ECONOMIC
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Estimation of an allowed rate of return for the electricity transmission (ADMIE) and distribution (DEDDIE) businesses

Final Report

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Submitted to the Regulatory Authority for Energy by:

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1 Introduction

The Regulatory Authority for Energy (RAE) contracted Economic Consulting Associates (ECA) to estimate the weighted average cost of capital (WACC) for the electricity transmission system and distribution network operators, 'ADMIE' and 'DEDDIE', respectively.

The WACC estimate is needed for the purposes of RAE setting an allowed rate of return and therefore regulated revenues for the two businesses in 2014. However, RAE is also minded to moving away from annual tariff/revenue setting and towards a multi-year, incentive-based regime. In this context, RAE is currently preparing an interim methodology for electricity transmission allowed revenues that is expected to apply for a three-year period (from 2015 to 2017) and will soon be appointing a consultant (following an open tender process) to develop a new framework for both electricity transmission system and distribution network revenues and charges that would apply from 2018 onwards. In light of these intentions and developments, we have also been requested to estimate a prospective cost of capital (at least for ADMIE) that extends beyond 2014 and covers the period to 2017.

This report responds to RAE's request. In this Section, we detail our terms of reference for the project and summarise the structure of the rest of the report. For ease of reference, we also provide a summary of our findings and recommendations, which derive from our more detailed analysis later in the report.

1.1 Terms of reference

The terms of reference (ToR) for this assignment are to:

- Update our March 2012 paper prepared for RAE entitled "Gas and electricity networks - Advice on the methodology and estimation of the WACC", which examined relevant risk issues and developed WACC estimates for both electricity and gas networks. Our ToR require that the focus of this review be particularly on assessing whether the risk environment has significantly altered since producing the previous report, as well as re-examining the underlying WACC parameters for the electricity transmission and distribution networks.

- Review the ADMIE and DEDDIE/Public Power Corporation (PPC) accounts and any other available data regarding actual borrowing costs with a view to estimating a cost of debt that is reflective of the businesses' *ex post* borrowing costs.

- Review how countries experiencing similar economic and sovereign debt crises (namely, Ireland and Portugal) have treated the issue of country risk and whether this has been reflected in higher WACCs for their respective network businesses and/or whether other regulatory measures have been adopted for mitigating against such risk.

- Review any proposals submitted or put forward by the regulated companies requesting a specific WACC, including any supporting studies independently procured and made available by the businesses.

1.2 Report structure

The remainder of this report is structured as follows:

- Section 2 provides an introduction to our report by explaining the context for undertaking a WACC assessment for ADMIE and DEDDIE and discusses the concepts of WACC, the Capital Asset Pricing Model (CAPM) and the associated theoretical framework together with our proposed approach for estimating an appropriate cost of capital.

- Section 3 examines the individual components of the WACC. Our analysis covers, among other things, the embedded cost of debt and our assessment of the risk environment, as required by our ToR, and we provide our estimate of the overall cost of capital for ADMIE and DEDDIE. We also refer back to our 2012 paper wherever necessary, particularly to note any differences in our current estimates and to highlight matters of particular relevance for the current re-examination of the cost of capital for the electricity networks.

- Section 4 contains a brief review of the recent Irish and Portuguese regulatory experience in relation to the setting of a cost of capital.

- Section 5 provides an overview and assessment of the WACC proposed by ADMIE on the basis of a study it had commissioned from PriceaterhouseCoopers Business Solutions S.A. (PWC) in 2012.

1.3 Summary of findings

The main points of our analysis of the cost of capital for ADMIE and DEDDIE are as follows:

- Regarding the cost of equity:

  - Current index-linked yields are very low (and probably negative) but may still be affected by the actions of the monetary authorities, so we consider that a range of 1 to 1.5 per cent for the risk-free rate is appropriate (and we cautiously adopt the upper end of this range).

  - We have revised down our estimate of the market risk premium in line with a total market return range of between 5 and 6.5 per cent, which seems consistent with the most recent assessments of both historical and forward-looking returns and evidence suggesting that returns of 7 per cent may no longer be realisable. This implies a

market risk premium of between 4 and 5 per cent, and we adopt 4.5 per cent for our best point estimate.

- We suggest that a reasonable asset beta range for both ADMIE and DEDDIE is 0.3 to 0.45 and adopt the mid-point of this range, which with our gearing assumptions translates into an equity beta of 0.58.

- We add a country risk premium of 6 per cent, as markets seem to be still pricing in a risk of a sovereign default in Greece and regulatory protection mechanisms of the type we recommended in our 2012 paper have not been established to insulate the electricity networks from the consequences of a sovereign default.

- Regarding the cost of debt:

  - We calculate a weighted average cost of debt for ADMIE (for embedded and new debt), rather than rely on comparator information and adopt this as a the 'reference rate' for setting the WACC for both ADMIE and DEDDIE, as we do not consider that the debt costs of the parent company (the Public Power Corporation) are representative of the debt costs of the distribution network business alone. We refer to this rate as a reference rate, as we also recommend that RAE allow borrowing costs to be passed through on an *ex post* basis (subject to certain safeguards) given the significant uncertainty in determining future debt costs. The reference debt cost is set at 6.1 per cent, real.

- We consider that the assumed gearing level for setting the WACC should be consistent with actual gearing (subject to this being consistent with a prudent capital structure) and therefore adopt a ratio (for both businesses) of 35%, which is ADMIE's current and expected gearing ratio.

The resulting cost of capital estimate is shown in Table 1 below. The proposed real, pre-tax WACC for both ADMIE and DEDDIE is **11.0 per cent**; this in nominal terms translates to 10.5 per cent.

Table 1 WACC estimate for ADMIE and DEDDIE

Cost of equity (pre-tax)	13.6%
Cost of debt ('reference rate')	6.1%
Gearing	35%
WACC (real, pre-tax)	**11.0%**
WACC (nominal, pre-tax)	**10.5%**

2 Contextual background and approach

2.1 The objectives behind setting the WACC

The immediate purpose of setting the WACC is to determine an appropriate level of pre-financing return to allow for in the required revenue calculation, which would be used to set tariff controls for ADMIE and DEDDIE in 2014 and, potentially, for 2015 to 2017. We need to establish what we mean by an appropriate level of return.

We consider there are two main objectives that inform such a judgement:

- To help encourage efficient investment in maintaining and improving the service capability of the infrastructure that ADMIE and DEDDIE are responsible for; and
- To protect and further the interests of electricity consumers.

Our general view and a common opinion expressed by regulatory authorities, informed by the long debate on utility regulation since the early privatisation programmes in the 1980s and 1990s, is that these objectives are inter-related and largely mutually reinforcing. Crucially, consumers benefit from well-incentivised electricity network businesses which are able to raise finance efficiently to maintain and enhance essential infrastructure. This also requires stable and predictable regulatory and financing regimes, particularly given the large and long-lived nature of investments in the utility sectors.

2.2 Implications for the WACC assessment

The above objectives have important implications for the WACC assessment.

First, the WACC assessment forms a part of, and should be considered in the light of, a particular regulatory regime. The WACC assessment is primarily driven by assessments of risk, and risk for regulated monopoly network businesses is fundamentally affected by the processes for tariff review in a regime. This was a major theme of our 2012 paper (as we discuss in Section 3.3.4).

Second, consumer interests could be materially damaged if the WACC is systematically set too high or too low. Where regulatory authorities have analysed the potential detriments of assessment errors, they have generally concluded that the damage to consumer interests from overstating the WACC may be smaller than the damage from understating it. While this appears at first to be counterintuitive, it recognises that deteriorating essential infrastructure and services can have far-reaching consequences. The implication of this insight is that we generally err on the side of caution in setting the WACC parameters, while recognising that customers pay directly and unnecessarily if the WACC is set too high.

2.3 The methodological framework

2.3.1 The WACC concept

The WACC takes into account the two components of the cost of capital, the cost of debt and the cost of equity, and is calculated by taking the weighted average of the two, weighted by the relative importance of each type of financing in a company's capital structure. There are three different approaches to computing the WACC:

- Pre-tax WACC – under this approach a pre-tax cost of equity percentage must be determined that incorporates both the rate of profit reasonably expected by shareholders (after tax) and the level of tax on that profit. Mathematically, this requires multiplying the after-tax cost of equity by the factor 1/(1 - t), the 'tax wedge'.

- Vanilla WACC – this computation does not apply the tax wedge and therefore allows for a post-tax cost of equity (and thus a post-tax WACC), but requires that a separate allowance be made for tax on profits as a separate amount in the composition of the required revenues.

- Post-tax WACC – with this method the cost of debt is multiplied by the factor (1 – t) to capture the tax benefit associated with higher gearing (as interest is deducted before tax is calculated). However, this calculation should not be used for determining required revenues, as interest payable on debt is already factored into taxable profit.

We adopt the pre-tax WACC measure, consistent with RAE's existing and proposed tariff methodology. We also use a real rather than nominal WACC, as RAE has indicated that it will move to a real terms basis of regulation (i.e. indexation of the regulatory asset base and use of a real WACC). However, we also convert the real WACC to nominal, as the latter is needed by RAE for setting 2014 allowed revenues under the current tariff methodology.

2.3.2 WACC estimation techniques

Generally, there are three main approaches to estimating the WACC:

- ***Direct estimation of the relevant business's cost of capital*** – this is most obviously possible for the cost of debt where the embedded cost can be determined from company financial information while the cost of new debt can be estimated, for example, from existing yields (where debt is traded), together with expected trends in interest rates.

- ***Direct estimation of the cost of capital of comparator companies*** – this might be necessary where there is insufficient information for the regulated businesses concerned. It might also be relevant for regulatory regimes that seek to provide incentives for regulated entities to incur the costs of an 'efficient company'. Finally, it may also be used in combination with model-based estimates (see below) for the calculation

of particular parameters, such as the beta calculation, where again information is not readily available for the companies in question.

- ***Model-based estimation*** – models are simplified representations of the workings of capital markets and can be useful in providing insights where information is either lacking or inherently unobtainable, or to provide additional relevant data. Models are generally employed for the estimation of the cost of equity, given that there is direct data available for computing the cost of debt.

As we explain in the Sections that follow, in the case of ADMIE and DEDDIE we believe it appropriate to apply model-based estimation for the cost of equity and rely mostly on direct estimation for the cost of debt – the latter is also consistent with the approach requested of us by RAE under the assignment ToR. However, we also refer to international data and comparator companies where necessary to inform the estimation of certain WACC parameters.

2.3.3 The cost of equity - Capital Asset Pricing Model

The fundamental question to be addressed in estimating the cost of equity is what rate of return would be necessary to attract equity finance? The conventional model generally employed (outside North America) to address this question is the Capital Asset Pricing Model (CAPM). While there are other models available, we rely on this model because:

- Notwithstanding its limitations, CAPM provides a powerful and robust tool to analyse the effects of risk on how investors value future cash flows, namely the discount rate or the rate of return that investors require to make an investment attractive;

- The CAPM model in our view has the strongest theoretical underpinnings and it is not clear to us from the academic and regulatory literature that other models have better predictive power;

- The alternative models do not solve the fundamental problem with CAPM, which is having to deal with limited market data; and

- Importantly, RAE has relied on CAPM estimations of the cost of equity in the past (for example, for the gas transmission company, DESFA) and therefore this ensures a consistent regulatory approach across sectors and over time.

The CAPM approach to estimating the cost of equity was discussed in our 2012 paper. To recap, the central tenet of CAPM is that the main explanatory factor for the rates of return implicit in market valuations is an asset's (perceived) sensitivity to systematic risk (also known as non-diversifiable risk or market risk). The level of systematic risk is represented by a number referred to as beta (β). [1]

[1] The beta in an asset can be estimated by observing the historical sensitivity of the returns on that asset to fluctuations in returns in the market as a whole. Where an asset is traded on a daily basis, on a stock

The risk in any one investment, the uncertainty in its future returns, can be thought of as having two components, diversifiable and non-diversifiable risk. Non-diversifiable risk will be the uncertainty that 'co-varies' with the returns on a diversified portfolio, or with the market as a whole. In other words, non-diversifiable or systematic risk is risk that is 'in sympathy' with risk in the investment market as a whole. Returns that would tend to be higher when returns in the wider investment market are higher and lower when the markets are lower would be a manifestation of systematic risk. The theory implies that all other risk, by definition risk that is independent of the market, would not lead portfolio investors to require an additional level of expected return as this can be diversified away.

We emphasise that by 'the market' we mean a global investment market. Investors who may be interested in investing in Greek energy network businesses generally have the choice of investing in other assets, both in Greece and outside Greece. The valuations of such participants in the Greek market are made in the context of the larger market for investments. If the returns available in one market start to look relatively attractive compared with other markets, those marginal investors will invest more in it and the law of supply and demand will in due course ensure that valuations find a new level so that the markets become broadly in equilibrium again.

This means that any one market, for example the Greek equity market, can be thought of as part of the global market for financial investments.

The above insights are embodied in the standard CAPM formula for the minimum expected rate of return (after taxes) on an investment ($r_{expected}$) that would make the investment attractive to investors[2]:

$$r_{expected} = RFR + MRP \cdot \beta_{investment}$$

In this formula:

- The RFR is the risk-free rate, the rate of return that would be available from a risk-free investment
- The MRP is the market risk premium, the additional return (over the risk-free rate) that can be expected from a balanced portfolio of investments in an investment market
- $\beta_{investment}$ is the exposure to market risk in the investment, the extent to which the investment's returns and the returns from the wider market are expected to co-vary (i.e. vary in sympathy).

The theory applies to any investment asset, including debt, but is most useful when thinking about the cost of equity (CoE), post-tax, with reference to an equity beta:

exchange, estimated beta values can be easily inferred from a large quantity of daily (or less frequent) data using standard statistical calculations.

[2] The existence of a market will tend to make this "=" rather than ">". See Section 3.3.4 for further discussion on how we distinguish between expected returns, $r_{expected}$, and forecast returns, $r_{forecast}$.

$$\mathrm{CoE}_{\mathrm{post-tax}} = \mathrm{RFR} + \mathrm{MRP} \cdot \beta_{\mathrm{equity}}$$

2.3.4 Determining the cost of debt

In principle, identifying the cost of debt can be relatively straightforward – it is the interest payable on the regulated entity's debt, which can usually be observed from the company's financial accounts. In practice, it is not that straightforward as the cost of debt allowance in the WACC is generally estimated in advance, so accounts are not yet available. There can be considerable uncertainty about the cost of debt that will be issued in the future, even in relatively stable markets.

Ex ante vs. *ex post* assessment of the allowed cost of debt

Making a debt allowance in advance (without subsequent adjustment for realised debt costs) risks either of two outcomes:

- Market conditions improve so that the company is able to issue debt at substantially lower cost, creating undeserved gains for shareholders and higher costs for consumers than is necessary. Also, this would create incentives for bringing forward investments that might not be necessary; or
- Market conditions deteriorate so the company is only able to issue debt at substantially higher cost, creating undeserved losses for shareholders and disincentives to invest (including postponing needed capital expenditure), to the detriment of consumers.

Recognising the difficulties involved in estimating the cost of debt in advance, it is possible for a regulator to operate a mechanism for the cost of debt allowance to vary with market conditions. The UK's energy regulator, for example, now operates such a debt indexation mechanism so that allowances for debt costs can be updated annually, using a 10-year trailing average of two 'iBoxx indices' of sterling-denominated corporate bonds. Alternatively, and especially where there is no acceptable benchmark index of debt costs, the allowed debt costs can be adjusted for the actual debt costs of the regulated companies, subject to regulatory review for their reasonableness.

It appears to us that the future environment for new debt in Greece remains exceptionally uncertain. Any allowance for the cost of debt at this time would therefore appear to be highly speculative and require considerable judgement. We therefore recommend (consistent with our 2012 paper) that borrowing costs be allowed on an *ex post* basis. We believe such an approach (subject to credible commitment from RAE) would provide the network businesses and their investors with confidence that cash flows will support the efficiently incurred cost of new debt finance.

Estimating debt costs

In broad terms, there are two methods for estimating the cost of debt:

- Embedded cost of debt – the cost of debt is determined on the basis of the actual cost of debt of the regulated company in question

- Market based estimation – the cost of debt is estimated by reference to businesses with comparable regulatory and business risks. This can be done by assessing observed yields for an index of companies or through a combination of the risk free rate and a debt premium.

A significant problem with the second approach is determining the benchmark entities that might be relevant for ADMIE and DEDDIE. There are no obvious comparators within Greece for these companies and we question whether there would be any relevance in assessing yields of companies that are generally listed and of investment grade in other countries. We therefore rely on the embedded costs of debt and also attempt to assess what the future cost of debt might be through recent issues and other markers, to derive a weighted average cost of debt.

3 Assessment of underlying WACC parameters

3.1 Which time period?

An initial question to be addressed before assessing the various WACC parameters is what time period is relevant. As mentioned in the introduction, the immediate need for RAE is to adopt a WACC for approving 2014 revenues and tariffs. However, RAE has indicated that it may wish to set a WACC for a longer period in the case of ADMIE (say, to 2017) to provide greater certainty to potential investors in light of its impending privatisation.

As the WACC is an input to the allowed revenue calculation, we believe the relevant period is the duration of the given revenue control. In the present circumstances, this seems to be just 2014 for both ADMIE and DEDDIE. Notwithstanding this, we have taken a more medium term view in assessing the WACC parameters to respond to RAE's request.

We note, however, that there remains considerable uncertainty in the risk environment in Greece and our judgements are liable to be overtaken by events. Given this uncertainty in the financing environment, we would consider it unsafe to set a WACC (in the case of ADMIE) for a full four-year period (2014 to 2017) without some mechanism that would permit adjustment in the event that conditions substantially deteriorate or improve. In the former case in particular, the company may have strong disincentives to finance continuing investment which could be severely detrimental to consumers.

We have explicitly accounted for this in our proposed approach for adjusting for *ex post* debt costs (see Section 3.4), but RAE may wish to consider the possibility of either:

- Providing for a mechanism to permit a WACC adjustment for other risk factors (primarily, country risk) within the 2015-17 control period (for ADMIE), or
- Reassessing the risk environment *prior* to setting a WACC under RAE's proposed interim tariff methodology for that control period (i.e. in about 12 months from now).

3.2 Which company's cost of capital?

A second issue that must be resolved before proceeding to estimating the WACC is which company's cost of capital is relevant, that of ADMIE and DEDDIE or their holding company, the Public Power Corporation (PPC)?

Although both ADMIE and DEDDIE are fully-owned PPC subsidiaries, the European and Greek legislative and regulatory regimes for the electricity sector

clearly require that both companies operate as independent stand-alone businesses. We are therefore concerned with ADMIE and DEDDIE as separate free-standing, ring-fenced companies. The two companies must be able to stand independently financially, which means that they need to be permitted sufficient revenues (including a return on capital) to fund their activities and not have to rely on excess earnings from other parts of the vertically integrated business.

Perhaps more fundamentally, the business activities of the network companies and their underlying risks are very different compared to the other parts of the PPC business (mining, electricity generation and retail supply). Competitive power generation, for example, typically has a higher beta than regulated network utilities; also, the nature of the network function does not change if PPC acquires or loses generation or supply capacity. It is therefore inappropriate to apply a firm-wide WACC if the network businesses differ in terms of their riskiness from the rest of PPC's assets. The cost of equity should generally be based on the risk to which the capital is exposed and the opportunity cost of that capital.

As with so much else on the cost of capital, this last statement is not universally accepted and is subject to controversy. Some analysts point out that in practical terms the parent company is the only possible investor and the subsidiary's only source of external equity financing (and hence the parent's weighted average cost of capital should be used as the cost of equity to the subsidiary – the 'double leverage approach'). We note, however, that at least in the case of ADMIE, it will be (partially) privatised and will therefore involve an injection of equity capital over the relevant WACC-setting period and therefore it is appropriate to treat it as an independent business. Moreover, adopting a double leverage approach necessarily induces cross-subsidisation since it allows each PPC subsidiary to earn the same rate of return on equity regardless of the level of risk specific to the subsidiary. We believe this would be inconsistent with the spirit (if not the letter) of EU and national laws on the operation of the electricity sector.

Regarding the debt component of the cost of capital, ADMIE raises its own debt and so we use ADMIE data for estimating debt costs. DEDDIE, however, relies on debt financing from its parent company, PPC. We examined the annual accounts of PPC to identify whether debt costs are allocated across its subsidiaries in its ring-fenced accounts, but there is no such allocation. For the purposes of estimating the cost of debt for DEDDIE, therefore, and for the same reasons discussed above for the cost of equity, we adopt the ADMIE debt costs. The alternatives would be to adopt a market-based cost of debt for similarly situated companies, but as we argued in Section 2.3.4 there are few comparators for DEDDIE, particularly given the profound economic and financial turbulence in Greece – the most obvious comparator is in fact ADMIE; or, rely on the PPC overall debt costs, but these necessarily reflect differential premiums across PPC's activities.

We turn now to the estimation of the various WACC parameters and provide our overall estimates and the end of this Section.

3.3 Cost of equity

In this sub-Section we determine our projected cost of equity, which is based on estimates of the following four parameters:

- ❑ The risk-free rate;
- ❑ The market risk premium;
- ❑ The beta estimate; and
- ❑ 'Asymmetric' risk (including country risk).

3.3.1 The risk-free rate (RFR)

In our 2012 paper, we had concluded that we could not rely on historical assessments of real returns on bills and bonds for setting the RFR because such returns have not been stable. This is because bills and bonds are denominated in *nominal* terms. The existence of inflation uncertainty therefore means that *ex post* measures of real returns on bills and bonds do not necessarily reflect the *ex ante* expectations of investors[3]. As we explained in our 2012 paper, a lagged growth in inflation expectations before the 1980s and a lagged decline in inflation expectations from the 1980s seem to have been key factors in marked shifts in annual rates of return on bills and bonds.

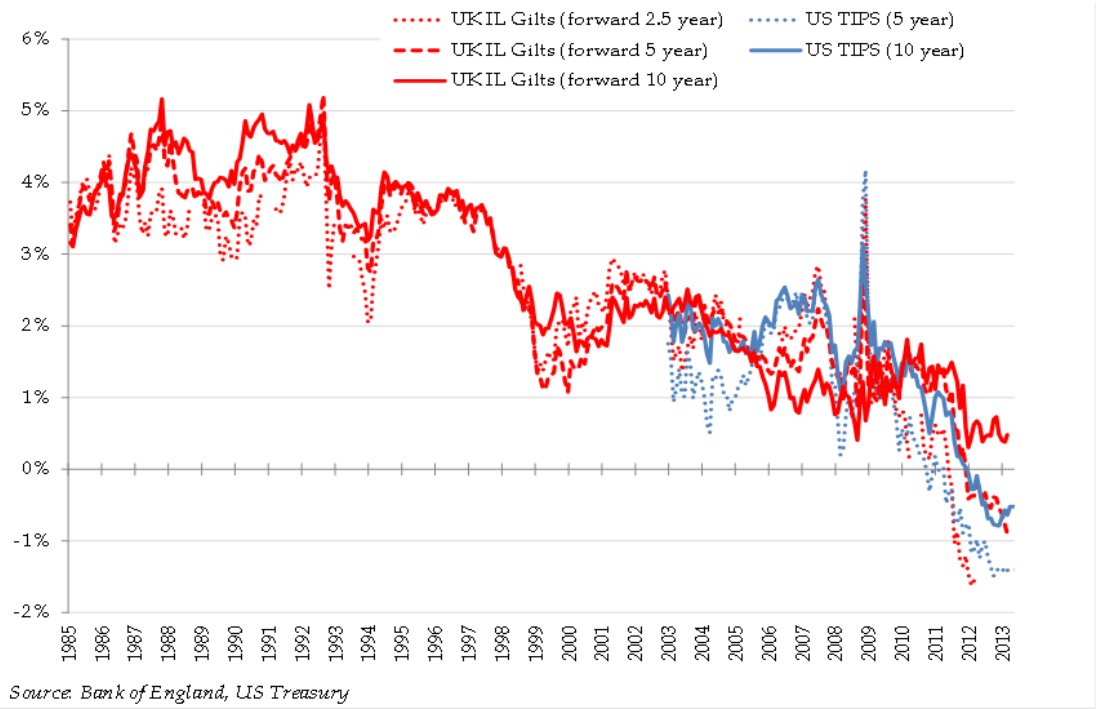
On the other hand, *real* bill and bond returns are relevant because equity valuations are denominated in real terms (the underlying value of business assets will increase in nominal terms with inflation). As yields on nominal government bills and bonds are affected by inflation rate expectations, we concluded (consistent with the view of many regulatory authorities[4]) that yields on inflation-adjusted bonds provide a better insight into the RFR than yields on nominal bonds.

Figure 1 below updates, for 2012 and 2013 data, a similar diagram included in our previous report and shows market yields on index-linked securities since 1985. Inflation-adjusted bonds are a relatively new form of security which have been traded in some markets since the 1980s. The two leading markets for inflation-adjusted bonds are now the US (known as Treasury Inflation-Protected Securities or TIPS) and UK (known as index-linked gilts) – the Figure below shows yields for these securities of differing maturities.

[3] Of course, *ex post* measures of real equity returns also do not necessarily reflect the *ex ante* expectations of investors (which as we stated earlier are inherently unobservable), but real equity returns are not in the same way affected by large swings in inflation expectations.

[4] For example all the utility and transport sector regulators in the UK.

Figure 1 Forward-looking yields on inflation-adjusted bonds



Source: Bank of England, US Treasury

The chart shows that yields on inflation-adjusted bonds have progressively reduced over the last 20 years[5]. It appears that the real RFR has fallen markedly over this period. Current estimates of the RFR would therefore be very low or even negative. In general, the spot rate is the best measure of the current expectation of the future RFR given it incorporates, in theory, all evidence available at this time. However, we do not believe current spot rates can safely be used for a CAPM assessment, given that current yields are affected by what are expected to be temporary actions of the monetary authorities, such as quantitative easing and other unconventional monetary policies.

The issue also becomes subtly different when considering the RFR that might apply over a *period* into the future. The chart above shows that yields can vary significantly over relatively short periods of time, say two years. A cautious forward estimate of the RFR might therefore recognise that negative yields are unlikely to be sustained. Historically, the period of high returns on bonds from about 1980 also appears to be untypical, since bonds barely generated any real returns over the previous 80 years, and the higher returns from 1980 probably reflect lags in investors adjusting their inflation expectations downwards following the experience of unanticipated high levels of inflation during the 1970s.

Recognising that long-dated index-linked yields have remained below 1.5 per cent for the past 4-5 years, ***we consider an RFR of 1.5 per cent would be a reasonable, if rather cautious, assumption for a medium term forward-looking period*** (up to, say,

[5] With the exception of a spike in US TIPS and UK short-term in October and November 2008 during the peak of the last financial crisis. At that time, yields on longer term UK index-linked gilts dipped in the opposite direction, briefly going negative.

eight years). This RFR remains consistent with our recommendation in the 2012 paper. It is also consistent with recent decisions by the main UK economic regulators, for example. In addition, we would adopt a lower-end estimate of 1 per cent, which we note is still above current short-term real interest rates and forward rates.

Alternative estimate of the RFR

In responding to an earlier version of this paper, RAE expressed a concern that it may be inappropriate to rely on indicators from the UK and US securities markets, as the estimate from using such data would require projections of relevant exchange rates and the calculation of an exchange rate premium. Although the countries have different inflation contexts (which are key determinants of real exchange rate movements), Euro inflation prospects would not seem to be significantly different to those in the UK and US. We are therefore comfortable that the broad conclusions we draw on the RFR translate to the Euro.

Nevertheless, we have responded to RAE's request to refer to Euro evidence by examining yields on:

- An index of triple A-rated Eurozone countries' bonds (of 10-year maturity) that is reported on by the European Central Bank (ECB); and
- German government bonds, also with a 10-year maturity.

The reported yields on the above are in nominal terms and therefore need to be adjusted for inflation to convert to a real measure of the RFR. Specifically, nominal yields need to be adjusted for:

- Inflation expectations – that is, the rate of inflation that investors believe will prevail in future and that they will therefore factor into their decision-making in assessing their prospective real returns.
- Inflation risk premium – this premium is required to compensate investors for inflation risk that arises from the fact that investors holding nominal assets are exposed to unanticipated changes in inflation.

As markets for inflation-linked bonds have grown in recent years, the yield spread between these and nominal bonds of similar maturity has become a commonly used indicator of inflation expectations. However, this differential yield or the 'break-even inflation rate' does not generally reflect inflation expectations alone; it also includes risk premiums, notably for inflation risk as mentioned above, and possibly for differential liquidity risk in the nominal and index-linked bond markets.

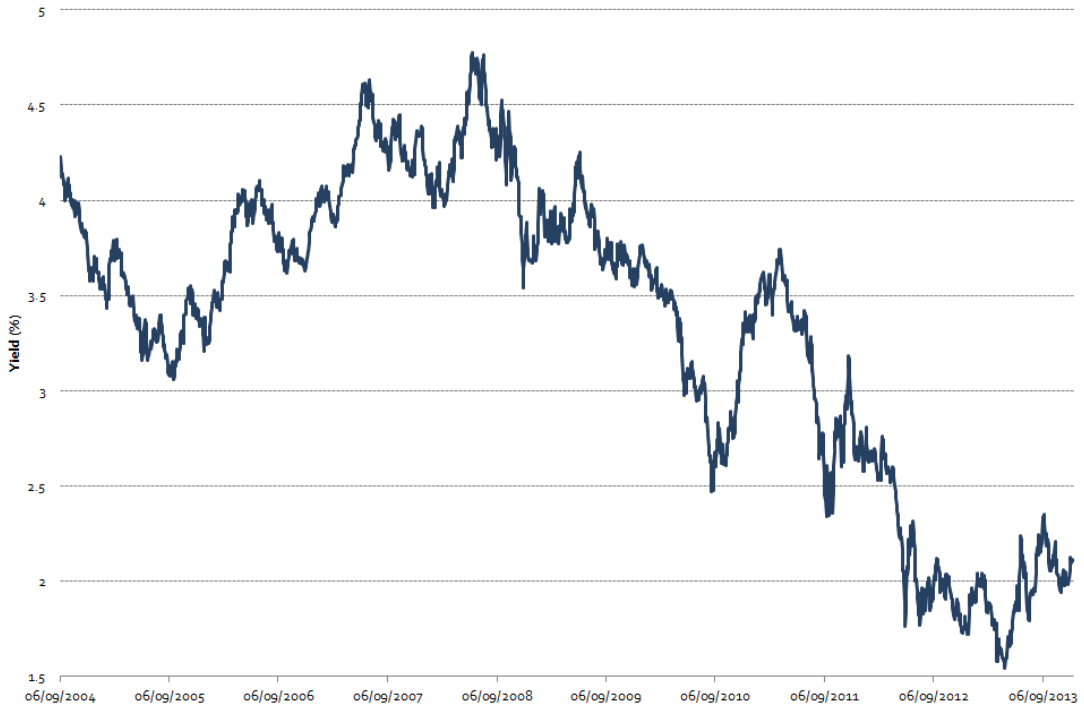
Our analysis below relies on available empirical evidence that suggests inflation expectations to be fairly stable over time at around 2 per cent and that the inflation risk premium over the long term is in the order of 25 basis points (0.25 per cent).[6]

[6] See, for example, Garcia, Juan Angel and Thomas Werner, "Inflation risks and inflation risk premia", European Central Bank, Working Paper Series No. 1162/March 2010.

Triple A-rated bond index

The figure below shows the nominal yield on an index of government bonds issued by countries in the Eurozone whose rating is triple A and with a 10-year maturity. We note that there has been a substantial drop in bond yields since the onset of the financial market crisis in 2008. This is most likely due to the 'flight to safety' phenomenon that has increased demand for government securities perceived to be less risky. Interestingly, at the height of the Eurozone crisis in late 2010 - early 2011, yields steeply increased, perhaps as investors became nervous about the currency union remaining intact and the uncertain consequences of a break-up. Also, substantial liquidity injections by the ECB are likely to have played a significant role in lowering yields over time.

Figure 2 Yield on nominal government bond index of triple A-rated Euro area countries



Source: European Central Bank

The following table summarises nominal and real bond yields for this index over the following time periods:[7]

- From the index's inception on 6 September 2004
- For the pre-world financial crisis period – we assume the onset of the latter from 15 September 2008 i.e. the date Lehman's filed for bankruptcy

[7] The table shows simple averages as we could not access information on the composition of the index to develop appropriate weights. The results should therefore be treated as only indicative.

- For the post-crisis period – i.e. from the same date above until 16 December 2013 (when we downloaded the relevant data).

Table 2 Nominal and real bond yields (triple A-rated issuers, Eurozone), per cent

	From start of series	Pre-crisis	Post-crisis
Nominal yield	3.35	3.90	2.93
Estimated real yield	1.10	1.65	0.68
Mid-point of real yield		1.2	

Source: ECA calculations using ECB data

The above table shows that the real yield over the life of the index has averaged 1.1 per cent in real terms, although the yields for the pre- and post-crisis periods vary substantially, by almost 100 basis points. Taking the mid-point of these last two estimates (1.2 per cent) places the estimated yield within the range we have previously identified for the RFR. However, we reiterate our points earlier about being cautious in relying on prevailing or recent estimates of the RFR, particularly given current actions of the monetary authorities and the need to determine an RFR that might apply for a period into the future.

German nominal bonds

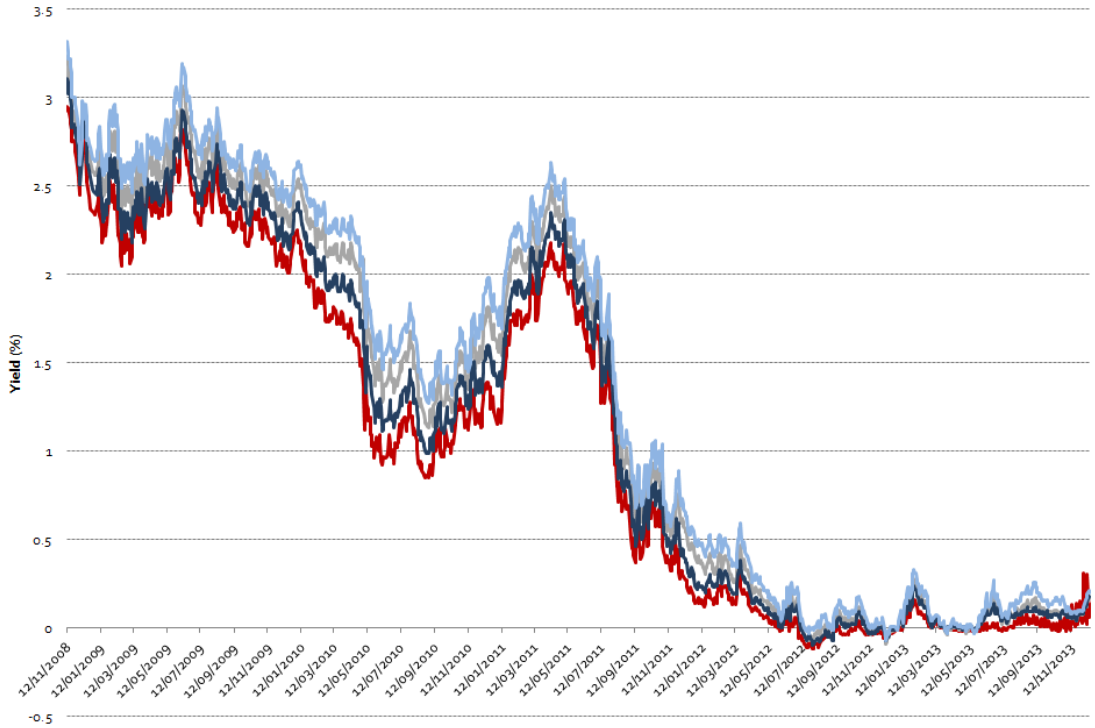
For the calculation of nominal yields on German bonds of 10-year maturity, we use data from the Bundesbank (downloaded on 17 December 2013). To develop our estimates we relied on the reported yields on a selection of 11 bonds issued within the past 5-10 years that continue to be traded to the present day. Figure 3 charts the yields for a sub-set of these over the period for which there is available data for all the selected bonds.[8]

As with the ECB index, the German bonds demonstrate a sharp fall in yields since the onset of the financial crisis in 2008, although yields have been much flatter in the past 18-24 months and very close to zero or even negative (in nominal terms). This is probably as a result of Germany's 'haven' status given that a number of other Euro area countries have been downgraded and have lost their triple A rating over this period (Austria, France, Netherlands), declining growth expectations in the industrialised world, and continued strong demand for assets perceived as safe given the uncertainties confronting the Eurozone and world economies.

Table 3 immediately following the figure contains the estimated nominal and real yields for the pre- and post-crisis periods defined as above. The estimated pre-crisis real yield is 1.79 per cent, but over the post-crisis period this has turned negative (-0.74 per cent). As we mentioned above, we believe that negative yields are unlikely to be sustained in the future and that current spot rates cannot be safely used in our view for a forward-looking CAPM assessment. Having regard therefore to the totality of the information above (including regulatory precedents), we do not alter our preferred range for the RFR of 1.0 - 1.5 per cent.

[8] Including other bond series does not alter the overall picture. They have simply been removed so that the figure is more legible.

Figure 3 Yield on selected German 10-year nominal government bonds



Source: Bundesbank

Table 3 Nominal and real German 10-year government bond yields, per cent

	Pre-crisis	Post-crisis
Nominal yield	4.04	1.60
Estimated real yield	1.79	-0.74
Mid-point of real yield	0.52	

Source: ECA calculations using Bundesbank data

3.3.2 The market risk premium (MRP)

Consistent with our 2012 paper, we believe that the RFR and MRP should be considered together as they are the two components of the expected return from a well-diversified investment portfolio. As we highlighted in that paper, this then raises the question of whether the fall in the RFR referred to above reflects an overall fall in expectations of equity returns or an increase in the risk premium, or both. In other words, should we:

- Estimate an underlying MRP and add that to the RFR to estimate total market returns (MRP emphasis), or

- ❑ Estimate total market returns then deduct the RFR to infer an MRP (total market return emphasis)?

In general, we consider it is more appropriate to adopt a total market return emphasis, recognising that low risk-free rates may in part reflect lower expectations for returns in investment markets as a whole and might be consistent with a lower total market return estimate than was common a few years ago.

There are chiefly two approaches to estimating the market return and the MRP:

- ❑ Historical data reflecting actual returns over time; and
- ❑ Forward-looking data relating to investors' current expectations of returns.

As we indicated in our 2012 paper, we lend particular weight to the analysis undertaken by leading academic authorities from the London Business School, Dimson, Marsh and Staunton (DMS). DMS have been assessing historical market returns and equity market premiums for some time and their dataset now contains 113 years of data from 1900 to 2012. In their most recent analysis[9], the estimated annualised total market return for world and individual country markets generally lies between 5 and 6 per cent. This compares with estimated real total market returns of 6.5 - 7.5 per cent that were commonly assumed until recently.[10] The historical MRPs suggested by the latest DMS analysis for the period 1900-2012 are:

- ❑ 5.3 per cent for the USA (the world's largest economy), but this is confirmed to be at the high end of the range due to a 'success bias'
- ❑ 3.5 per cent for the world, excluding the US
- ❑ 4.1 per cent for the DMS world equity index (covering 20 countries[11] weighted by market capitalisation).

An alternative approach, suggested by an influential paper by Fama (the 2013 Nobel laureate for Economics) and French, is to estimate the underlying return from the sum of the average dividend yield and the average rate of dividend growth[12]. Applying this approach to US data (from 1872 to 1999), Fama and French provided evidence of a fall in expected returns over time, with expected returns being lower since 1950 than before 1950. They also concluded that expected future stock returns would be low relative to the last 50 years.

[9] 'Credit Suisse Global Investment Returns Yearbook', February 2013.

[10] For example, this was the estimated total market return of the 'Smithers & Co report' commissioned by UK regulators across sectors and which has guided the majority of UK regulatory decisions over the past decade.

[11] The countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, South Africa, Spain, Sweden, Switzerland, United Kingdom, and United States.

[12] Fama, E.F. and French, K.R., "The Equity Premium", Journal of Finance, April 2002.

DMS adopt a similar approach for their forward-looking estimates, but use data from multiple countries. In their latest report, they discuss the building evidence that we are now living in a low-return world, developing their view on a prospective basis of "an expected real equity return in the region of 3-3½% over 20-30 years" (on a geometric mean basis), recognising that forward-looking risk-free returns are likely to be close to zero. DMS have therefore lowered their forward estimate of market returns in line with their estimate of the risk-free rate. Importantly, in assessing whether the current risk environment justifies a higher premium, DMS state the following:

> "Today, risks abound relating to the Eurozone, world growth, and political and geopolitical concerns. Many argue that this high level of uncertainty should command a high risk premium.
> It is hard to find either historical or current market support for this view. First, the empirical evidence over 113 years indicates that, when markets are turbulent, volatility tends to revert rapidly to the mean, so that we should expect any period of extreme volatility to be relatively brief, elevating the expected equity premium only over the short run. Second, at the time of writing, volatility is in any case below the long-run average." (p. 12).

In our view, the DMS authoritative historical and prospective estimates of total market returns provide a compelling basis for a CAPM assessment for international investors. It also seems reasonable to us to assume that the long-term decline in the RFR discussed earlier is associated with an increased demand for equities and therefore increased prices and lower returns. Moreover, continued returns at 7 per cent (or more) above inflation do not seem credible, given economic conditions observed since the global financial crisis of 2007-08.

Nevertheless, we recognise that the interpretation of evidence on market returns remains subject to considerable uncertainty and therefore we believe it is appropriate to adopt a cautious view when determining allowed returns for the regulated electricity networks. Recognising also that we have built some caution into our RFR assumption, we adopt an assumption of between 5 and 6.5 per cent prospective real returns in the market as a whole (on an arithmetic mean basis). After deducting our assessment of the real RFR at 1.5 per cent, we are left with ***an MRP of between 4 and 5 per cent and we adopt a point estimate in the middle of this range i.e. 4.5 per cent***.

We note that our 2012 paper had adopted an MRP of 5.5 per cent, which was consistent with an upper limit of 7 per cent for total market returns. We think it appropriate to move away from this limit on the basis of the evidence outlined above, including:

- ❑ the 5 to 6 per cent range for total market returns suggested by the historical analysis conducted by DMS
- ❑ DMS' prospective approach suggesting an MRP of 4.5 to 5 per cent
- ❑ Similar conclusions from Fama and French's forward-looking projections based on dividend growth models.

3.3.3 The beta estimate (β)

Asset and equity betas

The beta estimate relates to the systematic component of risk facing the business. In general, beta risk is focused on risk capital, namely equity. However, debt is not entirely insulated from beta risk – if there is a default risk in debt, there is likely to be a beta component of that risk. To take account of both debt and equity beta, beta is commonly analysed with reference to an asset beta, or unlevered beta.

A general formula[13] for converting an asset beta to an equity beta (where β_E is the equity beta, β_A is the asset beta, β_D is the debt beta, D is the value of debt and E is the value of equity) is:

$$\beta_E = \beta_A + (\beta_A - \beta_D) \cdot \frac{D}{E}$$

It is often assumed that debt has zero beta. This can be a useful simplifying assumption for investment grade debt but less realistic otherwise. When inferring an equity beta for a company with more risky debt than the developed country comparator companies typically used for asset beta estimates, more of the risk burden will be shouldered by lenders so it is likely to be more important to consider a debt beta. However, as we stated in our 2012 paper, in the case of the Greek network businesses, we anticipate that additional debt costs will be caused by financial sector liquidity and systemic risk issues rather than any more underlying systematic risk in these businesses than the comparators. We therefore consider it remains consistent to assume debt beta is zero. Hence, the above formula reduces to the following (and it is this formula that we employ to covert the chosen asset beta estimate to an equity beta for computing the WACC):

$$\beta_E = \beta_A \cdot (1 + \frac{D}{E})$$

Beta estimation

Beta is usually estimated from the observed covariance of returns on frequently traded shares with returns on a diversified stock market. We note, however, that there are a limited number of pure regulated network businesses listed on stock exchanges, which means that betas estimated in this way may also reflect systematic risks associated with unrelated business activities. Also, the exposure to beta will be affected by the characteristics of the regulatory environment the businesses operate in, so caution must be exercised in drawing any conclusions from such data across countries.

We have not been able within the limitations of the present study to undertake our own analysis of betas from stock market data. In our 2012 paper, we had considered that, on the basis of previous analysis and regulatory precedents, the following beta estimates would be appropriate:

[13] Some practitioners use other formulae. See Pablo Fernández, 2003. "Levered and unlevered Beta," IESE Research Papers D/488, IESE Business School. Some commonly used ones apply a $1 - t$ factor to one or both variables in $\beta_A - \beta_D$.

- 0.30 for mature networks subject to annual price control reviews
- 0.40 for mature networks subject to five-year price control reviews.

To further test these assumptions, below, we also examine:

- The PWC asset betas estimated in the study commissioned by ADMIE
- Regulatory precedents from Ireland and Great Britain, where this information is more readily available.

PWC asset betas

In the study commissioned by ADMIE for the estimation of its WACC in September 2012, PWC derived estimates of the asset betas of a number of possible comparator energy network companies employing Bloomberg weekly stock market data for the period 20 July 2007 to 7 September 2012. Table 4 below shows PWC's resulting asset betas (excluding National Grid, which we consider less relevant for the present purposes).

Table 4 PWC asset beta estimates for comparator companies

Company	Country and sector	Asset beta
Enagas SA	Spain – natural gas	0.44
Red Electrica Corp SA	Spain - electricity	0.42
Redes Energeticas Nacionais SA (REN)	Portugal – electricity and natural gas	0.27
Snam Rete Gas SpA	Italy – natural gas	0.35
Terna Rete Elettrica Nazionale SpA	Italy –electricity	0.34

The range of asset betas is from 0.27 to 0.44, while excluding REN, the range is narrower, namely 0.34 – 0.44. PWC derives its asset beta estimates from equity beta observations that have been adjusted towards 1.0 by a factor of a third, i.e. the 'Blume adjustment' (which assumes that companies' betas converge to one over the long term). As we stated in our 2012 paper, this adjustment is adopted by some practitioners but is not universally accepted. It is therefore arguable that the asset beta estimates PWC derives are overstated. However, we consider that the overstatement in the PWC figures caused by using the Blume adjustment will be small relative to the margins of error in the estimates. On balance, therefore, we consider that an asset beta range of 0.27 to 0.44 seems plausible.

Regulatory precedents

Table 5 below shows the asset betas adopted in a number of regulatory reviews in Ireland and Great Britain, primarily for electricity transmission and distribution (which we consider most relevant as comparators), but also for gas transmission and

distribution and the water sector. The regulatory precedents give an asset beta range of 0.2 to 0.45.

Table 5 Previous regulatory decisions on asset betas

Regulator	Case	Asset beta
Ofgem (Great Britain)	Electricity transmission (2013)	*0.38*
	Gas transmission (2013)	*0.34*
	Gas distribution (2013)	*0.32*
	Electricity transmission (2006)	*0.24*
	Electricity distribution (2009)	0.24 – 0.34
	Electricity distribution (2004)	0.21 – 0.4
CER (Ireland)	Electricity transmission and distribution (2010)	0.2 – 0.4 (point estimate 0.3)
	Electricity transmission and distribution (2005)	0.2 – 0.4 (point estimate 0.4)
	Electricity transmission and distribution (2001)	0.41
Ofwat (Great Britain)	Water and sewerage (2004)	0.45
	Water and sewerage (2009)	0.4
Competition Commission (Great Britain)	Bristol Water (2010)	0.32 – 0.43
	Northern Ireland Electricity and Distribution (2013 – provisional determination)	0.4 – 0.45

Note: the asset betas shown in italics were calculated from equity betas stated in the relevant determinations and the notional gearing levels, while the debt beta was assumed to equal zero.

Conclusions on asset beta

In our previous report we had indicated a range of 0.3 to 0.4 as an asset beta for mature networks, which was based on our analysis over a number of years for various regulators. To test the reasonableness of these estimates, we compared them with both the PWC estimates developed for ADMIE's WACC submission in 2012 and a range (most) of the relevant regulatory decisions that have been issued in the past 10 years or so in Ireland and Great Britain. Combining these findings gives an asset beta range of 0.2 to 0.45, with a cluster of betas in the 0.35 to 0.4 range. Hence, we adopt an asset beta range of 0.3 to 0.45 for ADMIE and DEDDIE and for our point estimate use the midpoint of this range (i.e. 0.375), which also corresponds to the mid-point of the 'cluster' range.

3.3.4 Asymmetric risks

Country risk as a particular case of asymmetric risk

The allowance for WACC needs to be made in the context of forecasts. If those forecasts are prepared on a fully probabilistic basis, so that forecast figures reflect probabilistic estimates, CAPM indicates that investors should be content with an allowance for returns that provides only for systematic risk.

However, forecasts are seldom prepared on a fully probabilistic basis. Instead, business forecasters often exercise some judgement to interpret a range of possible outcomes for a component of a forecast and choose a central estimate. In some cases, those judgements might be suitably weighted. In other cases, however, especially where downside risks can be both severe and difficult to estimate (as is presently the case for Greece), forecasts may tend to be biased towards optimism. Put simply, forecasted costs and returns are generally not symmetrically distributed. If risk then is asymmetric, there are two ways to take it into account:

- Revise the forecast to ensure estimates are probabilistically balanced, or
- Make an adjustment to the required return to compensate.

Turning to the matter of country risk, in the absence of much evidence for a systematic component of such risk[14], in CAPM terms, country risk will be strictly diversifiable for a global portfolio investor: the market should not expect higher returns overall. The market would, however, require higher returns to be built into forecasts to compensate for downside risk of adverse political and economic conditions in the country that are not otherwise factored into those forecasts. Therefore, and in our view, country risk can be thought of as a special case of asymmetric risk.

Estimating country risk for Greece

A debt crisis in Greece has been recognised since the start of 2010 and continues to evolve. Market confidence in the ability of the Greek government to engineer a sustainable financial future within the euro zone was exceptionally low for the last quarter of 2011 and the first three quarters of 2012. The debt restructuring in March 2012 did not by itself trigger a wholesale return of confidence. Doubts remained over the capacity and willingness of the country to implement the necessary structural reforms and fiscal consolidation.

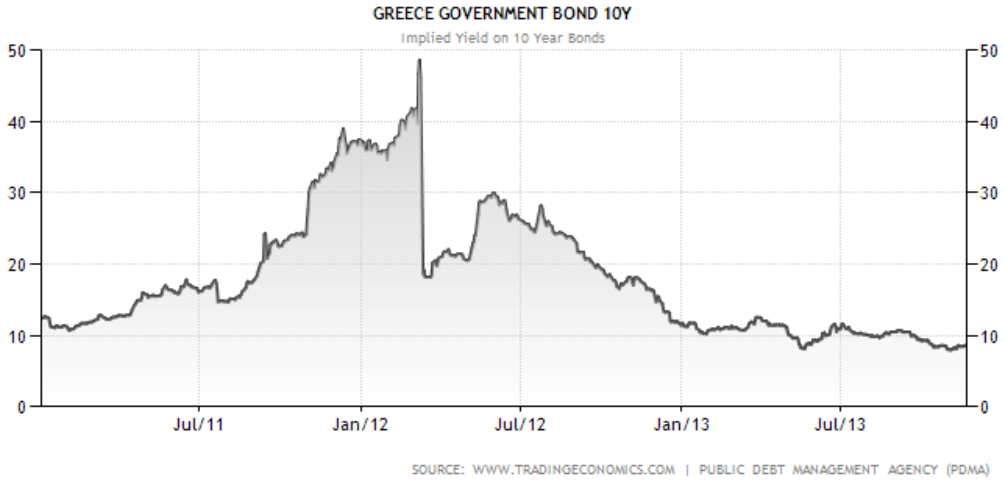
Some doubt remains in the minds of the markets. However, since a coalition emerged from the June 2012 elections[15] and showed itself (at least partially) capable

[14] Campbell R.Harvey, 'Country Risk Components, the Cost of Capital, and Returns in Emerging Markets', Available at SSRN: http://ssrn.com/abstract=620710 or http://dx.doi.org/10.2139/ssrn.620710

[15] This was initially a three-party coalition, but one of the parties has since departed. So far, the remaining coalition partners have managed to implement measures required under the country's lending agreements.

of implementing reform and since the European Central Bank (ECB) signalled its determination to avoid a crisis across the euro zone, markets have settled somewhat. As a result, yields on Greek government bonds are currently at about 8.5 per cent (see Figure 4 below) - this is well below the +30 per cent yields in the period from November 2011 to March 2012, but still represent a large spread of about 7 per cent per annum above yields on the equivalent German bonds. Markets are therefore still pricing in a very substantial risk of sovereign default.

Figure 4 Yields on 10-year Greek government bonds to 21 November 2013



The onset of a sovereign default in unpredictable circumstances could have severe implications for many businesses in Greece, not least electricity network businesses offering an essential service. Nevertheless, and even though the more recent crisis in Cyprus shows us that events can still destabilise, the environment for investment in Greece is very much more positive than it was, say, a year ago. On the other hand, we recognise that this is also contingent on the ECB's continued commitment to purchase the sovereign bonds from crisis-affected euro-zone countries in unlimited quantities, which has yet to be tested. Arguably, this has been the single most important factor in the steady decline from about the third quarter of 2012 of sovereign bond yields for Greece and other troubled euro-zone economies (such as Italy, Portugal and Spain).

Country risk is often discussed and analysed with reference to spreads on sovereign bonds, which reflect the market's assessment of the risk of a sovereign default. However, the risk of a sovereign defaulting on its bonds is likely to be only one aspect of country-related risk for any other investment. An investment may be exposed to losses from an economic or political crisis within a country even if bond holders escape a default, while conversely another investment's cash flows may be relatively insulated from the effects of a sovereign default.

Another important factor is that the risk environment in Greece, as perceived by markets, may still change significantly and unpredictably over the coming months and years. Nevertheless, in recent months, the financing environment has stabilised sufficiently to permit some high profile corporate debt issues. Notable among these, have been the following:

- In January 2013, cement and building materials producer Titan issued €200 million of bonds with a coupon rate of 8.75 per cent nominal
- In February 2013 there was a €700 million bond issue for OTE, the telecoms group, which was priced to provide a yield of 7.875 per cent nominal
- Again in February 2013, dairy product producer, FAGE, issued bonds of €400 million with a 9.875 per cent nominal interest rate
- Hellenic Petroleum issued €500 million in bonds with a nominal rate of 8 per cent in May 2013
- Also in May 2013, commercial refrigeration and glass-bottle producer Frigoglass issued €250 million of bonds, with a yield of 8.25 per cent, nominal
- In August 2013, Intralot, a supplier of gaming systems and services issued €325 million in bonds with a coupon rate of 9.75 per cent, nominal
- Minerals and materials group, S&B, issued €275 million of bonds, yielding a nominal 9.25 per cent
- Most recently, in September 2013, PPC (Public Power Corporation) issued €739 million of bonds, with a total yield of 'about' 5 per cent.

We estimate that in general, the above interest rates represent a spread of 4-5 per cent over equivalent German companies. We consider this provides another useful reference point for a current estimate of the country risk premium that would be appropriate for ADMIE and DEDDIE.

We would however need to make *adjustments* for the electricity network businesses for the following reasons:

- All the companies mentioned above (excepting PPC and perhaps OTE) are diversified international businesses with substantial non-Greek revenues which means they are less exposed to the Greek economy and that their exposure to a sovereign default may be lower than that of the government. OTE, on the other hand, is 40% owned (and backed by) Deutsche Telekom, while the PPC bond is tied to the construction of the Ptolemaida 5 power generation plant and is being guaranteed by German credit insurance company, Euler Hermes, presumably because of the participation of German companies supplying a significant part of the equipment for the new plant.
- ADMIE and DEDDIE do not operate in a competitive market, and are therefore potentially less exposed (in principle) to wider economic consequences of a sovereign default and the associated political and economic uncertainties.

- ADMIE and DEDDIE are subject to regulation by RAE, which may either have a positive or negative impact.

The last point is critical. To estimate asymmetric risk for regulated electricity networks, we consider it essential to examine the wider political and institutional arrangements surrounding the network's on-going regulation. This was the central theme of our 2012 paper.

Exposure of ADMIE and DEDDIE to country risk

In our 2012 paper, we highlighted the interaction of regulation and the negative outcomes that might follow a sovereign default and argued that:

> "The fact that the regulatory regime is an artefact of regulation and not a market environment means that there is scope to design regulatory mechanisms to engineer a desirable risk profile, one that secures an appropriate balance of risk between consumers and investors. Were it to be appropriate, RAE may in principle be able to engineer the regime so that it could provide significant protection for investors from the country-level risks."[16]

On this basis, we tried to identify the outcomes that could follow a default by the Greek government on the payment of interest or principal of its debt and characterised a number of mechanisms that could mitigate the exposure of investors in the electricity network business to those downside risks. As markets continue to price in risk of a default in Greece, we consider that this analysis remains relevant.

We do not propose to reiterate our previous analysis and proposals and would refer readers to the paper itself for more information. However, in the table below we reproduce Table 1 from that report, which summarised the possible consequences of a sovereign default and the regulatory mechanisms that could be instituted to protect against those risks. We also add a column to show whether RAE has developed any such mechanisms for the electricity network businesses.

As shown in Table 6, with the possible exception of RAE moving to an indexed-based regime for setting allowed revenues (and which would therefore entail indexation of the RAB), none of our proposed legislative, policy and regulatory proposals have been adopted. We interpret this as possibly reflecting the difficulty that RAE would have in credibly committing to implementing the proposed mechanisms. As these protection mechanisms were not adopted at the height of the sovereign default crisis, we consider that the probability of these being implemented now is low.

[16] At the same time, we had recognised that absent explicit regulatory mechanisms to protect against downside risks, investors might be particularly exposed to political risks, as government may be even more likely to default on its commitments to regulated businesses providing essential services than its commitments to bond holders.

Table 6 Country risk outcomes and possible regulatory protection mechanisms

Possible outcomes following a (non-negotiated) sovereign default	Direct impact on regulated network business (in the absence of protective regulatory mechanism)	Type of regulatory mechanism that might help protect investors	Degree to which RAE has developed such protection mechanisms
Currency conversion and major devaluation	Directly, the euro-value of the RAB would fall, indirectly any or all of the outcomes below	Use of a non-Greek index to roll forward the RAB	No such protection introduced
Low or negative growth, falls in living standards	Volumes will fall, customer defaults (or boycotts), regulated cost-recovery tariffs would increase, affordability would deteriorate	Error correction and pass-through mechanisms, price re-profiling to permit longer-term recovery of affordability-constrained tariffs	No such mechanisms introduced
High inflation	Real value of unindexed RAB will fall	Roll forward the RAB on an inflation indexed basis	RAE is minded to introduce RAB indexation as part of a revised tariff methodology (at least for ADMIE)
Greece financial system cut off from international finance	Limited and high cost debt funding, customer defaults	Pass-through of financing, customer default etc. costs (in tariffs or RAB)	Unclear – the pass-through of actual borrowing costs also forms a proposal of the present paper
Severe economic, social and political instability	Regulatory uncertainty, political pressure on tariff levels	Establish key regulatory components through licence terms and/or state commitments under Greek or, if necessary, international law	No such legislative or policy changes have been adopted

Conclusion on country risks

We recognise that investors would be subject to significant actual or perceived risk of losses arising from economic and political uncertainty in the present environment in Greece. Although market perception of risk in Greece has calmed substantially since early 2012, considerable default risk is still priced into Greek government debt prices. The broader economic and political risks associated with the prospect of a

government defaulting on its obligations would in our view remain significant factors in an investor's decision to invest in Greece, and these concerns may be accentuated in the case of the electricity network businesses, i.e. companies that provide essential services and which therefore might be subjected to considerable political pressure, notwithstanding their oversight by an independent regulator.

In our 2012 paper, we had recommended a series of policy and regulatory measures that RAE could adopt to try insulate the network businesses from market concern about the government's own financing. These recommendations have not been implemented to date, although RAE is currently developing a new revenue setting methodology for ADMIE[17], which includes the indexation of the RAB and allowed revenues for inflation. This, together with our recommendations in this paper (if adopted) for pass-through of debt funding costs (subject to regulatory safeguards), would represent a significant component of 'de-risking' the businesses. However, RAE's commitment to these regulatory policies remains untested and we therefore conclude that, on balance, ADMIE's and DEDDIE's overall exposure to country risk may not be lower than the 4-5 per cent evident in recent Greek corporate debt issues, and in fact might be higher, as the network businesses have no exposure to non-Greek markets and insufficient legislative and regulatory protection to substantially differentiate their risk profile from that of the sovereign.

In our 2012 paper, we adopted notional downside risk adjustments of 1 per cent and 6 per cent, for a scenario where RAE had undertaken all our proposed legal and policy initiatives or just the policy initiatives, respectively. ***We therefore consider a premium at the upper end of our range i.e. of 6 per cent is a reasonable estimate of asymmetric or country risk for ADMIE and DEDDIE at this stage, assuming that RAE is minded to adopt the key policy initiatives (i.e. RAB indexation and pass-through of ex post debt costs). However, this is an estimate that can only be based on a broad judgement and should be taken as indicative***. We would recommend that RAE carry out consultation with the network businesses and the financial advisers for the ADMIE privatisation before finalising any such estimate.

3.4 Cost of debt

Our analysis of the cost of debt entails:

- An assessment of the actual costs of ADMIE's existing debt;
- An examination of the cost at which new debt might be raised during the short to medium term (i.e. over the revenue control period of 2014 and 2015 to 2017); and
- The calculation of the weighted average cost of (embedded and new) debt under broad assumptions about the level of capital expenditure and (notional) gearing levels.

[17] We are not certain whether this will be extended to DEDDIE as well.

As we explained in Section 2.3.4, we use the estimated weighted average cost of debt for calculating an *ex ante* WACC. However, we believe it is appropriate in the current uncertain lending environment to allow for borrowing costs on an *ex post* basis, subject to regulatory safeguards protecting against incurring inefficient borrowing costs to the detriment of consumers. We therefore conclude this sub-Section with an outline of the procedure that could be employed by RAE for allowing debt costs on an *ex post* basis relative to the reference interest rate given by the weighted average cost of debt. This procedure (but not the reference rate) mirrors that which we had recommended in our 2012 paper.

3.4.1 The reference cost of debt

Embedded debt costs

For ADMIE, we were provided with its 2012 annual accounts and also a spreadsheet with borrowing and interest information for the six months to 30 June 2013. According to the company's accounts, its embedded (gross) debt cost at 31 December 2012 was 5.7 per cent. However, our view is that ADMIE's existing debt cost should be assessed based on the actual cost of its *outstanding* loans and therefore we rely on the spreadsheet information.

Specifically, we calculate the interest rate by using the relevant current market base (Euribor) rate plus the spread (for floating rates), or the fixed rate, and add any fees. We calculate the weighted average cost of existing debt, weighted by the balance at 30 June 2013. For all the debt, the cost is ***5.46 per cent*** in nominal terms. As there is current uncertainty about whether the EIB loans would be rolled over without government guarantees under new (private) ownership[18], we also calculate the cost of debt excluding EIB loans. For all non-EIB loans, the rate is ***6.78 per cent*** (nominal).

The future cost of debt

We were not provided with information regarding the date that the various ADMIE debt instruments were issued and therefore have no information about recent debt issues that could provide insight to the current market rates available to the company. Hence, for forward-looking debt, we assume that debt costs will be commensurate with rates paid on outstanding balances of non-EIB loans (i.e. ***6.78 per cent*** nominal), on the assumption that the preferential rates available from EIB may no longer be accessible.

To check the reasonableness of this level of interest rate we compared it with rates disclosed in Table IV.24.4 ('Interest rates on new euro-denominated loans by domestic MFIs[19] to euro area residents') of the Bank of Greece Bulletin of Conjunctural Indicators (Number 151, July-August 2013). For loans of over €1 million, the floating rate (excluding charges) in the first half of 2013 has averaged 5.78 - 6.02 per cent per annum, nominal. Adding 0.5 per cent for fees and charges

[18] This has received considerable coverage in the Greek business and energy media in the last month. See, for example, http://www.energypress.gr/news/Narkh-kai-apo-ETEp-gia-thn-idiwtikopoihsh-toy-ADMHE.

[19] Monetary Financial Institutions.

(e.g. issuance costs), this amounts to an average cost of debt of up to 6.52 per cent. Our estimate of 6.78 per cent therefore sits only slightly above the average rate available to other non-financial corporations and we therefore consider our assumption to be reasonable. Table 7 below summarises our assumptions about the cost of embedded and new debt for ADMIE (and, therefore, by assumption, for DEDDIE).

Table 7 The embedded and new nominal cost of debt for ADMIE and DEDDIE

Embedded debt cost	5.46%
New debt cost	6.78%

The weighted average cost of debt

Taking the above rates together we then determine a weighted average cost of debt after making assumptions about the weight of embedded versus new debt. To determine these weights we have assessed the forward capital programmes of the businesses[20] and estimate, given our assumption about gearing (see Section 3.5 below), that new debt can represent a maximum of between 10 and 20 per cent for the forthcoming control periods (i.e. between 2014 and 2017). ***Employing also an estimated inflation rate of -0.4 per cent (as given by the European Commission's European Economic Forecast, Winter 2013), we estimate a real cost of debt of between 6.0 and 6.1 per cent for both ADMIE and DEDDIE***.

3.4.2 Regulatory process for adjusting for the *ex post* cost of debt

In our previous report we did not have access to the debt costs of the companies and therefore had set a reference rate on the basis of DESFA's Tariff Regulation proposals of 6.2 per cent nominal, which taking account of inflation at the time, broadly corresponded to a real rate of 4 per cent. In the preceding sub-Sections we determined a weighted average cost of debt using information on embedded debt costs and assumptions about future market interest rates. Given that the latter are still very uncertain and can change dramatically if perceptions of sovereign risks shift again, we recommend that the rate we have derived in Section 3.4.1 above be employed for setting the WACC on an *ex ante* basis, but that borrowing costs be allowed on an *ex post* basis. As there is no established external and accepted benchmark measure of *ex post* funding costs, RAE would have to assess the reasonableness of new loan costs before their inclusion in the *ex post* debt cost allowance.

We envisage the process for setting the *ex post* cost of debt allowance largely as described in our 2012 paper, which we re-state here:

- A reference interest rate, expressed in real terms, would be used for the purpose of setting prices (necessarily on an *ex ante* basis) – for 2014, the

[20] We note that information was limited in this regard. We were given figures for 2014-2016 for ADMIE and only for 2014 in the case of DEDDIE, and these were preliminary.

reference rates we propose are the derived weighted average costs of debt of the preceding sub-Section

- The financing cost of debt would be computed, based on the reference rate and forecast gearing assumptions – the gearing assumption is discussed in the following Section
- Required revenues would be calculated to take into account the cost of debt, a reasonable return on equity and all other costs
- Tariffs would be set accordingly
- Interest rate variances against the reference interest rate on approved new loans would be established at the time of approval, using a benchmark rate or, when no suitable benchmark is available, the actual rate
- Those interest rate variances would be projected at the time of approval and incorporated as upward or downward adjustments to the regulatory asset base (RAB) on a compounded basis (using an average of marginal borrowing costs) for inclusion at the next price review
- Interest rate variances on variable interest rate loans and other outturn variances in real interest costs, including those arising from outturn variances in inflation rates, would be computed annually and rolled forward into the RAB on a similar basis
- It would be open to the companies to propose to RAE to approve tariff adjustments within the control period in respect of interest rate variances, for example where it is necessary to avoid undue financing difficulties.

3.5 Gearing

In calculating a WACC estimate, it is necessary to make an assumption about the gearing level (i.e. the ratio of debt to debt-plus-equity) so as to:

- Lever the asset beta (i.e. derive the equity beta); and
- Place the relative weights on the cost of equity and the cost of debt.

There are two fundamental approaches in choosing the relevant gearing level:

- The overall estimate can be based on what may be considered a typical, objective or ideal capital structure without regard to the actual capitalisation of the company under review – this happens particularly in circumstances where regulators have concerns about companies paying out 'avoidable' dividends to shareholders thereby raising gearing levels

and limiting the business' capacity to fund new capital expenditure through borrowings[21].

- The alternative is to use the actual capital structure of the company as it currently stands or is expected to stand over the revenue control period. This therefore employs a capital structure under existing conditions rather than substituting a hypothetical gearing level for what it actually is or will soon be. This approach is often preferred, as basing the weighted average return on an equity component that is greater than it actually is would result in 'excess' returns flowing to equity. Nevertheless, if the existing capital structure is considered to be unsound or unduly conservative, regulators do substitute 'legitimate' for actual capital structures in the public interest.

In practice, regulated network utilities will often have between 50 and 60 per cent debt in their capital structure, though the proportion varies between countries. ADMIE has in fact a lower gearing ratio, between 30 per cent and 40 per cent. Notwithstanding that higher gearing levels are commonly accepted in some countries, this might not be the case in Greece given the prevailing financial conditions already discussed.

For our WACC estimates, we consequently adopt a range of 30 to 40 per cent gearing and adopt the middle of the range for our point estimate, as this broadly corresponds with ADMIE's current gearing. We also assume that the same notional level would apply to DEDDIE on a stand-alone basis.

3.6 Estimated cost of capital

Based on the parameter ranges set out in the previous Sections, our view is that the real, pre-tax WACC for ADMIE and DEDDIE lies within the range ***7.2 per cent to 12.4 per cent*** with a best point estimate of the cost of capital of ***11.0 per cent***.

As shown in Table 8 below, the WACC point estimate is based on a pre-tax cost of equity of 13.6 per cent, which is calculated by uplifting the post-tax cost of equity with the 26 per cent Greek corporation tax, and a pre-tax cost of debt of 6.1 per cent. The parameter estimates for the proposed WACC and the various ranges are also shown in the table.

As discussed at the outset, a primary need for the WACC estimate is for RAE to set 2014 allowed revenues for ADMIE and DEDDIE. As these are still set on a nominal basis we need to convert our WACC estimate into nominal terms. The relationship between the real and nominal WACC is defined by the 'Fisher equation':

$$(1 + WACC_{nominal}) = (1 + WACC_{real}) \times (1 + i)$$

where i is the inflation rate. Employing the above equation (and assuming an annual inflation rate of -0.4 per cent for 2014, consistent with the European Commission's

[21] In many jurisdictions, the regulated networks are in fact required to retain investment grade credit rating, which implies a particular gearing range in any case.

European Economic Forecast, Winter 2013) gives a **nominal, pre-tax WACC of 10.5 per cent**.

Table 8 WACC estimate for ADMIE and DEDDIE

	low	high	point estimate
RFR	1.0%	1.5%	1.5%
MRP	4.0%	5.0%	4.5%
Asset beta	0.30	0.45	0.38
Gearing	30%	40%	35%
Equity beta	0.43	0.75	0.58
Equity return	2.7%	5.3%	4.1%
Country risk premium	3.0%	7.0%	6.0%
Cost of equity (post-tax)	5.7%	12.3%	10.1%
Corporation tax rate	26%	26%	26%
Cost of equity (pre-tax)	***7.7%***	***16.6%***	***13.6%***
Cost of debt	***6.0%***	***6.1%***	***6.1%***
WACC (real, pre-tax)	**7.2%**	**12.4%**	**11.0%**

4 Experience of other countries with debt crises

This section provides a brief summary of the approach used in Ireland and Portugal for setting the WACC, two countries that have been facing sovereign risk issues, although not of the same magnitude as Greece.

4.1 Ireland

The Commission of Energy Regulation (CER) issued its revenue determinations for transmission and distribution in 2010, for the five-year period 2011-2015. The WACC adopted was ***5.95 per cent***, real, pre-tax, although this is currently being reviewed and may be reset for early 2014.

It is worth noting that the TSO's view is that while the allowed WACC is now probably close to prevailing or forward-looking financing conditions for 2014 and 2015, the rate was lower than the actual cost of capital for the period 2011-2013, resulting in significant under-remuneration for the cost of capital (this has been estimated to be equivalent to a write-off of 5.2 per cent of the company's RAB).

The methodology used for determining the WACC was the standard CAPM model and there was ***no country risk premium*** recognised in the calculation. However, a point figure towards the top end of the range for the market risk premium was chosen to reflect the potential for the premium to be temporarily elevated during periods of recession.

Table 9 below sets out the WACC parameter values of the CER 2011-2015 price determination ('PR3') for both electricity transmission and distribution. We note that the same parameter values were used for both networks, while the parameter estimates are those calculated by CER's consultants (and are contained in a separate paper accompanying the price determination). CER adopted a different/higher WACC, but CER's decision document does not clarify the grounds for its decision.[22] We further complement this information with a similar table in Annex A1 for gas transmission covering the period 2012-2017.

Table 9 CER allowed WACC for the PR3 determination and underlying parameter estimates

WACC parameter	Low estimate	High estimate	Point estimate	Comments
Risk-free rate (RFR)	1.6%	2.2%	2.0%	The RFR was calculated considering government bonds of 5, 10 and 15 years maturity in Germany and Ireland (nominal yields deflated by inflation expectations and an inflation risk premium) and French index-linked government bonds. Irish bonds were adjusted using credit default swap (CDS) data due to the

[22] The CER decision cross-refers to a separate consultation paper (CER/10/186), but we have been unable to locate this document.

WACC parameter	Low estimate	High estimate	Point estimate	Comments
				increased perceived risk of default on Irish government debt. The calculation also took UK regulatory precedents into account, which at the time placed the RFR at between 2 and 2.5 per cent.
Market risk premium (MRP)	4.5%	5.4%	5.2%	The MRP was estimated using Irish data (the Dimson Marsh Staunton dataset of historical equity returns for Ireland and regulatory precedents), rather than international, and a point figure towards the top end of the range was chosen to reflect the potential for the MRP to be temporarily elevated during periods of recession.
Asset beta	0.2	0.4	0.3	Comparator analysis was used for asset betas of firms (owning transmission and/or distribution) listed on the stock market and beta estimations by other regulators. [Firms: Scottish Power, Scottish & Southern Energy, Viridian, E.ON, ENEL, EDF, RWE, National Grid, Redes Energeticas Nacionais, Terna, Red Electrcia, Snam Rete Gas, Enagas, Severn Trent, Northumbrian Water] [Regulators: CER, Comreg, CAR, Ofcom, NIAUR, Ofgem, Ofwat, CC, CAA, Postcomm] Assumption: Debt beta = 0
Gearing (D/(D+E))	50%	60%	55%	Notional gearing figure, which is considered consistent with an A rating (if ESB and EirGrid were to be rated) and regulatory precedents in Ireland and the UK.
Equity beta	0.4	1.0	0.67	
Country risk premium	-	-	-	No explicit risk premium added. The country risk premium was analysed by assessing the spread between Irish and German and French CDS rates for the purposes of risk-adjusting bond rates when calculating the RFR, but this was not used as a premium to equity. As discussed above, Irish data is used for determining the MRP. On the cost of debt, the analysis is based on the assumption that the CER's financeability analysis targets an A category rating and factors country risk into the ratings assessment.
Cost of equity (after-tax)	3.4%	7.6%	5.5%	
Tax rate			12.5%	Irish statutory Corporation Tax Rate
Cost of equity (pre-tax)	3.9%	8.7%	6.2%	
Cost of debt	2.6%	3.6%	3.2%	The RFR plus a debt premium is used for determining the cost of debt with the latter

WACC parameter	Low estimate	High estimate	Point estimate	Comments
				ranging from 1.0% to 1.4% (point estimate, 1.2%). The debt premium was based on a range of market data including comparator listed bond spreads (same comparators used as for the asset beta), new bond issues by utility companies, wider market indices and regulatory precedents.
WACC	3.2%	5.6%	4.6%	As mentioned above, CER adopted a real, pre-tax WACC of 5.95%, which sits outside the range recommended by the Consultants, but we have been unable to trace the regulator's reasoning other than a broad statement in the final decision document that "the increase in the WACC reflects the increased costs that are faced by the transmission utilities to finance its business".

4.2 Portugal

In Portugal, the last review date was in 2011 and prices were set for the period 2012 to 2014. The WACC adopted in this case was ***9.75 per cent***, real, pre-tax. Again, the CAPM model was employed for determining the cost of equity, however, the Portuguese added a ***country risk premium*** which was incorporated in the MRP. The MRP was obtained from a survey carried out by academics at IESE Business School.

Table 10 provides the parameter values used by the Portuguese Energy Services Regulatory Authority (ERSE) in the above price determination for setting the WACC.[23] We note that the decision only exists in Portuguese and we were therefore somewhat constrained in identifying all the relevant information and underlying rationale. As for Ireland, we have a similar table in Annex A1 containing the relevant information for the most recent price determination for gas transmission and distribution.

Table 10 ERSE allowed WACC for electricity transmission and distribution and underlying parameter estimates

WACC parameter	Low estimate	High estimate	Point estimate	Comments
Risk-free rate (RFR)			3.41%	The RFR was set as the mean of yields on 10-year Eurozone bonds with AAA rating (DE, FI, FR, AT, NL). The rate was set at 3.41%. In the previous regulatory period, this rate was based on 10-year Portuguese Treasury bonds.
Market risk premium (MRP)			6.50%	The MRP incorporates a country risk premium (although we have been unable to ascertain the level of this premium). The MRP was obtained from

[23] We present figures for REN, although similar assumptions were used for EDP. The latter however has a higher equity beta.

WACC parameter	Low estimate	High estimate	Point estimate	Comments
				a survey carried out of academics at IESE Business School.
Asset beta				
Gearing (D/(D+E))			50%	
Equity beta	0.51	0.6		
Country risk premium				See MRP above
Cost of equity (after-tax)	6.72%	7.32%		
Tax rate			31.5%	Corporation tax rate (25%) plus state and municipal surcharges
Cost of equity (pre-tax)	9.81%	10.69%		
Cost of debt			7.71%	The RFR plus a debt premium is used for determining the cost of debt with the latter set to 4.3%.
WACC	8.76%	9.20%	9.75%	

5 Cost of capital proposed by ADMIE

ADMIE had commissioned a study by PWC in 2012 for the estimation of the company's cost of capital for the years 2012-2014. The study was completed in September 2012 but has not been updated. We understand that ADMIE is requesting an allowed WACC consistent with the estimate for 2014 in the PWC report.

Table 11 below shows the PWC parameter estimates and resulting WACC for 2014. We note the following with respect to the parameters of the table:

- These are presented in nominal terms and are therefore not strictly comparable to our own estimates
- PWC apply the equity beta to the country risk premium in deriving the WACC
- At the time of the PWC study, the Greek corporation tax was 20 per cent – in the table below we apply the current tax rate of 26 per cent. This accounts for the discrepancy between the 10.1 per cent in the PWC report and the 10.7 per cent which we calculate in the table.

Table 11 PWC estimate of ADMIE WACC for 2014 (in nominal terms)

RFR	1.5%
MRP	6.0%
Asset beta	0.38
Gearing	35.6%
Equity beta	0.54
Equity return	4.7%
Country risk premium	10%
Cost of equity (post-tax)	10.1%
Corporation tax rate	26%
Cost of equity (pre-tax)	***13.7%***
Cost of debt	***5.3%***
WACC (nominal, pre-tax)	**10.7%**

The resulting WACC estimate is not materially different to ours, although there are some underlying differences of approach and/or parameter estimates:

- While we adopt the same risk-free rate, PWC calculates theirs on the basis of yields on German government bonds.
- PWC assumes a market risk premium of 6 per cent, which would imply total market returns of 7.5 per cent - as we have explained in Section 3.3.2, we consider this level of return to be implausible.
- The country risk premium is determined somewhat arbitrarily by PWC – they essentially take IMF forecasts of Greek government bond spreads at

the time but push them back two years on the basis that the spread the IMF had predicted for 2012 (at the time of PWC's report) was substantially lower than the prevailing spreads.

- The cost of debt (which is expressed as net debt rather than gross debt) was calculated on the basis of forecasts in ADMIE's business plan at the time, but it is not clear what assumptions underpin the calculations.

A1 Allowed WACC for gas networks in Ireland and Portugal

Table 12 below sets out the WACC parameter values of the CER 2012-2017 price determination ('PC3') for gas transmission. We note that some of the information was redacted from the public version of the documents, hence the gaps in the information provided.

Table 12 CER allowed WACC for the PC3 determination and underlying parameter estimates

WACC parameter	Low estimate	High estimate	Point estimate	Comments
Risk-free rate (RFR) + 'crisis premium'	3.5%	5.5%		RFR estimated on the basis of observed (historical) and forward yields for German and Dutch government bonds with a maturity of five and ten years, to which a 'crisis risk premium' is added (see below).
Market risk premium (MRP)	4.5%	5.0%		Used historical estimates combined with forward-looking estimates from the dividend growth model, as well as surveys of academics and professionals, and regulatory precedents.
Asset beta	0.3	0.4	0.35	As BGN is not listed, comparator companies were selected that focus predominantly on either gas transmission or gas distribution activities, and that operate in countries where there are minimal concerns about the sustainability of government's fiscal positions.
Gearing (D/(D+E))			55%	Notional gearing level
Equity beta				
Country risk premium				The estimates of the cost of capital "include an adjustment to the cost of equity and cost of debt in order to take into account the risks associated with the Eurozone crisis." "The CP [crisis premium] for debt is estimated based on yields on investment-grade utility corporate bonds in Ireland less the equivalent yield on bonds with a similar credit rating that are issued by companies operating in countries used as a proxy for the risk-free rate estimate (Germany and the Netherlands)." "The CP added to the cost of equity is of the same magnitude as that added to the cost of debt".
Cost of equity (after-tax)	6.9%	9.2%		
Tax rate			12.5%	Corporation tax rate
Cost of equity	8.1%	10.8%		

WACC parameter	Low estimate	High estimate	Point estimate	Comments
(pre-tax)				
Cost of debt	3.8%	4.9%		Calculated as a weighted average of the cost of new debt and the cost of existing debt. The cost of existing debt reflects the lower rates locked at a time of relatively more benign conditions. As BGN will need to access capital markets during PC3, the cost of new debt incorporates the crisis premium.
WACC	5.8%	7.6%	6.7%	The rate was reviewed again in August 2013 and was reduced to 5.2%.

Table 13 provides the parameter values used by ERSE in the 2013 price review for gas transmission and distribution covering the period 2013-2016.

Table 13 ERSE allowed WACC for gas transmission and distribution and underlying parameter estimates

WACC parameter	Low estimate	High estimate	Point estimate	Comments
Risk-free rate (RFR)			4.9%	
Market risk premium (MRP)	3.75%	4.0%		
Asset beta				
Gearing (D/(D+E))			60% 53%	Distribution Transmission
Equity beta			1.1 0.6	Distribution Transmission
Country risk premium				See MRP
Cost of equity (after-tax)	9.0% 7.1%	9.3% 7.3%		Distribution Transmission
Tax rate			31.5%	Corporation tax rate (25%) plus state and municipal surcharges
Cost of equity (pre-tax)	13.2% 10.4%	13.6% 10.6%		Distribution Transmission
Cost of debt			5.9%	RFR plus 1% debt premium
WACC	8.8% 8.0%	9.0% 8.1%		Distribution Transmission