impacted by congestion and ongoing maintenance needs. However, the benefits of the scheme extend beyond congestion relief to regeneration and business development benefits in the area as a whole. The bridge forms part of the regional development plan and has had the support of Department for Transport (DfT) for a number of years.

Prequalification of bidders commenced in 2011 and the project reached financial close in 2014. The procurement followed a competitive dialogue process following prequalification which was designed to ensure a targeted dialogue that would keep bid costs down. The dialogue process allowed the designs submitted by the three participating consortia to develop within the restrictions of the planning consents obtained by Halton and the process is credited with delivering considerable savings (c£250m).

Consistent evaluation criteria were used throughout the dialogue and published with the invitation to participate. The Council evaluated final tenders consistent with the evaluation criteria used throughout the dialogue process. The process was centred on identification of the participant in the dialogue process who had submitted the most economically advantageous tender, by reference to the evaluation criteria.

The Merseylink consortium, comprised of *Macquarie, FCC Construction, BBGI, Kier, Samsung and Sanef*, were appointed as the project company, awarded a design-build-finance-operate (DBFO) contract for the Mersey Gateway Project in March 2014. The project uses toll revenue to fund the total investment required to construct the new crossing and for its maintenance and operation over the next thirty years. Funding the project will cost £1.86bn over the time period.

The risks associated with the cost of construction, maintenance and operation and the delivery programme are placed with the Merseylink Consortium and the Council is contracted to pay for the project through agreed unitary charge payments.

Status: Construction	Project type: Greenfield
Total project cost: £1.86bn (DBFO and maintenance through to 2044)	Debt-Equity Ratio: 91:9
Key dates	
Pre-launch: 4 th October 2010	Financial close: 31 st March 2014
Tender launch: 25 th October 2011	COD: Autumn 2017
Preferred bidder: 20 June 2013	
Summary of finance being provided	

Mersey Gateway

The remainder of the project will be funded by the government, through the Department for Transport, who are contributing up to £470m:

- *Part 1* – Upfront grant of £86m
- *Part 2* – Long term revenue support of £14.55m per annum for 26.5 years after opening.

Project development process

The procurement process was relatively innovative as the design responsibilities were transferred to the contractor. Key elements were fixed but contractors had flexibility in detail design to reduce costs and improve innovation.

The appointment came after an 18-month procurement process involving a competitive dialogue process with three shortlisted bidders.

Post-financial close

No cost overruns to date.

Lessons learned

The £600m initial capital cost of the project is supported by the government in several ways: firstly, the capital grant as part of the overall funding reduced the financing requirement; secondly, the tolling revenue risk was not value for money to pass to lenders and Halton (the local borough council) had insufficient financial capacity to take this risk and so there was a government back to back arrangement which provided the council some protection. Finally, a government guarantee, under the new HM Treasury Guarantee Scheme, increased the financial deliverability.

This support from the Government Guarantee Scheme enabled the local authority to procure such a large project and attract the amount of private finance necessary.

Sources

- <http://www.merseygateway.co.uk/2013/06/merseylink-announced-as-mersey-gateway-project-preferred-bidder/>
- http://www.merseygateway.co.uk/wp-content/uploads/2013/07/Merseylink-Bridgewater_Junction_plans.pdf
- [http://www.merseygateway.co.uk/wp-content/uploads/2011/10/Mersey - Gateway Bridge Project Prequalification document.pdf](http://www.merseygateway.co.uk/wp-content/uploads/2011/10/Mersey_-_Gateway_Bridge_Project_Prequalification_document.pdf)Planning
- <http://www.merseygateway.co.uk/wp-content/uploads/2011/07/Mersey-Gateway-Project-information-leaflet-July-2013.pdf>
- <http://www.merseygateway.co.uk/about-the-mersey-gateway-project/funding-of-the-mersey-gateway-project/>
- <http://www.merseygateway.co.uk/benefits-of-the-mersey-gateway-project/>

A.9. Pevensey Bay Sea Defences

Pevensey Bay Sea Defences

Project summary

The Pevensey Bay is a coastal defence scheme in which a contractor is required to provide coastal defence services to prevent flooding of 10,000 properties, roads, rail and local amenities in Pevensey, East Sussex. The project is the only coastal defence project in the world to be delivered under a PPP arrangement.

The project follows a standard PFI arrangement whereby a private contractor (namely SPV Pevensey Coastal Defence Limited, PCDL) is responsible for delivering a given service in return for payment from the public sector - the Environment Agency (EA). PCDL have been contracted to ensure that the bay is maintained to a set standard that is consistent with an expected probability of a 'flood event' of once every 400 years or fewer for 25 years.

The contractor's risks include the variable cost of the materials and staff to maintain the beach, completion of works and sharing reinstatement costs with EA should a weather event with a probability of occurring between 1 in 50 and 1 in 400 years. However, should a weather event of greater than 1 in 400 occur, EA will be responsible for reinstatement costs.

Status: Operation

Project type: OMR

Total project cost: £30m

Debt-Equity Ratio: 0:100

Key dates

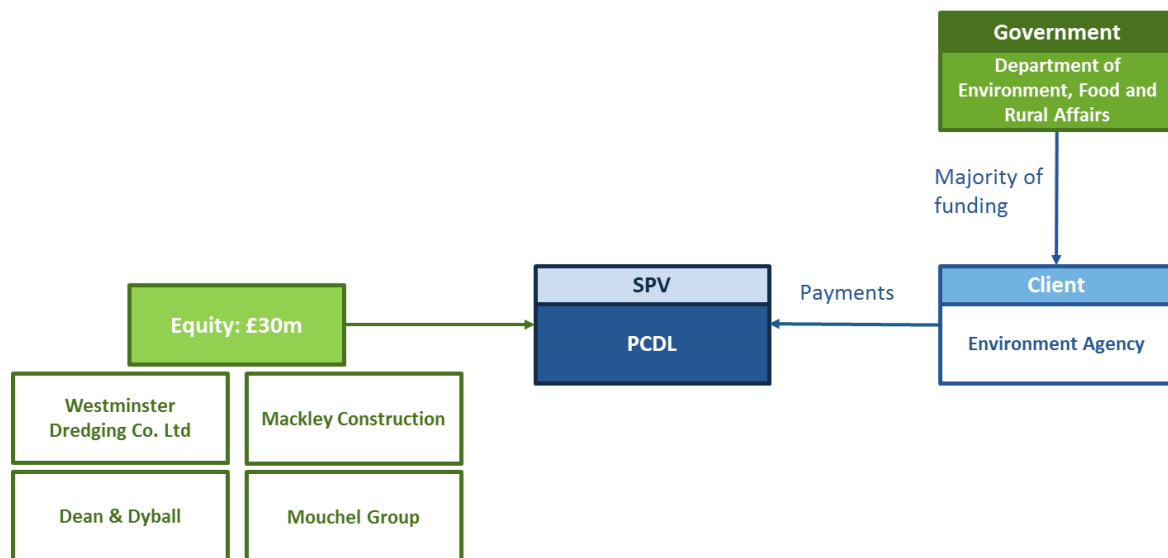
Tender launch: May 1997

Financial close: May 2000

Preferred bidder: June 1999

COD: June 2000

Summary of finance being provided



Equity – £30m

Pevensey Bay Sea Defences

The project sponsors were provided the entire amount of capital investment required for the project. Sponsors when the contract was signed included:

- Westminster Dredging Co. Ltd (Boskalis Westminster)
- Dean & Dyball
- Mackley Construction
- Mouchel Group

Since the project was completed, Dean & Dyball has been sold to Balfour Beatty.

Debt – N/A

The project required limited construction of assets, therefore the shareholders did not need to seek additional debt finance.

Public sector support

The unitary charges paid as part of the project, is the responsibility of EA, an executive non-departmental body sponsored by the Department for Environment, Food and Rural Affairs (Defra).

Funding arrangements

PCDL are paid a unitary charge by the Environment Agency's budget, which in turn is mostly funded by grants from Defra (in addition to income from issuing licences for abstraction, waste handling and navigation), meaning that taxpayers ultimately bear the majority of the project's funding obligations.

Project development process

During the mid-1990s Pevensey Bay was identified as being particularly susceptible to flooding, with 50km² of land at risk during high tides. In order to overcome this, EA decided to adopt a PPP structure for the project and launched the tender in 1997, which attracted interest from over 50 firms. Following this, 13 consortia responded to the invitation to tender, and the preferred bidder was selected and awarded the contract by May 2000. The long development process can be partly explained by the uniqueness of the contract, which involved identifying specific performance measures and outlining what risks each party would take during the implementation of the contract.

Post-financial close

The project has been supported by a number of local stakeholders and interested parties for its success in maintaining the coastal defences and the innovation that has been introduced to the contract. For example, the contractor has brought shingle stone from further up the coast to the bay via a hopper dredger and then spouted it onto the beach, as opposed to delivering it by road, which has resulted in considerable cost savings. Many stakeholders have noted that this method of delivery would not have been likely if the project were delivered by the public sector, which has helped deliver value for money for taxpayers.

Lessons learned

While the project is small relative to those that have reached close in other infrastructure sectors, it demonstrates that private sector investment can be attracted into the flood defence sector. The project also provides a blueprint for potential deals in the sector in future.

While the overall design of the contract is unique, the specific payment arrangement is similar to other PFI deals, whereby the taxpayer bears ultimate responsibility for funding.

Pevensey Bay Sea Defences

Sources

- Tanis and Vergeer (2008), [Long-term Coastal Defence and Management at Pevensey Bay, UK: A Public Private Partnership](#)
- <http://www.pppforum.com/case-studies/pevensey-bay-sea-defence>
- <http://www.pevensey-bay.co.uk/ppp.html>
- <http://www.pevensey-bay.co.uk/who-are-pcdl.html>

A.10. Heathrow Terminal 5

Heathrow Airport Holdings (formerly the British Airports Authority) construction of Terminal 5

Project summary

Heathrow Airport Holdings Limited (HAL) completed the £4.3bn construction of Heathrow Terminal 5 (T5) in 2008 to give the airport the capacity to handle an additional 35m passengers (increasing its capacity by 32.5%). This is an interesting project to look at because:

- It was a large and lumpy investment that constituted two-thirds of HAL's capital value at the time.
- It was subject to considerable delays due to the regulatory, legal and policy risks that it faced – there was initially an expectation that the project would be given planning permission in 1997 but this did not occur until 2001.
- It was technically difficult to deliver. The construction of the terminal required the extension of the London Piccadilly Line, Heathrow Express and the M25 as well as the rerouting of two rivers.

Despite these risks HAL was able to finance the project through the issuance of bonds as part of its corporate bond programme. The investment demonstrates that it is possible to get private investors to finance large, complex projects. However in practice this may only have been possible as a result of the use of the pre-funding mechanism that was put in place to facilitate the completion of the investment.

Use of pre-funding mechanism

At the time of the project HAL was subject to price regulation. The typical regulatory arrangement for a capital investment was to allow an increase in the Regulatory Asset Base (RAB) and thus the price that HAL could charge to its Airlines for landing at the terminal when the project became operational i.e. the Airlines (and therefore passengers) would pay for the investment when they could benefit from it. The problem with this typical approach was that the T5 project was so large that it would have exposed HAL to some financial risks:

- Given the potential for time delays and cost over-runs associated with the project there were concerns about the ability to attract investors without an approach being put in place to provide a clearer funding profile for the project.
- Without gaining some form of revenue advancement, HAL would face a cash flow mismatch during the construction of T5.

Heathrow Airport Holdings (formerly the British Airports Authority) construction of Terminal 5

- Waiting for the asset to be operational would increase the RAB and thus HAL's price cap sharply upon completion of the project leading to an inefficient price profiling.

As a result of these concerns the regulator developed a mechanism by which the RAB and the cost of capital was increased (and therefore the revenue that HAL could recoup from its existing customers) while the project was being completed. This mechanism meant that the Airlines had to begin funding the completion of the project before it was operational.

While it gave HAL had a clear schedule for recovering payments for the investment there were some issues with the use of the approach:

- Intergenerational concerns that some of the Airlines funding the construction of the project might not end up benefiting from the investment – the approach did receive opposition from HAL's airlines.
- Concerns that the use of pre-funding would create an incentive for HAL to delay the project so that it could benefit from the up-front funding but delay incurring some of the construction costs; which would become particularly attractive if over the course of the construction there were material changes to the perceived level of demand risk.

To try to address the later problem the regulator made use of an asymmetric trigger mechanism by which the RAB would increase each time HAL completed specific parts of the project (each of the five triggers). However, if HAL failed to deliver the triggers within the required timeframe it incurred a penalty such that its price cap was adjusted downwards by 2% for each trigger.

Status: Operation	Project type: Greenfield
Total project cost: £4.3 billion ⁴⁸	Debt-Equity Ratio: n/a
Key dates Financial close: August 2002 COD: 2008	
Debt – £1.7bn HAL financed the project through the issuance of corporate bonds, these bonds were issued as general corporate bonds by HAL so it is not possible to obtain exact financing details for the T5 project. However, in July 2001 HAL was able to raise £2bn from a bond issuance and then in 2002 it raised £3bn. The project also received a loan of circa. £239m from the European Investment Bank (EIB).	
Lessons learned Once the project achieved planning permission it is seen as having been delivered on time and to budget. Though T5 soon ran into operational difficulties once it was opened. The main outcome is that the use of the pre-funding mechanism did play a role in enabling HAL to finance the project through corporate bond offerings, though there are issues around the appropriateness of making use of the pre-funding approach and particularly the incentives that it places on the project sponsor. In the case of T5 the penalties that were in place for failure to meet	

⁴⁸ Cost at 2008 prices.

Heathrow Airport Holdings (formerly the British Airports Authority) construction of Terminal 5

the specified delivery targets were not large enough to incentivise the investment if the project sponsor decided to delay – in practice it is not clear that there is any precedent for a regulator to apply penalties large enough to provide adequate incentives.

Further, whilst T5 was a large project, for larger/ projects involving longer construction periods, the use of the pre-funding approach would become more complex and probably subject to even more challenge from the funders of the project.

Sources

- Frontier Economics (2008). Regulation of capacity investment at Stansted Airport.
- Ian Alexander and Clive Harris (2005). The regulation of investment in utilities. Concepts and applications.
- PwC (2015). Airports Commission. Sources of Finance Report. Cost and Commercial Viability: Sources of Finance.
- www.eib.org

A.11. UK Digital Infrastructure Investment Fund

The government is currently in the process of developing the Digital Infrastructure Investment Fund. We understand that the aim of the fund is to increase access to commercial finance to support the growth of the UK's ultrafast broadband network, in particular for alternative network developers (other than Openreach).⁴⁹ According to multiple sources the government will commit £400m to the fund with the expectation that the government's funds will be matched by the private sector.

The fund will potentially be structured as a closed-ended fund and seek debt or debt-like investments for at least 50% of its capital. However, the fund will not rule out equity investments.⁵⁰

Three fund managers have been selected as final bidders to raise capital and manage the fund, it is expected that the winning bid will be announced by the end of the year and officially start fund raising in Q1 of 2017.

A.12. Bond investment in UK regulated sectors

This section reviews the way in which bond finance has been used to facilitate investment in UK's regulated infrastructure sectors.

A.12.1. Background

Regulated infrastructure in the UK is largely privately-owned and has attracted significant amounts of private capital over the past 25 years.

The following sectors are currently subject to economic regulation in the UK:

- electricity and gas transmission and distribution (but not generation or retail);
- national rail infrastructure;
- water and wastewater;
- civilian en route air navigation services;
- Heathrow and Gatwick airports; and
- BT Openreach - as the dominant provider of consumer-facing 'last mile' networks of copper, fibre and co-axial (cable) networks or mobile masts.

⁴⁹ <https://www.gov.uk/government/publications/broadband-investment-fund/broadband-investment-fund-request-for-proposals>

⁵⁰ <https://ijglobal.com/articles/103463/uk-commits-400m-to-digital-infrastructure-investment-fund>

Assets in the national rail and civilian traffic control sectors are currently subject to public ownership. Network Rail - a government agency, has owned and operated the national rail infrastructure since it was re-nationalised in 2002. Civilian en route air navigation services are the responsibility of NATS En Route Plc, which is a part of NATS (Holdings) Plc - a PPP 49% owned by the UK Government with a golden share.

Other regulated infrastructure assets are mostly in private ownership. They are either owned-and-operated by a single company for the whole of Great Britain (i.e. National Grid Gas), divided into regional monopolies (i.e. for electricity transmission, gas/electricity distribution, water/wastewater), or on an individual asset basis (i.e. Heathrow and Gatwick, OFTOs).

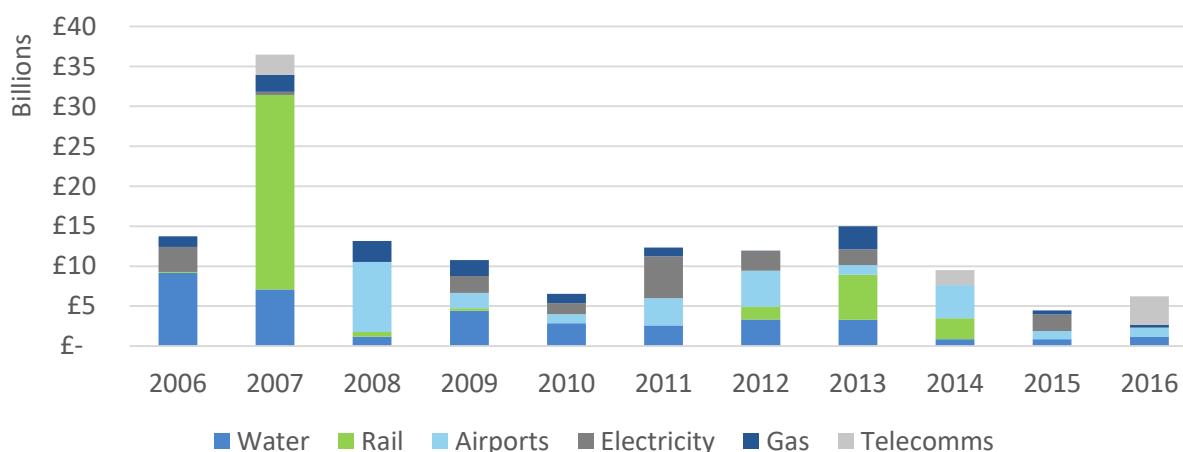
Given the nature of the underlying assets, regulated companies typically require long-term financing to carry out large ongoing capital investment programs, as opposed to borrowing for specific projects. They therefore raise large volumes of debt through investment grade bond financing, generally at rates that reflect the reduced risk associated with stable regulated cash flows.

Network Rail and NATS have also used public bond markets to attract private finance rather than drawing from the government budget. However, from September 2014 was reclassified as a public sector body, following a statistical change announced by the Office for National Statistics (ONS) in December 2013. Following this, the UK Government decided that it would be more efficient to lend to Network Rail directly, and that it should no longer issue debt in its own name. Since then, Network Rail's capex programme has been financed via direct government loans from the Department for Transport (DfT), as opposed to issuing its own bonds on the financial markets.

A.12.2. Profile of bond issuances in the regulated sectors

Figure A.5 shows the total amounts of fixed income securities (bonds) issued by UK regulated companies over the past ten years. It demonstrates that regulated companies have tapped continuously capital markets for new funding or refinancing at a large scale, though the amounts issued have varied from year to year.

Figure A.5: Bond issuance (amounts) by UK regulated companies, 2006-16⁵¹



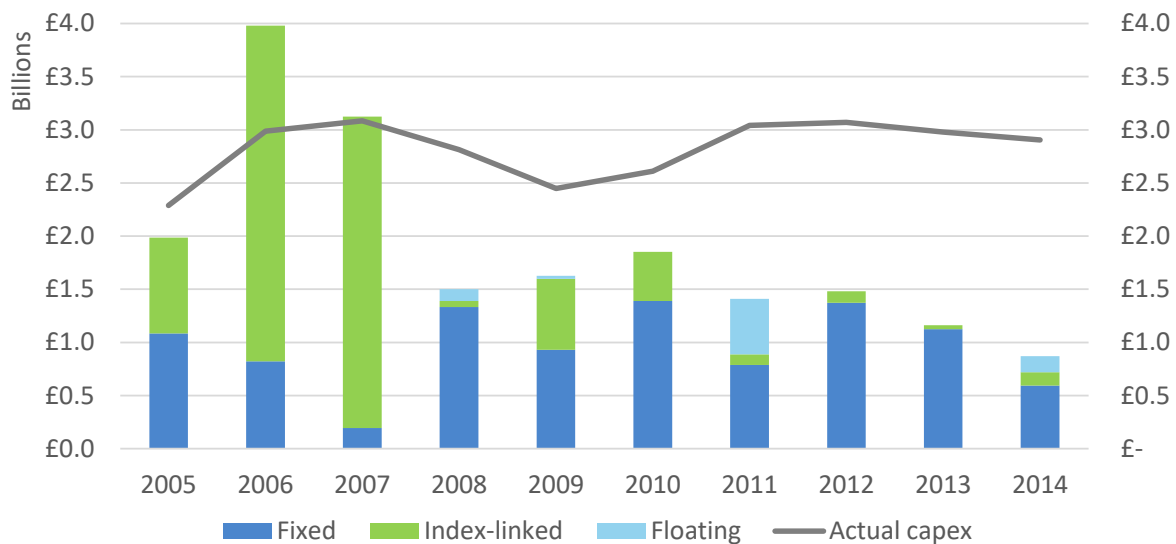
Source: Bloomberg; CEPA analysis

The variation in total issuances over time is more closely linked to capital market conditions and (in some cases) the regulatory cycle than with the requirements of individual investment projects. For instance, the spike in 2007 was driven by three large index-linked long-term bonds issued by Network Rail totalling £23bn. There was no project-specific rationale for raising such large amounts of debt at that time (Network Rail would only require £2.3bn for Crossrail-related works). Instead, the issuance was motivated by favourable pricing at that time - partly as a result of a change to rules affecting pension funds and insurers which increased their appetite for holding index-linked bonds, and an announcement that the UK Debt Management Office was not planning to issue any further index-linked debt.

Variance in water sector issuances also appears to be unrelated to the requirements of particular capex programs. Figure A.6 suggests that the high levels of borrowing by water and wastewater companies in 2006-07 was not linked to peaks in capital expenditure, which stayed fairly stable over the period. Nor is there a clear linkage over longer periods, even when taking into account time lags. Instead, we can see that the elevated issuances were largely composed of index-lined debt - suggesting a similar interpretation as for Network Rail (i.e. companies taking advantage of high demand for index-linked debt to gear up). Issuances were also more frequent during this period, with 47 water bonds issued in 2006 and 37 in 2007, versus an average of 8 per year from 2008-16 (i.e. after the global financial crash). Energy utility issuances follow a similar trend.

⁵¹ Includes regulated company bonds for which UK is country of risk. All 'telecomms' bonds were issued by British Telecommunications PLC which borrows on behalf of the whole group and not just the regulated entity, Openreach. NATS En Route Plc did not issue any bonds during this period. Does not include a £30.3bn loan to Network Rail from the UK Government in 2014 to cover the 2014-2019 control period.

Figure A.6: Bond issuance (amounts) by water companies in England & Wales, 2005-14

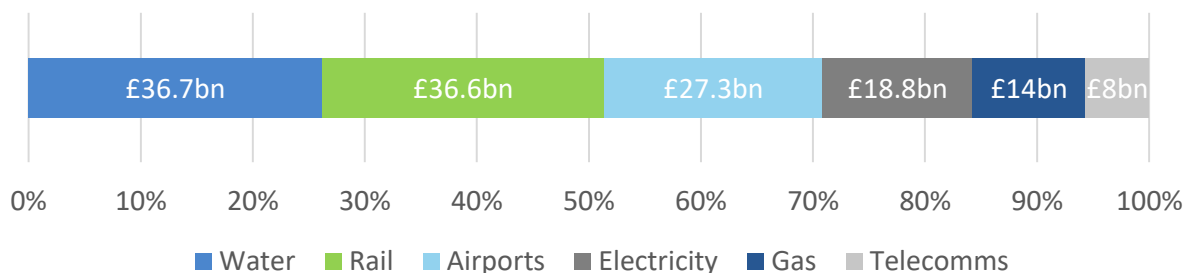


Source: Ofwat

Anecdotal evidence would suggest that some companies prefer to issue debt shortly before or after the beginning of a new price control period to take advantage of favourable regulatory rules before/after they change. For example, Gatwick Funding Ltd issued a £582m 20 year bond on 27 March 2014, just before the start of the Q6 price control on 1 April.

Figure A.7 splits the total £140.5bn of regulated company bonds issued between 2006 and 07 December 2016 by sector.

Figure A.7: Bond issuance of UK regulated companies, 2006-16 - by sector⁵²



Source: Bloomberg; CEPA analysis

The water, rail, airport, and combined energy sectors all contribute approximately 20-30% of the total. Telecommunications issuances make up 6% of the total, but note that these were made by British Telecommunications PLC which borrows on behalf of the whole group and not just Openreach - the regulated entity. Borrowing for the purposes of Openreach is likely

⁵² As above, this does not include the £30.3bn loan to Network Rail from the UK Government in 2014 to cover the 2014-2019 control period.

to be only a small fraction of this amount. NATS En Route Plc did not issue any bonds during this period, after raising a £600m 23 year bond in 2003.

ANNEX B INTERNATIONAL CASE STUDIES

This annex includes a number of international examples where private finance has been provided to infrastructure projects.

The annex contains the following case studies:

- The Gemini Offshore wind farm project in the Netherlands.
- The Meerwind Offshore Wind Farm in Germany.
- The Logan Motorway Enhancement Project in Australia.
- The A7 Bordesholm-Hamburg Motorway PPP in Germany.
- The WestConnex Road (Phase 2) in Australia.
- The South Europe Atlantic High Speed Rail (HSR) in France.

B.1. Gemini Offshore Wind Farm, Netherlands

Gemini Offshore Wind Farm (600MW), Netherlands

Project summary

This project consists of two greenfield wind farms in the North Sea located 85km off the Dutch coast. It was the largest project finance transaction in the offshore wind sector anywhere in the world. Installation began in early 2016 with final commissioning expected in 2017.

The project is being delivered by the private sector, but will benefit from public support through the Dutch government's SDE+ 'contract for difference' scheme and a 15-year PPA with state-owned utility company, Delta.

The SDE+ scheme is very similar to the UK's Contracts for Difference regime. The SDE+ compensates for the difference between the cost price of renewable energy (depending on the technology) (the "strike price") and the wholesale energy price ("reference price"), therefore stimulating investment in otherwise unprofitable renewable energy projects. The government makes a maximum annual budget available and allocates the subsidy in rounds, with earlier rounds favouring lower cost production. We think there may be some differences. In the UK scheme, producers pay back the difference when the market price is higher than the strike price, but this is not explicit in the Dutch scheme. However, the Dutch scheme caps the maximum payment, so the private sector still takes some tail risk on the energy price.

Status: In construction

Project type: Greenfield

Total project cost: £2,309m

Debt-Equity Ratio: 55:45

Key dates

Pre-launch: N/A

Financial close: 15 May 2014

Tender launch: N/A

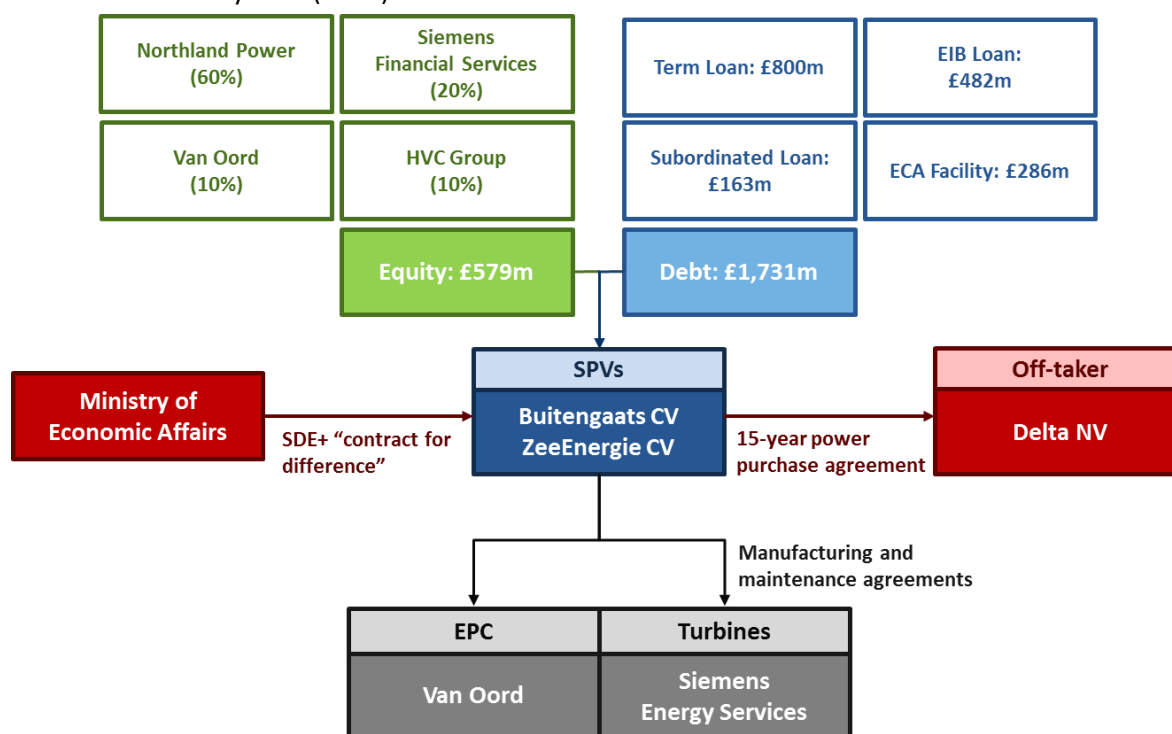
COD: 2017 (expected)

Gemini Offshore Wind Farm (600MW), Netherlands

Preferred bidder: N/A

Summary of finance being provided

The diagram below shows the basic project stakeholders and financing structure. Financing has been structured as a “mini-perm” (short-term financing to cover construction) with incentives (full cash sweeps – using excess cash to pay down existing debt) which encourage the debt to be refinanced before year 8 (2022).



Equity – £578.5m

- Northland Power (developer) – £266.5m (60%)
- Siemens Financial Services – £89.1m (20%)
- Van Oord (engineering/construction firm) – £44.6m (10%)
- HVC group (state-owned waste management company) – £178.3m (10%)

Debt – £1,730.7m

- 17-year commercial term loan – £800m Euribor+300bps for construction and drops to Euribor+275bps after completion.
Lenders: Export Development Canada, ABN AMRO, BNP Paribas, Natixis, Bank of Tokyo MUFJ, CIBC, Bank of Montreal, Santander, CaixaBank, SMBC, Deutsche Bank, Bank Nederlandse Gemeenten (Dutch state bank)
- EIB loan – £481.7m
- 17-year debt facility – £285.7m

Gemini Offshore Wind Farm (600MW), Netherlands

Lender: Euler Hermes (credit insurance subsidiary of Allianz)

Mezzanine – £163.3m

- 17-year subordinated loan – £163.3m

Lenders: PKA Group (pension fund) and Northland Power (developer)

Public sector support

The project is underpinned by the Dutch government's Stimulation of Sustainable Energy Production (SDE+) scheme - a 15-year contract for difference, as in the UK, whereby the Dutch government tops up the market price to a fixed level (€168.9/MWh). Various caps also ensure that the amounts committed by taxpayers are fully known in advance. The project has also signed a 15-year power purchase agreement with Delta, a Dutch utility company owned by the municipalities of Zeeland and Noord-Brabant.

Funding arrangements

Funding will be provided by energy users via a power purchase agreement signed with a Dutch utility company and Dutch taxpayers through the SDE+ renewable energy incentive scheme.

Project development process

The project was initially developed by BARD Offshore in 2010, which successfully bid for the SDE incentive, and sold to another offshore developer.

Contractors Siemens (turbines) and Van Oord (EPC) were brought on board in 2011-12 with both groups agreeing to make equity contributions to the development.

In August 2013 Canadian IPP Northland Power reached a deal to take a majority stake in the project.

One of the main challenges was the number of parties required to finance the project, given that it was the largest project financing in the offshore wind sector to date. The main turbine and EPC contracts for Gemini were negotiated and signed off ahead of taking the project to the banking market - in contrast to previous offshore wind financings in markets such as the UK and Germany. The lead financial advisers ensured that contracts were structured such that the banks would be familiar with them, reducing the possibility of delays before financial close.

Lessons learned

Detailed preparatory work meant that the turbine and EPC contracts were negotiated and signed off before the project was taken to the banking market, preventing drawn-out contractual negotiations across multiple parties. Investors were comforted by the limited number of contracts and therefore reduced number of potential issues between contractors and their suppliers – the prime contractor, Van Oord, is liable if sub-contractors fail to deliver.

Northland Power's role as the main equity provider was also important to the project's success, with lenders emphasizing the management and balance sheet capacity that the group was able to bring to the deal.

To access a record amount of financing for an offshore wind project, the project had to tap a large portion of lending capacity. The liquidity offered by multilateral lenders (such as the EIB) and export credit agencies was essential.

Finally, stable and transparent government policy also helped. The Netherlands has a renewable energy target of 14% by 2020 under the EU renewable energy directive, and this is driving a lot of

Gemini Offshore Wind Farm (600MW), Netherlands

the support for investment. The SDE+ scheme also helps to mitigate revenue risk from short-term fluctuations in the market price for energy.

Sources

- [IJ Global](#)
- [Northland Power](#)
- [Freshfields Bruckhaus Deringer](#)
- [International Energy Agency – Renewable Energy Technology Deployment](#)
- [Green Giraffe](#)

B.2. Meerwind Offshore Wind Farm, Germany

Meerwind Offshore Wind Farm (288MW), Germany

Project summary

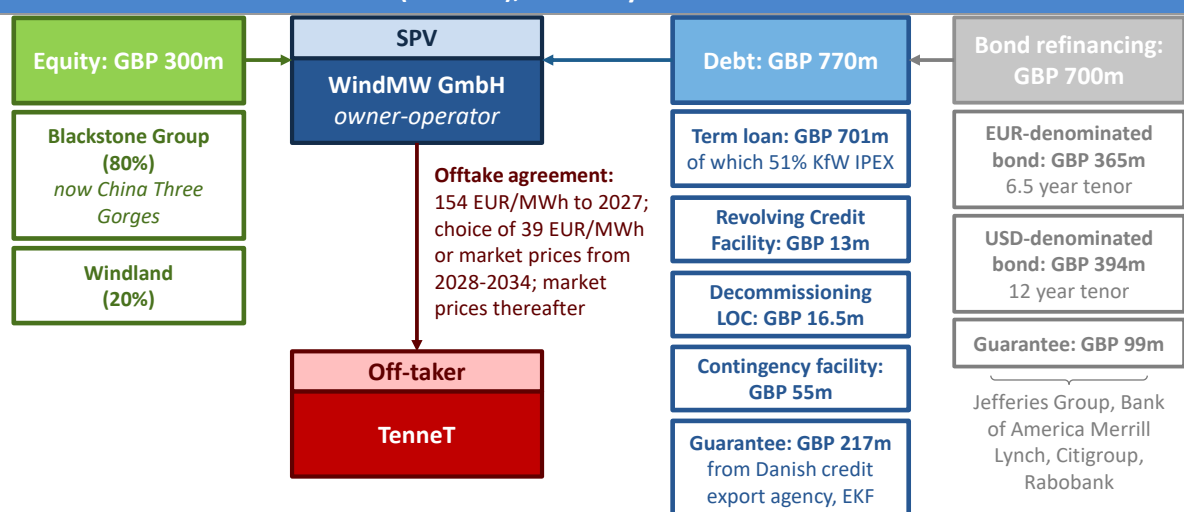
The 288MW Meerwind offshore wind farm is located in German section of the North Sea, 23 km north of the island of Helgoland. The 288 MW wind farm consists of 80 Siemens wind turbines with a power output of 3.6 MW each. The sponsors faced construction risk, but Siemens provided an availability guarantee backed by EKF - the Danish credit export agency (EKF are seen as having specialist expertise in wind farm financing). TenneT is responsible for connecting the farm's transformer platform to the shore.

The project was notable for being the first European offshore generation project operated by a private equity investor (as opposed to a utility), and for being the first offshore wind farm built under KfW's €5bn debt financing programme for German renewables. KfW IPEX provided 51% of the project's term loan and contingency facility, and provided a revolving credit facility.

Status: Operational	Project type: Greenfield
Total project cost: £1,044m (€1,200m) ⁵³	Debt-Equity Ratio: 70:30
Key dates	
Pre-launch:	Financial close: 08 Aug 2011
Tender launch:	COD: 29 Dec 2014
Preferred bidder: 09 Aug 2010	Bond refinancing: 16 Dec 2015
Summary of finance being provided	

⁵³ Values have been converted from € to £ at the average rate for the year of the transaction (2011: 0.89).

Meerwind Offshore Wind Farm (288MW), Germany



Equity – £300m (€345m)

- Blackstone Group - £240m, 80% (acquired by China Three Gorges in Jun 2016)
- Windland Energieerzeugungs GmbH - £60m, 20%

Debt – £770m (€885m)

At financial close:

- 18 yr **Term Loan** - £701m at 290 bps over Euribor, falling to 275bps for the first years of operation, and climbing to 320bps by end of tenor (51% KfW IPEX-Bank GmbH; 49% bank consortium - Commerzbank, Dexia, Lloyds Banking Group, Mitsubishi UFJ Financial Group (MUFG & BTMU), Santander, Siemens Financial Services).
- 15 yr **Revolving Credit Facility** - £13m (KfW IPEX-Bank GmbH).
- 17 yr **Decommissioning LOC** - £16.5m (Dexia).
- 3 yr **Standby/Contingency Facility** - £55m (51% KfW IPEX-Bank GmbH; 49% bank consortium - Commerzbank, Dexia, Lloyds Banking Group, Mitsubishi UFJ Financial Group (MUFG & BTMU), Santander, Siemens Financial Services).
- £217m **guarantee** from Danish credit export agency EKF, funded by BTMU and KfW-IPEX.

Dec 2015 Bond refinancing - £700m (€960m):

- £365m euro-denominated 6.5 year **project bond**. Maturity 2022. Investors: Jefferies Group, Bank of America Merrill Lynch, Citigroup.
- £394m dollar-denominated 12 year **project bond**. Maturity 2027. Investors: Jefferies Group, Bank of America Merrill Lynch, Citigroup.
- Bond-subscribers also provided £99m of **credit facilities** with a six year tenor.

Public sector support

The offtake regime with TenneT provides a degree of revenue certainty - with high rates guaranteed for the first few years and an optional price floor to fill the interim before full exposure to market electricity prices. The agreement would see TenneT paying €154/MWh until 2027; then offering a choice between €39/MWh and market prices from 2028-2034; and market prices thereafter.

Meerwind Offshore Wind Farm (288MW), Germany

Note that this regime will only apply to installations that start to operate before 2020, following reform of Germany's Renewable Energy Act. The reform will replace feed-in-tariffs with a system of auctions aimed at controlling capacity growth.

KfW contributed approximately 51% of the debt at financial close (almost £400m) from its €5bn loan programme for German offshore wind farms. Under the programme KfW can contribute up to half of the finance for German offshore wind farms. This debt support was originally requested from the EIB.

EKF - the Danish export credit agency, provided a €250 million guarantee (funded by BTMU and KfW-IPEX) in support of the turbines ordered from Siemens.

Funding arrangements

Project revenues are derived entirely from sale of energy to the grid. Payments made by TenneT are funded through levies at various stages of the supply chain which are ultimately borne by the end-consumer.

Project development process

The 288MW Meerwind scheme was initially developed by Windland Energieerzeugungs, a Berlin-based company headed by Joachim Falkenhagen. Blackstone bought 80% of the project in 2008, with Falkenhagen keeping a residual interest. Project development stalled until early 2010 due to permitting issues with other wind farm sites. From the time work restarted to financial close was therefore relatively short, a year and a half, and certainly very short compared with other development timetables in the German offshore sector where deal closings have been few and far between – despite a large list of potential schemes.

Two weeks before financial close Blackstone realised that Siemens was not going to be able to build the substation in time - requiring them to negotiate a new turnkey contract with a consortium of France's Alstom Grid and Germany's WeserWind.

Post-financial close

The project has commenced operation with no cost overruns reported.

WindMV (the owner-operator) launched a £700m bond refinancing in December 2015. Buyers included Aegon Asset Management, La Banque Postale Asset Management and Edmond de Rothschild Asset Management's BRIDGE fund.

In June 2016 Blackstone sold its 80% equity share in WindMV to China Three Gorges for an undisclosed sum.

Lessons learned

The project demonstrated the appetite of private equity investors and commercial banks engage with well-structured offshore generation projects, albeit with buy-in from KfW's offshore financing programme (replacing the role played by the EIB in many other offshore projects). Bank lending terms were considered to be attractive according to some (interested) commentators:

IJGlobal - Jérôme Guillet, Managing Director, Green Giraffe Energy Bankers, financial advisors to the private equity sponsor Blackstone, described the deal as "a first". He says, "Meerwind shows you can do a billion-euro deal without the EIB and it shows that investors who want private equity-type returns can find ways to invest in the sector with support from the banks."

Construction risk was managed through an availability guarantee from Siemens, supported by EKF. This was the first time Siemens had supplied turbines on a non-recourse construction risk basis.

Meerwind Offshore Wind Farm (288MW), Germany

Sources

- [InfraDeals](#)
- [IJ Global](#)

B.3. Logan Motorway Enhancement Project, Australia

Logan Motorway Enhancement Project, Australia

Project summary

This recently approved brownfield road project will upgrade and expand a series of highways and interchanges in Queensland, Australia. The project will be entirely financed by Transurban Queensland – the private sector owner/operator of a network of toll roads – and funded through user charging.

Sydney, Melbourne and Brisbane have established systems of road user charging with a number of PPP projects built since the 1990s. Road user charging is less accepted in the UK.

Status: Contractors appointed

Project type: Brownfield

Total project cost: approx. £380m

Debt-Equity Ratio: N/A

Key dates

Pre-launch: N/A

Financial close: N/A

Tender launch: N/A

COD: Completion planned for 2019

Preferred bidder: N/A

Public sector support

No public support was offered by the public sector, other than engagement through the Market-Led Proposals framework, discussed below.

Financing and funding arrangements

The project will be delivered with Transurban Queensland financing 100% of the project.

The source of funding for the project will come from the installation of new toll points (the road was already tolled), and there will be a moderate increase to truck tolls on the Logan Motorway and Gateway Motorway. The changes will take effect once construction is completed in mid-2019 and the benefits of the project start to be realised.

Project development process

The project was proposed by the private sector (Transurban) through the Market-Led Proposals framework. A market-led proposal is a proposal from the private sector which seeks an exclusive commercial arrangement with government to provide a service or infrastructure to meet a community need. It includes a role for government such as access to government land, assets, information or networks. Proponents must bring initial proposals to the government for discussion. Promising proposals can get approval to submit a detailed proposal. Detailed proposals which gain approval proceed to final negotiations between the government and proponent. The result is often a well-prepared, “market-ready” project.

Logan Motorway Enhancement Project, Australia

Proposals are assessed for value for money and a “unique competitive advantage”, i.e. proponents must demonstrate to the government the benefit of engaging with them exclusively rather than procuring the service or infrastructure via a competitive tender process.

The UK government doesn’t have a similar approach as most rail and road infrastructure is publicly-owned.

The Logan Enhancement project has passed through the initial and detailed proposal stages and the parties have agreed a final binding offer. The project is now formally contracted as a variation to the existing government franchise agreement with Transurban Queensland.

Post-financial close

N/A

Lessons learned

Some of the observations on the project include:

- The close engagement of public and private sectors through the MLP framework can result in well prepared, “market-ready” projects;
- Large brownfield road projects can be financed entirely by the private sector under certain conditions;
- The acceptability of user charging and proven market size gave Transurban confidence that the project was financially viable;
- Transurban’s existing franchise provides diversification if Logan revenues underperform.

Sources

- [IJ Global](#)
- [Queensland Treasury](#)
- [Logan Enhancement Project](#)

B.4. A7 Bordsesholm-Hamburg Motorway PPP, Germany

A7 Bordsesholm-Hamburg Motorway PPP, Germany

Project summary

Increasing 65km of the A7 motorway to six lanes between the Bordsesholm junction and the Hamburg-Nordwest interchange in northern Germany, to improve capacity and reduce congestion. The project was tendered as a 30-year design, build, finance, operate and maintain concession. Construction, availability and performance risk were all transferred to the private sector.

Status: Construction

Project type: Brownfield

Total project cost: £513.3m

Debt-Equity Ratio: 93:7

Key dates

Pre-launch: 30 January 2009

Financial close: 27 August 2014

Tender launch: 14 December 2011

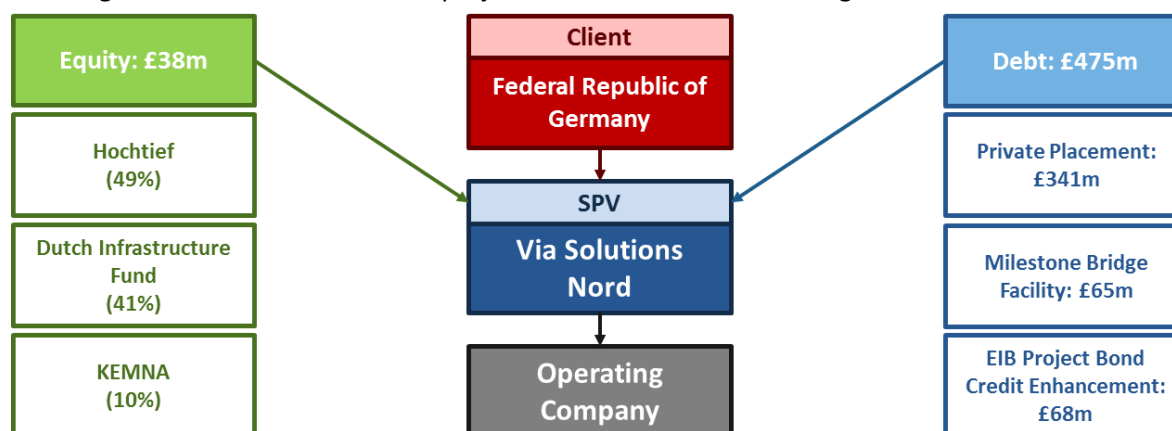
COD: N/A

Preferred bidder: 28 April 2014

A7 Bordsesholm-Hamburg Motorway PPP, Germany

Summary of finance being provided

The diagram below shows the basic project stakeholders and financing structure.



Equity – £38.4m

- Hochtief £18.9m (49%)
- Dutch Infrastructure Fund £15.7m (41%)
- KEMNA BAU £3.9m (10%)

Debt – £474.9m

- 29-year commercial bond – £341.2m
Maturity 2043, private placement, investors: EIB, AXA, KfW, Aegon, ING, Sun Life Financial, MassMutual
- 4.5-year bridge facility – £65.2m
Maturity 2018, lenders: Credit Agricole, Societe Generale
- 30-year EIB subordinated loan – £68.4m
Maturity 2044 – Project Bond Credit Enhancement Scheme

Public sector support

The EIB is providing a subordinated loan of £68.4m for the project, representing about 20% of the volume of the senior debt through the issuance of capital market instruments. Raised the credit rating one-and-a-half notches to A3 (Moody's).

Funding arrangements

Availability payment mechanism funded via general taxation. The fee depends on the extent and quality of the road section made available for use by motorists. Compliance with the contractual requirements ensures that the contractor receives the full availability payment as agreed; in the event of non-compliance, a deduction is made.

Project development process

No information available

Post-financial close

No information available

A7 Bordesholm-Hamburg Motorway PPP, Germany

Lessons learned

This is the first project to be implemented under the European Project Bond Initiative in Germany and the first use of bond financing in the greenfield road sector. The Project Bond Credit Enhancement (PBCE) scheme provided additional liquidity in the form of an irrevocable Letter of Credit to either fund cost overruns where the longstop date could still be met, or to compensate senior debt in a termination scenario.

Through early engagement with the EIB and the market, the project was structured in such a way as to enable a bond solution, such as the possibility of deferred drawdown. DEGES, the state-owned institution in charge of major transport infrastructure projects, supervised the project on behalf of the German government.

Sources

- [IJ Global](#)
- [European Commission](#)
- [EIB](#)

B.5. WestConnex Road (Phase 2), Australia

WestConnex Road (Phase 2), Australia

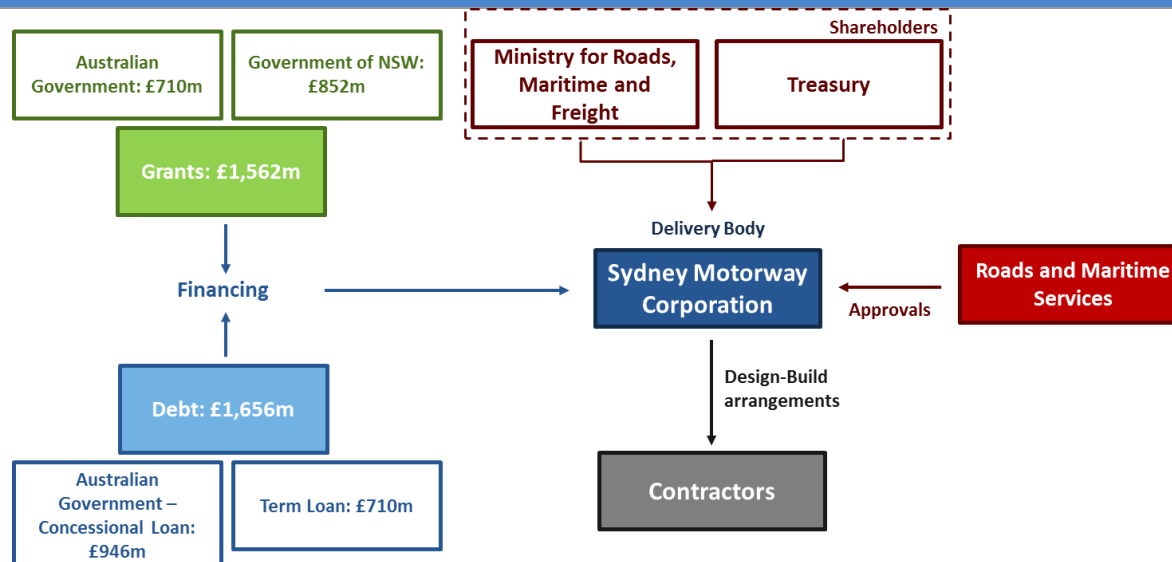
Project summary

WestConnex (WCX) is a brownfield motorway scheme currently under construction in Sydney, New South Wales. The project is being built in three phases: phase two involves the upgrading of an existing interchange and an extension of the motorway.

WCX is a design-build arrangement where ownership of the completed asset will be in the public sector. Finance is provided by both the public and private sectors. There is significant transfer of construction risk to the contractors, but some remains with the public sector. The NSW government will take traffic risk whilst the asset is under public ownership. The value of any future sale to the private sector will be maximised by establishing the level of traffic on an operational asset.

Status: Construction	Project type: Brownfield
Total project cost: £3,217m	Debt-Equity Ratio: 51:49
Key dates	
Pre-launch: 2014	Financial close: 20 November 2015
Tender launch: Late 2014	COD: 2019, with Phase 3 scheduled for 2023
Preferred bidder: 04 September 2015	
Summary of finance being provided	
The diagram below shows the basic project stakeholders, responsibilities and financing structure.	

WestConnex Road (Phase 2), Australia



Equity – £1,561.5m

- Australian Government – Grant – £709.8m
- Government of New South Wales – Grant – £851.7m
- Sponsor Equity – CIMIC Group (33%), Dragados (33%) and Samsung Group (33%) – N/A

Debt – £1,656m

- 7-year term loan – £709.8m
Maturity 2022 loan provided by commercial lenders (Commonwealth Bank of Australia, National Australia Bank, Westpac, Credit Agricole, Hua Nan, First Commercial, CIC, Hana Financial Group, Sumitomo MBC, Bank of China), a pension fund (Australian Super) and a development bank (Korea Development Bank).
- 19-year concessional loan – £946.4m
Concessional loan from Australian government will provide bridging finance during construction, with repayment to occur when the project becomes operational and generates revenue.

Public sector support

WCX has benefitted from a concessional loan from the Australian government, in addition to the grants provided by the federal and state governments. The concessional loan was granted to accelerate the delivery of Phase 2 by one year, which is possible because Phase 2 was previously reliant on the sale of Phase 1. The asset will be under public ownership initially, with a view to a future sale once operational and traffic volumes are established.

Therefore the government will take initial traffic risk.

Funding arrangements

Long term funding will be provided by user fees (tolls). To the extent that the government is unable to cover the initial capital cost through tolls and revenues generated from the final asset sale, the project is funded through general taxation and asset sales from the Restart NSW Fund.

WestConnex Road (Phase 2), Australia

Project development process

WestConnex was originally recommended by Infrastructure NSW in 2012, and over the next two years extensions to the project which facilitated greater connectivity were investigated and adopted. The project consists of three stages split into six sub-projects, tendered separately and delivered sequentially between 2015 and 2023. Procurement is based on an output specification approach, allowing tenderers to propose the detailed design.

A key project constraint was affordability and fundability – i.e. to maintain the Government's AAA credit rating and minimise the impact on the NSW state finances. This was overcome by deciding that the finance not provided by the state should come from private sector capital raised against future tolls. The NSW government will recycle the capital invested in constructing the asset by selling it once traffic volumes are established and reinvesting the capital in other projects.

Post-financial close

It has been reported that the completion date for Phase 2 has recently been extended to 2020 from 2019, due to a delay in obtaining environmental approvals during Australian federal elections.

Lessons learned

Due to affordability constraints, an early decision was taken to fund the project through user charging. This allowed the project to raise private finance secured against future toll revenues.

The early phases required initial seed capital to get the project moving, which was provided through government grants. Sale of Phases 1 and 2 upon completion allowed state capital to be reinvested into Phase 3 (capital recycling). Value for money was maximised by selling operational assets, once traffic volumes had been demonstrated.

To expedite delivery of Phase 2, which was originally dependent on the sale of Phase 1, by 18 months, the Australian government granted the project a concessional loan with repayments to begin once toll revenues were generated.

Sources

- [IJ Global](#)
- [Updated Strategic Business Case, November 2015](#)
- [Australian Government](#)

B.6. South Europe Atlantic High Speed Rail (HSR), France

South Europe Atlantic High Speed Rail (HSR), France

Project summary

This project will see the development of a new 303km high-speed line that will transport up to 20 million passengers per year between Saint-Avertin, south-east of Tours, and Ambarès-et-Lagrave, north of Bordeaux, also serving the intervening stations of Poitiers and Angoulême. The 50-year concession contract involves building a high speed line between Bordeaux and Tours, which will link up with another high speed line running to Paris. The new line will reduce travel time between the two cities from 2 hrs 30 mins to 1 hr 30 mins. It includes 39km of connections with existing

South Europe Atlantic High Speed Rail (HSR), France

lines and involves the construction of 40 overpasses and 390 bridges. The scale and cost makes this one of the world's largest public works projects.

The project is being financed partly by SNCF Réseau (the French state-owned national rail company) (€1 billion), partly by the LISEA consortium with a mixture of equity and bank debt (€3.8 billion) and partly by local authorities, the State and the EU (€3 billion). The LISEA tranche includes portions of debt guaranteed by the state.

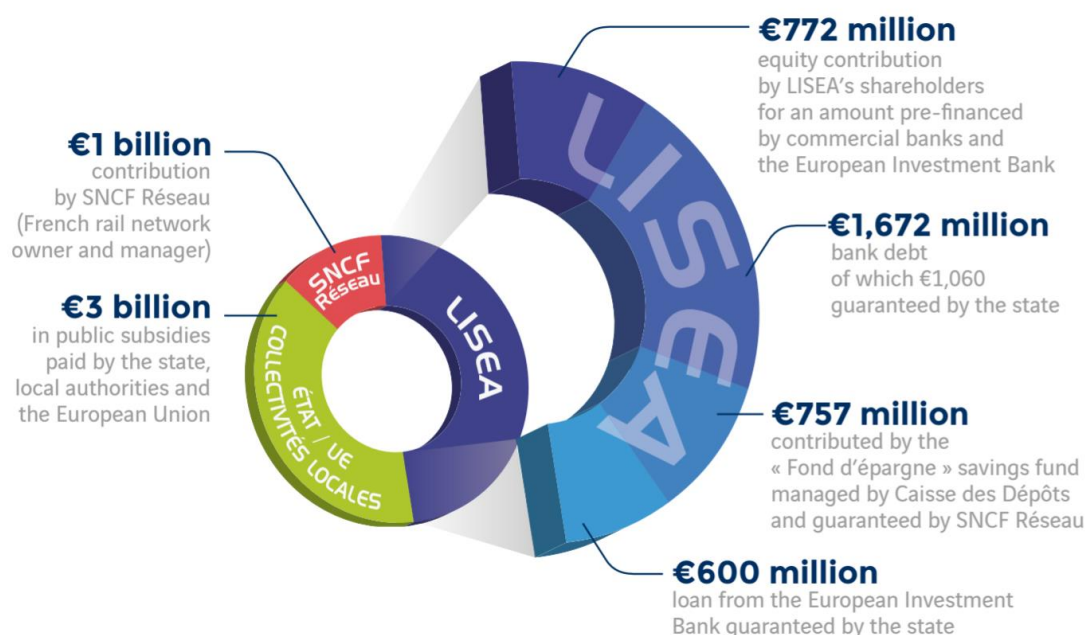
LISEA assumes risks related to design, construction, operation and maintenance of the line. It will generate revenue through reservation, access and use, and electricity charges paid directly by train operating companies using the line for a period of 50 years (i.e. until 2061). Reservation charges are expected to account for over 80% of revenues (see funding arrangements below for further detail).

Charges and their indexation are pre-determined according to the Concession Agreement, with higher than inflation increases. Revenues do not therefore depend on passenger numbers per se, but on the number of scheduled trains that use the line.

The main project risks are in construction and traffic risk. Construction is currently on track.

Status: Construction	Project type: Greenfield
Total project cost: £4,862m (€7,800m)	Debt-Equity Ratio: 80:20
Key dates	
Tender launch: 01 Mar 2007	Financial close: 16 Jun 2011
Preferred bidder: 30 Mar 2010	COD: Mid-2017 (expected)

Summary of finance being provided



Source: [LISEA press kit](#)

Equity – £481m (€ 772m)

South Europe Atlantic High Speed Rail (HSR), France

Project sponsor: LISEA Consortium

- Vinci⁵⁴, 33.4%
- CDC Infrastructure⁵⁵, 25.81%
- Meridiam Infrastructure SCA⁵⁶, 21.31% (bought from Vinci shortly after financial close)
- AXA Infrastructure Fund II⁵⁷, 19.48%

Debt – £1,892m (€3,036m)

- **40 year term loan (£472m)** provided by CDC. Guaranteed by SNCF Réseau.
- **27 year term loan (£386m)** provided by banking consortium.⁵⁸ Not guaranteed. 300bps over Euribor, rising to 430bps.
- **27 year term loan (£661m)** provided by banking consortium. Guaranteed by French Government. 145bps over Euribor, rising to 175bps.
- **40 year multilateral loan (£374m)** provided by EIB, of which two-thirds (£249m) guaranteed by French Government.

Just under 5% of the bank-owned debt package was syndicated in 2012.

Mezzanine – £661m (€1061m)⁵⁹

- 6 year Equity Bridge Loan (£481m) provided by EIB (50%) and bank consortium (50%) at 225bps over Euribor.
- 2 year Subsidy Bridge Loan (£111m) provided by bank consortium at 300bps over Euribor.
- VAT Facility (£69m) provided by bank consortium.

Public sector support - £2,494m (€4,000m) grants

Public subsidies:

- Grant from French Government, 58 local authorities & EU: £1,870m (€3,000m).
- Contribution from SNCF Réseau: £623m (€1,000m).

Debt guarantees (as noted above):

- French Government guarantee for £661m (€1,060m) bank debt.
- French Government guarantee for £374m (€600m) loan from EIB.
- SNCF Réseau guarantee for £472m (€757m) loan from CDC.

Public equity investment (as noted above):

- CDC Infrastructure holds 25.81% of the equity in LISEA: £124m (€199m).

Public debt investment (as noted above):

- CDC contributed a £472m (€757m) 40-year loan, guaranteed by SNCF Réseau.

⁵⁴ French concessions and construction company

⁵⁵ Publicly-owned French financial institution under the control of the French Parliament.

⁵⁶ Paris-based investment fund. Investors are mostly public development banks and institutional investors.

⁵⁷ Paris-based investment fund. Investors are mostly AXA, French family offices and institutional investors.

⁵⁸ Banco Bilbao Vizcaya Argentaria (BBVA), BNP Paribas, Credit Agricole CIB, Dexia, Mediobanca SpA, Santander, Societe Generale (SocGen), Sumitomo Mitsui Banking Corporation (SMBC), UniCredit Group

⁵⁹ Note that mezzanine financing has been excluded from total project costs to avoid double counting with the equity (in the case of the Equity Bridge loan) and the debt (for the other facilities) included elsewhere.

South Europe Atlantic High Speed Rail (HSR), France

Government subsidies were justified with reference to the size and strategic nature of the rail line - providing a high-speed connection between Paris and the South-West, and paving the way for future developments towards Toulouse and Spain.

Guarantees were provided to encourage investment during a period of illiquidity and uncertainty following the global financial crash and the Eurozone debt crisis. Government guarantees resulted in a 155bps premium between the covered and uncovered portions of bank debt, stepping up to 255bps.

Funding arrangements

LISEA's €3,800m investment will be recouped through payments by train operating companies running on the new line, with the cost ultimately being borne by passengers. LISEA's payment mechanism will have four revenue lines:

- Reservation charge (€ / path km) paid by railway operators to reserve a train path
- Access & use charges (€ / train km) paid by railway operators for the effective traffic on the line
- Electricity charges (€ / train + € / electricity distribution)
- Adjustments to the electricity tariff over LISEA's actual electricity spending

As such, revenues do not depend directly on passenger traffic per se, but on the trains scheduled. Reservation charges are expected to account for over 80% of LISEA's revenue. Charges and their indexation are pre-determined by the Concession Agreement.

The €3,000m government subsidy will be split between the central government and local authorities in the five partner regions - to be borne by taxpayers. The €1,000m contribution from SNCF may be collected from a mixture of rail company access charges and support from the French state - so will ultimately be paid by a mix of passengers and taxpayers. This may not necessarily be limited to passengers on the new line, as improved connectivity could generate increased revenue across the wider network.

Project development process

Project development began when SNCF Réseau published a tender (01 Mar 2007), shortlisted three bidders (14 Nov 2007) and selected a preferred proponent (30 Mar 2010).

The bidding process was slowed by uncertainty following the aftermath of the international financial crisis and the Eurozone financial crisis. Commentators have suggested that guarantees from the French Government were offered in response to bidders' hesitancy and to prevent delays, and that the project was *"unlikely to have received sufficient support from commercial banks without the guarantees"* (InfraNews).

State guarantees were initially offered under the provision that the project (and a second high-speed rail project) reached financial close in 2010. When both projects missed the deadline the French parliament voted for a legal amendment to enable them to still receive state guarantees.

Post-financial close

An eight month syndication process took place between February and October 2012 to sell down 5-10% of the initial €2.3bn debt package. The process was drawn out as a result of the large number of players involved, due diligence issues, and the downgrade of a number of the new lenders during the worsening Eurozone financial crisis. On completion, just under 5% of the debt was syndicated - mostly from €1.06bn tranche guaranteed by the French government.

South Europe Atlantic High Speed Rail (HSR), France

In late 2015 LISEA and the project's bank club began a dispute with SNCF over the frequency of trains to be run on the line, following SNCF concerns over high track access costs. LISEA had previously forecast 19 daily trains, but SNCF were considered running as few as 13 per day. The bank club threatened to suspend provision of drawdown loans to the project until a December 2015 agreement to unlock c.€140m. Agreement in principal was reached in April 2016, when SNCF announced that it would run 18.5 daily trains.

The project is currently under construction with no cost overruns reported.

Lessons learned

The key aspects that attracted private finance to this project were mainly the willingness of the French government and the French Rail Network owner-operator SNCF Réseau to provide guarantees and to back the project through subsidies and direct debt/equity investments.

Some commentators indicated that the project would have been unlikely to reach financial close with government-backed guarantees, while others reported that the intervention accelerated the process during a time when large-scale private investment was highly illiquid. As noted above, Government guarantees resulted in a 155bps premium between the covered and uncovered portions of bank debt, stepping up to 255bps.

Sources

- [InfraNews](#)
- [IJGlobal](#)
- [LISEA press kit](#)

ANNEX C BIBLIOGRAPHY

- Alexander, Ian and Harris, Clive (2005). The regulation of investment in utilities. Concepts and applications.
- Allianz. Infrastructure and local authority pension schemes – beyond philosophical mysticism.
- Allianz. Infrastructure debt and institutional investors.
- Aviva investors. Investing in infrastructure brochure.
- BBA (2015). Financing the UK's infrastructure needs.
- Beardon, Justin (2015). The drive for more UK-based pension funds investing in infrastructure.
- BT Pension Scheme (2015). Report and accounts for the year ended 30 June 2015.
- CEPA (2015), Thames Tideway Tunnel – Cost of Capital.
- CMA (2016), Energy Market Investigation – Final Report.
- Financial Times (2015), Critics decry costs of London's £4.2bn 'super sewer'.
- Frontier Economics (2008). Regulation of capacity investment at Stansted Airport.
- Greater Manchester Pension Fund (2016). Report and accounts 2016.
- Greater Manchester Pension Fund and London Pension Fund Authority (2016). Press release: Greater Manchester Pension Fund and LPFA infrastructure joint venture invests in rail.
- Helm, Dieter (2013). British infrastructure policy and the gradual return of the State. Oxford Review of Economic Policy, Volume 29, Number 2.
- House of Commons (2011), Written Ministerial Statements, Thursday 3rd November 2011.
- HM Treasury (2014). National Infrastructure Plan 2014.
- HM Treasury and Infrastructure and Projects Authority (Jun 2016). Broadband Investment Fund: request for proposals.
- HM Treasury, UK Trade & Investment (2014). Investing in UK infrastructure.
- ICAEW (2016). Funding UK infrastructure. Policy insight.
- IJGlobal (2015), Thames Tideway Tunnel, UK.

- IJGlobal (2016), Thames Tideway Tunnel.
- Infrastructure and Projects Authority (2016). National Infrastructure Delivery Plan 2016 – 2021.
- InfraNews (2016), Thames Tideway Bond Investor Revealed.
- Joint Working Group of Local Authorities (2016). Findings of Project POOL. Summary report.
- KPMG (2014): Offshore Transmission: An Investor Perspective – Update Report.
- Llewellyn consulting, Pension Insurance Corporation (2013). UK infrastructure: The challenges for investors and policymakers.
- London Pensions Fund Authority (2016). Annual Report 2015-16.
- OECD (2014). Private financing and government support to promote long-term investments in infrastructure.
- OECD (2016). Progress report on approaches to mobilising institutional investment for green infrastructure.
- Ofcom (2016), Strengthening Openreach’s strategic and operational independence: Proposal for comment.
- Preqin (2015). Infrastructure spotlight.
- Preqin (2012). Pension funds investing in infrastructure.
- Preqin (2015). Sovereign Wealth Fund review: Exclusive extract.
- Preqin (2016). The UK infrastructure market.
- Preqin (2013). UK-based infrastructure fund managers.
- PwC (2015). Airports Commission. Sources of Finance Report. Cost and Commercial Viability: Sources of Finance.
- The City UK (2014). Infrastructure 2014. Trends, demands and challenges. Financial Market Series.
- The Investment Association (2015). Making Investment Better. The Investment Association Annual Survey.
- The Parliamentary Office of Science and Technology (May 2015), UK Broadband Infrastructure.