OFGEM

FINANCEABILITY STUDY ON THE DEVELOPMENT OF A REGULATORY REGIME FOR INTERCONNECTOR INVESTMENT BASED ON A CAP AND FLOOR APPROACH

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20 February 2013

Final report

Submitted by:

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GLOSSARY

Annuity	An annual flat payment whose Net Present Value is equal to the original underlying cost/revenue stream.
Article 16(6)	A provision under European Commission (EC) regulation No. 714/2009. It governs usage of revenues from interconnection.
Beta	A measure of the sensitivity of a company's returns to changes in the market as a whole. Two measures of beta exist. The asset beta captures the underlying business risk while the equity beta also captures the impact of the financial structure (i.e. gearing) of the company. The market as a whole has an equity beta of one by definition.
Capital asset pricing model (CAPM)	A commonly used approach to assessing the cost of capital for an asset.
Corporate finance	Traditional approach to funding a business where the funds are backed by the whole company rather than any specific assets.
Cost of debt	The cost of borrowing funds where the funds have specific maturities, interest payments and repayment schedules. Interest on debt is paid before equity returns and ranks above equity.
Cost of equity	The cost of borrowing funds where the funds have no specific maturity, pre-specified periodic payment or repayment schedule. Equity is considered riskier, as it ranks below debt.
Credit rating	An evaluation of the ability of a company or government to meet its fixed payment obligations under debt finance.
Covariance	A measure of the degree of commonality in movement in two series of data.
Debt premium	The premium that a company has to pay over and above government bonds with similar characteristics to reward investors for the greater risk inherent in a corporate bond.
Dimson, Marsh and Staunton (DMS)	Source of the standard, annually updated, measure of the equity risk premium for the UK and other countries.
Diversifiable risk	Equity risk can be considered in two forms: diversifiable and non-diversifiable. Diversifiable risk

	can be removed through the formation of a portfolio of assets and so equity investors do not need to be compensated for this type of risk. Non-diversifiable or market risk cannot be removed this way and so does need to be remunerated. The beta measures the exposure of a company to non-diversifiable risk.
Elia	The Belgian Transmission System Operator.
Efficient markets hypothesis (EMH)	The assertion that financial markets reflect all available information. The weaker form asserts only that financial markets reflect historic publicly available information.
Electricity Market Reform (EMR)	A UK Government initiative to attract investment into low-carbon electricity.
Equity risk premium (ERP)	The additional amount of return required by an investor to hold the entire risky portfolio of assets rather than the risk-free rate.
European Investment Bank (EIB)	The European Union's long-term lending institution. The EIB is a non-profit, policy-driven public bank. GearingA measure of the capital structure of a company. Defined as the proportion of debt in the financial structure which is in turn equal to the amount of debt and equity.
Index-linked	Debt for which repayments are adjusted on the basis of some reference index (often an index of inflation).
Inflation	A measure of economy-wide changes in prices, captured in a range of inflation indices (such as the Retail Price Index).
Interest during construction (IDC)	Thefinancing cost allowed by the national regulatory authorities (NRAs)during the construction phase.
Market risk premium (MRP)	Another name for the equity risk premium.
Net Present Value (NPV)	The value of a discounted flow of future revenue or costs where the WACC is used as the discount rate.
Nominal return	A rate of return that includes inflation.
Pre-tax return	A rate of return which includes the cost of corporate income tax, i.e. the post-tax rate of return plus the required tax.
Private Finance Initiative (PFI)	A UK Government initiative to fund public infrastructure projects through private capital.

Post-tax return	A rate of return which is received by investors and which excludes corporate taxes paid out of pre-tax returns.
Project finance	An alternative form of finance to corporate or traditional finance. Under project finance any funds are linked specifically to that project and investors have no recourse to the parent company if the project is delayed or fails.
RIIO	Ofgem's framework for regulation of GB energy networks, introduced in 2011 following its RPI-X@20 review.
Real return	A rate of return that excludes inflation.
Regulatory Asset Base (RAB)	The value of the assets that is used by the regulator when setting an allowed level of revenue.
Risk free rate	The cost of borrowing for a government. This is perceived as the least risky type of investment in an economy and, as such, forms the base against which all other risky investments are priced.
Risk of unrewarded costs (RoUC)	A measure of the relative riskiness of a project with respect to aspects of construction, especially cost over-runs or time delays. Used as part of our IDC calculation.
Swap rate	An alternative measure of the risk free rate that is used when pricing project finance debt. Is the cost of swapping variable rate debt into fixed rate debt.
Tax allowance	A provision in the amount of revenue allowed by a regulator to enable the regulated entity to meet its tax obligations.
Third party developers	Potential interconnector operators that are not existing operators of an onshore transmission network.
Transfer value	The value of an asset at the point when it moves from one phase of the regulatory regime to another (for example, from the construction phase to the operational phase, if these are treated differently).
Transmission system operators (TSOs)	One of the entities responsible for transporting electricity or gas through onshore networks.
Transaction cost	Costs associated with the issuance of debt or equity. Can be both direct and indirect costs.

Variance	A measure of the volatility in a series of data.
Vanilla return or vanilla WACC	The required return or cost of capital before taking into account the impact of taxes on required returns.
Weighted average cost of capital (WACC)	The WACC is the measure of the cost of funds for a company, based on a weighted average of the cost of equity and the cost of debt.
Yield to maturity (YTM)	A forward looking estimate of the interest rate on debt where the current price of the debt is equated to the future flow of interest and principal repayments. The yield to maturity (YTM) is the discount rate which makes the flow of income equal to the current market price.

1. INTRODUCTION

Ofgem has appointed CEPA to provide advice and support in relation to the development of a methodology for calculating the cap and floor to be applied to the UK electricity interconnector regime. This methodology will be based on estimation of cost of capital parameters for regulated interconnectors. The proposed 'NEMO' interconnector is to be used as a pilot for this approach, and is a key reference point. As such, CREG, the Belgian national regulator, is also participating in this work. Together, Ofgem and CREG are referred to as the National Regulatory Authorities (NRAs).

1.1. Report scope

This report represents out final output under the project. It provides a detailed recommended methodology for the cap and floor regime, and parameter estimates for the NEMO interconnector based on that methodology.

It also addresses issues related to wider regime design. These design issues provide important context and input to our methodology work, but are not themselves part of the cap and floor methodology. Our approach to these issues over the course of the project has been iterative: while the methodology we have produced is based on working assumptions for the regime provided by the NRAs, we have also highlighted areas that might impact significantly on the cap and floor methodology. Where appropriate, this report contains our suggestions for optimal regime design.

This report has been prepared as an input to the Consultation paper that Ofgem is publishing. Ofgem's consultation will outline the proposed design of the cap and floor regulatory regime and the methodology for setting the returns at the cap and floor for NEMO. This report, however, sets out the views of CEPA and not Ofgem. Aspects of the broader proposed cap and floor regime are also set out in the Consultation paper and previous Ofgem documents.

The analysis in this report has been prepared on the basis of information available to end-December 2012. Numbers presented in this report are correct as at that date[1] and illustrate the approach outlined in this report. Once Ofgem has established a final methodology there will be work to establish numbers that illustrate the final approach. Then, as new interconnectors arise, calculations of the appropriate inputs can be undertaken as necessary.

1.2. Cost of capital approach in general

Businesses are financed using a combination of debt and equity (or 'hybrid' securities, such as convertible debt, which have characteristics of both debt and equity). Conceptually, the cost of equity is the expected return that must be offered to providers of equity if they are to acquire share capital in the business. This return should take into consideration the opportunity equity investors have to diversify their holdings. It should therefore generally

[1] Please note that all calculations use figures up to and including December 31, 2012.

reward investors only in proportion to the non-diversifiable (or systematic) risk they face. The cost of debt is similarly the expected return required by debt providers.

The cost of equity and debt are determined in the financial markets and are equal to the rate of return expected to be available from alternative opportunities with comparable risk. It follows that if the allowed cost of equity and debt are set at the level that would be faced by an efficiently financed notional developer, then developers should always be able to raise finance to invest in new facilities so long as the new capital expenditure (capex) is included in the regulatory asset base (RAB).

The weighted average cost of capital (WACC) is the average of the cost of equity and debt, weighted by the proportions of equity and debt which an efficiently financed company can be expected to use to fund its activities. Hence to determine the WACC, it is necessary to determine the cost of debt, the cost of equity and the proportions of debt and equity (i.e. the level of gearing) that would be used by an efficiently financed company.

1.3. Report structure

Following this introduction, the report is structured as follows:

- Section 2 provides context and background information on the regime and the policy environment, including a summary of key working assumptions we have made regarding regime design.
- Section 3 summarises the key issues affecting our analysis, including the interplay between regime design and risk.
- Section 4 sets out the potential options for each element of the cost of capital methodology, and provides our assessment based on clearly defined criteria.
- Section 5 presents an analysis of sources and levels of risk from the perspective of debt and equity investors, drawing on analysis of relevant comparators.
- Section 6 presents our specific detailed methodology for estimating the cost of capital at the cap and the floor.
- Section 7 summarises our estimates of each parameter (based on the methodology set out in Section 6), and subjects these to robustness checks including an analysis of financeability.
- Finally, Section 8 briefly summarises our main recommendations.

In addition, we attach annexes setting out useful supporting information. Annex Asets out our analysis of the required allowance for interest during construction. Annex B discusses the key differences between different financing models, and Annex C discusses the importance of different revenue profiles for financing models. Annex D summarises the approach of different rating agency methodologies. Finally Annex E provides details of alternative formulations of the cost of capital.

2. CONTEXT

This section sets out our view of the background and context to the project. It begins with a high level summary of the NRAs' wider role (Section 2.1) and the wider policy environment (Section 2.2). It then summarises the proposed interconnector regime and the working assumptions we have made (Sections 2.3 and 2.4).

2.1. NRA objectives and constraints

Elia, the Belgian Transmission System Operator (TSO), delivers all interconnection investment in Belgium. Investment is reimbursed through transmission tariffs. By contrast, interconnection investment in the UK has followed a largely merchant structure with little or no limitation on investment returns or protection for developers from exposure to risk. This merchant approach has led mostdevelopers to seek an exemption from the revenue, third party access and methodology approval requirements set out in existing legislation. However, these exemptions are increasingly hard to obtain and recently have been granted with additional conditions on the interconnector (such as a cap on returns for the BritNed interconnector).

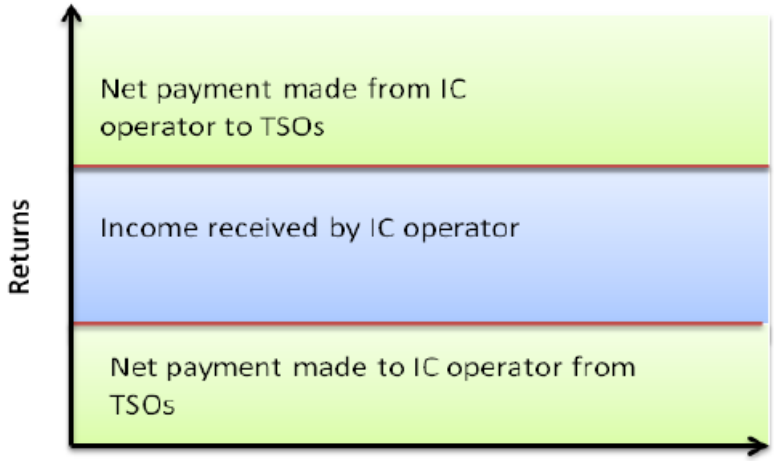
In addition, three years ago Ofgem decided to review its approach to interconnector investment. In September 2010, Ofgem publicly committed to develop a regulatory regime for interconnection, open to third party investors (i.e. ensure an impartial treatment between TSO and non-TSO developers).This would help to facilitate investment, where economic, by overcoming the challenges of the merchant-exempt approach and would allow GB to realise projects with countries where a merchant orexempt route is not available. The proposed cap and floor regime is a regulatory regime, compliant with EU legislation and therefore an exemption is not required. It aims to facilitate interconnector investment, where economic and efficient, while maintaining the developer-led approach;and where interconnectors are responsible for choosing the size, timing and location of the link.[2] In addition the proposed regime aims to ensure it is equivalent to the other GB transmission regimes (onshore and offshore) with respect to risk andreward exposure.

The proposed cap and floor regime is being developed together with the Belgian Regulator CREG, using the proposed 1 GW link between the two countries as the pilot project.

Figure 2.1 below gives an overview of the cap and floor mechanism. If revenues fall below the floor, a payment will be made to the developer by the TSO. If revenues exceed the cap, a payment will be made to the TSO by the developer.

[2]Ofgem's Integrated Transmission Planning and Regulation Project is considering the current approach to interconnector investment planning. This is part of a wider review of the current arrangements for system planning and delivery which aims to determine whether they are appropriate to achieving a long-term efficient integrated network - onshore, offshore and cross-border.

Figure 2.1: The cap and floor mechanism



Source: Ofgem, Cap and floor regime for regulation of project NEMO and future subsea interconnectors*, public consultation from 28 June 2011, page 18.*

The cap protects consumers from excessive revenues. To ensure an appropriate balance between risk and return, a floor is required.

Clearly, a source of tension in the development of the cap and floor will be setting parameters that ensure a balance between the needs of developers and consumers (although to an extent their interests are aligned, assuming the interconnector has a positive valuation), as well as consistency with legislation. Striking this balance will ultimately translate into setting a cap and floor that are designed to minimise the likelihood of their being breached.

When the cap and floor range is very wide, the interconnector is most similar to a pure merchant interconnector; when the range is narrow, the interconnector is more closely related to a pure regulated interconnector. Under the proposed regime levels of revenue that fall between the cap and the floor are unadjusted. Hence even a regulated interconnector will face some incentives and be exposed to some risk. In particular, the developer remains subject to a degree of market valuation risk.

A particular element of the cap and floor regime that remains aligned with the merchant approach is allowing the developers to choose thesize, timing, location and technology of the interconnector. This also requires them to manage the related construction and operational risks. However, since the NRAs recognise the wider benefits of interconnection (i.e. security of supply, market integration and integration of renewable energy sources, and competition), the regime seeks to acknowledge and minimise this risk to a certain degree.

2.2. Wider policy environment

The developers will not be exempt from legislation under the proposed cap and floor regime. As a result, the regime will need to account for risk relating to the policy and legislative environment. Each interconnector owner will have to comply with a variety of existing and future European legislation, including:

- *Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity*;
- *Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity*;
- Future framework guidelines and network codes developed under the Third Package (henceforth referred to as "the European Target Model"); and
- The UK's Electricity Market Reform (EMR).

We discuss each of these in turn.

Firstly, a critical policy requirement for the cap and floor methodology is that it ensures full compliance with the Regulation of the European Directive No 714/2009, specifically Article 16(6) – detailed in Box 2.1 below.

Box 2.1: Article 16(6)

REGULATION (EC) No 714/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003

Article 16: General principles of congestion management

6. Any revenues resulting from the allocation of interconnection shall be used for the following purposes:
    a. guaranteeing the actual availability of the allocated capacity; and/or
    b. maintaining or increasing interconnection capacities through network investments, in particular in new interconnectors.

    If the revenues cannot be efficiently used for the purposes set out in points (a) and/or (b) of the first subparagraph, they may be used, subject to approval by the regulatory authorities of the Member States concerned, up to a maximum amount to be decided by those regulatory authorities, as income to be taken into account by the regulatory authorities when approving the methodology for calculating network tariffs and/or fixing network tariffs.

    The rest of revenues shall be placed on a separate internal account line until such time as it can be spent on the purposes set out in points (a) and/or (b) of the first subparagraph. The regulatory authority shall inform the Agency of the approval referred to in the second subparagraph.

Providing a reasonable return on investment for developerscould implicitly be deemed a legitimate use of the revenues under Article 16(6). We consider that Article 16(6) should be interpreted to allow for legitimate risks being reflected in the allowed return at the cap. Remuneration of those risks should not constitute excessive returns.The Regulation also includes an annex on Congestion Management Guidelines. Notably, the Regulation requires that when there is no congestion, the operators cannot restrict access to the interconnector.

European Directive 2009/72/EC lays out common rules for the European Union's internal electricity market. The most relevant part of the Directive for the cap and floor methodology is Article 37, sub-articles 37(6) and 37(10), which requires that TSOs' charging methodologies be approved by the NRAs (see Box 2.2).

Box 2.2: Directive 2009/72/EC

Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity

Article 37: Duties and powers of the regulatory authority

6. The regulatory authorities shall be responsible for fixing or approving sufficiently in advance of their entry into force at least the methodologies used to calculate or establish the terms and conditions for:
    a. connection and access to national networks, including transmission and distribution tariffs or their methodologies. Those tariffs or methodologies shall allow the necessary investments in the networks to be carried out in a manner allowing those investments to ensure the viability of the networks;
    b. the provision of balancing services which shall be performed in the most economic manner possible and provide appropriate incentives for network users to balance their input and off-takes. The balancing services shall be provided in a fair and non-discriminatory manner and be based on objective criteria; and
    c. access to cross-border infrastructures, including the procedures for the allocation of capacity and congestion management.
10. Regulatory authorities shall have the authority to require transmission and distribution system operators, if necessary, to modify the terms and conditions, including tariffs or methodologies referred to in this Article, to ensure that they are proportionate and applied in a non-discriminatory manner. In the event of delay in the fixing of transmission and distribution tariffs, regulatory authorities shall have the power to fix or approve provisional transmission and distribution tariffs or methodologies and to decide on the appropriate compensatory measures if the final transmission and distribution tariffs or methodologies deviate from those provisional tariffs or methodologies.

This Directive also regulates third party access. Effectively, the NRAs will require the interconnector operators to allow third party access to the asset when sufficient capacity exists. This would typically not be the case for an interconnector with an exemption. Article 32 on third party access is presented in Box 2.3 below.

Box 2.3: Directive 2009/72/EC

Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity

Article 32: Third-party access

1. Member States shall ensure the implementation of a system of third party access to the transmission and distribution systems based on published tariffs, applicable to all eligible customers and applied objectively and without discrimination between system users. Member States shall ensure that those tariffs, or the methodologies underlying their calculation, are approved prior to their entry into force in accordance with Article 37 and that those tariffs, and the methodologies — where only methodologies are approved — are published prior to their entry into force.
2. The transmission or distribution system operator may refuse access where it lacks the necessary capacity. Duly substantiated reasons must be given for such refusal, in particular having regard to Article 3, and based on objective and technically and economically justified criteria. The regulatory authorities where Member States have so provided or Member States shall ensure that those criteria are consistently applied and that the system user who has been refused access can make use of a dispute settlement procedure. The regulatory authorities shall also ensure, where appropriate and when refusal of access takes place, that the transmission or distribution system operator provides relevant information on measures that would be necessary to reinforce the network. The party requesting such information may be charged a reasonable fee reflecting the cost of providing such information.

The cap and floor regime will also need to be in line with the European Target Model. This will be the principle vehicle for achieving European electricity market integration from 2015 onwards. The main features of the Model can be expressed in terms of timeframes, as listed in Box 2.4.

Box 2.4: The Target Model

The Target Model expressed in timeframes

Day-ahead market coupling. "Implementation of market coupling will mean that the GB day-ahead price will be calculated at the same time and through the same process as prices in neighbouring markets. Prices across borders will converge when sufficient cross border capacity is available. Across the market coupled area as a whole, consumers should benefit from lower prices as demand is automatically matched with the cheapest generation in Europe as long as there is sufficient cross-border transmission capacity."

Continuous intraday trading. "Implementation will allow cross-border trading of electricity closer to real time. To the extent that cross-border capacity is available, market participants will be able to buy or sell energy to fine tune their positions to take into account changes in demand or outages. For intermittent generators, intraday trading provides an opportunity to manage their positions as the accuracy of their forecast generation improves closer to real time."

Electricity balancing. "Following gate closure, the Target Model would require balancing between Transmission System Operators (TSOs) using any remaining available capacity. This would be initially through a bilateral sharing of balancing bids and offers (TSO-TSO common merit order), evolving to a multilateral concept. Consumers should benefit from lower balancing costs and improved security of supply as this is expected to improve National Grid's access to cheaper balancing resources in neighbouring markets when available."

Long-term transmission rights. "In the forward time frame, the Target Model mandates the development of cross-border markets based on increasingly harmonised long term rights to access capacity on interconnectors. These changes are expected to enhance long term hedging opportunities for GB market participants."

Source: Ofgem (28 March 2012), *Open letter: Implementing the European Electricity Target Model in Great Britain.(p.3)*

Finally, the UK's Electricity Market Review (EMR)may also impact interconnectors under the proposed cap and floor regime. The EMR aims to support investment in low-carbon generation and improve security of supply, via the following mechanisms:

- a carbon price floor;
- an "Emissions Performance Standard";
- reduction in electricity demand;
- improvements in market liquidity and accessibility for independent generators; and
- various transitional arrangements.

Specifically, one aspect of the EMR is that it aims to introduce a capacity market that will require capacity providers to deliver energy at times of system stress in exchange for a predictable revenue stream.This is in contrast to the current situation where capacity providers self-declare availability at particular times. This may have implications for interconnection demand. More generally, the EMR will impact interconnection in that it will influence the future mix of energy generation sources, which will in turn have implications for interconnector capacity and congestion.

2.3. Characterisation of the regime

This section aims to characterise the cap and floor regime in general terms, before the more detailed working assumptions are discussed in following sections.Where useful it highlights comparisons and differences with the onshore regime.

Investments through the onshore regime have similar time horizons (in terms of asset life) to those of the cap and floor regime. However, onshore networks are natural monopolies requiring periodic investment in an existing asset base. These requirements are assessed every five to eight years (with eight being the requirement under Ofgem's new regime for onshore regulation, RIIO). The proposed cap and floor regime for interconnection investment is longer term in nature, with the regime 20 or 25 years in duration. Interconnector investment involves a one-off investment in an asset that is subject to some market risk. There are therefore important differences.

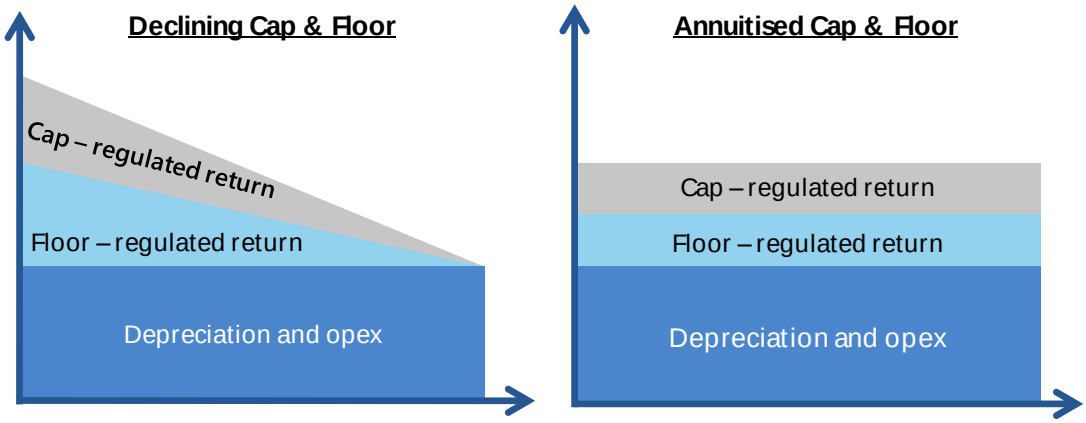
The cap and floor relates to revenues rather than returns. This means that even below the floor or above the cap, a degree of residual risk remains to the extent that outturn costs are higher or lower than forecast. The floor effectively provides a minimum level of revenue that will be achieved by an efficient developer. It is not riskless, however, since the floor revenue will not be received in cases where a developer earns revenue below the floor as a direct consequence of its own poor performance.

For onshore networks, the overall RABhas historically often been quite stable.[3] This means that the profile of allowed revenue has been a relatively minor consideration. In this case, over any single price control period, incremental investment is likely to be closely balanced

[3] Under the first price controls under the RIIO model of regulation there has been a sharp increase in the RAB for the network companies, especially for the Scottish electricity transmission companies, as significant incremental investment is required.

by depreciation of existing assets. For interconnector investments, however, the RAB will be depreciated in full over the life of the regime. The NRAs have proposed to annuitise cap and floor allowances, since otherwise cap and floor revenues will be heavily profiled. Figure 2.2 below summarises the difference between the proposed annuitised cap and floor and the alternative of a declining cap and floor.

Figure 2.2: The cap and floor profile



Source: Ofgem internal presentation (2012)

The proposed regime contains fewer NRA-determined incentive schemes than, for example, the UK onshore regime. It will, however, employ an availability incentive. This will modify the cap revenue in each applicable year. It is designed primarily as an additional incentive, to ensure that the developer retains an interest in maintaining high availability even in scenarios where revenue is above the cap (and so the marginal benefit to the developer from ensuring availability is zero).

As noted above, the floor also incorporates protection for consumers, since it is not riskless. If availability is below a pre-defined threshold for reasons that are not adequately justified to the NRAs, then the floor payment will not be made.

2.4. Working assumptions

In order to estimate the relevant cost of capital for a regulated interconnector, we need to take a view on the overall design of the regime. Clearly this would be simplest were the design of the regime (apart from the cap and floor mechanism) finalised. In Q1 2013, Ofgem will consult on the proposed design of the regime, together with the methodology for calculating allowed return at the cap and floor, and so we have used working assumptions to facilitate our Stage 2 work. As noted in the Introduction, this report is being published alongside those consultation documents.

We have made the assumptions listed in Table 2.1 below based on the NRAs' guidance – more detail on the proposed regime is provided in the accompanying consultation documents. In some cases the working assumptions are simply aspects of the regime that will be consulted upon and subject to further discussion between the NRAs. In others, we provide feedback to the NRAs regarding the interplay between regime design and risk.

Table 2.1: The NRAs' key working assumptions for the cap and floor regime

Item	Proposal
Assessment periods	5-year assessment periods.
	If revenue earned to date during an assessment period is significantly below the cumulative floor to date, a within-period adjustment may be considered to the extent necessary to support financeability
Availability	A target availability will be set for each project.
	A symmetric financial incentive is likely to be applied to the cap only.
Capex	For NEMO an ex-post review of capex will be carried out; inefficient or uneconomically incurred spend will be disallowed along with associated returns. Capex incentive will be reviewed for projects following NEMO. Replacement capex will be treated as capex, the level agreed up front will feed into the cap and floor calculation.
Decommissioning	An allowance will be provided in the regime to cover full cost of decommissioning. This will feed into the cap and floor. Any changes in legislation will mean a pass through (either negative or positive) of all additional (the reduction) economically and efficiently incurred costs from the change.
Financial	Annuitised cap and floor.
	The annuitised cap and floor will be specified in real terms, with inflation indexation applied separately.
	The decision taken on refinancing policy will be consistent with the GB offshore regime, which is currently consulting on this issue. Under the current arrangements, the developers are allowed to keep any gains.
Opex	Scope and coverage of opex, and the associated cost, during the 20-25 year regime will be set up-front. This will feed into the cap and floor calculation.
Non-controllable costs	A pass-through revenue adjustment term (either positive or negative) will cover costs determined to be non-controllable, with a materiality threshold for income-adjusting events.
Re-openers	To be determined – but could be allowed based on specific circumstances or NRA discretion.
Second regime	Consultation will set out options

Two of these working assumptions warrant further consideration.

Availability incentive

Our working assumption for the availability incentive sets the benchmark against which the incentive should be assessed. The level of the incentive, however, requires calibration and is likely to be specific to the project being considered.

One possible benchmark is the Offshore Transmission Owner (OFTO) availability incentive. The OFTO availability benchmarkis based on an availability target of 98% with:

- annual revenue adjusted each year by 2.5% for each percentage point deviation of availability from the benchmark; and

- total penalties capped at 50% of annual revenue[4], with this penalty spread over five years.

Our understanding is that the 98% target is unlikely to be appropriate for most interconnector projects. In our analysis, we consider a lower target of 97.5% with symmetric incentives of 4% for each percentage point deviation (i.e. a maximum reward or penalty of 10% of annual revenue, similar to the OFTO incentive). This incentive is applied to the cap only. Our modelling suggests this is consistent with the NRAs' intention to provide an additional incentive.

Financeability test: within period assessment

One of the key dependencies between the regime and the WACC is the risk created by the five year assessment periods. With the additional delay of two years between assessment and the corresponding revenue adjustment, floor revenue adjustments may be made as many as seven years after the initial shortfall.[5] (The two-year delay stems from reported revenues needing to be ratified and then suppliers being notified of the revenue adjustment from the TSO before the adjustment takes place.) By contrast, rating agencies will assess performance against key credit metrics on an annual basis.The need to meet these ratios maytherefore require access to either a financial buffer of equity, or additional borrowing or facilities to provide a buffer.

This is likely significantly to increase the cost of capital. Furthermore, due to the plausibility of very low revenue scenarios, in extremis such a buffer would need to cover as much as seven years' operating and financing costs. Such a financeability challenge may render interconnector investment uneconomic – particularly for project finance type structures. It is therefore appropriate to consider the possibility of allowing further revenue adjustments to be made based on a within-period assessment. This 'financeability adjustment' would need to have two features:

- It would be provided only where the developer is able to demonstrate an acute revenue shortfall as a consequence of factors outside its control. It would not be intended to provide insurance against poor operational performance.
- It would be provided on a net present value (NPV) neutral basis. The objective is only to bridge the gap between a revenue shortfall and the corresponding five-yearly adjustment. Consumers should therefore be left indifferent between making this adjustment within the period or at the end of the period.

The adjustment would therefore be targeted only at supporting financeability for developers' with a notional financing structure. As a result, which elements are included and at what level is an empirical question. We assess the available options and appropriate calibration of the financeability adjustment in Section 7.3.

[4]Although, there is the ultimate sanction of licence revocation for repeated poor performance. 100% of revenue is at risk under this scenario.

[5] Clearly the same is true for cap revenue adjustments. However, since these would have no financeability implications we do not focus on them here.

3. KEY ISSUES

This section covers some of the key issues that affect our proposed methodology. Section 3.1 provides our analysis of the key areas of regime design that will influence our view of risk. Section 3.2 discusses how risks develop over different project stages. Section 3.3 summarises the range of potential financing options. Finally, Section 3.4 discusses the implications of the ratio of 'signal' to 'noise' in relevant data sets.

3.1. Regime design and risk

When assessing risk and the cost of capital for regulated entities, it is important to consider the influence of the design of the regulatory regime on the extent and allocation of risk. In principle, most aspects of regime design will influence risk in some way. In this section, however, we note the following key areas that in our view will have a significant bearing on the cap and floor methodology:

- *Indexation*. How will investors be compensated for the effect of inflation, and to what extent will they bear inflation risk?
- *Assessment periods*. There are two key questions. First, what will be the duration of each assessment period? Second, will adjustments be made on a cumulative or discrete basis?[6]
- *Revenue adjustments*. Since the timing of payments will differ from the period to which the adjustment relates (our working assumption is a delay of two years), how will developers be compensated?
- *Profiling of revenue*. Will cap and floor revenues be constant over time, or will they vary (for example tracking the value of the RAB)?
- *Availability*. What proportion of revenue will be at stake based on the NRA-determined availability incentive, and how sensitive will the incentive calculation be to changes in availability?
- *Decommissioning costs and asset life*. What options and obligations will the developer have at the end of the regulatory regime? How will these be captured in its allowed revenues?

Each of these may be a function both of regime design and of our proposed methodology for calculating the cap and floor.

Our report therefore has a dual purpose. Where our methodology is based on working assumptions for the above points, it will be important to highlight aspects of regime design that contribute significantly to our overall assessment of risk. There is scope for our analysis to give rise to suggestions in relation to regime design, where this will help to

[6] Adjustments made on a discrete basis will consider only revenues generated within the period concerned. Adjustments made on a cumulative basis will consider all revenues generated up to and including the period concerned. The latter makes breaches of the floor (cap) less likely, as a low (high) revenue year will be offset against previous high (low) years.

produce a consistent approach. Our key conclusions in this area are summarised in Section 8.2.

The primary purpose of the report, however – and the narrow definition of CEPA's role – is to propose a cap and floor methodology that is tailored to the proposed regime, and to estimate benchmark costs of capital using that methodology. Hence many of the above points will be covered directly in our methodology.

3.2. Risk in different project stages

Our analysis of perceived risk (as informed by discussions with the NRAs, consultations and research) will drive our WACC calculations, particularly through the equity beta and the debt premium. Since risk differs across project stages (i.e. construction and operation; the project development stage is not considered in this work), our calculations will need to account for this. Of particular importance is interest during construction (IDC) since it captures risk during construction.[7]

IDC captures the cost of financing construction of an asset and is set by the NRA; and it is only applicable to capex and development costs during construction. Although Ofgem has developed an IDC regime for offshore transmission, as we describe in Annex A, there are factors that we believe make it inappropriate for interconnection. Consequently we have developed our own methodology which captures:

- the cost of funding construction;
- the impact of cost over-runs when only a single project exists; and
- the cost of time delays when only a single project exists.

This approach is discussed in detail in Annex A.

Ofgem faces a choice as to how it implements our proposed approach. One of the benefits of the existing approach applied to OFTOs is the simplicity it offers – a fixed known value of IDC. Our approach would lose that simplicity since it could require a new calculation for each interconnector. It could be possible for Ofgem to adopt a simpler version of our approach where the detailed calculation is made once and a premium over the operational WACC established. Then, provided no new information arises or the regime does not change significantly, the same premium could be used for future projects. This way developers would have greater certainty about the value of IDC likely to be applied.

3.3. Financing options

A key consideration for this project is the way in which different financial structures could be used and the way in which the regime design influences or constrains those financing options. Briefly, different financial structures entail a different mix between debt and equity finance; since debt finance is cheaper than equity finance, this may result in apparent

[7] Annex A of this report provides a detailed discussion of IDC.

differences in the overall cost of capital.[8] The relative importance of fixed payments (i.e. debt) may also mean different financial structures face different financeability challenges. This section presents an overview of the key questions; Annexes B and C provide more detail on specific aspects, namely:

- balance sheet and project finance and what may explain the difference between the cost of funding for the two approaches;[9] and
- the implications of different revenue profiles.

The NRAs aim to ensure the regime is open to TSO and non-TSOthird-party investment and therefore is finance solution invariant. It is, however, equally important to ensure that consumers do not pay excessive costs – this leads to a trade-off between broadening the potential pool of developers and potentially imposing additional costs on consumers.

When considering the question of type of finance, we have tended to characterise the choice between two forms:

- balance sheet finance, or standard corporate finance, where lending is not linked to a specific asset but rather to a company and its overall financial strength or balance sheet; and
- project finance where the borrowing is by a special purpose vehicle with the asset being developed providing the only security for the borrowing.

Clearly these are two extremes and it is increasingly possible to structure financing arrangements that lie between these two options.

When thinking about the types of finance, the main variables to consider are:

- the capital structure with respect to the amount of debt being utilised, this is normally referred to as the level of gearing (debt as a proportion of capital employed or RAB); and
- whether broader guarantees are being provided by the borrower (one of the key differences between balance sheet and project finance).

With respect to the capital structure of a project the key factor is likely to be the underlying revenue structure faced by the company. Interest payments on debt obligations require stable and predictable revenue flows. Since a regulated interconnector is unlikely to enter into long term agreements, its primary source of predictability would be the floor. Setting the floor (and thefinanceability adjustment) at an appropriate level will be a key part of facilitating a range of financing options. We have not explicitly taken into account any implicit guarantees that might be provided under a balance sheet approach.

[8] Although we note that according to the Modigliani-Miller theorem, from a strict theoretical standpoint changes in financial structure do not change the underlying project risk. It is only the incorporation of additional factors, like tax, which create deviations from the underlying theory.

[9] We assume that the market is able to correctly price risk in this section. If it cannot this may then explain some of the differences between balance sheet and project finance.

3.4. Signal-to-noise ratio

The signal-to-noise ratio concerns the balance, in a given data set, between useful and misleading or irrelevant information. For example, in a time series of benchmark bond yields, the "signal" would be the information conveyed regarding the underlying cost of borrowing, and the "noise" would be random statistical fluctuations around that cost.

The balance between signal and noise may influence the optimum approach in some areas. Broadly speaking, we would be more inclined to advocate:

- a relatively mechanistic approach in cases where the signal is clear and easy to interpret; and
- a more reactive, discretionary approach in cases where there may be significant amounts of noise.

We return to this issue in considering specific approaches to estimation and to the timing of key decisions.

4. METHODOLOGICAL OPTIONS FOR A CAP AND FLOOR REGIME

In this section we set out and assess the methodological options for the cap and floor regime. We distinguish between high level, general options that would be considered as part of any regime, and detailed, cap and floor specific options. We consider the full range of options, and their strengths and weaknesses, before commencing (in Sections 5-7) to consider the specifics of how the level of risk might be assessed and a cap and floor cost of capital estimated.[10] The key questions include:

- Should the cap and floor costs of capital be based on a single, central estimate or on two separate estimates?
- Which of the three basic elements of the WACC is employed? (Here we consider the cost of debt, the cost of equity and the WACC as the three separate elements.)
- To what are they applied? (Here the options are net debt, equity finance and the RAB.)
- How will inflation be treated (through a nominal WACC or an adjustment to the RAB)? And
- How will the impact of two jurisdictions be addressed (separate calculations or a blended estimate)?

There is a wide range of options. In reaching an overall view it is important that the cap and floor are consistent with one another, and that they are consistent with the degree of risk in the regime as a whole.

Each key question is addressed in turn in the sub-sections below. In each case, we first set out the available options before providing our assessment drawing on the criteria summarised in Section 4.1 below.

4.1. Assessment criteria

In the remainder of this section we set out a range of options for defining and calculating the cap and floor. In each case, we also provide an assessment of these options against the following broad criteria:

- clarity and ease of explanation;
- theoretical robustness;
- frequency of triggering the floor and cap;
- potential cost to consumers; and
- financeability implications (including neutrality to different financing models).

[10] To complement this discussion and that found in Sections 5-7 Annex E of this report provides an explanation of the various formulations of the cost of capital.

Each individual criterion may be more or less important in relation to each option considered. Hence we do not provide a formulaic assessment; rather our assessment in each case is based on consideration of all criteria.

4.2. High level options

In this section we consider general options for elements of the methodology that are not directly related to the cap and floor mechanism. These are more conceptual aspects that would have to be addressed as part of any regulatory regime.

4.2.1. Discretionary versus mechanistic calculation

Options

The calculation methodology for cap and floor returns could in principle be either:

- discretionary – meaning that while a methodology exists, the NRAs have some choice over how the elements are calculated and can deviate from the methodology when appropriate (i.e. the methodology is at a 'high level'); or
- mechanistic – meaning that the methodology leaves little or no room for the NRAs to deviate from the estimation process and data sources detailed in the methodology.

While Ofgem has tended to adopt a discretionary approach to the WACC in its previous determinations there are examples from countries like Australia and New Zealand where a much more mechanistic approach has been adopted. This can be especially important if significant certainty is desired to encourage new developers to enter the market. Further, discretion can be seen as a key element of a price review process where multiple projects and a portfolio of existing assets exists. Interconnectors are different inasmuch as they are primarily a single one-off initial investment decision.

Assessment

Table 4.1 summarises what we see as the strengths and weaknesses of the two approaches.

Table 4.1: Strengths and weaknesses of the different treatments of discretion

Approach	Strengths	Weaknesses
Discretionary	Allows adjustment to market circumstances – say the global financial crisis In line with traditional Ofgem approach	Provides limited certainty for investors
Mechanistic	Provides certainty for investors	Does not allow an immediate response to market or unusual events

Overall, we recognise that the methodology we produce is intended to provide guidance on the future implementation of a new regime. In this context, we consider that the certainty

of a mechanistic approach is worthwhile.Ofgem has asked us to produce such a methodology as a key part of our work, and we see no issue with this.

Our view is that the final answer should also allow for a degree of discretion. This allows the NRAs to take emerging evidence into consideration before the final decision is made, and for potential developers to submit their own evidence and interpretation. In the context of a relatively mechanistic methodology, this review and interpretation of the evidence is important. For example, recent data on benchmark UK Government bonds, if interpreted mechanistically, would result in negative estimates of the risk-free rate.

The implementation timeline should allow for the NRAs to review and interpret such data carefully, and adjust the mechanistic calculation where necessary to take account of any statistical noise. The methodology statement will need to spell out as clearly as possible the circumstances under which such discretion would be exercised – which is discussed in Sections 7.2 and 7.3 of this report.

4.2.2. Timing of decisions

Options

There are two broad forms of uncertainty to be resolved in relation to regulatory decisions. The first concerns the regulator's overall approach or strategy. This issue should be addressed through the development of a clear, mechanistic baseline methodology. In effect this element of the decision is finalised in advance, on publication of the NRAs' methodology decision. We therefore do not consider it any further in this section.

The second form of uncertainty, however, is an important factor in the timing of decisions.It concerns the final estimates of key parameters, in particular those parameters determining the cost of capital. As discussed in Section 4.2.1 above, we propose that these final estimates allow for the NRAs to exercise a degree of discretion. The issue to be considered is therefore the point at which this discretion is exercised.

One aspect of this concerns the point at which developers' proposals are considered. Two broad approaches are available:

- a relatively *proactive* approach, in which the NRAs make periodic cap and floor determinations without reference to specific proposals; and
- a more *reactive* approach, in which the NRAs' primary role is to respond to specific proposals as they are made by developers (although the rules would be clear and so developers would have a good view about the result of an actual determination).

Under the former approach the NRAs could, for example, issue a determination on an annual basis. Under the latter, the question of timing becomes partly one of balancing risks between investors and consumers. Decisions can be made:

- relatively*early* in the process, in which case the risk of movements in underlying borrowing costs lie with the investor; or
- relatively*late* in the process, in which case the risk lies more with consumers.

More precisely, decisions can be made at various different points along the project development timeline, from development and financial close to construction and operation.

Assessment

As noted in Section 4.2.1, we recommend setting out a clear mechanistic version of the methodology.This will permit a relatively mechanistic calculation to be made at any point in time – either by the NRAs or by other interested parties. As a result, the issue of timing diminishes in significance, since it relates only to the exercise of discretion around these baseline estimates.

Table 4.2 sets out the broad options for when the NRAs could reach a final decision.

Table 4.2: Strengths and weaknesses of different timing options

Approach	Strengths	Weaknesses
Proactive (periodic calculations)	Simple to communicate and execute Provides certainty for early stage developers	Limited added value given clear methodology May be susceptible to gaming
Pre-financial close	Provides certainty for early stage developers	Developers exposed to movements in borrowing costs
Post-financial close but pre-construction	Allows inclusion of up-to-date information (including actual financing costs)	May not be compatible with confirming finance Consumers partly exposed to movements in borrowing costs
Post-construction	May allow inclusion of more up-to-date information for some parameters	Risks undermining clarity of regime

If a mechanistic methodology is produced, there seems to be little merit in considering a proactive approach to the timing of discretionary decisions. These periodic updates would provide little additional certainty, and could be susceptible to gaming. Depending on the balance between signal and noise in data on financing costs, developers may be inclined to propose projects at times when evidence regarding key parameters suggests an unusually high allowance. As a result, we would be inclined to recommend a relatively reactive approach.

Assuming that the methodology statement and mechanistic calculation provide sufficient clarity as to the basis of the final decision, our view is that that decision should be delayed as far as is practicable. This is more true in the case of an interconnector that is financed on a one-off basis than, for example, the UK onshore regime which applies to assets that will be incrementally refinanced over the course of a price control period.

In some contexts elements of the decision can be adjusted once the regime has begun. In this case, that is captured by the 'post-construction' option in Table 4.2 above. Where this is done, however, the adjustment is typically made mechanistically: for example, the cost of debt indexation for the UK onshore network price controls. The post-construction phase

is unlikely to be an appropriate time for the exercise of discretion in estimating cap and floor returns.

The two options remaining under consideration, therefore, are to lock down parameters pre-financial close or between financial close and construction. From the perspective of developers, two forms of uncertainty will be resolved in this period. They will learn both the NRAs' final cap and floor allowance, and their actual borrowing costs[11]. The former is likely to be particularly important from the perspective of securing finance. Lenders are likely to require a firmer view on the applicable cap and floor regime than can be provided by a mechanistic calculation alone. As a result, we would recommend locking down parameters prior to financial close.

As noted, actual borrowing costs will only be resolved when financial close is reached. This approach will expose developers to the risk of movements in borrowing costs. To the extent that such costs are controllable (for example, based on the credibility of the developer's business plan) this may be desirable. In some circumstances, however, changes in borrowing costs may reflect underlying issues over which the developer has little or no control. In extreme cases these changes could be dramatic. We would therefore recommend allowing for the possibility of an adjustment (linked to movements in market rates) or a reopener in situations where the developer is able to demonstrate its actual financing costs differ materially from those assumed by the NRAs, for reasons outside its control.[12] Although the circumstances under which such a reopener might be triggered are likely to be rare, allowing for this possibility should provide an important additional degree of security.

We note that in principle the option chosen could differ for the cost of equity estimate and the cost of debt estimate. In particular, the cost of debt decision could be delayed until towards the end of the construction period, when actual debt costs are finalised. In our view this delay would:

- decrease the amount of certainty available to investors pre-construction; and
- add only limited additional value relative to the possibility of a reopener in the case of material divergence in actual from estimated borrowing costs.

Such an approach may also be more susceptible to gaming from developers. Hence although we consider a two-stage decision to be a viable option, we do not recommend it in this case.

4.2.3. Use of different cost of capital estimates

Cost of capital estimates enter the regulatory decision at a range of different points. These include those applied in calculating:

- returns applicable under the financeability adjustment, the floor and the cap;

[11] Strictly speaking, their fixed rate financing costs will be known. The cost of equity may continue to vary depending on, for example, movements in the underlying cost of riskless borrowing.

[12] For example, this may require the developer to present evidence from a significant number of lenders showing that none is willing to lend to an investment grade rated project at the rates assumed by the NRAs.

- NPV neutral payments under each of the above, as well as for changes in uncontrollable opex;
- returns accrued during the construction phase (the IDC); and
- the discount rate used in annuitising the cap and floor allowances.

The range of available options here is extremely wide, potentially encompassing separate estimates for each of the elements above. We therefore do not attempt to evaluate each potential combination of options separately, but rather apply some general principles.

The most important principle is that the financeability adjustment, the floor and the cap are an integral part of the overall regime. It is clear that these amounts need to be calculated separately. Options available for these amounts are discussed in Section 4.3, and their calculation is the main focus of this report.

For the other elements, there is a trade-off between strict theoretical accuracy and simplicity. Estimating costs of capital separately will improve the overall quality of the regime where there are material differences in risk – but doing so will materially increase the complexity of the regime. The latter is an important consideration especially since this is a new regime. With no existing precedent, developers will need to refer to the stated methodology to understand the available returns and degree of risk exposure. We suggest that simplicity is preferable except in instances where there are clear and material differences in risk.

As suggested by our analysis in Section 3.2, we consider there are differences in risk between the construction and operation phases. The sets of activities being carried out are fundamentally different, and the sources of risk are largely cost-related during the construction phase and revenue-related during the operation phase. We conclude it would be useful to calculate a separate measure of construction risk (the IDC).

The remaining question is whether there are differences in the discount rates used in relation to changes in the timing of allowances and cash flows. We acknowledge that there may be arguments to suggest these could differ. For example, a delay in the recovery of revenue under the floor mechanism may be perceived differently from a delay in a payment to the TSO under the cap mechanism. The rationale for such a difference, however, is far from clear cut. There is also no clear basis on which alternative estimates could be based.

We consider that for simplicity it is preferable to consider all NPV-neutral adjustments and annuitisation calculations to be part of returns volatility for the project's operational phase. This suggests that a measure of the overall operational cost of capital would be relevant. This would also be consistent with our approach to the construction phase, which is treated separately using the IDC allowance.

4.3. Cap and floor options

In this section we consider options for elements of the methodology that are directly related to the cap and floor mechanism.

4.3.1. Central versus separate estimates

Options

The first basic question is whether the cap and floor should be based on:

- a central WACC; or
- separate estimates.

While it is necessary to understand what the central estimate of the cap and floor regime WACC (as this may, for example, be used for any NPV neutral adjustments) it is not necessarily the fact that this central value will determine the individual cap and floor estimates. The alternative approach is to consider the risks inherent in the cap and floor regime at the cap and floor points and to estimate a separate WACC at each point.

In a sense it is inescapable that the floor, cap and central measures of the cost of capital are mutually interdependent. The overall WACC will depend on the degree of risk faced, which will in turn depend on the details of the cap and floor. We acknowledge, therefore, that the distinction we draw is somewhat artificial, though in our view defensible.

Assessment

Table 4.3 below summarises what we see as the strengths and weaknesses of the two options.

Table 4.3: Strengths and weaknesses of the overall approach

Approach	Strengths	Weaknesses
Single WACC	Transparent Easy to understand	Requires separate cap and floor comparators to estimate Arbitrary decision about central point Arbitrary decision about how cap and floor values are determined
Separate cap and floor WACCs	Reflects risks associated with the cap and floor Able to be adjusted more easily (and transparently) if the regime is adjusted	Complex Relationship with the central estimate of the regime WACC is less transparent

While the differentiation we draw is to some extent arbitrary, since the way in which we would estimate the regime WACC is to consider the separate cap and floor WACCs, it is important to consider the choice of how the values for the cap and floor will be established. On balance we believe it is preferable to consider the separate WACC

approach, although we also consider the ways in which a regime WACC would be estimated in this section as it is also a required element for the overall methodology.

4.3.2. Element of the WACC

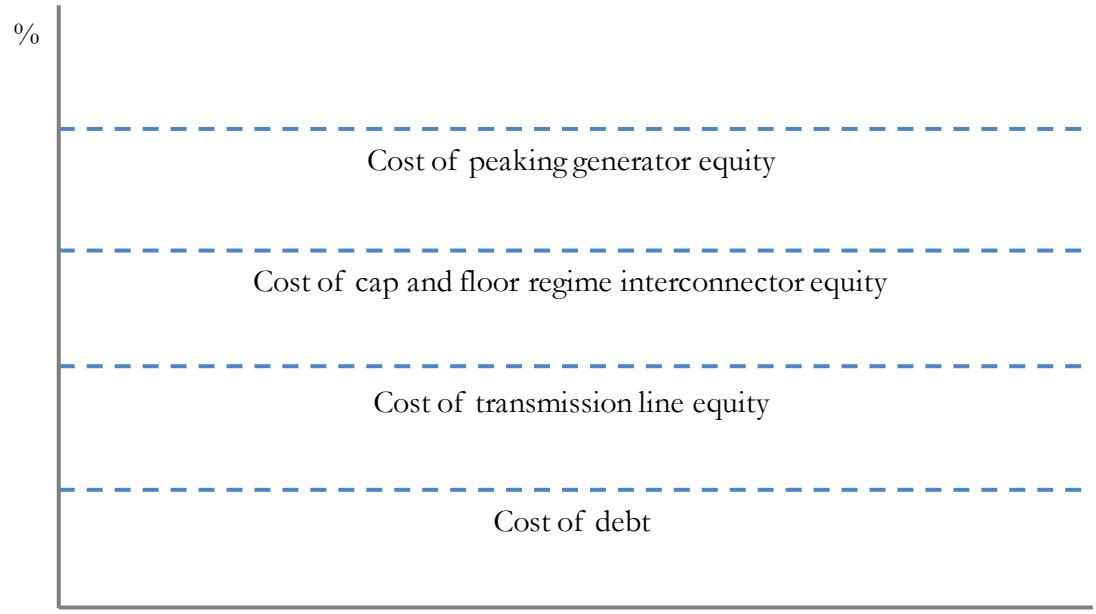
Options

There are basically three elements that could be considered when setting the separate cap and floor WACCs. These are:

- the cost of debt – reflecting obligations that the company faces and which could act as a measure of the minimum financing costs within the cap and floor regime;
- the cost of equity – reflecting the risk taken by the shareholders and which could act as the determinant of the cap within the regime; and
- the WACC – reflecting the average risk taken at either the cap or floor.

Figure 4.1 illustrates the likely relative ranking of the different measures. It should be noted that we have assumed that there is a single cost of debt in this figure, something we return to later in this report.

Figure 4.1: Options for the elements of the WACC



Assessment

Table 4.4 assesses the strengths and weakness of the different measures and the way in which they could be used.

Table 4.4: Strengths and weaknesses of the cost of finance options

Approach	Strengths	Weaknesses
Cost of debt	Should be sufficient to underpin access to debt finance Simple, clear and transparent Reflects the minimum risks faced by an operator	Could be gamed with companies gearing up to exploit the rule. So would need to be applied to a notional net debt figure – this would need to be made clear Would not be an appropriate measure of risk if being applied to the cap May not be sufficient to meet the additional "buffer" costs –depends on the way it is applied
Cost of equity for a transmission project	Reflects the risks that investors take in certain types of investment	Not clear that equity investors will need to be remunerated at this level at the floor – especially if the requirement is for a floor which will be triggered as little as possible Does not reflect the risks that need to be remunerated in the cap
WACC for a transmission project	Overall cost of finance for the simplest way of thinking about the risks inherent in the floor	Not clear that this approach meets the objectivesof establishing a floor which would be triggered as little as possible Not an appropriate reflection of risk when thinking about the cap
WACC for a peaking generation project	Overall cost of finance for the simplest way of thinking about the risks inherent in the cap	Not clear that this approach meets the objectivesof establishing a ceiling which would only be triggered in unusual circumstances May not provide sufficient additional reward to make interconnector investments worthwhile for equity investors (depends in part on the way the floor is set)
Cost of equity for a peaking generation project	Provides a realistic measure of the upside that could be expected at the cap reflecting the risks inherent in the type of investment Clear, simple and transparent	Could be gamed with companies degearing as a way of maximising upside potential – would need to be linked with a notional capital structure May not provide sufficient additional reward to make interconnector investments worthwhile for equity investors (depends in part on the way the floor is set)

From this review, the following options would seem to be appropriate:

- a floor that captures the cost of debt for a notionally financed company; and
- a cap that captures the cost of equity for a peaking generation plant for a notionally financed company[13].

These seem to be the options that best reflect the risks inherent at the cap and floor, while at the same time minimising the risk of triggering the cap or floor.

4.3.3. Base

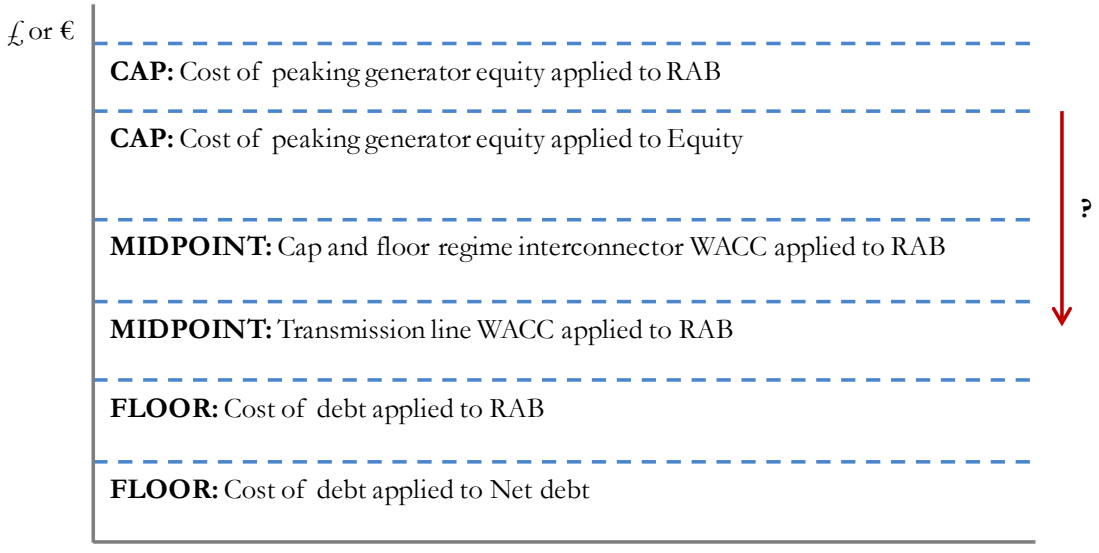
Options

Having determined the measures of return to use for the cap and floor it is now necessary to consider the options for the base to which they are applied. These are the:

- net debt in the company – measured on a notional basis and reflecting the fixed obligations faced by the firm;
- equity finance – measured on a notional basis and reflecting the risk capital in the company; and
- RAB – reflecting the overall capital employed in delivering the interconnector services.

The revenue implications of each of these are illustrated in Figure 4.2. The precise position of the lines obviously depends on the relative cost of finance and the notional gearing that is adopted – issues discussed later in this report.

Figure 4.2: Illustration of the revenue impacts of different 'base' decisions



Assessment

The strengths and weaknesses of the various options are discussed in Table 4.5 below.

[13] Note that it may be difficult to measure this specific cost of equity – an issue that is discussed further in Sections 5 and 6.

Table 4.5: Strengths and weaknesses of the different base options

Approach	Strengths	Weaknesses
Net debt	Reflects the fixed financing costs faced by the business Likely to be the option that leads to the floor being triggered the least	May not be sufficient to meet all minimum financing costs when the buffer costs are included[14] Not an appropriate base for considering the cap[15]
Equity	Reflects the at risk capital which needs to be attracted to finance a project	Not an appropriate measure for the floor Not an appropriate measure for the cap since debt finance costs need to be captured somewhere, otherwise the level of return being earned by the investors is not commensurate with the risk being taken
RAB	Reflects the capital actually required to deliver the project	Could become an incentive to inflate costs without other cost performance incentives being applied (although costs will be subject to ex-post review) Will lead to a higher floor (and cap) than if the net debt is employed

We do not think the choice of the base is as straight-forward as the element of the WACC. There are clear tensions between setting a:

- floor that is high and so leads to this being triggered more frequently than expected or desired but acknowledging the need to ensure that sufficient funds will exist to develop interconnector projects; and
- ceiling which is high and so although it is triggered infrequently, it may not achieve the purpose of the EU "use of revenue" requirement. However, the ceilingneeds to acknowledge the risk inherent in the project being developed and the limited downside protection provided by the floor for the risky equity capital.

Given this, we think there is value in applying the cap and floor to the RAB.For the latter, however, further analysis is needed to ensure that a sufficiently strong argument can be madefor applying the cost of equity for a peaking generation plant to the whole of the RAB. This is investigated later in this section with respect to the impact that the low floor revenuehas on the average expected return for equity.

4.3.4. Inflation

[14] This obviously depends on the details of the assessment period and the within-period floor.

[15] The cap should allow for investors (including equity investors) to earn returns on their investment. If returns are included in the cap allowance only on the debt-financed portion of the RAB, there is no scope for equity investors to earn a return.

Options

Having decided on the core parts of the approach, there are two more issues linked to the way in which the calculations are made. The first of these relates to the way in which inflation is captured.

There are two options for capturing inflation.It can be included in:

- an annual adjustment to the RAB (with a real WACC being used); or
- the WACC (with a nominal or fixed RAB).

It should be noted that care is needed with the way that the inflation adjustment is made since double counting is possible. The choice about the treatment of inflation also has implications for the way that depreciation is calculated.

A final aspect that needs to be considered is the measure of inflation that is used. Where existing measures are already employed by the NRAs, it is likely that these will continue to be used unless specific issues arise with an interconnector. Currently we see no issues that would change the NRAs' decision.

The above applies to general, economy-wide inflation. It may also be possible to capture movements in input costs specifically as a way of de-risking the investment. In our view this is not a material consideration in this case. The vast majority of costs relate to the initial investment; operating costs are relatively low. As a result, the impact of real price effects (RPEs) is likely to be minimal and we do not consider it any further.

Assessment

Table 4.6 summarises the strengths and weaknesses of the two approaches.

Table 4.6: Strengths and weaknesses of the different base options

Approach	Strengths	Weaknesses
RAB adjustment	Simple to understand Consistent with standard Ofgem approaches	Back end loads revenue – which may cause problems for project finance Not simple to apply when considering a fixed revenue stream over a 20-25 year time frame
WACC adjustment	Simple to understand Simple to implement	Front end loads revenue – which may facilitate project finance Not consistent with standard Ofgem approaches

We would recommend using the WACC adjustment as it is simpler to implement, although not consistent with Ofgem's other determinations. However, since it is our understanding that an annualised approach to revenues is being adopted, the key difference of the profile of the revenues does not matter. So, either approach can be applied with no real impact on what the interconnector operator will experience. What is important is that an adjustment is made.

A final point on inflation concerns consistency. Unless there are strong arguments otherwise, inflation indexation should follow a similar approach as for other regulated sectors. For example, in the UK it would be natural to follow the onshore regime in using retail price index (RPI) inflation.

4.3.5. Jurisdictions

Options

A final implementation issue that needs to be considered is how the impact of the two jurisdictions is applied. If an interconnector is expected to earn revenues in multiple jurisdictions then the way in which risks are captured would probably lead to finance being raised in the currencies of the revenues.

If multiple currencies are being applied there are two ways in which this could be done. Specifically:

- separate cap and floor calculations could be undertaken in each currency, using the same methodology for each calculation (subject to the availability of relevant, liquid comparators in each case); or
- a blended WACC could be calculated for a single cap and floor calculation.

If a blended WACC is to be employed, on what basis would the weights be chosen? Two basic options exist, using expected proportions of:

- revenues – this captures the allocation on the basis of where a merchant interconnector would be earning revenue, either from selling in the GB market or the continental market;[16] or
- costs – this captures the allocation on the basis of where the costs for building and operating the interconnector have been incurred.

Assessment

Table 4.7 summarises the strengths and weaknesses of the two overall approaches.

[16] We appreciate that under the Target Model a company would actually be selling capacity on the interconnector through auctions rather than directly selling energy into one or other market. However, the underlying demand for the capacity in the auction will be driven by the assessment of the need for power at different times in the GB and continental markets. Subsequently, understanding the source of the congestion rents is an appropriate basis for allocating the weights.

Table 4.7: Strengths and weaknesses of the different treatments of jurisdiction issues

Approach	Strengths	Weaknesses
Separate calculations for each jurisdiction	Allocation between the jurisdictions is straight forward (at least for this element of costs)	Would be a fixed allocation of costs or revenues which might not be appropriate
A blended WACC	Single calculation Allows a separate allocation of costs each year based on a rule	Would need to split the costs or revenues in some way for allocation between the jurisdictions

For ease of implementation it would seem to make sense for the blended WACC approach to be adopted. If separate calculations for each jurisdiction were to be made, then further assumptions about cost or revenue allocation would need to be made.

Under a blended WACC approach, it is possible to use fixed or variable weights for each jurisdiction. Table 4.8 below summarises the strengths and weaknesses of each.

Table 4.8: Strengths and weaknesses of different approaches to jurisdiction weights

Approach	Strengths	Weaknesses
Fixed	Simple to understand Simple to implement Provides clarity for investors	Difficult to establish the basis on which to fix weights
Variable	Potentially more accurate Allows for adjustments (e.g. following currency fluctuations)	More complex and may create incentives to game revenue or cost allocations Would represent an additional source of risk for developers to manage, increasing the cost of capital Frequency of updating would need to be discussed

The variable approach has some intuitive appeal due to the apparent potential for greater accuracy and flexibility. However, it would be more complex and potentially more risky to implement. The benefits of accuracy and flexibility may also be somewhat spurious: for example, it is not clear that an efficient notional developer would adjust its jurisdictional exposure over time. The fixed approach provides simplicity and clarity – and, since the overall regime is based on revenue, still requires developers to manage the risk of fluctuations within the cap and floor.

As noted in Table 4.8, the main challenge with the fixed approach is establishing the basis for the fixed weights. Table 4.9 summarises the strengths and weakness of the two approaches to choosing weights for deriving a blended WACC.

Table 4.9: Strengths and weaknesses of the different weighting bases for a blended WACC

Approach	Strengths	Weaknesses
Revenue	Reflects a key risk faced that would be faced by a merchant operator but not a regulated one	Link to this risk is broken by the cap and floor regime as well as the Target model Great uncertainty about what revenues will exist let alone where they arise and so could create risk for the operator if adjustments are made as revenue develops
Costs	Simple and reflects one of the risk areas for an operator Easy to forecast as costs are relatively well known (especially when compared to revenue)	Not linked to the key revenue risk May be relatively arbitrary as the costs are likely to be incurred and then allocated

From a pure implementation perspective, a cost-based blended approach is simplest. It is our understanding that the NRAs propose tosplit the costs equally between the jurisdictions.

5. ANALYSIS OF RISK

The main objective of this project is to develop a detailed cost of capital methodology for the proposed cap and floor regime. There are two aspects to this:

- *Benchmarking regime risk.* We will take a view on the riskiness of the NRAs' proposed regime from the perspective of investors.
- *Supporting regime design.* Where appropriate, we will also provide the NRAs with input on elements of regime design that have a particular impact on risk.

These are effectively two sides of the same issue. Both require an understanding of risk from the perspective of both debt and equity investors. This is the subject of this section, which focuses on risk during the operational phase. Construction risk is addressed separately through the IDC allowance.

We begin in Section 5.1 with a summary of the main categories of risk. Section 5.2 is then an assessment of the riskiness of the regime relative to other benchmarks, from the perspective of equity investors. Section 5.3 is an analysis of risk from the perspective of debt investors, drawing on credit rating agencies' published approaches. Finally, Section 5.4 summarises the key implications of our analysis.

In carrying out this analysis, we acknowledge that risk allocation is a balance. There is a spectrum of potential approaches, with full exposure to risk for end users at one end and full exposure for developers at the other. In these sections we ask where the balance lies for the proposed regime, and whether there are any areas where this balance could be changed through further mitigation.

Note that in line with the majority of similar work in the regulatory context, this analysis is qualitative in nature. We consider that an attempt to provide largely quantitative analysis would provide only spurious accuracy.

5.1. Types and sources of risk

This section summarises the key areas of risk to which interconnector developers are exposed, focusing on the risks that would be faced under the regime planned by the NRAs (as captured in our working assumptions). As noted in Section 3.2, different risks may materialise during different project phases. This section is primarily concerned with summarising risks over the course of the operational phase; we discuss construction risk separately in Section 5.1.7.

5.1.1. Revenue and volume risk

Interconnectors derive their revenues from congestion rents. Congestion rents are dependent on the existence of price differentials between markets at either end of the interconnector.

Actual interconnector usage will be influenced by legislation, in particular,the European Target model. This is designed to facilitate the flow of energyin order to support a more

integrated European market, and will reduce the degree to which the developer perceives it can control its exposure to revenue risk in two ways:

- by locking in firmness obligations for explicit and implicit auctions; and
- byrequiring interconnector operators to allocate capacity implicitly in day-ahead and intraday timeframes.

Nevertheless, there are two broad categories of price differentials that can be expected to drive underlying demand for interconnection:

- longer term, stable differentials; and
- shorter term, volatile differentials.

The degree of systematic risk associated with each is very difficult to ascertain.[17]However, given the prospect of recovering zero revenues if the interconnector is not used, the relative stability of the former would be expected to be an important factor in enabling a merchant interconnector to raise debt finance.

Ultimately, interconnector usage (and associated revenue risk) will be heavily driven by the existence of price differentials.

5.1.2. Operational risk

In this sub-section on operational risk, we consider the extent to which operational factors (in particular planned and unplanned outages) influence risk through affecting revenue or costs.As discussed elsewhere in this section, the cost implications depend in part on the firmness of the capacity being offered.

Availability is an important determinant of revenue risk for both a merchant interconnector and (under most likely regimes) a regulated interconnector. Unplanned events could result in both lost revenue and, depending on contractual arrangements, penalty costs. For example, if the owner issues firm Transmission Rights and the line fails, the owner could be liable for the price difference across the interconnector. This is the reason that normally such contracts have limited rights once a failure has been declared. This issue is more acute for interconnectors than, for example, for onshore networks due to the lack of inherent meshing. Interconnectors are also exposed to potentially large price differences, rather thanjust to a loss of regulated revenue.

Unplanned maintenance will also result in a direct repair cost. It is important to understand both the expected rate of such problems and the magnitude of costs involved, relative to relevant comparators.Planned maintenance, however, is likely to coincide with periods of limited or no usage. Thus while there are associated costs and a degree of foregone revenue, the risk involved is likely to be small and diversifiable.

[17] The ability to control longer-term revenue risk is greater than for short-term, through long-term contracts for example. However, while in principle a regulated interconnector could enter into long term contracts, in practice these would be unlikely to be authorised given regulatory requirements.

In this case, availability will also affect risk through the availability incentive. By design this does not impact on the level of risk at the floor, but makes cap returns more sensitive to pure availability than they would otherwise be.

5.1.3. Cost risk

There are four relevant aspects to cost risk:

- capex risk;
- opex risk;
- uncontrollable opex risk (including tax); and
- cost allowance risk.

Capex risk is to be partly captured through the IDC allowance. Operating costs are likely to be relatively small.One cost category to be considered carefully, however, is market related costs, and in particular firmness costs. These relate to the risk of incurring penalties in relation to undelivered capacity. Capacity may be:

- physically firm – in which case the interconnector operator would be liable to buy and sell power in local markets to ensure the nominated capacity-holder were left in the same position as if the capacity had been available; or
- financially firm – in which case the interconnector operator would be liable to pay compensation equal to the difference in wholesale prices in the two markets.

The key issue is to ensure consistency, whether they are treated as lost revenue or as a cost incurred. Our approach is likely to be the former as it minimises the risk of perverse outcomes (but does not fully remove it) while ensuring a simple overall approach.

It is important to consider carefully uncontrollable costs. While in many cases the distinction between controllable and uncontrollable costs is clear, for others it is less so. In particular, tax costs have controllable and uncontrollable aspects. What is important is clarity and predictability from the rules.

A key point of departure between a merchant and a regulated interconnector is the introduction of cost allowance risk for the latter. Cap and floor revenues will be set on the basis of agreed baseline costs and parameter estimates. Deviations from this baseline may not be allowed, leaving the developer exposed to risk.

A final cost-related issue that influences overall risk is the company's operational gearing. This is analogous to financial gearing. In the case of financial gearing, the volatility of equity returns is heightened by the extent to which the company faces fixed obligations due to debt. In the case of operational gearing, the sensitivity of total returns to changes in revenue is heightened by the extent to which the cost base is fixed.

5.1.4. Financial risk

There are two aspects to financial risk:

- the risk of movements in underlying financial parameters and hence the cost of borrowing; and
- financing risk introduced by the company's financial structure (i.e. gearing).

Exposure to the former would result from systematic fluctuations in the actual cost of debt. This in turn would be determined by the extent to which the company faces refinancing risk. This may differ substantially depending on the chosen financial structure. Given an interconnector represents a single stand-alone asset this risk may be limited to the extent that debt costs are matched to the life of the asset.

The latter is related to the risk introduced as a result of fixed obligations incurred through debt finance. As a company's reliance on debt finance (its gearing) increases, its fixed obligations rise as a proportion of total returns. This has the effect of increasing the volatility of returns to equity investors, who receive the residual returns after accounting for such fixed obligations. As a result of this additional volatility, the cost of equity rises.

This issue is partially complicated by the covenants and restrictions resulting from the use of debt finance. Either to satisfy bank lenders or to meet a target credit rating, companies may be required to commit to certain cover ratios indicating (among other things) the size of the buffer between typical or forecast returns and fixed interest payments. Breach of these ratios could result in restrictions on the use of funds, including equity lock-ups. The need to provide such cover – and the importance attached to credit ratios that capture it – may be expected to vary from sector to sector. The stronger the application of cover ratios, the more that debt finance can be expected to increase the risk to which equity investors are exposed.

5.1.5. Regime risk

It is important to recognise that the design of the regulatory regime will influence risk. This will happen both through high level decisions (in particular the choice of cap and floor) and more detailed aspects (such as incentive mechanisms). These factors are discussed in the remainder of this section, and we summarise our views on key aspects of regime design in Section 8.2.

5.1.6. Policy risk

There are a range of mechanisms through which interconnector developers are exposed to policy risk. (In this section we refer to risk relating to higher level decisions, rather than detailed elements of the interconnector regulatory regime.) These could include:

- strategic decisions that influence either country's sources of energy or policy regarding energy markets (such as the UK EMR or the European Target Model);
- decisions that influence relative energy prices; or
- decisions related to other transmission assets (for example, an increase in the number of interconnectors would tend to reduce price differentials, congestion

rents and revenue; note that such interconnectors would not necessarily need to connect the same two countries).

In practice these risks are likely to materialise as revenue volatility. However, they are included here for completeness.

5.1.7. Construction risk

As noted earlier, there are specific risks around construction that need to be considered. For an interconnector we believe the key construction risks are:

- cost over-runs;
- time delays; and
- technology risk.

These are potentially very important risks and consequently are being addressed through the way that we estimate the IDC allowance. This is described in detail in Annex A.

5.1.8. Summary

The above sub-sections summarise risks resulting from a range of sources. The importance of these categories will vary, and may be different for equity and debt investors. This issue is the subject of the following two sections.

In general, however, we would expect two risks to be particularly significant. First, developers will be exposed to significant uncertainty regarding revenue. This results both from likely fluctuations in the price differentials that ultimately drive interconnector use, but also from policy details of the European Target model. For example, a small change in price volatility or a change in the correlation between prices at either end can induce a large change in arbitrage profits, while a decision to move from zonal to nodal pricing could similarly have a large impact on the prices at either end of the interconnector. The requirement to sell all the capacity similarly impacts on profitability, as might constraints on the form and duration of contracts for using the capacity, all of which might be affected by changes mandated under the European Target model. These points imply that developers will have little or no control over their source of revenue. In practice, therefore, this revenue risk is likely to take the form of an uncontrollable market valuation risk: developers will be able to form a view of the likely profit stream, but will not be able to significantly influence it.

The second key risk is likely to be financial. A merchant interconnector may have the option of securing debt financing based on long term contracts for explicit capacity. This is important given the potential volatility of net revenue derived from the shorter term implicit market. Our understanding is that the European Target model is likely to expose regulated interconnectors to revenue risk akin to that of the latter market. This is likely to pose significant challenges in relation to meeting debt costs and cover ratios.

5.2. Viewpoint of equity investors

As discussed in the introduction to this section, here we consider both benchmarking the level of equity risk for the regulated interconnector (and therefore an indication of cost), and also aspects of equity risk that may influence overall regime design.

Direct estimation of equity risk through measurement of an equity beta is not possible in this case. To our knowledge there are no independently listed regulated interconnectors, and furthermore no interconnector is subject to a regulatory regime corresponding closely to that proposed by the NRAs.

As a result, this section focuses on analysis of relative risk. It begins with a brief explanation of the principles governing the return on equity required by investors. It then presents a qualitative assessment of the level of risk at the cap and the floor relative to key benchmarks for which data are available.

5.2.1. Principles

The compensation required through the return on equity by investors will vary depending on:

- the magnitude of risks faced; and
- thediversifiability of risks faced.

In general, equity investors should be compensated more for risks that are larger in scale and correlated with wider economic conditions (i.e. not diversifiable). The former point is intuitive, but the latter is important too. Risks that can be diversified by investors should not attract any additional return.

This report also considers the appropriate allocation of risks. Again diversification is an important factor: risks that can easily be diversified by investors are likely to be most efficiently managed by investors. Risk allocation may also depend upon controllability. In general, we would expect risks that are within the sphere of the developer's control to be best allocated to investors.

This is only a guide, however. In practice there may be valid reasons to allocate risks to developers even when they are not controllable. The rationale for this is clear in the case of risks that are easily diversifiable, since this may represent the cheapest way of dealing with the risk.

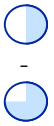
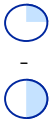
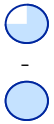
5.2.2. Qualitative assessment of relative risk

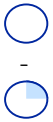
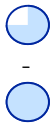
This section presents our assessment of risk for the cap and floor regime compared with relevant comparators. This is directly useful as a way of understanding potential benchmark costs of capital for use in our methodology. It also enables us to identify any areas of risk that are particularly significant from the point of view of the methodology and regime design. These may be areas where equity investors would be particularly exposed (and an alternative allocation may be considered) or where there is a discrepancy between the regime and the selected comparators. In both cases this may inform further suggestions regarding the consistency of the regime design with the NRAs' objectives.

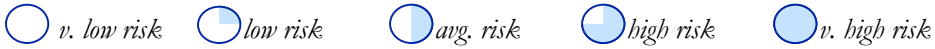
Table 5.1 overleaf summarises our assessment of relative risk for the following:

- a UK regulated network;
- a Belgian regulated network;
- a peaking generator;
- a merchant interconnector;
- the floor; and
- the cap.

Table 5.1: Qualitative assessment of relative risk

Risk category	**Regulated network – UK**		**Regulated network – Belgium**		**Peaking generator**		**Merchant interconnector**		**Floor**		**Cap**	
Volume/revenue/margin –Price diff. –Regime		Revenue cap with uncertainty mechanisms		Revenue cap		Market risk between inputs and power		Market risk based on price differentials		Underwrittenrevenue with upside potential		Exposedto downside risk (limited by floor)
Operational		Low complexity and mature technology		Low complexity and mature technology		Low complexity and mature technology		Significant exposure to market cost risk		Limited exposure to market cost risk		Greater exposure to market cost risk and availability incentive
Cost –Opex –Capex –Uncontrollable		Partial exposure but high capex in some cases		Significant pass-through of costs		Full exposure; complexity depends on technology		Full exposure		Exposuremitigated byregime design		Exposure mitigated by regime design
Financial		Cost of debt indexation and established regime		Clear regime, although no indexation		Financial risk typical of market		Difficult to secure finance on long term contracts		Potentially vulnerable to short-term interest cover risk		Sufficient short-term buffer

Risk category	Regulated network – UK		Regulated network – Belgium		Peaking generator		Merchant interconnector		Floor		Cap	
Regulatory regime –Duration –Periodicity		Frequent reviews		Frequent reviews		No regulatory protections		No regulatory protections		Must manage fluctuations over 5 year period		Must manage fluctuations over 5 year period
Policy		Relatively insulated from policy shifts		Relatively insulated from policy shifts		Exposure to policy dependent on technology		Highly exposed to policy decisions		Only exposed to upside potential		Exposed to policy decisions (risk limited by floor)
Operational gearing		Large fixed cost base		Large fixed cost base		Significant fixed cost base		Large fixed cost base		Cost base largely fixed but revenue underwritten		Large fixed cost base moderated by cap
Performance incentives (via regulation)		Significant focus on outputs under RIIO		Limited use of incentives		N/A		N/A		Incentives only applied to cap		Availability incentive
Overall										**Similar to regulated network – but financial and regime risk could be an issue**		**Comparable to/ lower than peaking generator or merchant interconnector**


v. low risk
low risk
avg. risk
high risk
v. high risk

5.3. Viewpoint of debt investors

The introduction to this section noted that risk should be considered from the viewpoint of investors both to benchmark the cost of capital and to inform regime design. The latter issue is much the more important in relation to debt. Given the NRAs' decision to target an investment grade credit rating for an efficient notional interconnector developer, the relevant cost of debt follows quite naturally.[18] In this section we focus on assessing whether the wider aspects of the regime design are likely to be consistent with the target credit rating.

In Sections 5.3.1 and 5.3.2 we base our assessment on three credit rating agency methodologies. In Section 5.3.3 we consider a case study of how Moody's applied its methodology in the case of the Moyle interconnector.

5.3.1. Qualitative assessment of credit rating factors

The NRAs have decided to target an investment grade credit rating for the regime. This section assesses whether the overall design of the regime is likely to be consistent with such a credit rating. We base this assessment on analysis of three different methodologies employed by credit rating agencies:

- Moody's *Generic Project Finance Methodology*;
- Moody's *EU Electricity Transmission Networks Rating Agency Overview*; and
- Fitch's *Rating Criteria for Availability-Based Infrastructure Projects*[19].

Details of these methodologies are provided in Annex D. We were able to access only limited information on Standard & Poor's equivalent methodology. However, it appears to conform broadly to the above approaches.

Table 5.2 below summarises the results of this analysis. We have grouped the factors considered by each agency into six core categories, which correspond closely to the sources of risk discussed in Section 5.1 above. The labelling of these categories reflects our judgement rather than the precise terminology used in the rating agencies' methodologies. For each of the three methodologies, we summarise the features that would be expected for an investment grade rating.

In the final column of the table, we present our own assessment of whether the design of the regime is likely to present an obstacle to an investment grade credit rating[20]. Our assessment seeks to highlight factors that would make it very challenging for even a notionally efficient developer to sustain an investment grade rating. In such cases, the NRAs may choose to adjust appropriately either the cost of capital allowances or the regime design.

[18] Subject to specific assumptions regarding the appropriate benchmark, which are discussed in more detail in Section 5.3.2.

[19] Many of the factors considered relate to construction risk; in this analysis we focus on operational factors.

[20] Taken to be a rating of Baa for Moody's and "midrange" attributes for Fitch.

Table 5.2: Summary of requirements for investment grade rating and assessment of obstacles to investment grade rating

Rating category	Moody's – Project Finance	Moody's – Energy Transmission	Fitch – Infra. projects	CEPA assessment
Competitive position	Solid and stable competitive position, or highly rated offtaker	Moderate focus on core regulated activity (e.g. up to 10-15% on non-core activities)	Established and stable industry with some barriers to entry	
Net cash flow	Good predictability with manageable or short-lived mismatches Limited downside risk on non-contracted volume	Cost recovery subject to infrequent reviews (>5 years) Moderate exposure to volume risk Some reliance on connection revenues	Predictable cost profile with regular adjustments to revenue and marginal cost in response to demand changes Moderate deduction risk and low revenue volatility	
Operation and technology	Commercially proven technology with recognised operator	Capex and repex 8-12% of RAB (i.e. moderately large and/or complex capex programme)	Experienced sponsors and operators with govt. commitment Limited operating history and access to parts and support	
Regulation and event risk	Potential material unmitigated exposures, but with low probability	New or untested regime based on established precedents Long-term concession	Strong legal or regulatory precedent with clear risk allocation Predictable regime	
Policy and economic rationale	Parties' interests are generally well-aligned	N/A	Government commitment in national strategic projects	
Renewal, obsolescence and early termination	N/A	Some instances of revenue back-loading	Adequate planning mechanisms and 1-2 year tail after debt maturity	

Notes:

For each individual methodology, the text in each cell describes the attributes that would be expected in order to achieve an investment grade rating. The final column presents CEPA's own judgement as to whether each category is likely to present an obstacle to an investment grade rating, based on our understanding of and working assumptions the proposed interconnector regime.

 *no obstacle to investment grade rating*  *major obstacle to investment grade rating*

Based on the analysis in Table 5.2, we consider that the following factors could be considered major potential obstacles to an investment grade credit rating:

- *Net cash flow*. This is a key input into rating agencies' decisions, and the only factor which may provide a major obstacle to an investment grade rating. Much depends on the details of the annual within-period financeability adjustment. If this provides a sufficient backstop, then this factor is likely to be no more than a moderate obstacle. If it is perceived to be insufficient, however, in our view there is potential for material uncertainty and long-term mismatches in net cash flow – which could present a major (arguably insurmountable) obstacle.

The remaining factors are unlikely to present a major obstacle, although we acknowledge some uncertainty in our assessment:

- *Competitive position.* Arguably there are some minor weaknesses under this category: interconnectors would not be established monopolies and would provide a discretionary service that could be exposed to increasingly broad competition. The inclusion of the floor underwritten by a highly rated offtaker, however, would mean in practice the developer would not be fully exposed to such competition.

- *Operation and technology.*Interconnectors operate using a relatively proven technology, and the project sponsor strength is likely to exceed the minimum requirement. In the operational phase, the bulk of capex will have been completed, meaning scale and complexity in operational phase is limited. In our view firmness cost risk is likely to be captured under net cash flow, making the remaining obstacle presented by this factor minimal.

- *Regulation and event risk*. Given the security provided by the floor, developers would be exposed to little or no regulatory or event risk (beyond that captured under the 'net cash flow' category). The regulatory regime would be considered new and untested, but our interpretation is that this status is consistent with an investment grade rating – particularly given the credibility of the existing onshore regimes.

- *Policy and economic rationale.* Current policy is clearly supportive of interconnectors, which could be seen as strategic projects with aligned interests between governments and potential developers. The direction of future policy (in particular the Target model) is uncertain though, and under some credible scenarios the economic logic underpinning any individual interconnector may be diluted. Our overall view is that the certainty provided by the regulatory regime is highly likely to mitigate this; however, our assessment attempts to capture that this factor is somewhat subjective, and could in the future be interpreted differently.

- *Renewal, obsolescence and early termination.* This factor is somewhat difficult to interpret, though it is unlikely to provide a significant obstacle. An economic tail after maturity is a positive factor in Fitch's assessment, whereas Moody's considers back-loading of revenue to be a risk. The use of a revenue floor is likely to make the former interpretation more appropriate. We note that planning mechanisms for the end of the regime are likely to be assessed as part of this factor.

5.3.2. Financial metrics

Assuming that the above points are addressed, the regime as a whole is likely to be consistent with an investment grade rating. In this case, Moody's *Generic Project Finance Methodology* ascribes 20-30% of its overall rating to performance against financial metrics (with the remaining 70-80% being driven by the above fundamental factors).

We note two key points in relation to these metrics. First, the average annual debt service cover ratio consistent with an investment grade rating (for the financial metrics element only) is likely to be at least 1.15-1.30 based on Moody's methodology.This is consistent with our consultations with industry participants. We note that higher values may be required, for example for European Investment Bank (EIB) funding or by other lenders. Second, a sub-investment grade rating (again for the financial metrics element only) could result if a cover ratio of 1.0 could be reached under a limited level of volume stress.

If the regime as a whole is judged to be low risk, there may be some limited scope for the above metrics to be relaxed. A strong rating based on fundamental project characteristics can to an extent compensate for a sub-investment grade rating based on financial metrics. It is therefore important to consider as part of the estimation methodology (particularly for the within-period financeability adjustment) whether providing full security up to investment grade interest cover levels delivers the optimum balance of risks between investors and consumers.

Financeability risks can be mitigated through a variety of factors. Where cash flow pressure is expected during the early phase of the project, non-amortising debt may be a viable option. This could be achieved through delaying repayment of the principal until the end of a loan, or through the inclusion of a short grace period (with no principal repayment) in the early years. In addition, developers may be able to access additional sources of finance to manage the relatively short delay between the calculation and payment of an adjustment under the floor. While we do not attempt to prejudge investors' actions, our analysis does seek to reflect the range of options available.

5.3.3. The Moyle interconnector

A highly relevant example of a qualitative assessment of credit rating factors is Moody's downgrading of the Moyle Interconnector in May 2012. Here, we complement our analysis by describing how a rating agency might view an interconnector in practice, using rating action by Moody's Investors Service in relation to the Moyle Interconnector as an example.

The Moyle Interconnector comprises two 250 MW capacity high-voltage direct current cables that link Northern Ireland and Scotland's electricity grids.[21] Construction for the interconnector ended in December 2001, with the first trial operations beginning in January 2002. Apart from funding from the European Union, construction costs for the interconnector have been funded by 2.93% index-linked guaranteed secured bonds that were issued in April 2003 by the Moyle Interconnector (Financing) PLC. The bonds have a total worth of £135m and are due in 2033.

[21]The primary purpose of the interconnector is to transfer electricity from Scotland to Northern Ireland.

In June and August 2011, Moyle had two serious operational failures, to the interconnector's south and north cables respectively; this meant that Moyle's capacity was unavailable between August 2011 and January 2012 – the point at which the south cable returned to service and restored roughly 50% of Moyle's capacity.[22]The costs of the deep sea repairs combined with the substantial loss in revenues resulting from the unavailability collectively amounted to significant financial losses; although, the majority of the costs are still expected to be covered by insurance, subject to policy limits and deductibles.

Moody's Investors Service placed the Moyle Interconnector (Financing) PLC on review for downgrade on 31 January 2012 following the interconnector's poor operational performance. On 21 May 2012, Moody's downgraded the Interconnector bonds' underlying ratings to A3 and assigned a negative outlook; Moody's simultaneously confirmed the bonds' definitive rating of Aa3.[23] This concluded the January-issued review for downgrade.

While Moody's negative outlook for Moyle Interconnector (Financing) PLC reflects poor past performance and uncertainty around future performance[24], the A3 underlying rating recognises that the Moyle Interconnector (Financing) PLC has maintained:

- "the strong revenue mechanism that ensures that the Issuer receives annual revenue that equals a pass-through of all operating costs, including debt service, plus a 1.35x coverage multiple and a make-up of any shortfall from the previous year;
- "the Issuer's significant cash reserves over and above the mandatory reserves;
- "the essentiality of Moyle to the security of supply in Northern Ireland and the positive relationship between Moyle and NIAUR; and
- "the increased operating risk of the asset and the possible need to undertake future works to improve the reliability of the asset."[25]

Accordingly, despite operational issues, Moody's suggests that the Moyle interconnector has been able to sustain an investment grade credit rating.

[22]This is in addition to a major outage that occurred in September 2010 and reduced capacity by half for a two-month period.

[23] "The definitive rating of the Bonds is determined as the higher of (i) Assured's insurance financial strength rating; and (ii) the published underlying rating of the Bonds." Accordingly, the definitive rating of the bonds' is Aa3 since "the insurance financial strength rating of Assured is Aa3/under review for downgrade, and the underlying rating of the Bonds is A3." (Source: Moody's Investors Service, *Moody's downgrades Moyle Interconnector (Financing) PLC's underlying ratings to A3; outlook is negative*. Global Credit Research – 21 May 2012. Accessed at: http://www.moodys.com/research/Moodys-downgrades-Moyle-Interconnector-Financing-PLCs-underlying-ratings-to-A3--PR_246285)

[24] Moody's also note that poor performance has resulted in an increased reliance on the regulatory framework – relative to what was already envisaged at financial close.

[25]Moody's Investors Service, *Moody's downgrades Moyle Interconnector (Financing) PLC's underlying ratings to A3; outlook is negative*. Global Credit Research – 21 May 2012. Accessed at: http://www.moodys.com/research/Moodys-downgrades-Moyle-Interconnector-Financing-PLCs-underlying-ratings-to-A3--PR_246285)

5.4. Implications for methodology and regime design

There are two sets of implications based on the above analysis.

First, we consider the suitability of available benchmarks for cap and floor risk, based primarily on the relative risk analysis in Section 5.2. For the floor, regulated networks are a useful guide. There are, however, important points of departure. The interconnector developer may have to manage larger fluctuations in net revenue, particularly in relation to fixed financing obligations. Though this may be mitigated by reduced risk from incentives, it is likely to represent a material difference in the risk profile. At the cap, implied risks are likely to be similar to (or slightly lower than) those faced by a peaking generator.

Second, we consider whether aspects of the regime design materially affect our assessment of risk or, from the perspective of debt investors, may present a material obstacle to an investment grade credit rating. Here, too, the potential unpredictability of net revenue is a key factor. It is plausible that interconnector revenue could be very low, and in this context five year assessment periods are unlikely to provide sufficient security to equity investors, who may require substantial reserves in order to meet required interest cover ratios. In light of the limited control that the developer would have over interconnector revenue, we consider this to be a regime design issue.

In our view the financeability test: within-period assessments discussed in Section 2.4 should be considered an important part of the regime. Without sufficient provision, it is likely that implied floor risk would be materially higher than that experienced by regulated networks, and an investment grade credit rating would be challenging for even a notionally efficient developer to achieve.

6. METHODOLOGY

This section sets out our approach to generating parameter estimates for the cost of capital. Annex E of this report provides a detailed explanation of the various formulations of the cost of capital.

We begin this section with an overview of our approach to estimating the cost of capital in general. We then discuss conceptual aspects of estimation, before setting out our proposed estimation approach in this case.

6.1. General WACC estimation approach

We focus in this paper on the 'vanilla' cost of capital, which denotes the return available to providers of (debt and equity) capital after company tax payments have been accounted for. This is the formulation used by Ofgem in its onshore regime, and follows the NRAs' proposal to account for tax obligations elsewhere in the allowed revenue calculation. Annex Esummarises alternative formulations of the cost of capital that would be consistent with different tax treatment.

We also focus on the Capital Asset Pricing Model (CAPM) as the theoretical approach underpinning our analysis. Ofgem reviewed the available theoretical approaches as part of its RPI-X review of onshore network regulation, and concluded that despite its restrictive assumptions and documented shortcomings the CAPM remains the best theoretical foundation for assessing the cost of capital. A similar conclusion has also been widely reached by other UK sector regulators, and by the Competition Commission (CC). For consistency we follow Ofgem's approach.

Working within the framework of the CAPM, the cost of capital comprises the following elements:

- the equity beta, which is multiplied by the equity risk premium (ERP) and added to the risk-free rate to give the cost of equity;
- the risk-free rate;
- theERP; and
- the debt premium, which is added to the risk-free rate to give the cost of debt.

The following sub-sections explore each of these in terms of the cost of equity and the cost of debt. Following this, the gearing of the notional entity is discussed.

6.1.1. Cost of equity

The CAPM equation for the cost of equity is as follows:

$$CoE = r_f + \beta(ERP)$$

where $CoE =$ cost of equity

$r_f =$ risk free rate

ERP = equity risk premium for the market portfolio

β = measure of non-diversifiable risk of the security relative to the market portfolio

According to the CAPM, the cost of equity is fully specified by r_f, ERP and β. The first two of these variables are economy-wide; only the β is security (strictly, project) specific. Note that this equation should be expressed in terms of expected values since it is forward looking.

Asset and equity betas

The equity beta is based on asset risk and financial risk, and is arguably the most important component of the WACC for the NEMO interconnector. It is a measure of the interconnector's non-diversifiable risk and is calculated by taking the co-variance over time between returns on the interconnector (proxied through a company's shares) and returns on the market portfolio, divided by the variance of returns on the market portfolio.

For corporate entities, the underlying asset risk is generally assessed directly through regression of stock returns on market returns. For new interconnector projects, of course, such an approach is not available, and in general there are no independently listed interconnectors that could be used as direct comparators.[26] The estimation of the asset beta must therefore proceed based on an assessment of relative risk (see Section 5). It is important to bear in mind that (under the CAPM at least) what matters is not cashflow risk alone, but systematic cashflow risk that is correlated with the wider economy and cannot be diversified away by investors.

The value of the measured equity beta reflects not only business risks but also the risks induced by financial leverage. Equity betas must therefore be adjusted to normalise for different gearing across companies. This involves 'de-levering' the equity beta to derive the 'asset beta'. This is done using the formula:

$$\beta_{equity} = \frac{\beta_{asset}}{\left(1 - D/(D+E)\right)}$$

where D is the value of debt

and E is the value of equity.[27]

Strictly, D and E should be valued at market values but usually book values of debt are used for simplicity. With regulated assets where no market value of equity is available the RAB can also be used as the sum of D and E.

The same formula can be used to derive the equity beta for a company with any assumed 'notional' gearing. For example, the implied equity beta of an asset with 45% gearing is:

[26] The Moyle Interconnector would be the closest comparator.

[27] This formula assumes a debt beta of zero, a widely-used assumption.

$$\beta_{equity} = \frac{\beta_{asset}}{1 - 0.45}$$

So, the equity beta in this case would be 1.82 times the asset beta.

Risk free rate

The risk-free rate is the cost of government borrowing (perceived to be the least risky borrowing in an economy). It reflects the basic option for investment in an economy against which other, riskier, investments will be measured. Key issues link to the maturity of the bonds being considered and whether index-linked (i.e. effectively inflation proofed) or nominal bonds are used. The yield to maturity is the appropriate measure of risk as it captures both income and capital risk linked to the bond. The risk-free ratecan be calculated by taking an index of yields from UK index-linked gilts (ILGs), UK nominal gilts, US ILGs or UK regulatory precedent.

More specifically, a popular approach used to assess the risk-free rate is based on benchmarking government bonds. In many cases, government debt can be treated as a proxy for a riskless asset. As such, yields on government bonds (deflated, if necessary, to remove the influence of inflation risk) should indicate the risk-free rate. In order to do this, one must consider data from two bond classes: ILGs and standard government bonds, deflated based on a reliable measure of inflationary expectations. Under normal circumstances, these two measures should be equivalent.

There are two further methodological choices to be made. The first relates to the tenor of government bonds under consideration. This should reflect, as far as possible, the asset life of the interconnector. However, certain long-dated government bonds may be artificially influenced by regulations regarding pension fund investments. This is the case for long dated (25+ year)UK government bonds, for example. As a result, it may be more appropriate to consider ten year bonds – which in practice are likely to be very close in yield to longer-dated debt.

The second methodological choice relates to the nationality of debt to be considered. For interconnector assets, both the physical location and the source of revenues will span multiple jurisdictions. Under these circumstances, it is not necessarily clear which benchmark bonds to use.

Calculation of the risk-free rate, when multiple jurisdictions are involved, will take into account borrowing costs from both countries, with the weight attached to each country dependent on that country's contribution to raising finance, revenue risk and cost risk.

Finally, our approach to the risk-free rate would explicitly take into account current financial market conditions. In the short (and even medium) term, benchmark government bond yields are likely to remain artificially low as a result of central bank policies. It is necessary to apply judgement in these circumstances, as the appropriate risk-free rate over the full life of the regime is likely to be higher – although in the context of a one-off investment this may be less of an issue than it would be in, for example, onshore network investment. In making this adjustment, it is crucial to be consistent in calculating premia (the debt premium and the ERP) based on the risk-free rate.

Equity risk premium

The ERP is the extra return (over the risk free rate) which investors must expect to earn if they are to hold a portfolio of (volatile) equities rather than risk free securities. Estimation of the ERP is fraught with difficulties. It is a variable whose value cannot be directly observed. It is usually estimated by determining the ex post excess returns of a market portfolio over the historic risk free rate. The value of the ERP measured in this way is sensitive to:

- the period over which the average is measured;
- whether arithmetic or geometric means are calculated; and
- whether the market portfolio is a portfolio of UK or global equities.

This estimation method assumes that historic excess returns are a fair reflection of the, ex ante, expected excess returns. Although the theory assumes that the ERP is constant over time, historic excess returns vary over time and there is evidence that suggests that the *ex ante* ERP varies systematically over the business cycle.[28]

The Credit Suisse Investment Returns Sourcebook (commonly referred to as DMS, after the authors Dimson, Marsh and Staunton) provides long-term data on realised equity returns that can be used to in the development of ERP estimates. These estimates are widely used in the regulatory context.Theycan be cross-checked against alternative sources based on similar methodologies, such as the Barclays Equity Gilt Study. As with the risk-free rate, it will be important to consider data from both countries contributing to the interconnector's risk.

6.1.2. Cost of debt

The appropriate cost of debt benchmark is the cost of borrowing that an efficiently operated and financed company would incur. The cost of debt of the regulated business is a function of debt market conditions, the business and regulatory risks facing the regulated business and its gearing (debt: RAB ratio).

This can be assessed based on the risk free rate and the debt premium expected to be payable over the price control period by an efficient business with comparable regulatory and business risks. The cost of debt should be estimated based on an efficiently financed notional entity.

Risk free rate

Since the risk free rate has already been discussed under the previous sub-section, we focus here on the difference in how the risk free rate should be captured for debt finance compared with equity finance. It is likely that any debt finance would be raised as a one off issuance at the beginning of the period, attracting a fixed rate of return. By contrast, recourse to equity finance may be required throughout, depending on revenue and cost fluctuations, and returns to equity are by definition not fixed.

[28]Fama and French (1989).

In estimating the risk free rate to be applied to the cost of equity, our proposed methodology includes the possibility of making an adjustment to spot rates (or very short term averages). Such adjustments would reflect any anticipated movements in the risk free rate and hence the cost of equity. These movements in the risk free rate would not have any implications for debt costs fixed at the outset. As a result, it is unlikely that any adjustment to spot rates (or very short term averages) would be needed in the risk free rate for the cost of debt. Indeed, given that the proposed regime design allows developers to keep the benefits of refinancing, since prevailing UK offshore arrangements will be followed, such an adjustment would effectively reward investors twice for the same risk.

Debt premium

This is the premium over and above the risk free rate which reflects the risk of lending to a corporate entity rather than the government.

This can be calculated based on bond issuances from close comparators (e.g. the East-West Interconnector, BritNed, IFA, the Moyle Interconnector, the Baltic Cable, etc.). While data availability is scarce, we place most weight on bond issuances with a similar tenor and geographical location, appropriate credit rating and from entities with a similar financial structure (i.e. corporate or project finance).Analysis based on comparators is likely to produce a relatively uniform estimate for a given target credit rating.

6.1.3. Notional gearing

Notional gearing enters our WACC calculation in two places:

- as an input to re-lever asset betas to equity betas; and
- as the weighting parameter for the average of the cost of debt and the cost of equity.

It is also relevant in the context of financeability. Notional gearing must be set at a level that would allow an efficiently run firm to finance its operations while maintaining an appropriate credit rating. In simple cases, this may be achieved by 'testing down' from the highest plausible notional gearing level for the chosen target credit rating. In this case, the NRAs have asked us to propose an approach that is consistent with a range of financing structures. This issue is assessed as part of Section 7.3, in which we consider financeability for a selection of archetypal financing structures.

6.1.4. Transaction costs

Raising finance, whether debt or equity, imposes costs on the company raising the money. Various fees need to be paid. For equity, these can relate to both the initial provision of funds as well as the termination fees (for private equity), and tend to be a mix of:

- direct costs, such as advisers (including lawyers) and banking fees; and
- indirect costs, such as under-pricing the equity to attract investors.

For debt, costs are primarily in the former category.

As discussed in some detail in a 2010 note for Ofgem's RPI-X@20 review, many of these costs are unobservable, and vary according to factors including market conditions or the amount of money being raised.[29] What is important is that an acknowledgement of the costs associated with raising finance is made. We suggest some appropriate values for the allowance later in this report.

It is also important to consider how transaction costs are incorporated. Three options exist:

- make an allowance in the WACC;
- make an allowance in the opex; or
- increase the RAB by the transaction costs.

The strengths and weaknesses of the three approaches are briefly outlined in Table 6.1 below.

Table 6.1: Strengths and weaknesses of different approaches to transaction costs

Approach	Strength	Weakness
Allowance in WACC	Can be perceived as a cost of finance and so inclusion here makes that clear	While these are costs of finance, like taxation, they are better captured elsewhere rather than reducing the transparency of the WACC being used to determine whether investments take place. Of course, this assumes nothing else has reduced that transparency
Allowance in Opex	Allows easy sculpting of costs to match actual timing of costs incurred	A sculpted cost would have some impact on the cap and floor and so lead to uneven profiles which might interact with the revenues to produce an impact on when the cap and floor are triggered
Increase in RAB	Simple and treats the costs as a cost of funds without distorting the WACC	Lack of transparency since the amount gets incorporated into the RAB and is not separately identified

All three options should produce the same net present value for the developer. Consequently we do not have a strong preference for any of the options but will use the RAB based approach as it can be simpler to keep the WACC relatively transparent, especially as there are so many WACCs being calculated for the interconnector. However, since the approaches, if applied correctly, are NPV neutral, Ofgem may prefer to use an alternative approach for consistency with other energy regimes that it operates.

There may also be circumstances in which fees will be lower than normal commercial rates. For example, if EIB funds are accessed these incur lower fees. This would need to be incorporated on an ad hoc basis, possibly as part of the discretionary review discussed later.

6.1.5. Tax

[29] *Cost of Raising Equity*, a July 2010 note prepared for Ofgem by CEPA. Available to download from the RPI-X@20 section of the Ofgem website.

The proposed regime must allow for tax costs. In general these could be provided through the cost of capital (by estimating a pre-tax cost of capital) or through a separate allowance. In our methodology, we calculate the cost of capital on a post-tax basis, since the NRAs propose to provide a separate allowance in line with the GB onshore regime. Performing tax calculations separately is a more flexible approach, which would allow the NRAs to ensure any capex allowances and timing issues are reflected as accurately as possible.Were the tax allowance to be provided through a pre-tax cost of capital, based simply on the relevant corporation tax rates, that allowance may be higher than required if the operator is able to utilise allowances.

6.2. Conceptual aspects of estimation

Before starting to develop the processes necessary for estimating the various elements of the calculation, there are a few key concepts necessary to consider. These are:

- spot versus average estimates;
- consistency; and
- the use of comparators

Each is addressed in turn.

6.2.1. Spot versus average

When estimating forward looking parameters, as is necessary for the WACC, we are forced to rely on historic estimates as the best available forward looking information. This raises a question about how we use that historic information.

The efficient markets hypothesis (EMH), or at least its strong form, states that the latest (spot) estimate of a parameter is the one that embodies all information available at this point and so provides the best estimate possible. As such, if markets exhibit strong form EMH, all we need use is the last value. What is clear is that while markets may exhibit aspects of the EMH it is not the strong form – clearly information takes time to work through the market and short-term volatility exists.

Correspondingly, if one is looking to use recent information to estimate the WACC parameters then it is necessary to consider the time period over which an estimate is computed. Here there is a trade-off:

- tooshort a period means that volatility may still unduly influence an estimate;[30] and
- toolong a period means factors influence the estimate that are potentially no longer relevant.

This is much less of an issue in standard UK regulation as some regulators (Ofgem and Ofwat especially) have focused on approaches that capture a mix of historic and current

[30] An issue that requires further consideration is the interaction of this period with the period over which a bank develops its lending offer. If banks require more time than proposed in the regulatory regime, should a longer period be adopted?

forward looking information. In other countries, especially Australia, where significant emphasis has been placed on ensuring the most relevant forward looking estimate is derived, the trade-off discussed above has been debated widely. The Australian Energy Regulator (AER) uses an averaging period of about 20 days when forming the best estimate of a forward looking value.

The precise amount of time over which an average is to be formed is relatively arbitrary. As short as 10 days may be too short while clearly a year would be too long. Overall, our starting point for any forward looking estimation is a month, i.e. approximately 20 working days. That should allow the trade-off between the volatility and historic influences to be addressed.

6.2.2. Consistency

As can be gathered from the discussion above, aspects of the WACC calculation for the cap and floor regime require decisions about approaches that differ from the standard regulatory WACC estimation model used for onshore. As explained elsewhere in this report, this is because we are concerned with a single, one-off, investment when considering an interconnector while onshore is concerned with a portfolio of existing and future investments subject to periodic review.[31]

There are, however, some areas where consistency is still an issue, primarily linked to:

- estimation of macro-economic variables; and
- choice of some of the data sources and definitions.

Macro-economic variables are part of both the cost of debt and cost of equity calculations and are linked to the:

- risk-free rate; and
- ERP.

The first of these is an area where the approach is likely to be inconsistent, owing to the nature of the averaging problem faced – although the definition and source of data should be consistent (i.e. for the UK, index linked long-dated securities should be used). For the ERP however, especially as there is little agreement on exactly how a value should be calculated, more consistency would seem to be appropriate. Now, this consistency could either focus on the use of:

- an unchanging long-term average (as discussed below, regulatory decisions have tended to be in the range of 3.5% to 5% for more than the last decade); or
- an agreed source of data, which we would expect to be the annual update of the DMS Credit Suisse Investment Yearbook (although in practice annual changes are likely to be modest except under the most turbulent of market conditions).

[31] OFTOs are closer to interconnectors in terms of their characteristics but are not subject to WACC estimation owing to the competitive nature of the price determination process.

It is also important that when considering calculations for other jurisdictions any precedent or consistency issues that arise for them are captured. No regulator is going to be able to tie the hands of the calculations undertaken by another regulator, especially when the other regulator is in a different jurisdiction. Consequently there will always need to be an option for the other jurisdiction's regulator to impose its own consistency values on the estimate being generated through this process. We return to this when considering the NEMO case in Section 7 of the report.

6.2.3. Use of comparators

A final general point to consider is the role that comparators can take. Direct estimation of most of the parameters for the WACC calculation is not possible. Specifically, for the:

- cost of equity there are no independently listed (quoted) interconnector companies that can provide estimates of the asset beta and even if they did exist, there are no companies subject to the type of cap and floor envisaged in the Ofgem regime; and
- cost of debt, while there are examples of publicly traded bonds raised by interconnector companies, again there are no companies subject to the type of cap and floor envisaged in the Ofgem regime.

Consequently comparators are going to be an important source of market data on which to base the parameter estimates. These were discussed in Section 5.2 on relative risk – but that analysis ignores the data problems that are considered below.

A range of comparators exist that can be considered, these include:

- market data on asset betas for network companies, generators etc;
- market data on debt premia for interconnectors, network companies, generators and corporates in general; and
- regulatory decisions on asset betas and debt premia.

While comparators do offer a solution to the data problem it is partial. Take for example the generator issue. There are numerous listed generating companies in Europe and more generally. But none of these specialises in peaking plants, which would have the closest risk profile to a merchant interconnector (which defines our cap). So, the generator comparator will be useful but will still need to be adjusted to provide a meaningful estimate for the asset beta for the cap.

So, while we argue for a more mechanistic calculation this will still require some discretionary input to determine the appropriate use of comparators.

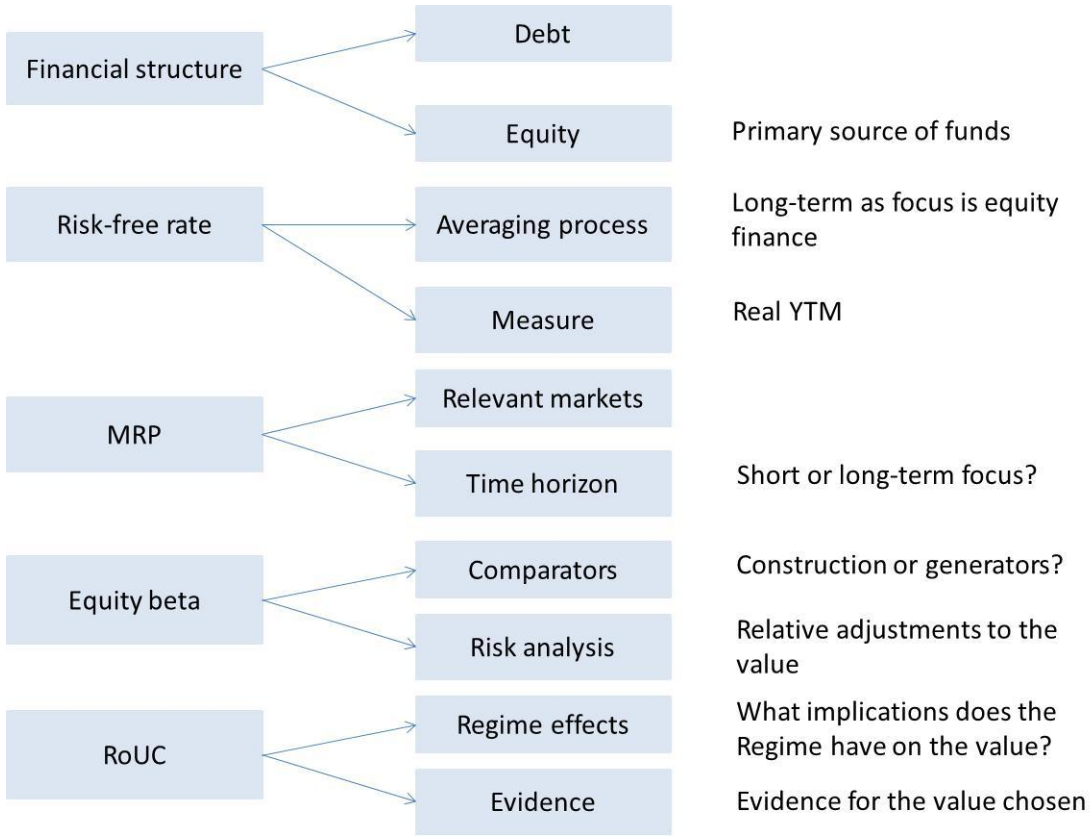
6.3. Estimation process and information requirements

This section further develops the WACC methodologies outlined in the sections above but now with a focus on the process and information requirements to undertake mechanistic estimation of the values. As discussed elsewhere, this is the starting point that should then be subject to review by the NRAs to determine whether discretionary adjustments are appropriate.

6.3.1. IDC

The first element that needs to be estimated is that of IDC. The approach we are recommending for this is outlined in detail in Annex A. Figure 6.1 below summarises our approach which is then outlined further.

Figure 6.1: Approach to estimating IDC



There are two key steps in this estimation process:

- deciding the appropriate capital structure during construction; and
- estimating the resulting WACC.

As argued in Annex A, during construction even if there is debt available it would normally require some form of parent guarantee which would make the debt similar to equity with respect to developer requirements. As such, it is simpler to assume that 100% equity finance is being employed and to just focus on estimating a cost of equity for construction. This assumption may not be appropriate if EIB funds are available to projects – this would need to be evaluated on a case-by-case basis.

When estimating the allowed cost of equity there are three traditional elements of the CAPM calculation that need to be considered and with IDC there is one further aspect that needs to be considered. Each of these is considered in turn in Table 6.2. The table sets out the key estimation options for each of the elements and their relative strengths and weaknesses.

Table 6.2: Estimating the IDC Cost of equity

Element	Option	Strength	Weakness
Risk-free rate	Short-term estimates	Reflects current market Easy to estimate	Does not reflect the long-term position of equity May under – or over-estimate the required value
	Long-term estimates	Reflects the longer-term perspective of equity holders Removes short-term volatility Consistent with Ofgem's standard position on equity	More difficult to directly estimate as it depends on a more nuanced view of the market
ERP	Short-term estimates	Consistent with short-term risk-free rate Reflects current market conditions Easy to estimate from DMS	Does not reflect the long-term position of equity May under – or over-estimate the required value
	Long-term estimates	Consistent with long-term risk-free rate Reflects long-term nature of equity Easy to estimate from DMS Consistent with Ofgem's standard position on equity	Is predicated on a specific view of equity
Equity beta	Generator	Captures risks of construction related to energy issues	Aspects of portfolio effect limit applicability to just construction Limited data availability Probably needs to be adjusted upwards through relative risk analysis
	Construction	Focuses on construction risks	Captures elements that are not relevant to the energy sector Limited data availability (but more than generation) Probably needs to be adjusted downwards through relative risk analysis
Risk of unrewarded costs	Include	Captures the fact that CAPM does not handle truncated returns well, especially if asymmetric Should help ensure that interconnection is perceived as a viable investment	Limited data availability on the types of unrewarded costs that need to be assessed Is not consistent with the standard approach to estimating equity returns Concern re possible double counting of risk if the equity β captures some of this. However, degree of overlap is likely to be small

Overall, our recommended approach to estimating IDC is:

- 100% equity financed, for the reasons set out above;
- long-term equity returns approach based on an adjusted CAPM;
- focus on construction risks, with a downwards adjustment if relative risk analysis shows this is necessary; and
- adjust the estimate for the risk of unrewarded costs (RoUC), these are primarily linked to cost over-runs and time delays.

RoUC is a new concept and is in part dependent on the type of regime. Consequently any changes to the IDC regime, such as shifting to cost sharing for over-runs rather than something more akin to a prudency test as is likely to be applied to NEMO, would alter the level of RoUC.

Further detail justifying our approach can be found in Annex A.

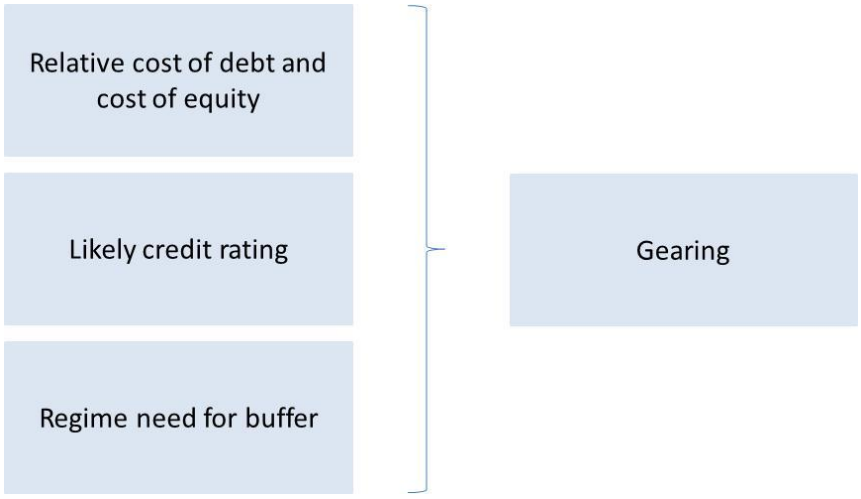
6.3.2. Cap and floor

Five specific parameters need to be estimated for the cap and floor regime. These are discussed below.

Gearing

The capital structure of the company, the amount of debt in the RAB, is driven by several factors, illustrated in Figure 6.2 below. A view about the appropriate average level of debt in the capital structure will be driven by a consideration of each of these factors.[32]

Figure 6.2: Influences on the level of gearing



[32] The decision to use an annualised flat revenue profile makes the use of an average gearing level appropriate. Otherwise some consideration as to how the gearing could be expected to change over the life of the project would be appropriate.

Of these we think the most important are the:

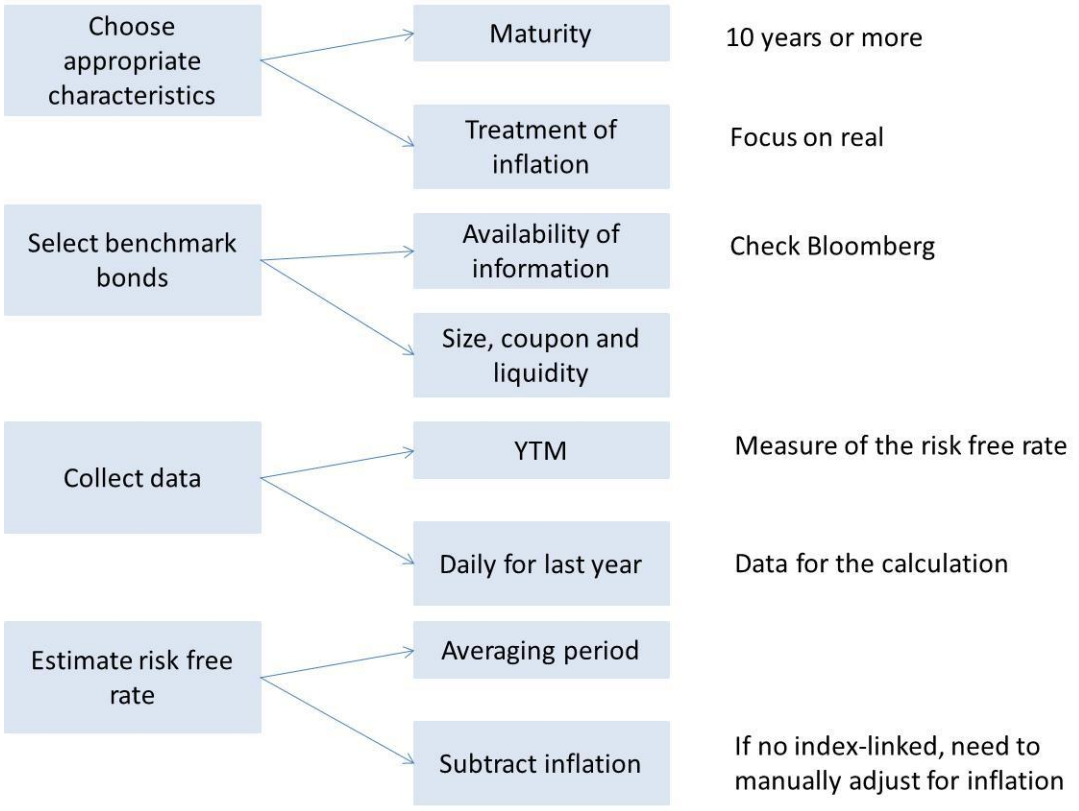
- regime design – especially whether an ex post (or ex ante) annual within-period financeability adjustment is provided; and
- desired credit rating.

A view on the likely impact of the overall differences in the relative costs of debt and equity (including the tax effects) should be a general point that the NRAs will have had to address in other determinations and so can provide a starting point. Deviations from this starting point would occur as per the views about the regime and appropriate credit-rating.

Risk free rate

The first of the macro-economic variables to be determined is that of the risk-free rate. As explained above, this is the estimate of the underlying long-term cost of Government borrowing. Figure 6.3 summarises the process by which an estimate would be derived. We have included the option of considering nominal bonds whose yields to maturity are deflated by an estimate of the long-term inflation rate.[33] This is because the use of index-linked bonds is relatively limited across Europe and consequently a process for the other jurisdiction involved in an interconnector is necessary.[34]

Figure 6.3: Process to estimate the risk-free rate



[33] The yield to maturity is the forward looking rate required to discount the flow of coupon payments as well as the repayment of the face value to the current market price.

[34] A second issue arises here, which has been brought into focus with recent regulatory decisions in countries like Ireland. What is the appropriate risk-free rate to use when looking at an individual jurisdiction within a broader currency area like the Euro-area?

Table 6.3 considers each of the main options relevant to Figure 6.3 and assesses their strengths and weaknesses.

Table 6.3: Estimating the real risk-free rate

Element	Option	Strength	Weakness
Type of bond	Nominal	Liquid market for these bonds Issued by all governments	Includes inflation risk that needs to be removed
	Real	Excludes most inflation risk and so more of a direct market estimate of borrowing	Only issued by a limited number of governments Liquidity of bonds or demand/supply situation may lead to biased estimates
Bonds	Actual	Reflects the actual rate linked to a bond	The remaining maturity of the bond changes over time and so the choice of bond has to be updated regularly
	Index	Reflects the rate associated with a specific remaining maturity type of bond Calculated externally by a reputable organisation	Not based on an actual bond and may not precisely reflect the headline remaining maturity (depends on the actual bonds in issue)
Tenor	Short	Liquid market Issued by all governments	Does not reflect the life of the assets being acquired, especially important for project finance Upward sloping yield curve means estimate will be biased
	Long	Better reflects the asset life and so preferred funding model for the developer	May be less liquid
YTM	Recent data	Captures the state of the market now	May be subject to volatility which does not reflect underlying fundamentals
	Long-term data	Reflects a more stable estimate of the underlying risk free rate	Captures periods which may no longer be relevant, especially true if market shifts have taken place
Inflation estimate	Market based	Better reflection of the expected level of inflation	Difficult to estimate, especially over longer-term without index linked bonds
	Target based	Reflects official government policy	May be wrong in the short, medium and long-term

When choosing the bonds it is important to ensure that they are:

- long-dated (at least 10 years) in order to best match the asset life, and consequently we believe best captured by an index with a pre-specified remaining life;

- liquid (so that the price used to determine the yield to maturity (YTM) is a fair reflection of the true market price); and
- as unaffected by market constraints as possible (here we draw a distinction between the general market effects of something like the quantitative easing programme underway in the UK with the specific requirements on certain institutional investors which creates "excess demand" for the limited supply of long dated index linked bonds).

Estimates of the cost of debt and cost of equity, in our opinion, need different risk-free estimates.Specifically:

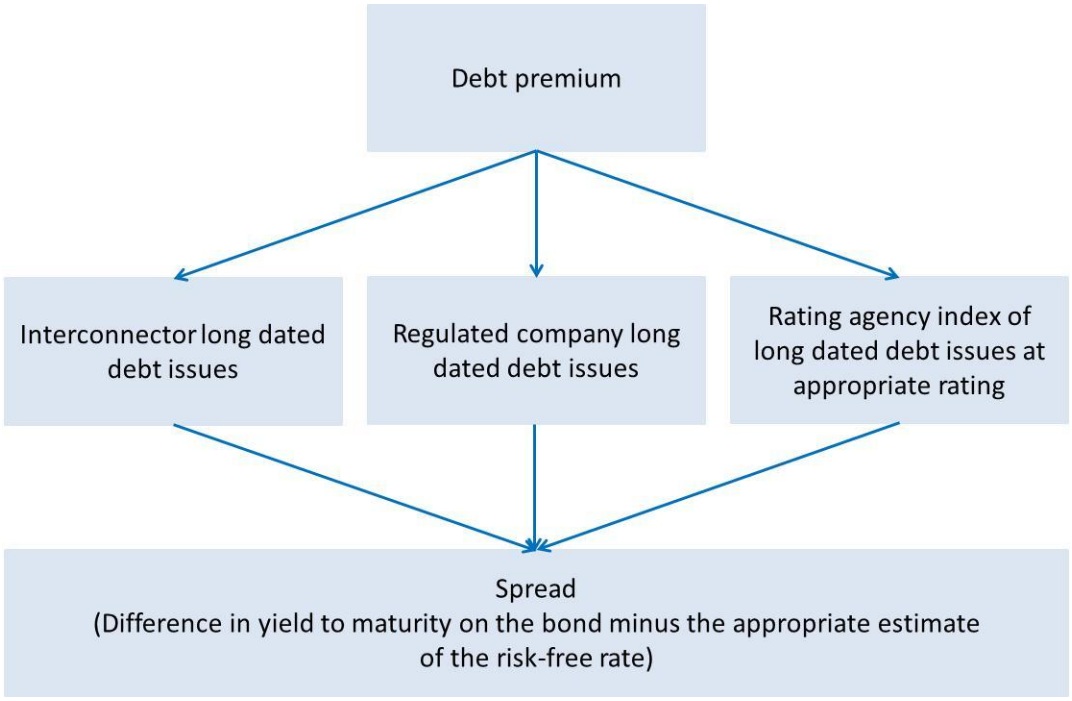
- the cost of debt needs to reflect the cost of raising debt finance today and so an estimate based on recent data is most appropriate; and
- the cost equity, since it reflects a longer-term nature of investment and focus, needs to reflect an estimate based on long-term data.

We do not believe that having two different approaches causes any consistency problems and, in fact, is more consistent with Ofgem's standard approach than using just one estimate of the risk-free rate.

Debt premium

The debt premium captures the additional return that debt investors require for the risks being faced in the project. A process by which the premium can be calculated is set out in Figure 6.4.

Figure 6.4: Process to estimate the debt premium



This process is based around finding a range of comparators and estimating the difference in the yield to maturity of the company bonds and appropriate government comparator bonds.[35]

As discussed in Section 2 of this report, we believe that the interconnector should be viewed as a stand-alone company with no explicit or implicit guarantees from the shareholders in the project. As such, while regulated company information will be useful it is likely to produce a biased result owing to the portfolio nature of the borrowing. Consequently, data that reflects project finance deals (possibly from a credit-rating agency) or specific comparators also needs to be considered. The availability of this type of data is discussed further later in the report.

Table 6.4 sets out the key options under each of the process points in the figure above.

Table 6.4: Estimating the debt premium

Element	Option	Strength	Weakness
Type of bond	Nominal	Liquid market for these bonds Issued by most companies	Includes inflation risk that needs to be removed, but provided appropriate government bonds exist this should not be a problem
	Real	Excludes most inflation risk and so more of a direct market estimate of borrowing	Only issued by a limited number of companies
Bonds	Actual	Reflects the actual rate linked to a bond	The remaining maturity of the bond changes over time and so the choice of bond has to be updated regularly
	Index	Reflects the rate associated with a specific remaining maturity type of bond Calculated externally by a reputable organisation	Not based on an actual bond and may not precisely reflect the headline remaining maturity (depends on the actual bonds in issue)
Tenor	Short	Liquid market Often issued by companies	Does not reflect the life of the assets being acquired, especially important for project finance Provided appropriate government comparators exist the upward sloping curve should not be a problem
	Long	Better reflects the asset life and so preferred funding model for the developer	May be less liquid
Issuer	Rated	Needs to be at least investment grade	

[35] Note, if the calculation is being done manually then the choice of comparator is very important. Remaining maturity of bond, coupon rate and size of the issue all affect the relevance of the comparator.

When choosing the bonds it is important to ensure that they are:

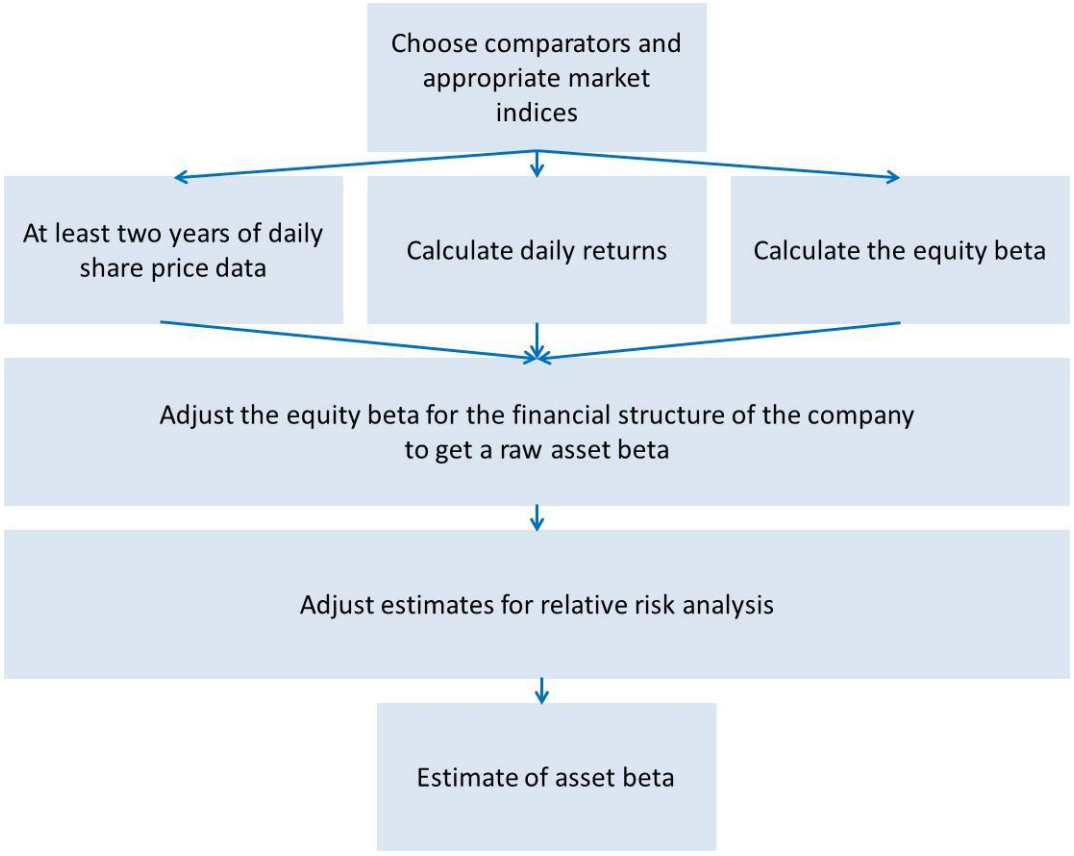
- 10 year investment grade rated bonds, in order to best match the asset life; and
- estimated over the same period as the appropriate risk-free rate, for consistency.

Asset beta

The key element that captures the risk faced by equity holders is that of the asset beta. As noted earlier, the asset beta represents the underlying business risk faced by equity holders. The WACC then incorporates this through the equity beta – the asset beta corrected for the financial structure (or gearing) of the business which magnifies the underlying business risk.

When estimating the asset beta a process like that set out in Figure 6.5 below should be followed.

Figure 6.5: Process to estimate the asset beta



The first step in this process is to choose the appropriate comparators – peaking generators for the cap. These comparators can then be used to collect information on asset betas. Two approaches can be followed:

- commercial financial information providers undertake these calculations and report them on their websites; or
- own calculations can be made.

Our preference is for the latter as greater control exists over the calculation and the way it is made. However, provided the calculations used by the commercial providers are fully understood (for example, whether some form of Bayesian adjustment is made) they can also be used.[36]

If manual calculations are undertaken the process to follow is:

1. collect the daily share price information on the chosen comparators and their associated market indices (for at least the last two years);[37]
2. calculate the daily return as the percentage change in the share price or index;[38]
3. estimate the equity beta for the company by running the simple equation set out below;
4. de-gear the resulting equity beta estimate into an asset beta – noting that the market value of equity should be used (this is often an issue with the commercial providers of financial information and may have to be adjusted for); and
5. form an overall estimate of the asset beta for use in the WACC estimation in the cap or floor.

The equation that is estimated is the following:

$$\beta_e = \frac{covar(r_i r_m)}{var(r_m)}$$

Where: r_i is the daily return on the company;

r_m is the daily return on the market;

covar is the covariance and *var* is the variance; and

β_e is the estimated coefficient.

Other sources of information for asset betas can include regulatory decisions where either an asset or equity beta may be published.[39]

To turn the asset beta back into an equity beta the estimate needs to be re-geared as per the discussion earlier in this Sectionof this report, using the average gearing assumed for the project (or aspect under consideration if it is assumed that the cap and floor would have different gearing levels).

[36] Bayesian adjustments are sometimes made because the a priori expectation of an average equity beta value of 1 across the whole market is not observed. This adjustment corrects for part of this deviation.

[37] Depending on the data source used it may be necessary to remove non-trading days as these are ones (like Easter, Bank Holidays etc) when neither the share or the index is traded and consequently a spurious perfect correlation arises which can bias the results.

[38] Whether the impact of dividends is corrected for is a moot point. Technically they should be, but this is likely to account for four observations out of close to 500 over a two year period and so dividend corrections are often not made.

[39] For example, the Commission for Energy Regulation in Ireland and the Utility Regulator in Northern Ireland jointly publish an estimate of the WACC for the "best new entrant" generator as part of the capacity payment linked to the Single Electricity Market across the island of Ireland. This and other examples are discussed further later in this section.

Equity risk premium

The final element of the WACC that needs to be estimated is that of the ERP. As noted previously, this is an area where consistency with the general approach adopted by the regulator to other price determinations will be important.

Figure 6.6sets out a process by which the estimate can be derived. What will be important is ensuring that the right markets are chosen if multiple jurisdictions are under consideration. For example, with NEMO, is it the Belgium or Euro-zone ERP that is required? This will depend, in part, on the way in which the risk-free rate has been estimated and the more general availability of data.

Figure 6.6: Process to estimate the ERP

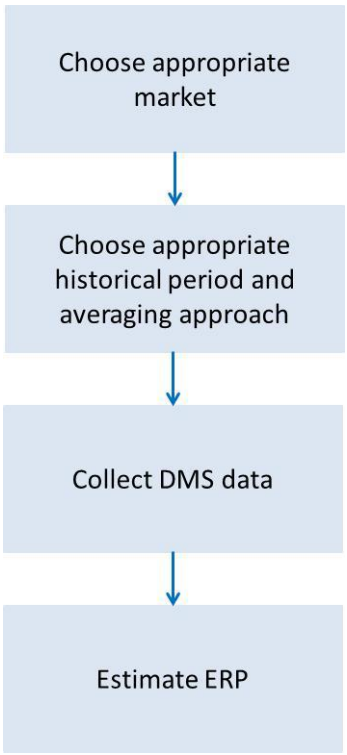


Table 6.5 below discusses the strengths and weaknesses of each of the options relating to the figure.

Table 6.5: Estimating the equity risk premium

Element	Option	Strength	Weakness
Market	Individual country	Reflects the requirements in the jurisdiction in which the investment is taking place	Data may be limited May not reflect the reality of the jurisdiction if it is part of a multi-country currency zone
	Europe	Reflects the euro-zone	Countries are different within this zone Consistency is needed to ensure that the right risk-free rate etc is being used
Approach	Own	Control over the time period and estimation approach	Data may be limited Significant debate over what approach to adopt to estimation
	Published	Use of a recognised dataset removes some of the debate about estimation approach etc Allows consistency with other decisions	Limited control over data used and approach
Averaging[40]	Arithmetic	Best estimate of the next year	Not appropriate if some form of mean reversion exists
	Geometric	Addresses any mean reversion concerns	Not appropriate if mean reversion does not exist
Period	Short	Captures existing market conditions	May not be consistent with time horizon and approach adopted by investors
	Long	Consistent with the long-term approach of equity investors	Does not quickly react to changes in market conditions Markets have changed significantly over time

Overall, our recommended approach is to use:

- DMS published data;
- calculated over the longest period possible; and
- an arithmetic average.

We do acknowledge that some other regulators may already have their own position on the relevant ERP value. If that is the case then our recommendation should obviously be replaced for that jurisdiction.

[40]It has been argued (Blume 1973) that the correct estimate is a weighted average of the two values with the weights depending on the length of the historic dataset used for the estimation and the investment period over which the estimate is being used. This tends to weight the average towards the arithmetic average.

Transaction costs

As outlined above, we believe that transaction costs should be incorporated into the RAB. The evidence for such costs is unlikely to change and consistency with other regulatory decisions are likely to be the most important consideration. Consequently, rates should be set and then only adjusted if new information becomes available.

Given that this regime should facilitate third party investment, transactions costs for both forms of finance need to be considered. For project finance, we believe the evidence presented by the UK National Audit Office is probably the most relevant when considering debt issuance costs. CEPA has previously advised Ofgem on equity issuance costs and nothing has happened since then to change our view of the appropriate costs.

6.3.3. Overall operational cost of capital

As discussed in Section 4.2.3, the overall operational cost of capital would be applied to all instances where the timing of cash flow is changed. This includes ensuring any cap and floor adjustments are made on an NPV neutral basis, as well as annuitising the revenue allowed under the cap and floor.

It is possible to argue that such timing changes should attract a lower return reflecting only the time value of money. In our view, however, the timing changes mentioned above would have material implications for overall volatility, the timing of investors' returns and the interconnector's performance against key credit ratios monitored by lenders and credit rating agencies. In addition, floor payments in particular cannot be considered riskless, since to receive an adjustment the developer must demonstrate that the revenue shortfall occurred due to factors outside its control.

We consider that an overall operational cost of capital should fall between the level of risk faced at the cap and the floor. This can be approximated by:

- theinvestment grade cost of debt (which is likely to be the same at the floor and the cap);
- a cost of equity that falls between that for onshore network investment and a peaking generator; and
- a level of gearing that falls between that for onshore network investment and a peaking generator.

In practice, refining this estimate any further would be a significant challenge given the lack of relevant comparators, and the lack of clarity around the precise nature of risk faced. We consider that a simple midpoint estimate is appropriate. Though it may be possible to argue for a higher or lower value, attempting to adjust the estimate would run the risk of introducing a source of bias into the calculation.

7. ESTIMATES AND ROBUSTNESS CHECKS

In this section we apply the general methodology developed in Section 6 to the specific case of the NEMO interconnector. It is intended as a demonstration of how the approach would work in practice, including any required adjustments to the mechanistic estimates that are produced.

It begins with Section 7.1, which sets out estimated parameters based on our proposed methodology. Section 7.2 then discusses and summarises discretionary adjustments, for example based on current market conditions. Finally, Section 7.3 presents the results of a high level analysis of financeability, including in particular an assessment of the need and appropriate level for a within-period financeability adjustment.

7.1. CEPA estimates

Using the processes set out in Section 6 we estimate the required WACC.

7.1.1. Floor

The calculation of the floor requires a:

- gearing appropriate for the floor regime;
- risk-free rate; and
- debt premium.

For NEMO each is required for both Great Britain and Belgium.

Gearing

Our starting point is the allowed level of gearing:

- from regulatory decisions for onshore and offshore; and
- consistent with an investment grade credit rating.

UK and Belgian regulatory decisions for onshore have focused on gearing levels of around 60% to 67% while OFTOs have a standard expected level of gearing of 85%.

We think the OFTO level is too high given the need for a buffer to cover financing costs in the event of very low revenues. So, we would expect a value closer to the onshore values to be chosen, but still accepting that some difference will arise because of the regime.

Our starting value for gearing at the floor is 60%. While this value might be considered a little conservative when compared to other values used by regulators (especially as this is focused on the operational phase of the project), we believe that the risk inherent in the regime is such that 60% is an appropriate value to employ. Given the differences in the corporate tax rates between the UK and Belgium we might expect a slightly higher level of gearing in Belgium. However, for the moment we will assume a single rate.

Risk free rate

Bloomberg provides an index of Government index-linked bonds with 10 years maturity, and it is this index that we focus on.[41] As at the beginning of December 2012 there were 19 index-linked UK Government bonds with a term to maturity of 10 years or more[42]. If an index were not available we would need to choose one of the specific bonds (or take an average of a subset of them).

These bonds have a range of remaining maturity (which is the focus rather than the term or maturity at issue) that ranges from 11 to 50 years. YTM data is available for the vast majority of these bonds and is summarised in Table 7.1.

In this table we report three possible short-term averages for the YTM, using ten, 20 and 40 days of data respectively[43]. As can be seen, there is a consistent trend in the YTM information with the longer maturity having a higher value than the shorter ones.

Table 7.1: UK index-linked Government bonds average YTM

ISIN/Code	Remaining term (years)	10 day average	20 day average	40 day average
Bloomberg Index	10	-0.816	-0.849	-0.825
EG6155006	10	-0.823	-0.856	-0.831
EJ4699082	11	N/A	N/A	N/A
EJ3889007	11	-0.547	-0.574	-0.544
ZZ2071996	13	-0.578	-0.588	-0.542
EF3722370	15	-0.311	-0.325	-0.286
EI8757755	16	-0.144	-0.158	-0.122
GG7133083	19	-0.203	-0.201	-0.159
EH6009185	20	-0.086	-0.090	-0.053
EI6849349	21	0.016	0.013	0.048
EG1963974	25	0.054	0.064	0.099
EC6107691	25	-0.017	-0.007	0.034
EI1164629	28	0.109	0.120	0.151
EH9048867	30	0.105	0.115	0.143
EJ2891202	31	0.176	0.184	0.212
EH0314151	35	0.153	0.163	0.190
EH9657204	37	0.169	0.180	0.207
EJ3730565	39	0.192	0.204	0.233
EF0936478	43	0.156	0.168	0.194
EI8446722	49	0.150	0.160	0.185

[41] Ticker is GUKGIN10 Index

[42] Using the ticker UKTI Corp on Bloomberg.

[43] All averages for the given period ending December 31st, 2012.

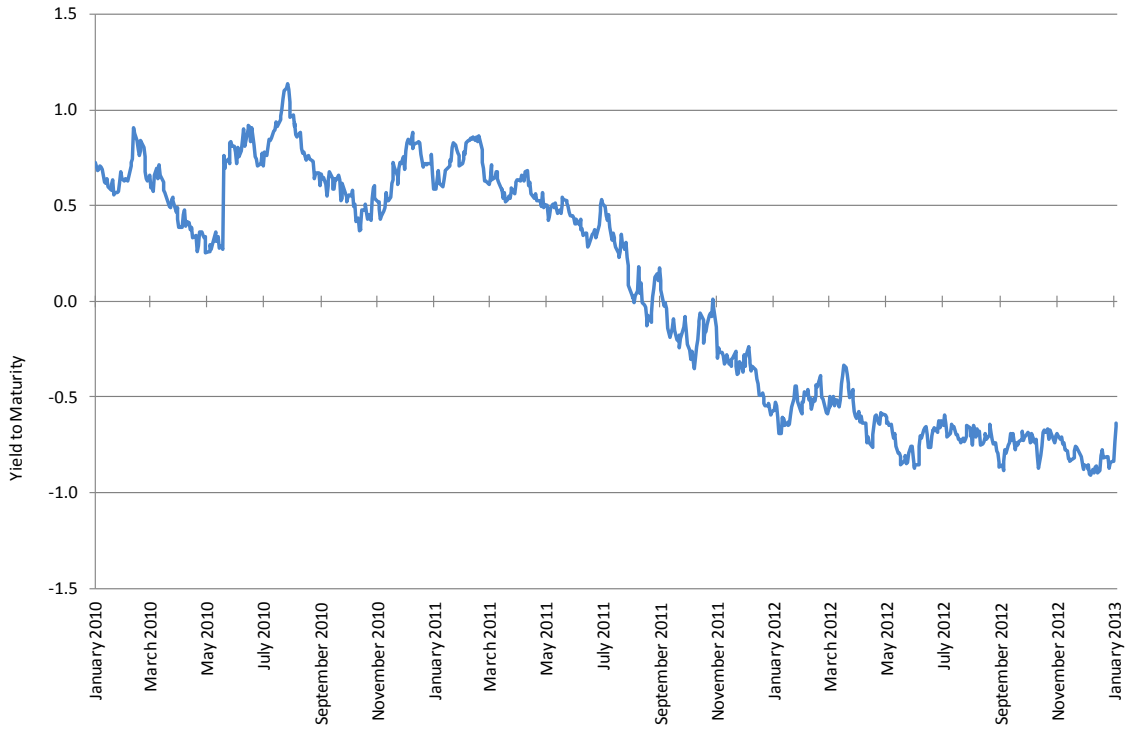
Table 7.2 summarises the information for those bonds with a remaining maturity of between 10 and 20 years. This is compared to the values for the Bloomberg index. As can be seen, the vast majority of the values are negative.

Table 7.2: Max and min YTM bonds remaining maturity 10-20 years

Code	10 day average	20 day average	40 day average
Bloomberg Index	-0.816	-0.849	-0.825
Min	-0.823	-0.856	-0.831
Max	-0.086	-0.090	-0.053

Figure 7.1 provides a graphical illustration of the daily YTM estimate for the last year for the Bloomberg index. This has been negative for the whole period and declining.

Figure 7.1: YTM over the last year of the UK Bloomberg 10 year index[44]



As of early December 2012, there are no index-linked Belgian government bonds with a term to maturity of ten years or more outstanding. However, similar data on nominal bonds is available, although the pool of bonds is much smaller than for the UK. Table 7.3 below provides information on the average YTM information for the three specific bonds and the Bloomberg index.[45]

[44] The YTM fell by around a further 30 bps in January 2013 on the news of the Office for National Statistics' decision regarding the RPI index. Our analysis is based on data to the end of 2012, and does not take this into account.

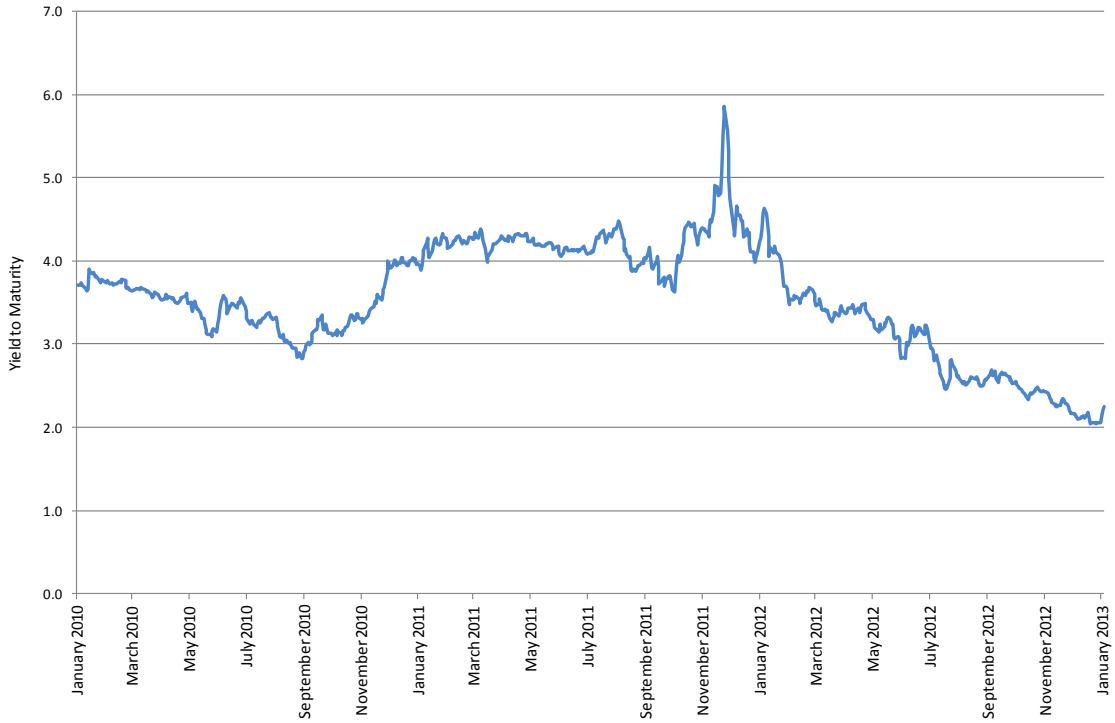
[45] All averages for the given period ending December 31st, 2012.

Table 7.3: Belgian Government nominal bonds average YTM

ISIN/Code	Remaining term (years)	10 day average	20 day average	40 day average
Bloomberg Index	10	2.05	2.08	2.13
GG7379504	11	2.52	2.56	2.64
EH6885329	17	1.15	1.18	1.25
GG7154089	71	N/A	N/A	N/A

Data was not available for one of the bonds and so we have two sets of specific bond YTM averages and the index information. Figure 7.2 provides a graphical illustration of the index YTM over the past year, which has been dropping steadily over the past year.

Figure 7.2: YTM on 10 year Belgium bonds



Since this is a nominal value, to find the real risk-free rate we need to subtract inflation from the estimate of the YTM. Over the longer-term, in the absence of data to the contrarywe assume that the target rate of Eurozone inflation is the best estimate available.[46] As such, we will subtract 2% from the average.[47],[48]

As such, the real averages are shown in Table 7.4.

[46] Ideally a market based, forward-looking estimate of long-term inflation expectations would be used, equivalent to the Bank of England's published inflation forecasts.

[47] Strictly speaking this is the upper limit of the Eurozone inflation target.

[48] We base this on historical information on Belgium's inflation rate. Belgium measures inflation using the harmonised index of consumer prices (HICP). HICP is a standardised measure of inflation across Europe and is thus relevant to the general debate on interconnectors. NRAs may consider alternative measures of inflation more appropriate.

Table 7.4: Belgian Government real bonds average YTM

ISIN/Code	Remaining term (years)	10 day average	20 day average	40 day average
Bloomberg Index	10	0.05	0.08	0.13
GG7379504	11	0.52	0.56	0.64
EH6885329	17	-0.85	-0.82	-0.75
GG7154089	71	N/A	N/A	N/A

This section has set out the steps involved in estimating the risk-free rate and then illustrated this through a consideration of the available UK and Belgian data. Our chosen approach is to use:

- the Bloomberg 10 year bond index YTM;
- the 20 days average; and
- a real value.

Table 7.5 summarises the real risk-free rates that arise from this calculation methodology.

Table 7.5: Estimates of the real risk-free rate to use in the WACC calculation

Country	Real risk-free rate
UK	-0.85%
Belgium	0.08%

Debt premium

The final element of the cost of debt is the debt premium. Figures 7.3 and 7.4overleaf provide information on general premia charged for long dated investment grade bonds in the UK.

To be conservative, we focus on the average BBB spot rate, which in the UKis about 200 basis points.The longest dated bonds have a slightly lower spread (reflecting the fact that the longest dated risk free rates are higher – or less negative – than the shorter-term ones).

All together this would suggest that a debt premium of 2% or a little higher would be appropriate. This is based on the most recent 20 days of data for consistency with the risk free rate calculation.

Figure 7.3: UK investment grade credit spreads on 10yr bonds

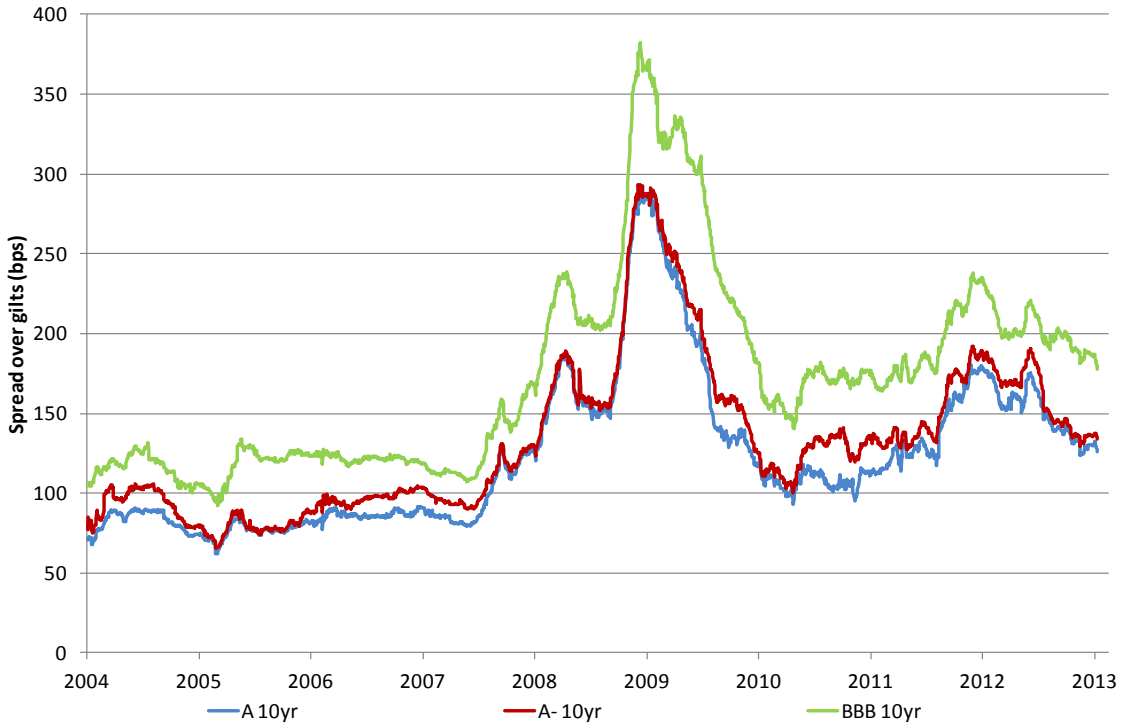
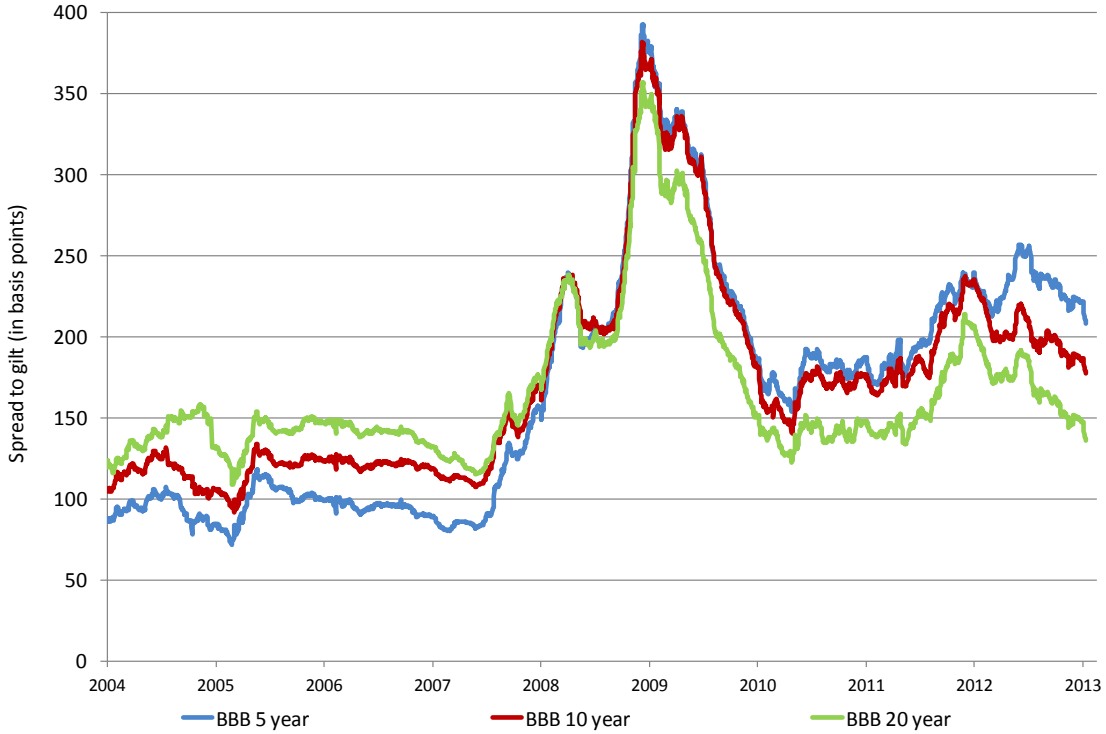


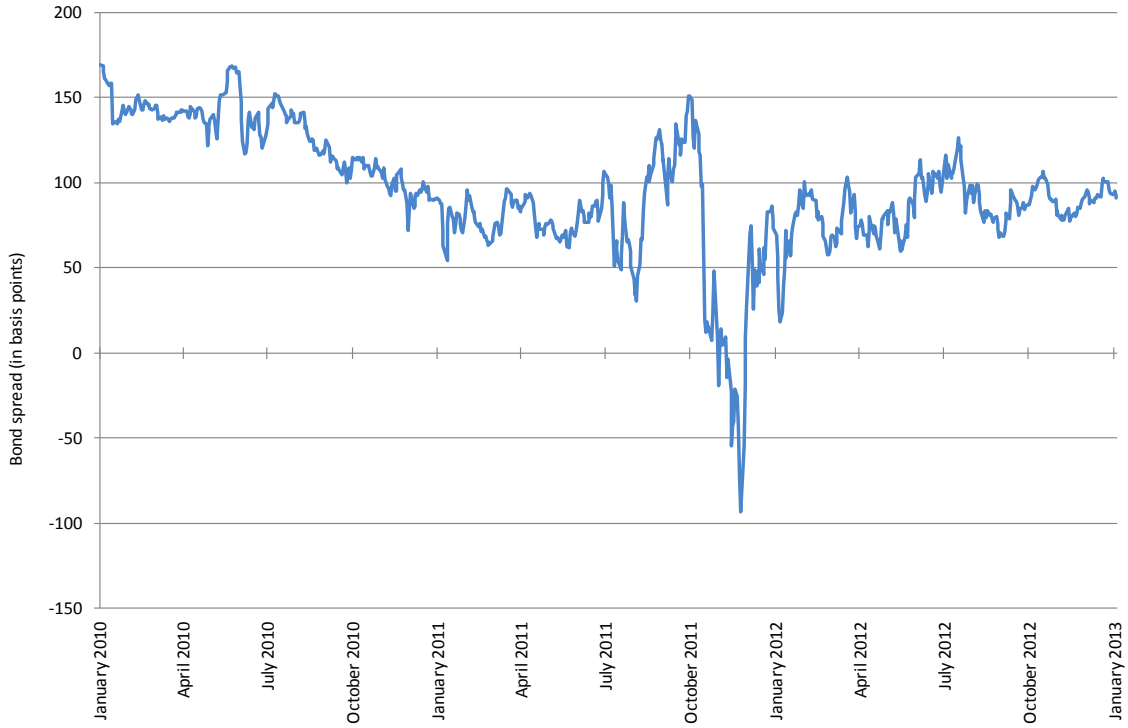
Figure 7.4: UK BBB-rated credit spreads by maturity



Source: Bank of England and Bloomberg

Our evidence for the Belgian debt premium is based on European corporate bond spreads over equivalent Belgian Government bonds. As for our GB evidence we have focused on BBB rated bonds of 10 year maturity. Figure 7.5 below summarises the recent data.

Figure 7.5: European BBB-rated 10y bond spreads over Belgian Government 10y bonds



Source: Bloomberg

This suggests a debt premium of around 100 bps over the past 20 days (the time period considered for the risk-free calculation).

Table 7.6 summarises the real debt premia that arise from this calculation methodology.

Table 7.6: Estimates of the debt premium to use in the WACC calculation

Country	Debt premium
UK	200 bps
Belgium	100 bps

Transaction costs

As noted in Section 6, rates for transaction costs should be set based on best available information and then only updated as new information becomes available.

The NAO 2010 report, *Financing PFI projects in the credit crisis and the Treasury's* response provides information on how commitment and arrangement fees have changed recently. A combined value of 2.5% of the loan amount would appear to be appropriate – this covers all fees including any swap fees.

CEPA's report for Ofgem on the cost of raising equity, noted earlier, provided evidence to support a 5% transaction cost. Finally, the more recent NAO report focusing on offshore

wind, *Offshore electricity transmission: a new model for delivering infrastructure*, suggest transaction costs of around 6% for the largest project considered.[49]

Given our position on equity financing of construction costs we recommend allowing:

- 5% on the full RAB for equity transaction costs; and
- 2.5% on 60% of the RAB for debt issuance.

In total this means a 6.5% uplift on the RAB. While we acknowledge that this looks high, it does cover:

- both equity raising and termination fees, important given the assumed 100% equity funding of the initial construction period; and
- only a single debt fee which means that the developer would be exposed to any refinancing transaction costs.

As noted elsewhere, if EIB funds are available for the construction phase then the 5% on 100% of the RAB would need to be revisited. This should be done on a case-by-case basis.

Summary

Our initial estimate of the allowed floor cost of debt is set out in Table 7.7 below.

Table 7.7 Estimate of the floor cost of debt

Element	Great Britain	Belgium	Average
Gearing	60%	60%	60%
Risk-free rate	-0.85%	0.08%	-0.39%
Debt premium	2.00%	1.00%	1.50%
Cost of debt	1.15%	1.08%	1.12%

So, our initial indicative calculation would suggest a weighted average real cost of debt of 1.12%. We acknowledge that this appears low and requires further attention, but also reflects the fact that current borrowing rates are low owing to quantitative easing. We return to this in the discretionary section.

[49] Transaction costs for the smaller projects were over 10%. However, the NAO noted that these values appeared particularly high, and that the costs for the Walney 1 site were a more appropriate target.

7.1.2. Cap

In this section we provide an initial first indicative estimate of the required return for the cap calculation.

The calculation of the cap requires a:

- gearing appropriate for the cap regime;
- risk-free rate;
- asset beta and equity beta for a peaking generating plant; and
- the ERP.

For NEMO each is required for both Great Britain and Belgium.

Gearing

Unlike the floor, when determining an appropriate level of gearing for the cap, our starting point would be the allowed level of gearing:

- from generating companies; and
- consistent with an investment grade credit rating.

Generators, unless supported through instruments like contracts-for-difference (CfDs) or long-term contracts, tend to have lower levels of gearing than transmission companies. This is supported by the Brattle work for NorNed which recommended values of between 30% and 40%[50].

Our starting value for gearing at the cap is 40%, at the upper end of the range for generators given the ability of transmission companies to sustain higher levels of gearing. Given the differences in the corporate tax rates between the UK and Belgium we might expect a slightly higher level of gearing in Belgium. However, for the moment we will assume a single rate.

Risk free rate

As noted earlier, a longer-term measure of the risk-free rate is appropriate when estimating the cost of equity. Table 7.8 below provides evidence on UK regulatory decisions.

[50]Brattle, *The cost of capital for the Nor-Ned cable*, June 2004.

Table 7.8: Recent regulators' assessments of the risk free rate

Regulator	Decision	Risk-free rate
NIAUR	NIE T&D proposals (2012-2017)	2.0%
Ofcom	Mobile calls (2011-2015)	1.5%
Ofgem	RIIO-GD1 & RIIO-T1 (2013-21)*	2.0%
CC	Bristol Water (2010-2015)	1.0% – 2.0%
Ofgem	Electricity distribution (2011-2015)	2.0%
Ofwat	Water & sewerage (2011-2015)	2.0%
CAA/CC	Stansted airport (2009-2014)	2.0%
CAA/CC	Heathrow airport (2009-2014)	2.5%
CAA/CC	Gatwick airport (2009-2014)	2.5%

Source: Regulatory determinations. Rates presented are before the addition of any 'uplifts'. Note, the GD1 and T1 determinations are strictly draft determinations as at September 2012.

We base our view of the Belgian risk free rate on the longer term average of nominal Belgian Government 10 year bond yields of 3.15%. As for the risk free rate as part of the floor calculation we deflate this by 2%– the Eurozone inflation target rate – to reach a real estimate.

Based on this information we would argue for the following risk-free rates:

- UK 2%; and
- Belgium 1.15%.

Asset and equity betas

As an example of how to calculate an appropriate comparator consider the following information on Drax. While this may not be a perfect comparator it is a pure generator stock. Further, since it is primarily a single project stock (some limited renewables investment is also being undertaken by the company) issues around construction risk are not relevant as the beta value is forward looking and so captures operational risk. It should be noted that Drax is rated BB and so greater risk than our benchmark, but since we are focused on equity here not debt that should not be an issue.

Figure 7.6 provides information on the share price of Drax and the FTSE100[51]. This was used to calculate the returns that are then used in Figure 7.7 which is the rolling two year equity beta[52].

[51] As of January 2013, Drax is a constituent of the FTSE250 index. However, here we are taking the standard approach of using the FTSE100 index as a proxy for market returns.

[52] Our standard approach is to consider two year rolling betas, i.e. those using a rolling two year window of data. We acknowledge that five year betas are also often used.

Figure 7.6: Drax and FTSE100 share prices (rebased to Jan 2010=100)

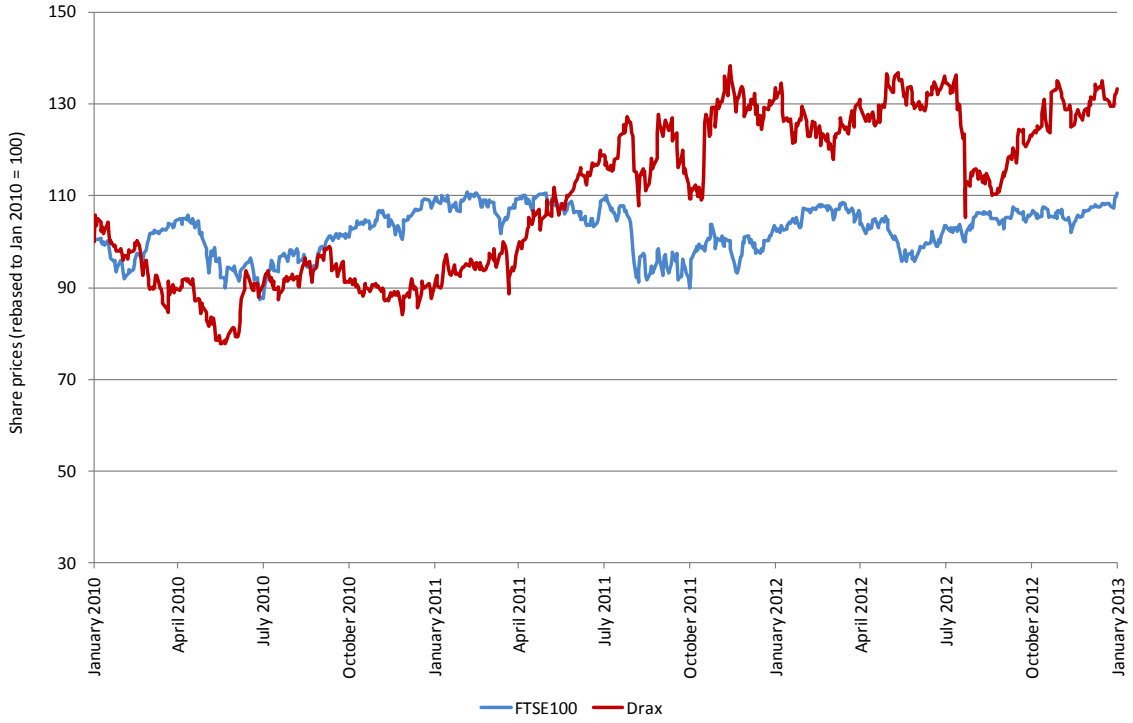
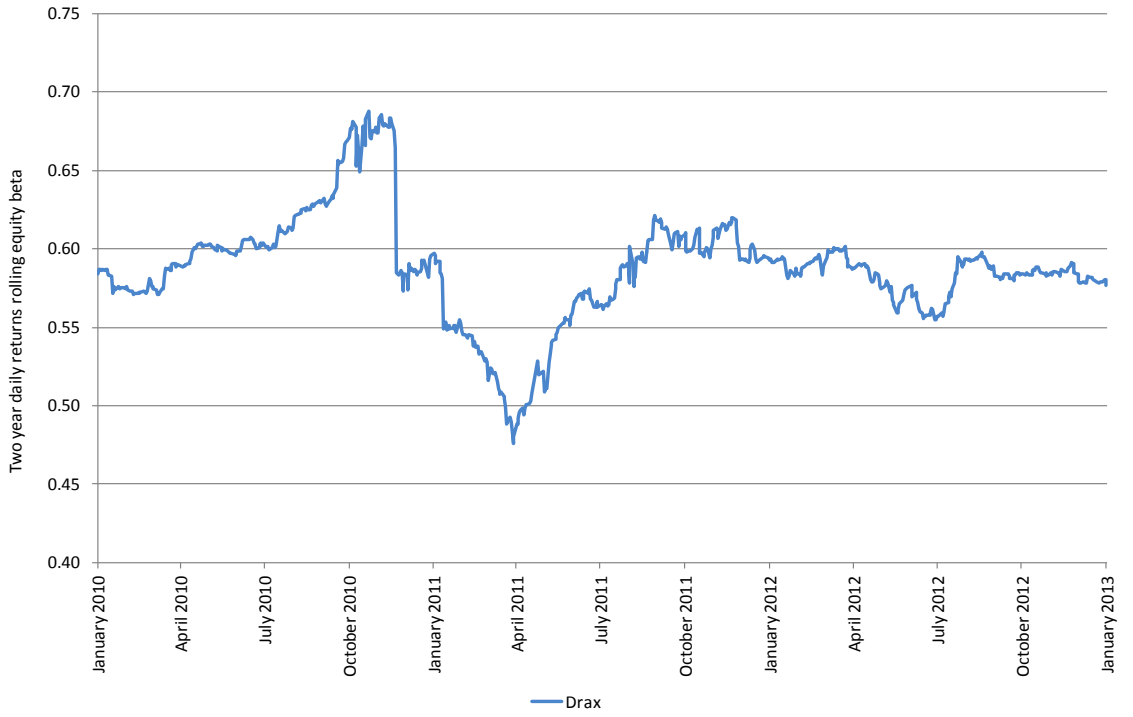


Figure 7.7: Drax two year daily returns rolling equity beta



Using financial accounts information from Bloomberg plus market value information it is possible to then estimate the asset beta. For much of this time Drax has had negative gearing, i.e. it had more cash and short term investments than loans. This means that the asset beta is higher than the equity beta – a value of 0.64 over the period since 2010.

To check this information we then considered further public domain information on equity and asset betas for generation companies, including data from Grant Thornton as part of the earlier OFTO IDC calculation[53]. This is reproduced in Figure 7.8 below.

Figure 7.8: Asset betas – Grant Thornton data

	31/12/2010		31/12/2009	
	2 years	5 years	2 years	5 years
TRADITIONAL ENERGY				
Centrica	0.33	0.29	0.37	0.27
E.On	0.50	0.77	0.72	0.89
RWE	0.57	0.49	0.62	0.59
SSE	0.13	0.37	0.47	0.43
Statoil	0.68	0.74	0.84	0.48
Average	**0.44**	**0.53**	**0.60**	**0.53**
RENEWABLE ENERGY				
Nordex	1.30	1.57	1.74	2.39
Gamesa	1.30	1.61	1.71	1.93
Repower	0.09	0.32	0.37	0.44
Vestas Wind	0.92	1.77	1.94	2.09
Iberdrola Renovables	0.32	0.57	0.94	2.06
Terna Energy SA	-	-	0.89	0.38
Average	**0.65**	**0.97**	**1.27**	**1.55**
ELECTRICITY TRANSMISSION				
Terna	0.14	0.25	0.20	0.25
Red Electrica	0.40	0.44	0.33	0.45
ITC Holdings	0.61	0.57	0.59	0.58
National Grid	0.20	0.22	0.23	0.18
Average	**0.34**	**0.37**	**0.34**	**0.36**

Source: Thomson Reuters DataStream and Grant Thornton analysis

Based on the values above, 0.6 to 0.7 is not an inappropriate level for the asset beta. This captures the Drax figure as well as the average renewable energy asset beta and some of the traditional energy companies that are also significantly active in generation. Given this we will use the 0.64 from Drax to illustrate the approach. With this we would find an equity beta of 1.07 (given the 40% gearing which, as noted earlier, is significantly higher than the actual gearing at Drax).

Based on this range of evidence, our first initial indicative estimate of the cap equity beta is 1.07 for both the UK and Belgium.

[53] Grant Thornton, *Interest during construction for offshore transmission assets*, 2011.

ERP

The most recent data from DMS is provided in Table 7.9 below.

Table 7.9: Premium against bonds

Country	Arithmetic Mean (% p.a.)	Geometric Mean (% p.a.)
UK (1900-2011)	5.0%	3.6%
Belgium	4.7%	
CREG	3.5%	-

Source: Dimson, Marsh & Staunton (2012) Credit Suisse Global Investment Returns Sourcebook 2012

While we believe the DMS numbers are appropriate, since CREG has used an alternative estimate of the ERP in the past, this has been included as a reference point. This may be one of the points where NRA data is used to replace the mechanistic calculation.

Transaction costs

The same numbers as provided in the floor discussion above should be utilised.

Summary

Our initial estimate of the allowed floor cost of debt is set out in Table 7.10 below.

Table 7.10: Estimate of the cap cost of equity

Element	Great Britain	Belgium	Average
Gearing	40%	40%	40%
Risk-free rate	2.00%	1.20%	0.60%
Asset beta	0.64	0.64	0.62
Equity beta	1.07	1.07	1.07
ERP	5.00%	4.70%	4.85%
Cost of equity	7.33%	6.16%	6.75%

This gives a cost of equity at the cap of6.75% post-tax. This is high when compared to traditional regulated utility allowed figures (which tend to be around 6.5% to 7% and at higher levels of gearing). However, this value does feel a little low when thinking about the general level of risk being faced by the interconnector at the cap. However, since there is a floor being provided and the cap rate is being applied to the whole RAB, on balance we think this value is appropriate.

7.1.3. Operational phase WACC

As discussed in Section 4.2.3, we consider it appropriate to apply a single WACC to calculations applying in the operational phase (other than calculation of allowed returns at the cap and floor). These include the annuitisation calculations and the calculation of NPV-neutral adjustments.

This operational phase WACC should lie between the implied WACC at the cap and floor. This is different to the cost of capital applied at the cap and floor –a cost of equity and a cost of debt respectively. Hence it requires a small amount of additional information.

This calculation requires some new inputs. For the cost of debt, we assume that for a given credit rating the floor and cap debt costs will be broadly equal. The main question then is the time horizon over which to calculate the risk free rate estimate. Given the purpose to which the operational WACC is applied – effecting NPV neutral adjustments to revenue whenever required over the course of the regime – we consider that a longer term view is required. The developer will have to manage its cashflow (including volatility resulting from the difference in timing between the calculation of adjustments and subsequent payments) and finance its activities on an ongoing basis. Its financial structure may therefore vary over time. The resulting estimate is consequently different to that used in the floor calculation.

We also need to calculate a cost of equity corresponding to the floor. Based on our analysis of relative risk in Section 5.2, this should broadly reflect the cost of equity for a regulated onshore network. We have based our view of the GB cost of equity on the lower end of the range of Ofgem's recent proposals for gas distribution and transmission, taking into consideration the importance of capex intensity in the higher estimates. For the Belgian cost of equity, we have applied our interpretation of CREG's standard methodology.

Table 7.11 summarises the basis on which we make the calculation. Each figure shown in the table represents the midpoint between our GB and Belgian estimate.

Table 7.11:Inputs to operational WACC

Element	Floor	Cap	Midpoint
Gearing	60%	40%	50%
Cost of debt	3.2%	3.2%	3.2%
Cost of equity	5.9%	6.8%	6.3%
WACC	4.3%	5.3%	4.7%

Table 7.11 reports an operational WACC estimate of 4.7% based on the simple midpoint between the cap and the floor. In our view this is appropriate, albeit that we recognise it is a simplification. It may be possible to argue that a value other than the midpoint could be used. However, it is not clear precisely how and on what basis any adjustment would be made. For transparency, therefore, we retain the midpoint estimate.

7.1.4. Interest during construction

The final mechanistic calculation that is needed is that of the IDC. As explained in Section 6, our estimate for this is based on a 100% equity financed construction company which is then adjusted for a 20% chance of RoUC (see Table 7.12 below). Since the construction company is 100% equity funded the equity and asset betas are the same. The application of RoUC does not lead to double counting in this case as the construction company's beta value only reflects market risk while the RoUC captures both diversifiable and non-diversifiable risk that would not be reflected in the beta value and which if not separately remunerated would mean this class of asset would never be able to earn its required rate of

return. The macro-economic aspects of the calculation – the risk-free rate and ERP – are the same as those used for the cap cost of equity set out in Table 7.10 above. All these elements are explained in more detail in Annex A.

Table 7.12: Real vanilla IDC estimate

Calculation	UK	Belgium	Average
Unadjusted cost of equity	5.10%	4.06%	4.58%
Adjusted cost of equity	6.88%	5.58%	6.23%

Given this information our estimate of the mid-point is 6.2%, significantly above the 4.7% mid-point for the operational phase, reflecting the greater risk faced by a developer during construction.[54]

7.2. Discretionary factors

In this section we summarise the use of discretion in arriving at the estimates above. This section is not intended to be an exhaustive list of possible discretionary factors – in every case, it will be necessary to rely on judgement, and the list of factors is likely to vary over time.In general, however, adjustment may be made to correct for data that is unrepresentative, since:

- present economic or market conditions (and data sources)may not reflect those that are likely to prevail during the regime; or
- direct data on parameters may be unavailable.

We discuss the extent to which such adjustments have been necessary (and the extent to which further adjustments could be considered) in the case of the NEMO interconnector.

Adjustments for prevailing conditions

The key building block that has recently been affected by changes in prevailing conditions is the risk-free rate. In the UK, in particular, benchmark gilt yields have been significantly depressed by the Bank of England's quantitative easing policy in response to the recent financial crisis. Nominal yields have shown a persistent negative trend, and real yields are currently negative.

Our response to this differs for the cost of debt and the cost of equity:

- For the cost of debt, we consider it appropriate to base our estimate on recent spot rates. This is because in the context of a single, one-off investment, a single debt issuance is likely to be required. This issuance is likely to reflect current low risk-free rates. However, we consider below a cross-check against alternative spot rates below to test whether in practice raising debt at such levels is feasible.

[54] Care should be made when comparing the 6.2% with the existing OFTO IDC of 8.5%. Our calculation is a real post-tax value while the OFTO IDC is nominal pre-tax. When placed on a similar calculation basis our estimate of IDC is significantly higher than the OFTO allowed 8.5%.

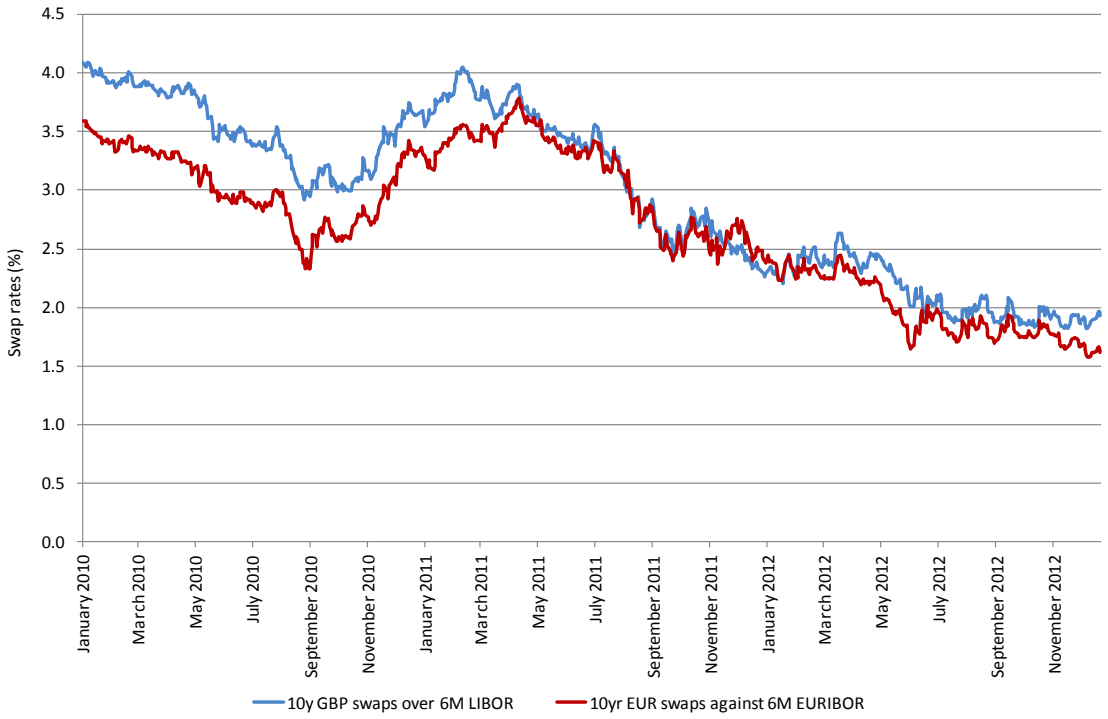
- For the cost of equity, our view is that a forward-looking estimate is required. The cost of equityis a reference point for equity investors over the course of the project life, since retained earnings are effectively fresh equity injections. Although for a one-off debt issuance the payments (and therefore the cost of debt) are known in advance, the timing and level of returns on equity are subject to uncertainty. Finally, we note that required total market returns (i.e. the sum of the risk free rate and the ERP) are widely considered to be relatively stable, even if estimates of the individual components are not.We consider that the estimates summarised in Section 7.1.2 make an appropriate allowance for prevailing conditions.[55]

Floating to fixed swap rates in the interbank lending market provide an alternative view of underlying debt costs. As for the gilt-based estimate, we recommend calculating swap rates in a mechanistic way. Our approach has been to consider as a cross-check:

- variable to fixed swaps with long maturities (10 years);
- swaps based on the LIBOR 6M index for the GB estimate; and
- swaps based on the EURIBOR 6M index for the Belgian estimate.[56]

Based on the evidence we have seen, swap rates have followed a very similar trend to government bond yields in recent years. Figure 7.9 below shows the trend since 2008 for the two indices. Each has fallen to just below 2%, which corresponds to around -0.60% in real terms for GB and -0.35% in real terms for Belgium

Figure 7.9: Variable to fixed swap rates for LIBOR and EURIBOR



[55]We would have used a similar approach in the context of an entity more like an onshore network – in which debt is likely to be rolled over throughout the course of the regime life (or price control period).

[56] We consider 10 year maturities for consistency with other elements of our calculations. Our understanding is that 6M swaps are a common benchmark for corporates.

Adjusted for inflation expectations over the next 10 years, the figure for GB is very close to our estimate of the risk free rate based on UK Government ILGs (-0.85%). We do not consider the difference to be material in this case. For Belgium, the nominal swaps-based rate (1.65%) is appreciably lower than the rate based on Belgian Government bonds (2.08%). In each case it appears that raising debt at our estimated rates is feasible.

Given prevailing conditions, we consider the main risk to be an estimate that is too low, based on government bond yields that are depressed due to monetary policy actions. Evidence from swap rates, though it may suggest that in Belgium a lower rate still may be feasible, is more difficult to interpret than evidence from government bond yields. Such data does not constitute a formally reported index. This suggests an estimate based on Belgian Government bonds is appropriate, and so we do not make any adjustment to our mechanistic estimate.

We also consider alternative evidence for the debt premium, based on regulatory decisions and a cross-check against data on the total cost of debt.

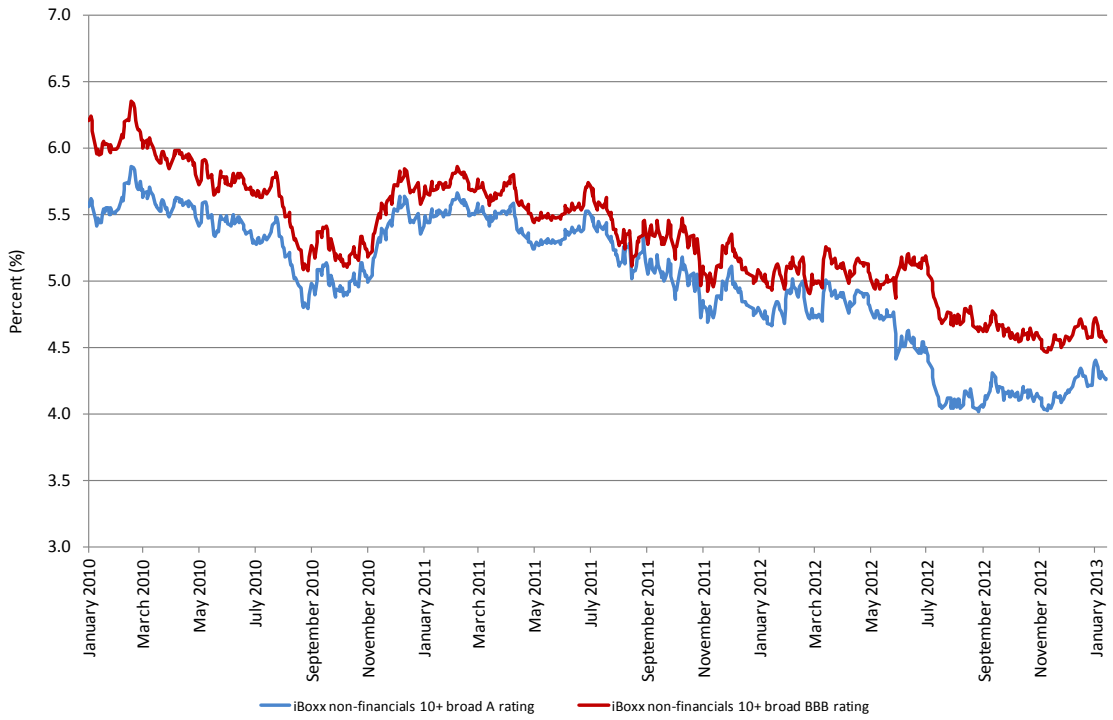
Table 7.13 summarises some of the recent UK regulatory decisions on the appropriate debt premium. It must be remembered that these rates are being used in conjunction with higher risk free rates than current spot rates, and while part of this reflects the uncertainty over future rates,it also reflects an averaging between the two elements.Consequently these rates are lower than the spot rates discussed in Section 7.1.1 above.

Table 7.13: Recent regulators' assessments of the debt premium

Regulator	Decision	Debt premium
Ofcom	Wholesale mobile calls (2011-2015)	1.5%
CC	Bristol Water (2010-2015)	1.9%
Ofgem	Electricity distribution (2011-2015)	1.6%
Ofwat	Water & sewerage (2011-2015)	1.6%
CAR	DAA (2010-2014)	1.6%

Figure 7.10 provides a reality check on UK data by considering the all in cost of debt for investment grade issues, as used by Ofgem in its onshore determinations. This provides a spot value a little in excess of 2%.

Figure 7.10: iBoxx non-financial A-rated and BBB-rated 10+yr cost of debt indices



Source: Ofgem.

Our mechanistic estimate of the debt premium combined with our estimate of the risk free rate suggests a real cost of debt of only around 1.2%. It is not clear that this really captures all the project finance risk associated with this approach, and indeed the iBoxx data above suggests a rate closer to 2%[57]. The NAO in its 2010 report provided data from KPMG suggesting that a spread over the swap rate of between 240 and 260 basis points was seen for Private Finance Initiative(PFI) projects, and the evidence used by Ofgem in its onshore determinations also suggests a higher figure would be appropriate. In the 2012 report on offshore transmission the NAO reported a spread of around 210 to 220 basis points. It did, however, also note that these spreads may have been depressed due to the use of EIB funding. Consequently we recommend a value above the current spot rate of 250 basis points. Similarly, our understanding is that in its most recent price control decision CREG used a value above the current European spot rate of 170 basis points.

Finally, prevailing conditions arguably also affect the ERP. In this case it is necessary to make a judgement as to whether changes in the DMS estimates represent updates based on latest available information, or short term deviations from the underlying value. This is an application of the 'signal-noise' problem discussed in Section 3.4.

Our view here is that although there is likely to be a cyclical component to ERP estimates based on historical data, in general the longer term evidence is most credible. Though it may be possible to consider moving away from this (for example based on alternative theoretical approaches), such an approach risks being arbitrary. It is not clear that such adjustments would improve the quality of the estimate in relation to this building block.

[57] There are a number of differences between the Bloomberg index used in Section 7.1.1 and the iBoxx data. In particular, the iBoxx data focuses on non-financials and includes data for bonds with maturity greater than 10 years. We consider it an important cross-check, alongside the other sources presented in this section.

Adjustments for lack of data

As noted throughout this report, a key difficulty encountered in estimating required returns for an interconnector is that no independently listed interconnector exists. Risk must therefore be assessed indirectly, through data on comparators. This in turn generates obstacles, since the proposed cap and floor regime is highly specific. It is therefore possible that data on either the cost of debt or the cost of equity would need to be adjusted in order to be relevant to this case.

For the cost of debt, this issue can in some cases be secondary. Assuming the overall regime design is consistent with targeting an investment grade credit rating, the relevant debt premium can be estimated with reasonable accuracy. Hence our conclusions in relation to the debt premium might primarily concern the extent to which regime design might prove an obstacle to the targeted rating. In this case, however, a range of data sources were available on the appropriate debt premium. Our estimate therefore also reflects a view of which source is most credible. It also takes into consideration that the cost of an estimate that is too high may be less significant than those of an estimate that is too low.

For the cost of equity, this issue is central to our analysis. Our approach is based in the first instance on a qualitative assessment of relative risk. Where this indicates that suitable comparators exist, data for those comparators might be used without adjustment. Otherwise, an adjustment may need to be made – but only in instances where the direction and scale of that adjustment is very clear.

In this case we have not made any adjustment. This is not necessarily because the available comparators are perfect indicators of risk at the cap or floor. As concluded in Section 5.2, there are some differences in risk between an interconnector operating around the cap and the peaking generator that represents the closest available comparator. Furthermore, data on pure peaking generators is not available.However, despite these potential differences, it is not obvious that our estimate would be improved by an adjustment. As a result, in this case we conclude that the transparency of basing our estimate on specified comparator data is the more important factor.

Summary of adjustments

For the cost of equity feeding into the cap, in this case we make no discretionary adjustments. For the cost of debt feeding into the floor, however, we have considered changes to both the GB and Belgium debt premium. The resulting final cost of debt estimate is presented in Table 7.14 below (for comparison the mechanistic estimates are provided in Table 7.7 above).

Table 7.14: Adjusted estimate of the floor cost of debt

Element	Great Britain	Belgium	Average
Gearing	60%	60%	60%
Risk-free rate	-0.85%	0.08%	-0.39%
Debt premium	2.50%	1.70%	1.50%
Cost of debt	1.65%	1.78%	1.72%

The changes reflected in Table 7.14 above are:

- an increase in the GB debt premium from 200 bps to 250 bps, based on the NAO reports and evidence on the all in cost of debt; and
- an increase in the Belgium debt premium from 100 bps to 170 bps, based onCREG's most recent debt premium allowance

The combined impact is to increase the average cost of debt from 1.12% to 1.72%.

7.3. Financeability analysis

Our proposed approach to this point has considered:

- mechanistic estimates for each parameter based on our proposed methodology; and
- discretionary adjustments to parameters based on cross-checks and wider evidence.

In this section we summarise the results of the final step in our analysis, which is to assess the consistency of the resulting estimates with the NRAs' need to ensure that an efficient notional developer could finance its operations.In particular, we assess the need for an additional, within-period financeability adjustment.

We have considered the following options:

- no adjustment;
- an adjustment based on the notional cost of debt applied to the notional debt-financed portion of the RAB; and
- an adjustment based on the notional cost of debt uplifted to reflect interest cover requirements and applied to the actual debt-financed portion of the RAB.

In both the second and third options we assume that an allowance is made for opex and for depreciation of the debt-financed portion of the RAB. An alternative would be to include no depreciation charge in the financeability adjustment. This is because the financeability adjustment is designed primarily to address short term cash flow pressure; depreciation is not a cash flow element. Debt repayment is a cash flow element, however, and one that is likely to be significant for project finance type financial structures in particular. Since one of the NRAs' objectives is to facilitate investment by a range of developers (and not just existing TSOs) through a range of structures, an element of depreciation is included in order to defray any debt repayments and allow a smaller contingency fund to be held by the developer.

Two options exist for the timing of payments under the financeability adjustment:

- payment is made on an ex ante basis each year; or
- payment is triggered if the actual revenue fails to meet the minimum level, with actual recovery occurring two years later (as per the working assumption for the timing of true-up payments; this allows accurate, audited figures to be used in calculating the required adjustment).

The former approach is simple and leads to less volatility in network charges for consumers, but means that the operator may be over-recovering. We therefore propose the latter approach, with a trigger determining the need for the payment. Payments will be made on an NPV neutral basis.

This will introduce some volatility into network charges but minimises the risk of consumers paying when it is not necessary. It means that the operator will still need a contingency fund to cover the within year costs, but this will be smaller than the contingency required if only the five year assessments are considered.

Determining the appropriate magnitude of adjustment is a question of judgement. It should balance the NRAs' objective of infrequent adjustments with the need to facilitate financeability. Our conclusions are as follows:

- With no adjustment the developer would have little to no resilience to sustained low revenues or outages.This may cause the notional developer to fail the break-even test element of its credit rating assessment.
- A minimal adjustment (covering base costs, depreciation and the cost of debt on notional debt) provides a significant degree of additional security in the case of outages and very low revenues, except in exceptional circumstances (such as a year-long outage).
- A stronger financeability adjustment appears to provide limited additional resilience. We therefore see no reason to advocate a financeability adjustment any stronger than the "minimal adjustment" described above.

Based on our analysis, weconsider that an appropriate within period financeability adjustment would be based on applying the cost of debt to the notional opening debt.

The question then is whether an appropriate degree of balance is reached. The issue of low cover ratios in individual years appears to us likely to be a challenge. Although the challenges may be somewhat greater under a more highly leveraged project finance structure, in our view they do not appear insurmountable – provided the developer is willing to access additional sources of finance in extreme circumstances. In our view such a requirement is appropriate. The financeability adjustment ensures that an efficient developer would need to access additional finance only on a short term basis. An efficient developer, that suffers low revenue due to factors outside its control, can predict with confidence the future revenue adjustments that would follow periods of low revenue. It does not, however, transfer cash flow risk away from the developer entirely, which is consistent with the basis on which we have assessed risk.

8. CONCLUSIONS

Our key conclusions are set out in the detailed estimation approach in Section 7. In this section, we simply: highlight the main, high level methodology recommendations; summarise our main suggestions regarding overall regime design; and list the next steps in the project.

8.1. Summary of recommendations

Our detailed recommendations are contained in the detailed sections on our methodology (Section 6) and resulting estimates (Section 7). We do not replicate these here.

To summarise, the key features of our recommendations are:

- cost of capital allowances at the cap and floor based on separate assessments of risk;
- an initial mechanistic calculation, adjusted where appropriate based on discretionary factors; and
- separate allowances for the construction and operational phases.

Our analysis suggests these estimates would facilitate the use of a range of financing structures – although based on our financeability analysis the use of highly geared project finance structures may be a greater challenge.

In general, we would expect these estimates to be applied to a cost base (in particular a RAB) based on a detailed assessment of economically efficient costs. In addition, Section 8.2 summarises further aspects of regime design that we consider underpin our recommendations.

8.2. Regime design

Our key suggestions regarding regime design include:

- *Adjustment periods and periodic adjustments.* The working assumption of an annual adjustment to cover debt service costs at a minimum is essential. A five year true-up would likely be insufficient to support an investment grade credit rating.
- *Mechanics of adjustments.*It is important to be careful to ensure NPV neutrality in adjustments. We have assumed each 5 year period is translated into an NPV neutral overall quantity. This means timing of both adjustments and interconnector revenue matters – i.e. £100m of revenue earlier in the period is weighted more heavily than later. Note that the NPV adjustment for delay in payments means the modelled credit metrics may appear to perform 'better' in a lower revenue scenario. It is important to emphasise that this adjustment (and the other NPV neutral adjustments) partly reflects the risk resulting from the developer's need to demonstrate revenue shortfall out of its control.

- *Performance bond.*In our view the annuitised revenue profile means that developers would continue to face an incentive the keep the interconnector operational throughout the regime. As a result a performance bond should not be required.
- *Asset lives and decommissioning.* The key point is that the regime should, ex ante, be neutral. There are various options for what happens at Year 25, but (a) these are likely to be resolved in advance, e.g. in Year 15, rather than left open as a potential risk, and (b) under no option should the developer expect either to face uneconomic costs or to get 'something for nothing'.
- *Availability incentive.*Our understanding is that the proposed availability incentive is intended to be an additional incentive. We interpret this as meaning it should provide some financial reward based on availability for a developer earning revenues close to the cap, but should not fundamentally interfere with financeability. Our modelling suggests an incentive that adjusts the cap by 4% per percentage point shortfall in availability, up to a maximum of 10% of revenue, achieves such an objective.

ANNEX A: INTEREST DURING CONSTRUCTION

An issue that needs to be considered is the way in which the risk associated with construction of the interconnector is handled. There are two possible approaches, use:

- the IDC rate that is employed by Ofgem for the OFTOs (currently 8.5% - nominal pre-tax); or
- a rate specific to interconnectors.

Before deciding between the two options it is worth considering:

- the basis on which Ofgem's existing IDC was calculated; and
- how the second approach could be implemented.

A.1. Ofgem's existing IDC

In its October 2011 IDC final decision Ofgem determined that the appropriate rate was 8.5% (nominal, pre-tax). This was based on a July 2011 consultation that used work prepared for Ofgem by Grant Thornton (March 2011) and published on the Ofgem website.

The range determined by Grant Thornton was based on:

- CAPM;
- the cash-flows associated with OFTOs; and
- developers of OFTOs and appropriate comparators.

The key elements are:

- a risk-free rate based on two year average yields on 10 year bonds and five year average yields on 20 year bonds;
- debt premia based on the yield on A rated corporate bonds of more than 15 years maturity (data from 2009-2010);
- market risk premium of 4.5% based on the 1900-2010 value from DMS;
- asset betas based on traditional energy, transmission and renewable generation companies, considering two to five years worth of data. Note that the range of 0.4 to 0.6 excludes the higher results found from renewable generation;
- gearing (defined as D/E) ranged from 0.2 to 0.5 and was based on the results of the traditional energy companies and in this case is higher than values found for renewable generation; and
- a tax rate of 28%.

Figure A.1 below summarises the estimate used by Grant Thornton.

Figure A.1: Grant Thornton estimate

WACC Computation	Low	High	Reference
Risk free rate (real)	1.27%	1.85%	note 1
Risk free rate (nominal)	3.80%	4.40%	Table 4.1
Market premium	4.50%	4.50%	Section 4.3
Asset beta	0.40	0.60	Table 4.3
Equity beta	0.54	0.69	Appendix B
Cost of Equity	**6.2%**	**7.5%**	
Risk free rate (nominal)	3.80%	4.40%	Table 4.1
Debt premium	1.50%	1.80%	Table 4.2
Cost of debt before tax	**5.3%**	**6.2%**	
Tax rate	28.0%	28.0%	Section 4.4
After tax cost of debt	**3.8%**	**4.5%**	
Industry indebtedness (D/(D+E))	33.3%	16.7%	
Industry gearing (D/E)	50.0%	20.0%	Section 4.3
Post-tax WACC	**5.4%**	**7.0%**	
Vanilla WACC	**5.9%**	**7.3%**	
Pre-tax WACC	**7.6%**	**9.7%**	

note 1: Assuming long term inflation rate of 2.5% per annum

Source: Grant Thornton analysis, Ofgem, Reuters

Grant Thornton also provided a comparison with other estimates of WACC, summarised in Figure A.2.

Figure A.2: Other estimates of relevant WACCs

Model	Type of WACC[3]	Source	Range	Comparable IDC*	Comment
Regulated markets[4]	Post-tax nominal	National Infrastructure Plan, Table A.1	4.2% to 6.9%	5.4% to 7.0%	Includes allowance for construction risk
Availability based payment[5]	Vanilla WACC	National Infrastructure Plan	5.9% to 7.7%	5.9% to 7.3%	OFTOs receive an availability based payment
Offshore wind hurdle rates (R1/R2)	Equivalent to Vanilla WACC	Electricity Market Reform Consultation	10.1% to 11.2%	5.9% to 7.3%	Reflects construction risk, price risk and volume risk

* This is the most comparable estimate of the recommended TR2A WACC from Table 5.2

While we agree with the use of CAPM as the starting point for this calculation there are some issues that we believe further investigation, specifically:[58]

- whether CAPM adequately captures the risk during construction; and
- the capital structure and asset beta of the company during construction and whether the values used reflect the portfolio effect of traditional energy and transmission companies plus the mix of operational and assets under construction.

These points are developed further in our proposed approach outlined below.

A.2. An approach to estimating risk during construction

There are several ways in which the risk during construction can be considered or could be expected to influence the required return, some of which were considered in the Grant Thornton paper. They include impacts through the:

- asset beta;
- gearing; and
- level of finance needed.

Each is considered in turn

Asset beta

The risks faced during construction will be different to those during operation and, consequently, are likely to lead to a different required level of return. Here the risks are more likely to be influenced by:

- construction costs (which could be linked quite strongly to the state of the economy) and the risk of cost over-run;
- construction timing with possible delays potentially raising significant costs for the developer as well as potentially significant foregone revenue (this could be especially important if the opportunities for revenue are focused in the earlier years of operation); and
- technology risk if the developer is using new or less proven technologies that could impose additional costs on construction, or delays in delivery.

While some of these risks are potentially significant there is an issue as to whether they are diversifiable. If they can be diversified then they should not be rewarded through the asset beta – although if some of the diversification is through the design of the construction contract then any "insurance" costs charged by the constructor should be incorporated as part of the capex.

[58] The fact that some of the measures and values used diverge from standard Ofgem approaches should also be considered. For example, the focus on a pre-tax nominal rate for the WACC and the focus on recent estimates of the risk-free rate linked to a long-term ERP.

If aspects of construction risk are captured in the asset beta, what sort of comparator should be used for this? Three options can be considered, two of which build on comparators that we are using elsewhere in this report:

- network operator asset betas – here the portfolio effect of the scale of investments and the repetition of standard projects alongside the regulatory regime means that effective construction risk is likely to be very limited;
- generator asset betas – are likely to include construction risk but again the proven nature of the technology (unless focusing on some aspects of renewable generation) may limit the degree of construction risk; and
- construction company asset betas – will provide an indication of how generic construction risk is viewed by the market. However, ensuring that the degree of housing within the building portfolio is limited will be important as this is likely to be more exposed to market risk than commercial/industrial operations would be.

As such, probably a focus on generating company asset betas and construction company betas would be appropriate.

Linked to the discussion of whether a risk is diversifiable is a concern that portfolio theory and CAPM, which underlies the approach set out above adequately captures the risk faced by shareholders. This is not a new concern. Aspects of CAPM can be seen to suffer from a survivor bias. Only successful companies (or ones that are at least operating) at the time of estimation have an impact. But what of the failed companies where shareholders lost their investment?

A possible solution to this, considered in the 1990s from a regulatory perspective when research and development expenditure at British Telecom was considered is to adjust the calculated return by the risk of failure.[59] Similar approaches can be considered when thinking about the way projects for developing new drugs are undertaken by the pharmaceutical companies. If on average the company needs to earn a CAPM based return of 7% but 75% of projects never yield any revenue or profits, then successful projects need to earn 28%.

Of course, in unregulated markets this is not a concern, the hurdle rate, if set appropriately, should ensure that shareholders have a real possibility of earning their "normal" WACC on their total investment as the upside on successful projects counter-balances the failures. In a regulated world where the upside on the successful projects is limited or non-existent the ability to earn an overall required rate when some projects may fail is called into question. (Hence the need to consider the risk of failure adjustment.

What do we mean by failure here? In *extremis* it would be a project never becoming operational. Given the important emphasis being placed on interconnectors for the UK complete failure should be considered very unlikely (but not impossible). Possibly it is

[59] Effectively this becomes a project hurdle rate. It would be better practice to make the adjustment through the cash flows when undertaking project selection but this is not an option when thinking about the allowed return within a regulatory regime.

more appropriate to focus on the *risk of unrewarded costs* (RoUC) for a project rather than failure and this would consider:

- severe delays due to technology or unexpected events;[60] and/or
- cost over-runs.

It should be possible to consider the types of risk, their probability and likely cost and then use that to determine a RoUC factor that could be used. Given the limited number of interconnectors that could be considered for this it might be worth also considering OFTOs. Possible values for this, and the asset betas, are discussed further below. There are, however, examples of such events. For example, the newly completed East-West Interconnector between Ireland and Wales is currently non-operational while some potential issues around telecommunications interference are resolved.[61]

We noted above that the appropriate raw asset beta should be based on either a construction or generation company value. No matter which value is the starting point, a consideration of relative risk and the consequent change in the asset beta is required. In part this relative risk adjustment will be driven by the form of the regulatory regime. Examples of the way in which the regulatory regime can affect risk are the:

- degree and form of *ex post* cost review – the stricter the hurdle for allowing additional costs into the RAB the greater the RoUC; and
- treatment of IDC during delays. The NRAs have to decide whether to only allow the capitalisation of IDC into the RAB for planned construction time or to allow IDC for the whole period until an interconnector becomes operational. Clearly the shorter the period over which IDC can be charged the potentially greater the RoUC.

While NEMO may face both aspects of timing and cost over-run risk it is possible that further refinements to the enduring regime will take place which would mean that the RoUC could change. For example, if a cost sharing approach was to be adopted for any cost over- or under-runs then this more mechanistic and transparent process would be likely to reduce the perceived level of RoUC, although this does depend on the precise details of the proposed sharing regime.[62]

Consequently the IDC and any RoUC adjustment being made to it will need to be kept under review until the regime is fully finalised.

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[60] For example, the new East-West interconnector between Ireland and Wales became operational in September 2012 and then encountered potential telephone interference which has caused the interconnector to be closed while the problem is addressed.

[61] See *Commercial Operation of East West Interconnector Update*, www.eirgrid.com/eastwest/news, accessed December 16th 2012.

[62] For example, if some precedent had been built-up such that investors would expect cost over-runs to be allowed even though the formal requirement was still for an ex post review while a sharing regime while more transparent would limit the allowance to only 50% of any cost over-run then RoUC could increase.

Gearing

A second way in which construction risk is likely to be experienced is through the capital structure of the business during construction. It is unlikely that any debt will be available during construction – or that any debt needs to be guaranteed by the project sponsors and so effectively ties up equity or imposes costs on the company which increases the debt risk to something closer to the cost of equity. As such, we believe for simplicity of calculation and acknowledging the risks that are involved, the effective capital structure should be viewed as 100% equity.[63]

Level or amount of finance needed

A final aspect that could be affected by construction risk is the amount of finance that is required during this phase. Access to additional funds may be necessary to insure against the impact of cost over-runs, delays etc. Whether this is through actual additional equity being raised prior to construction commencing or through the establishment of external lines of credit (or implicit self-insurance through internal group lines of credit) does not matter. In each case there is a cost of having additional funds available which may never be needed or rewarded, but which impose a cost on the developer.

It is possibly simplest to think of this as an additional tranche of equity that has had to be raised and paid for during construction. So leading to a higher working capital/finance requirement until the project is commissioned and operational.

We believe that there is a risk of double counting between this approach and the RoUC. Consequently we believe a focus on the RoUC is more appropriate and is used for the remainder of this work.[64]

Summary

Overall, it is clear that during the construction phase the cost of finance will be different to that during the operational phase. Further, what is clear is that the adjustment is not a simple change to just the WACC since construction risk:

- affects a range of the financial aspects that also impose additional transaction costs etc; and
- may not be adequately captured in the standard CAPM framework when considering regulated companies where the upside is limited and consequently requires a focus on something more akin to a hurdle rate.

Given these concerns we have developed an alternative approach to estimating the IDC. Table A.1 below sets out what we believe the strengths and weaknesses of the existing Ofgem approach to IDC and our own alternative when applied to interconnectors.

[63] This is borne out by our understanding of BritNed which was 100% equity financed both during construction and the first year of operation.

[64] This is an area where developer views would be appreciated.

Table A.1: Strengths and weaknesses of existing and proposed approaches to IDC when applied to interconnectors

Approach	Strengths	Weaknesses
Existing Ofgem approach offshore	Uses energy company evidence Clearly understood and in use Simple	Differs from existing Ofgem approach to WACC Fails to take into account the aspects of the interconnector regime that create potential unrewarded risks and consequently may under-reward investors
Alternative approachbuilt around RoUC etc	Captures the potential risks of unrewarded risks Can be made more consistent with Ofgem's general approach to WACC Allows a greater focus on the risks being faced by developers and their interaction with the regulatory regime. Makes the approach more accurate	Involves greater regulatory discretion than the existing approach Data requirements may make this difficult to implement with any degree of accuracy May over-reward the developers for risks that might be insured or diversified in some way

We appreciate that the shift to an alternative approach to setting IDC for interconnectors is a significant issue. However, the strengths and weaknesses that we have outlined in the table do, we believe, provide sufficient justification for using the alternative approach. Effectively a key part of this is a simplicity versus accuracy argument. The existing approach is simple, but loses accuracy because of this. It may well be appropriate for the OFTO regime, but the risks faced by interconnectors especially under an evolving cap and floor approach (linked to the Target Model) mean that accuracy is more important. Later in this section we discuss some ways in which simplicity could be re-introduced to the IDC approach.

Aspects of the concerns in the table touch on a wider concern. Some of the risks faced by a developer during construction should be able to be insured against through the materials and construction contracts used for the project. As such, there is always a risk that investors are being over-rewarded for perceived risks that do not actually exist. One approach to addressing this would be for the regulator to undertake a very detailed analysis of the contracts, or at least to exclude any costs associated with insurance etc. The developer could then have an opportunity to justify why additional costs should be allowed, but it would be their responsibility.

We do, however, believe that the risks associated with setting too low an IDC when combined with the significant revenue and policy risk that might be faced by an interconnector means that shifting to the proposed alternative approach to estimating IDC is appropriate.

This discussion has outlined the issues that need to be considered when estimating the WACC during construction. The following sub-section considers an estimate of such a cost of equity.

A.3. Estimating an allowed cost of equity during construction

Having developed our approach it is now necessary to determine what level of IDC would be appropriate. Table A.2 sets out the information needed for estimating a real post-tax IDC.

Table A.2: Data for real pre-tax IDC estimate

Element	UK	Belgium	CREG	Comment
Risk-free rate	2.0%	1.15%	1.15%	Long-term value. Belgium data based on last 12 months of nominal bonds minus 2% inflation
Asset beta	0.62	0.62	0.62	Based on long-term European estimate. UK data yields surprising values owing to the global financial crisis and significant cash balances being held by companies. For example, a 20 day average of daily two year asset betas estimates for Costain yields an asset beta of over 4. We think this longer-term Damodaran value provides an appropriate indicative value to test our approach
MRP	5.0%	4.7%	3.5%	First two values are based on DMS and the third is from a recent CREG determination. The justification for the different values is provided in the main part of the report
RoUC	20%	20%	20%	This is based on providing an illustrative value and captures the fact that some risk does exist but the precise level is uncertain. Further work is required in this area
Tax	24%	33%	33%	Based on current financial year data. Should be noted that the UK number will reduce to 23% in the next financial year

This data allows us to estimate the IDC value as per the following calculations.

Unadjusted cost of equity is the standard CAPM calculation, but based on using the asset beta since 100% equity financing is assumed, i.e.:

$$r_i = r_f + \beta_a ERP$$

The adjusted cost of equity is the unadjusted figure divided by 1 minus the RoUC, i.e.:

$$r_i^a = {}^{r_i}/_{(1 - RoUC)}$$

Where *RoUC* is the risk of unrewarded costs.

Table A.3 sets out the results of the calculations for real post-tax IDC and Table A.4 provides the nominal pre-tax estimate.

Table A.3: Real post-tax IDC estimate

Calculation	UK	Belgium	CREG	Comment
Unadjusted cost of equity	5.10%	4.06%	3.32%	No RoUC adjustment
Adjusted cost of equity	6.88%	5.58%	4.65%	20% RoUC adjustment

It should be noted that when making the real adjusted estimate we have calculated a nominal adjusted cost of equity and then subtracted inflation – otherwise the full impact of the adjustment is not captured in the calculations.

Table A.4: Nominal pre-tax IDC estimate

Calculation	UK	Belgium	CREG	Comment
Unadjusted cost of equity	9.34%	9.05%	7.94%	Real number plus 2% inflation then adjusted for tax
Adjusted cost of equity	11.68%	11.31%	9.93%	20% RoUC adjustment

Our range for the UK of between 9.34% and 11.68% is approximately comparable to the Grant Thornton range which yields the existing 8.5% value. There is a small degree of overlap between the bottom end of our range and the upper end of their range. But, it should be noted that they use 28% tax and we use 24% tax meaning that our numbers are understated relative to theirs.

While we believe further work is necessary on the RoUC, we propose to assume a 20% illustrative value in our calculations for IDC to be applied in the remainder of this document. Consequently the IDC rates in the calculations are:

Country:	Nominal pre-tax	Nominal post-tax	Real post-tax
UK:	11.68%	8.88%	6.88%
Belgium:	11.31%	7.58%	5.58%

Given the 50:50 jurisdiction approach explained elsewhere in the report we propose to use this in the calculation of the appropriate IDC. Further, we think an inflation adjustment should be made to the construction values and we will use a real IDC. Tax will continue to be treated separately.

This means our proposed IDC rate is 6.23%.

A.4. Impact on the project WACC

When thinking about the project WACC to use we recommend employing a weighted average of the construction and operation values with the weights based on the proportion of years that the rate is applicable. So, if we assume that three years of construction occur with a further 25 years of operation the appropriate project WACC would be given by the following formula:

$$r_i^p = \frac{r_i^c}{3/28} + \frac{r_i^o}{25/28}$$

Which is the equivalent of:

$$r_i^p = 0.107r_i^c + 0.893r_i^o$$

This is likely to overstate the impact of the construction period since not all the funds will be needed at the same time. In principle the profile of spend could be considered and the corresponding years weighted. As an example, suppose the spend in year one of construction is 50% of the total and the remainder is spent in year two. Then, an average spend over the whole of year one could be 25% of the total and 75% in year two.

To make this further refinement we would need to know:

- more about the profile of expenditure; and
- the declining RAB over the life of operation as this would reduce the equivalent operational phase.

For simplicity we propose to keep the simple three and 25 year approach outlined above and the corresponding weights rather than compute a more complex rate.

There are two options when thinking about implementing the IDC:

- use the average project WACC as discussed above for all 28 years; or
- apply the IDC rate for the construction period and then the operational WACC for the remainder of the estimate.

Under the former the post-construction RAB will be a little lower than under the latter approach, but the same NPV of cash-flows over the life of the project should occur.

A.5. Reintroducing simplicity

It was noted earlier that one of the arguments for retaining the existing OFTO IDC was based on simplicity. The cost of simplicity was, however, accuracy. One possible approach that Ofgem could adopt would be to undertake the more accurate calculation explained in this annex once. Then a premium to the operational WACC could be established which would be applicable – to the UK end of the interconnector – in all cases in the future.

Obviously adjustments might need to be made. For example:

- if the regime changes, as mentioned above cost sharing might be introduced and which would alter the risk profile, so changing the additional required return; or
- more information on RoUC could arise which would allow the calculation to be updated and made more accurate.

Consequently, Ofgem could consider adopting a premium based approach for future projects subject to no new information arising or significant changes to the regulatory regime. This would allow a simpler approach to be put in place than having to make the detailed calculation each time.

Naturally, were the non-UK end of the interconnector to exhibit different parameters to Belgium, a further calculation would be needed.

ANNEX B: BALANCE SHEET AND PROJECT FINANCE

One of the specific issues that we have been asked to consider is the way in which decisions could impact on the choice of funding option (effectively balance sheet or project finance). Ofgem wishes to ensure that any decisions taken do not constrain the choice of funding as this can help ensure the broadest range of potential interconnector suppliers. Equally, Ofgem do not want to put in place a system which over-compensates suppliers at the cost to consumers if the floor is triggered.

We think it is useful to consider some fundamental principles of corporate finance at this stage of the process to ensure that any consideration of this issue is couched in an appropriate framework.

At the heart of corporate finance is the idea that the WACC for a project is determined by the risk of **that** project. Most companies are a portfolio of projects and consequently their corporate WACC reflects the weighted portfolio of individual project risks.

When a stand-alone project like an interconnector is being evaluated (we consider it stand alone owing to the licence requirements) the determinant of the interconnector WACC will be the risks faced by that interconnector. It is these risks that Ofgem should be seeking to determine.

So, why is there a focus on potentially different WACCs depending on the source of finance? Three possible, not mutually exclusive, explanations exist such that one form of finance may:

- be subsidised and so apparently "cheaper" than the other;
- benefit from information asymmetries that allow more accurately priced funding to be provided; and/or
- benefit from advantageous tax treatment.

Each of these is considered in turn.

B.1: Subsidised finance

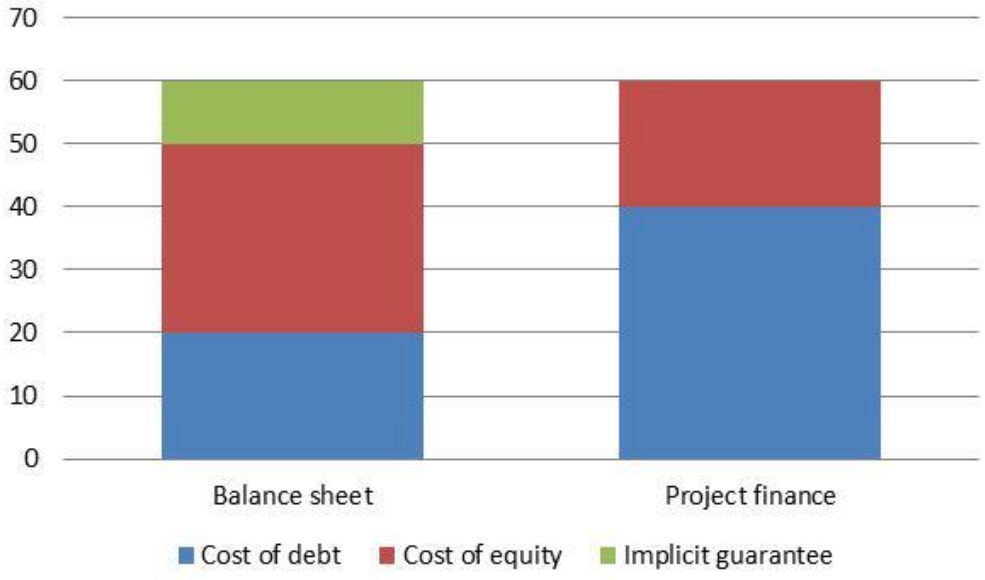
Project finance, owing to the non-recourse nature of the funding, is perceived to be more expensive than balance sheet funding. That, however, breaks the basic tenet of the corporate finance principle that it is the risk of the project that determines the cost. So, why might balance sheet funding appear cheaper than project finance (especially as in both circumstances the interconnector project will be operated via a separate licensed entity)?

The key answer to this lies in the fact that project finance is non-recourse. So, if the project fails, lenders will lose their money. Balance sheet finance is backed, either through an explicit parent company guarantee or an implicit guarantee, such that if the project fails lenders will be recompensed. It is this guarantee which allows the cost of funding to be cheaper for balance sheet funded projects.

Some parent companies charge a specific guarantee fee to the project company reflecting this service being provided but others do not. Unless the guarantee fee is reflected in the

estimate of the WACC a like for like comparison is not being made between the project finance and balance sheet finance costs. Figure B.1 below illustrates the equivalence that ought to exist if all the costs of funding are captured in the estimate.

Figure B.1: Build-up of the cost of funding



So, a solution to ensuring that the right decisions are taken about the appropriate WACC to facilitate different funding options is one that should capture all the costs of funding.

B.2: Information asymmetries

A second possible explanation for balance sheet finance to be cheaper than project finance is that the market is less able to determine the actual risks faced by the project than the parent companies providing the balance sheet funding. In this case, the information asymmetry enjoyed by the parent company(ies) allows them to price the risk more accurately and so cheaper than the market.

An alternative version of this would be that the market prices the risk at the same level but imposes additional conditions, such as relatively high debt service coverage ratios, which effectively increases the cost of the project as a greater level of funding has to be raised.

B.3: Tax

Major infrastructure investments, like all investments, are able to claim capital allowances that can be used to offset corporation tax.

It is possible that a new project entity will be unable to use all its capital allowances in the year that they are received. As such a company is able to either:

- carry forward the nominal value of the unused capital allowance (so a declining real value) to offset against future profits; or

- if part of a larger group, where at least 75% of the shares in the project entity are owned by that group, then the group can claim group relief to use the allowance in that year provided that the group has taxable profits available.

So, in both cases we would expect the capital allowances to be utilised but under the balance sheet funding model the maximum value would be extracted from the tax system compared to the project finance approach.

B.4: Summary

This annex has considered the three possible reasons why a difference in headline WACCs may be seen when considering balance sheet versus project finance based funding models.

While all three explanations are likely to impact on the values, we think it likely that the most significant one will be the exclusion of the costs linked to an implicit or explicit guarantee provided by the parent company(ies) under balance sheet funding. Innovative tax solutions can often be found and unless a project is truly new and unique, markets are unlikely to suffer from information asymmetries.

As such, our starting point is to seek to establish what the cost of funding for a truly stand-alone project would be and then allowing companies to seek the best funding option open to them.

There are alternative ways in which this set of arguments could be developed. For example, the implicit cross-subsidy under corporate finance could be seen as the provision of an implicit equity buffer, or recourse to parent equity if it is needed. Each formulation leads to the same final position.

ANNEX C: REVENUE PROFILES

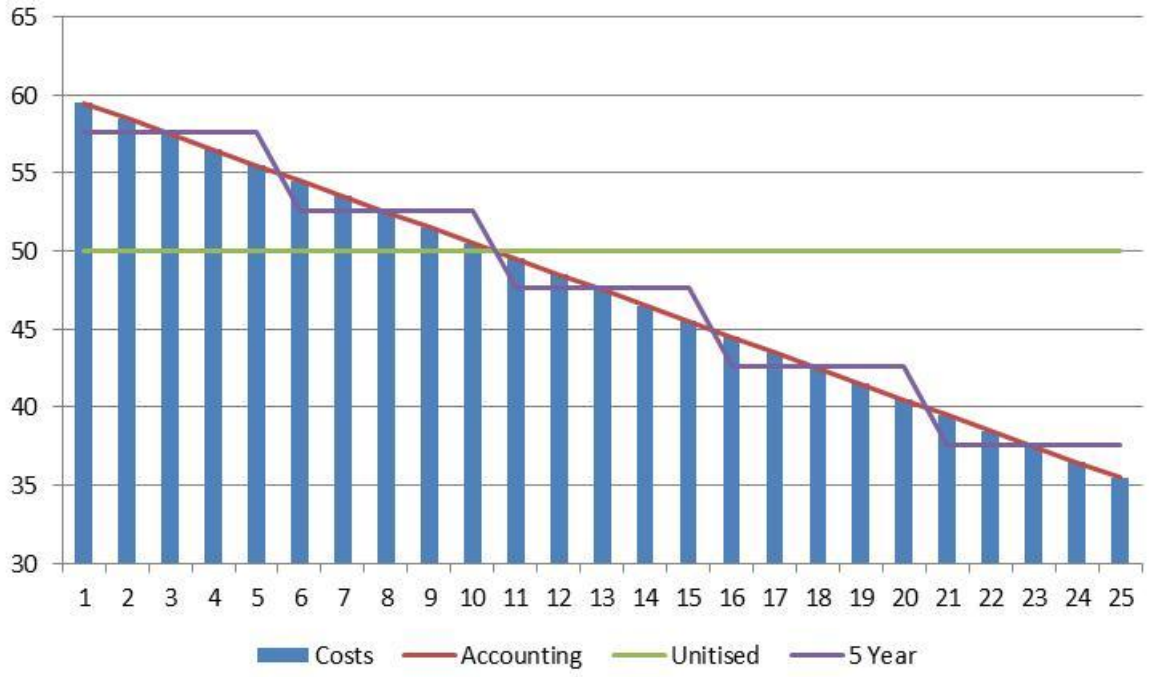
One issue that links across to several of the risks discussed in the main section and which could have an impact on the funding options is that of revenue profiling.

Our working assumption is that a revenue profile that matches the accounting cost profile based on a declining RAV – which we will assume declines to a zero asset value by year 25. There are, however, other possible scenarios, including:

- a flat real annuity/allowance set over the whole period; or
- flat real annuities set over shorter periods (say matching the five year assessment periods).

Figure C.1 below illustrates the costs and revenue profiles for the three revenue options noted above plus the underlying accounting costs (assuming straight line depreciation).

Figure C.1: Possible cost and revenue profiles



Unsurprisingly this shows that the revenue profiles either:

- match the cost profile (our accounting revenue profile above); or
- create a mismatch between revenues and costs with initial periods of under-recovery followed by over-recovery.

Further, a declining revenue profile may mean that a greater chance of triggering the:

- floor exists in the early years of the regime; and
- cap exists in the later years of the regime.

Figures C.2 and C.3 illustrate the implications that choosing the two extreme models would have on the return on capital (allowed "profit") and the cash-flow pre-financing costs (return on and of capital, i.e. allowed profit and depreciation).

Figure C.2: Allowed return under two revenue profiles

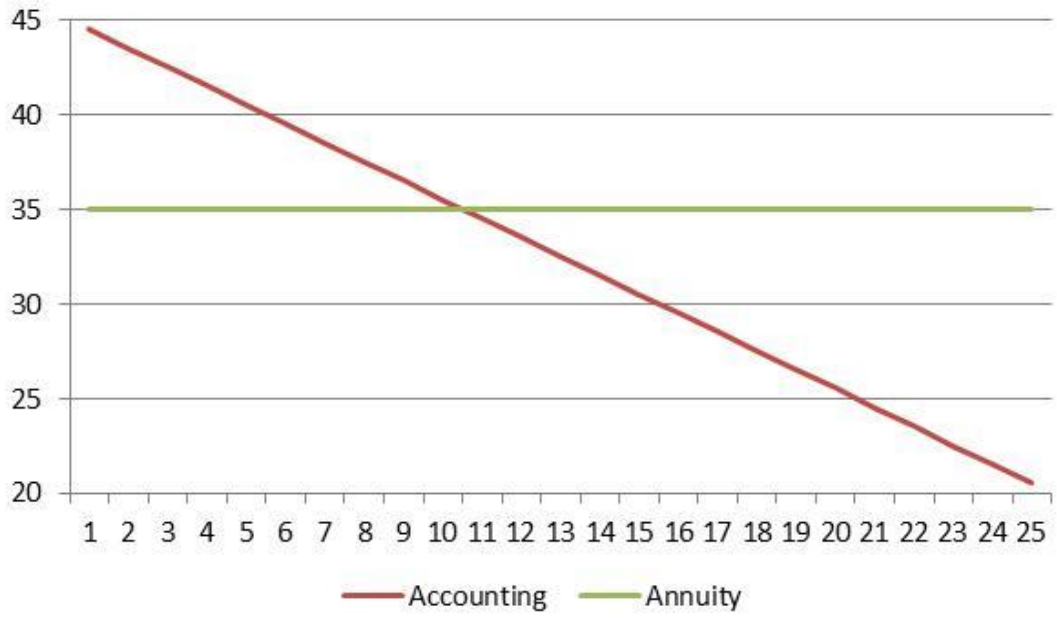
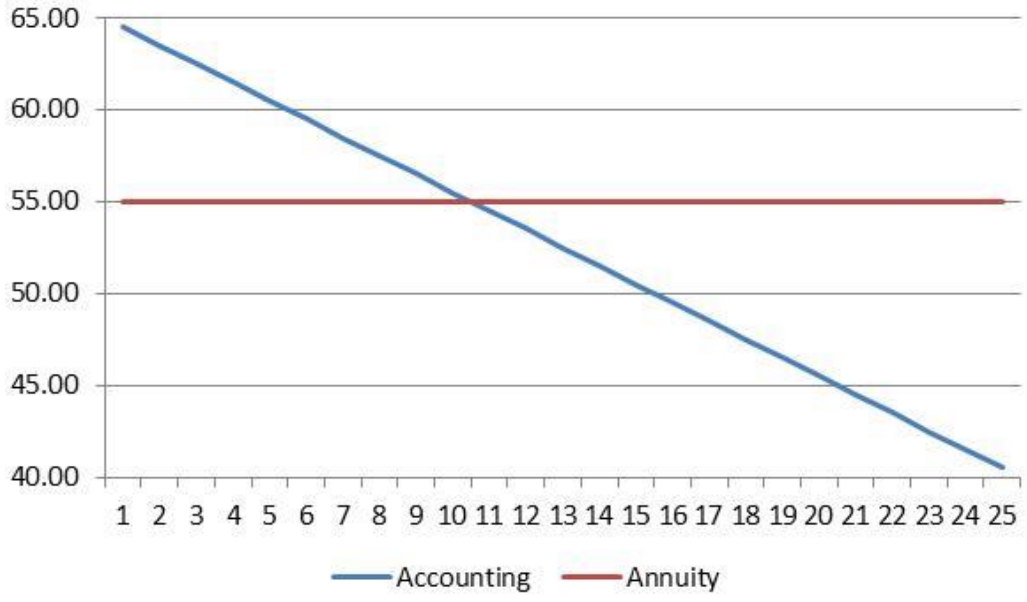


Figure C.3: Allowed pre-financing cash-flow under two revenue profiles



While both revenue models provide significant funds for financing, it is clear that the annuity or unitised approach provides less funds in the early years and more funds in the later years than the accounting approach. The implications of this include:

- a higher initial level of gearing could be supported under the accounting model; and
- the long tail under the annuity approach could provide greater opportunity for extending borrowing if the need arises.

ANNEX D: RATING AGENCY APPROACHES

D.1: Moody's – Project finance

The Moody's *Generic Project Finance Methodology* applies to special purpose entities that "are financed on a non-recourse, project finance basis and which are not assessed under other existing project finance and infrastructure methodologies". The Moody's Methodology covers long-term infrastructure entities including "parking garages, airport fuel facilities, stadiums, railways, and LNG liquefaction plans". The Methodologies is structured around four key scoring factors: Long Term Commercial Viability & Competitive Position; Stability of Net Cash Flow; Exposure to Event Risk; and Key Financial Metrics. Moody's calculates a score for each of the first three scoring factors. Following this, the following weights are applied to the three factors (25%, 60% and 15% respectively) in order to derive a fundamental project risk scoring.

D.2: Moody's – Electricity transmission networks

Moody's *EU Electricity Transmission Networks Rating Agency Overview* uses four rating factors, with a collective of 13 sub-factors. Similar to the Generic Methodology, each of the factors have an assigned weight used in the calculation of the overall project risk scoring. The four overarching rating factors are: Regulatory Environment and Asset Ownership Model; Efficiency and Execution Risk; Stability of Business Model & Financial Structure; and Key Credit Metrics.

D.3: Fitch – Availability-based infrastructure projects

The Fitch rating criteria "apply to the rating of debt issued to finance infrastructure projects built and operated by a single purpose project company (SPP) and governed by long-term (20 years or longer) contracts with local, regional or national government entities." Projects typically included under this category include social infrastructure and government buildings, and transportation. Fitch uses eight key rating factors detailed in Box D.1 below.

Box D.1: Fitch key rating factors

Factors
1. The financial strength and experience of sponsors, particularly in more complex transportation projects during construction and ramp-up.
2. The experience and financial strength of the construction contractor, relative to the complexity and timescale of the construction phase and the contractual support package provided.
3. The performance and ease of replacement of the operator and, for larger or more technically demanding projects, their experience and financial strength.
4. The allocation of operating and maintenance cost risk among the project parties and the level and profile of cost provision compared to similar projects (considering the length of the concession tail).
5. The materiality of performance deductions as an indicator of operating problems. Fitch will also check for any evidence of a deteriorating relationship between the SPP and the grantor.
6. The level and structure of debt service and maintenance reserving mechanisms.
7. The financial strength of the grantor and the relative ranking of its payment obligations.
8. Financial metrics, sensitivity analysis (including inflation exposure) and peer group analysis.
Source: Fitch Ratings, *Rating Criteria for Availability-Based Infrastructure Projects*, Global Sector-Specific Criteria Report. 20 June 2011.

In assessing each of these factors, Fitch examines: the ownership and sponsors of the project; the jurisdiction, structure and other legal factors; technology risk; the cost structure, delay risk and contract terms; operation risk; tail risk; price risk; performance risk; revenue risk; and debt characterisation and terms; as well as any additional stresses, such as inflation, interest rates and maintenance costs.

D.4. Standard & Poor's

A detailed methodology setting out the weightings and levels used for specific factors and metrics was not available. However, we consider the approach used to be broadly in line with other approaches considered.

ANNEX E: FORMULATIONS OF THE COST OF CAPITAL

Providers of equity and debt capital are concerned with the post-tax returns available to them. However, a company needs to be able to earn an appropriate pre-tax return to be able to make the post-tax payment. Hence when setting maximum prices the regulator must allow not only for the post-tax WACC to be earned but also must allow for taxation costs that must be paid. Since the tax treatment of interest on debt (deductible as a cost) is different to the tax treatment of net profit on equity (not deductible for tax purposes), the allowed revenues to fund taxation costs will be a fraction of the proportions of debt and equity assumed to be used to finance the business over the price control period. This means that there needs to be some adjustment for the WACC/maximum prices to take account of taxation costs.

In price regulated businesses, in addition to determining the 'correct' WACC the regulator must also set the 'correct' capital base to which the WACC is applied. The so-called Regulatory Asset Base (RAB) is the value of capital employed in the regulated part of the business on which the WACC must be earned if the business is to be able to finance the regulated business.

There are a number of different definitions of the WACC. Here we define three: the pre-tax WACC, the 'vanilla' WACC; and the post-tax net of debt tax shield WACC. Different definitions are used by different regulators and are needed to ensure that like is being compared with like and that taxation cost adjustments are appropriate to the chosen definition. The value of the WACC differs depending on the definition used – which formulation is used hasdifferent implications for how the allowance for taxation costs should be calculated. In Q5, the CAA and the Competition Commission applied the pre-tax WACC approach.

E.1: Pre-tax WACC

Some regulators use a pre-tax WACC. The pre-tax approach calculates the WACC as set out below.

$$\text{Pre-tax WACC} = \frac{r_e}{(1-t)} \cdot \frac{E}{V} + r_d \frac{D}{V}$$

where r_e is the post-tax cost of equity (i.e. equals the after tax rates of return on equity available or alternative equity investments of comparable risk)

r_d is the gross cost of debt (i.e. the sum of the risk free rate and the corporate debt premium available to debt providers an alternative debt opportunities of comparable risk)

D is the value of the firm's debt

E is the value of the firm's equity

V is the sum of $D+E$[65]

t = statutory company tax rate

The pre-tax WACC approach implicitly assumes that the effective tax rate on pre-tax profit is equal to the statutory company tax rate. If allowed revenues to fund the return on capital are set using the post-tax WACC, no further revenue should be allowed to fund taxation costs because the 'grossing-up' allows a notional amount to fund taxation costs and any additional allowance would be double-counting.

E.2: 'Vanilla' WACC

Another common formulation of the WACC is:

$$\text{Vanilla WACC} = r_e \frac{E}{V} + r_d \frac{D}{V}$$

where the terms above are as defined in the pre-tax WACC

The vanilla WACC is the return available to providers of (debt and equity) capital after company tax payments have been accounted for. If allowed revenues to fund the return on capital are set using the vanilla WACC, the expected taxation costs should be separately and additionally allowed for when setting maximum prices. This vanilla WACC is the formulation used by Ofgem.

E.3: Post-tax net of debt tax shield WACC

There is an alternative formulation of the post-tax WACC, called the net of debt tax shield WACC defined as:

$$\text{Post-tax WACC Net of Debt Tax Shield} = r_e \frac{E}{V} + r_d (1-t) \frac{D}{V}$$

This differs from the vanilla WACC in that it adjusts the gross cost of debt to a post-tax cost of debt by directly taking account of the tax deductibility of interest. This formulation is appropriate *only if* the regulator makes no further allowance for the tax deductibility of interest when calculating the allowance for taxation costs (i.e. allowed revenue to fund taxation costs should be calculated as if the company were 100% equity funded). This formulation is included here because it is used by some regulators and many city analysts quote the post-tax net of debt tax shield WACC value as the allowed WACC. If the allowance for taxation costs is correctly made (i.e. as if it were an all equity financed business) and if (but only if) the effective rate of tax equals the statutory rate, then this definition – although giving a different 'headline' allowed WACC – will provide the company with the same allowed revenue as the vanilla WACC and the pre-tax WACC formulations.

[65] The theory states that D and E should be market values. In practice, book values are often used for debt.