CEPA PEER REVIEW: COST OF CAPITAL UPDATE FOR ELECTRICITY GENERATION, STORAGE AND DEMAND SIDE RESPONSE TECHNOLOGIES

Cambridge Economic Policy Associates (CEPA) was contracted by the Department for Business, Energy and Industrial Strategy (BEIS) to provide a peer review opinion on a study commissioned by BEIS into the 'hurdle rates' for different electricity generation technologies. Hurdle rates are the minimum internal rates of return (IRR) required by investors over the life of the project and are typically described in terms of the weighted average cost of capital (WACC). The study commissioned by BEIS was to update estimates calculated in 2015 (the '2015 study').[1] This report presents CEPA's peer review opinion.[2]

1.1. SUMMARY OF PEER REVIEW OPINION

Estimating hurdle rates or the cost of capital is a challenging task and necessarily involves an amount of judgement. The primary difficulty lies in there rarely being a direct match to the projects/technologies being assessed, which could be used to identify the cost of capital. Instead, estimates need to be derived from comparators that match some, but not all, of the risks of the projects/technologies that are being assessed. The challenge is compounded for the study commissioned by BEIS by the need to estimate hurdle rates for thirty types of generators, as well as for battery storage and demand-side response.

CEPA has engaged with BEIS' consultants – Europe Economics – iteratively over the course of the study to understand the consultants' methodology and comment on draft results. Following those interactions, and bearing in mind the above challenges of the study, we consider that in many respects Europe Economics has adopted a reasonable methodology. Where we have some remaining questions regarding the details of the methodology, we expect that the impact on hurdle rates would be relatively small.

BEIS has to decide whether to continue using the hurdle rate estimates from the 2015 study or use the new estimates. To the extent that Europe Economics' estimates rely on updating components of the 2015 study for new information (with some methodological changes), we consider that they are more likely to represent current hurdle rates for the relevant technologies than the estimates produced in the 2015 study.

1.2. SCOPE AND REQUIREMENTS

According to the terms of reference for this project, CEPA's role as peer reviewer is to scrutinise the core analysis and provide constructive methodological/technical challenge of the work, and to suggest improvements or qualifications of the results. This included commenting on whether the results:

- are reasonable and reflective of consistent application of a suitable methodology; and
- take, as far as practical, good account of all significant data and evidence, paying particular attention to:
    - Suitability and consistent application of the methodology and data sets employed.

[1] NERA, Electricity Generation Costs and Hurdle Rates, Lot 1: Hurdle Rates update for Generation Technologies, Prepared for the Department of Energy and Climate Change (DECC), July 2015

[2] The comments in this report reflect our review of the report by Europe Economics dated 24 August 2018.

- Consistency with approaches taken by market participants and regulators to the extent evidence for this is available.
- Possibility and direction of bias inherent in the estimates (if any) and any qualifications or adjustments that may be necessary before the results can be used by BEIS in its analysis.
- The extent to which the results support/concur with recent experiences such as outcomes of auctions for contracts for difference (CfD) and in the capacity market (CM).
- The extent to which the set of estimates is internally consistent and accurately reflects the relativity of risks inherent in individual technologies.

1.3. OUR APPROACH TO THE PEER REVIEW

In light of the inherent judgement involved in estimating hurdle rates, our peer review focused on five elements:

- consistency between Europe Economics' methodology and the requirements set out in BEIS' terms of reference for the study;
- the extent to which Europe Economics used a methodology and data that are consistent with best practice for estimating the cost of capital;
- consistency between different components within Europe Economics' methodology;
- questions regarding the way Europe Economics interpreted market evidence; and
- apparent errors in Europe Economics' calculations.

The current study builds on a methodology and estimates derived in the 2015 study. We note that the 2015 study adopted a somewhat unconventional methodology for estimating hurdle rates, perhaps as a necessity given the task at hand. The methodology and estimates of the 2015 study were accepted by BEIS and its peer reviewers at the time, so we do not comment on whether they are reasonable. Rather, our focus is on whether the 2018 update provides a more suitable set of estimates for BEIS to use in the coming years than the 2015 estimates.

1.4. COMMENTS ON THE METHODOLOGY

As noted above, we consider that Europe Economics has broadly applied a reasonable methodology given the challenges of the study. For economy-wide components (risk-free rate, equity risk premium and inflation) and for the debt premium Europe Economics developed estimates independently of the 2015 study. For technology-specific components (asset beta, gearing, effective tax rate) Europe Economics sought to update the 2015 estimates with new information.

Europe Economics estimates hurdle rates under two sets of "revenue support assumptions": assumption #1 is that the majority of technologies would be eligible for CfDs, while assumption #2 is that no technologies are eligible for CfDs.

We provide brief comments on the different components below:

- **Risk-free rate** – Europe Economics uses spot rates that were uplifted to reflect forward interest rates. While this is a fairly common methodology, we note that the 2015 study used long-term interest rates (3-month and 12-month averages). Since interest rates have been declining, the change of methodology results in lower risk-free rates estimates than had the 2015 methodology

been used. This implies that all else equal, updating the 2015 methodology for the latest market figures would have resulted in lower hurdle rates than estimated by Europe Economics.[3]

- **Equity risk premium** – Europe Economics derives an equity risk premium of 6.75%. CEPA has applied a similar methodology in a recent study for Ofgem and reached a similar conclusion on the midpoint of the equity risk premium range.[4,5]
- **Debt premium** – Europe Economics assumes no impact on the debt premium from its revenue support assumption. This is a function of how Europe Economics derives its gearing estimates under revenue support assumption #2. We note that different approaches to estimating the impact of the revenue support assumptions could result in a change of debt premia (potentially with a smaller change in gearing), which would result in a different overall hurdle rate estimate.
- **Gearing** – Europe Economics makes the strong assumption that combined cycle gas turbines (CCGT) would be funded as part of a portfolio with gearing of 35%. This is materially lower than the gearing for other technologies, which are assumed to be project-financed. The portfolio assumption has a material impact on the estimated hurdle rate for CCGT but it is difficult to verify whether it is reasonable, as no new CCGTs have been commissioned for a number of years.
- **Asset beta[6]** – For technologies that Europe Economics does not estimate betas directly, it relies on a strong assumption regarding the relationship between changes in the volatility of returns and changes in the asset beta for a technology. This is unlikely to hold in practice since returns in a given year would also be influenced by non-systematic factors. The impact of this assumption is less material for technologies that are assumed to be CfD-eligible under revenue assumption #1, and we note that it is only one of several assumptions Europe Economics makes with regard to updating asset betas.
- **Effective tax rate** – Europe Economics makes a simplified assumption that effective tax rates are updated proportionately to their 2015 estimates, rather than deriving a bottom-up estimate. When estimating the change in effective tax rates in the way Europe Economics has done, care must be taken when applying the change to hurdle rates, as the change in *nominal* effective tax rates would be different from the change in *real* effective tax rates. Nevertheless, we consider that Europe Economics' approach is proportionate to the task at hand, and that any inaccuracies as a result of this approach can be expected to have only a small impact on hurdle rates.

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[3] This is because a higher risk-free rate (based on the 2015 methodology) would have been deducted from the total equity market return, resulting in a lower equity risk premium. Since equity betas are higher than 1 for all technologies, this would have flown through to lower cost of equity and lower hurdle rates.

[4] CEPA, Review of cost of capital ranges for Ofgem's RIIO-2 for onshore networks, February 2018

[5] Note that CEPA's estimate was in real terms using the Retail Prices Index (RPI), while Europe Economics' estimate was in real terms using the Consumer Prices Index (CPI). For the purposes of this comparison, the two are aligned assuming a 1% margin between RPI-based estimates and CPI-based estimates.

[6] Europe Economics uses debt betas in the calculation of the equity beta for each technology. Its debt beta estimates are informed by an assumption of a probability of default for each technology. Europe Economics assumes the same probability of default for all technologies, whereas this is likely to vary with credit ratings. We note that the impact of this assumption on the hurdle rates is likely to be small.

We note that Europe Economics has adopted a 'bottom-up' approach of updating each component individually, and did not apply a 'top-down' sense-check of the new hurdle rates. In future the methodology could be improved by adding that sense-check, for example by engaging with investors to understand their realised and expected IRRs for the technologies involved.

1.5. COMMENTS ON THE RESULTS

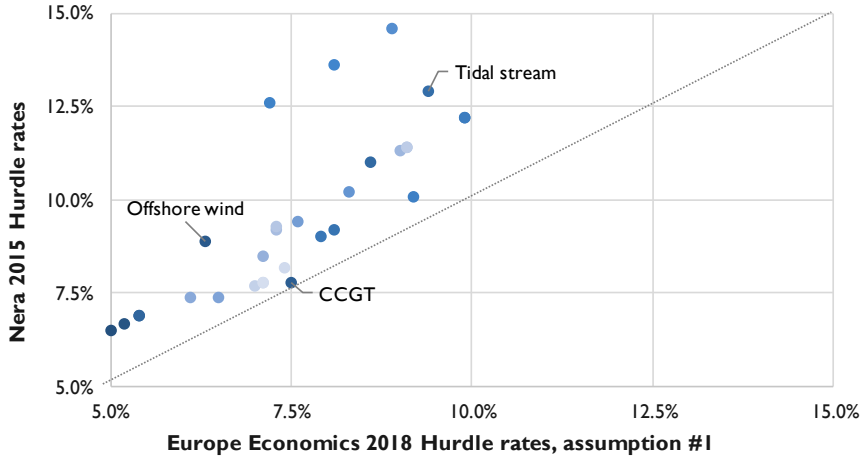
We note that the main factor influencing the hurdle rate estimates is the assumption made regarding revenue support mechanisms available to the different technologies. This has a material impact on gearing and the asset beta, with the result being higher cost of equity for all technologies under revenue support assumption #2, but lower overall hurdle rates owing to the reduction in gearing. We consider that it is for BEIS to decide which set of hurdle rate estimates is most suited to the different applications for which the hurdle rates are used.

Compared to the 2015 study, Europe Economics' estimates of debt premia have declined for all technologies, whereas asset betas have generally increased under revenue support assumption #1 (and have increased for all technologies under revenue support assumption #2). It is theoretically possible for the two to move in opposite directions – the debt premium reflects default risk while asset beta reflects cash flow risk – but we are unaware of any changes in the GB energy sector since 2015 that are likely to have increased cash flow risk while reducing default risk. Of the two, we consider it more likely that asset betas are lower than estimated by Europe Economics. One way to interpret this is to consider Europe Economics' hurdle rate estimates to be relatively conservative.

One potential side-effect of the bottom-up approach that Europe Economics used is that movements in the hurdle rates of individual technologies relative to others may not be intuitive. However, this does not invalidate the methodology used, and we expect the overall impact on hurdle rates to be relatively small. In future, BEIS could mitigate the risk of counter-intuitive movements in hurdle rate estimates by grouping technologies together.

In the figures that follow we plot the hurdle rates from the 2018 study against the corresponding estimates from the 2015 study. We also plot Europe Economics' estimates under revenue support assumptions #1 and #2.

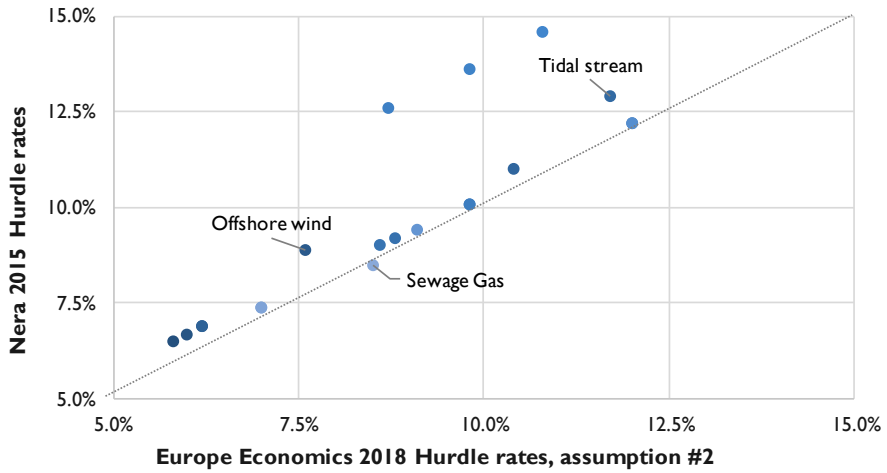
Figure 1: Comparison of hurdle rates from the 2015 study and 2018 study (revenue support assumption #1)



Source: CEPA analysis of Europe Economics' report

Note that geothermal CHP is not shown on the figures as it is an outlier.

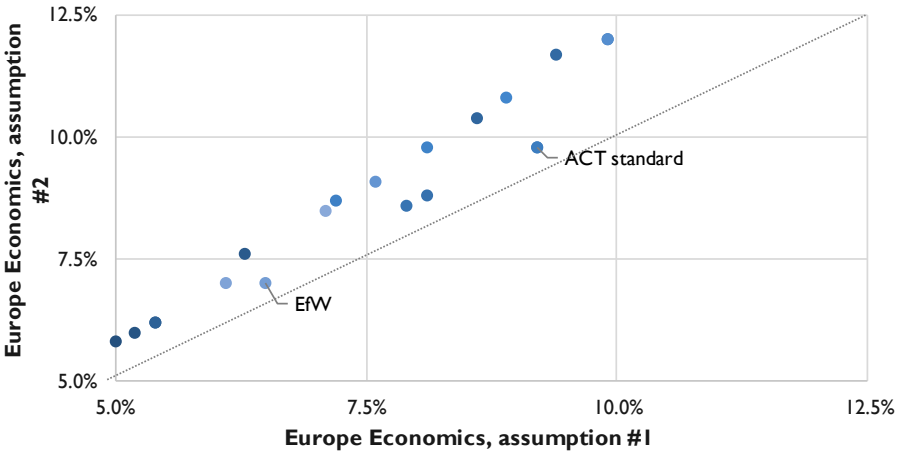
Figure 2: Comparison of hurdle rates from the 2015 study and 2018 study (revenue support assumption #2)



Source: CEPA analysis of Europe Economics' report

Note that geothermal CHP is not shown on the figures as it is an outlier.

Figure 3: Comparison of hurdle rates under revenue support assumptions #1 and #2



Source: CEPA analysis of Europe Economics' report

Note that geothermal CHP is not shown on the figures as it is an outlier.

ABOUT THE AUTHORS

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Jonathan has over 25 years of experience as an economist and finance professional in infrastructure, as a sell-side and buy-side investment analyst and as an advisor to global infrastructure companies, regulators, international organisations, and private equity investors. Jonathan heads CEPA's Australian office and is also a Visiting Professor at University College London (Adelaide), where he teaches a course in Energy Finance.

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Ben is an experienced regulatory economist and manager. He has worked extensively on regulatory finance, including managing the work on cost of capital, financeability and risk/reward for the first set of RIIO price controls at Ofgem. Ben's experience includes key roles in major policy and regulatory projects in the energy sector in the UK and Australia, as well as in other utility and infrastructure sectors.

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Petra is an Economist with a background in public economics and policy. She is an experienced economic and financial modeller, having worked on cost of capital methodologies in the energy and transport sectors. Petra has advised Ofgem and Ireland's Commission for Regulation of Utilities on issues relating to investment in energy assets.

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