



COMPETITION
ECONOMISTS
GROUP

AER equity beta issues paper: international comparators

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1 Introduction and summary

1. The ENA has asked CEG to respond to the Australian Energy Regulator's (AER's) equity beta issues paper released in October 2013. Specifically the AER's critique of the CEG report *Information on equity beta from US companies*¹ and the AER's assessment of international evidence more generally.
2. The remainder of this report is set out as follows:
 - Section 2 sets out the AER's critique of the CEG report and provides a response;
 - Section 3 provides my review of the AER's presentation of surveys of international beta estimates for regulated energy utilities.
3. I have read, understood and complied with the Federal Court Guidelines on Expert Witnesses. I have made all inquiries that I believe are desirable and appropriate to answer the questions put to me. No matters of significance that I regard as relevant have to my knowledge been withheld.
4. I have been assisted in the preparation of this report by Annabel Wilton from CEG's Sydney office. However, the opinions set out in this report are my own.

1.1 Summary of conclusions

1.1.1 AER critique of CEG report

5. In a departure from its previous approach, the AER rejects the use of foreign comparables to inform the reasonable range for the beta of an Australian regulated utility. The basis for this position is an assertion that beta risk for a US regulated energy utility is likely to be different to Australian regulated energy utility. While the AER asserts possible factors which might cause US and Australian beta risk to be different, such as 'geography', the AER provides no conceptual mechanism by which such factors could be expected to affect beta risk for a regulated energy utility. Without any conceptual basis for its claim it is not reasonable for the AER to conclude that these differences *are likely* to give rise to different beta risk. The only claim that is open to the AER based on the analysis it has presented is that these differences *might* give rise to different beta risk. The AER also fails to investigate empirically the role of any such differences on beta risk.
6. The potential differences between the operating environment for US and Australian regulated utilities are just as much differences between Australian companies as they are between Australian and US companies. For example, the AER states:

¹ CEG, *Information on equity beta from US companies*, June 2013.

...the difference in the regulation of businesses, the regulation of the domestic economy, geography, business cycles, weather and a number of different factors are likely to result in differences between equity beta estimates for similar businesses between countries.

7. However, geography, business cycles and weather are also different in different parts of Australia. The climate in the Northern Territory and Queensland is more different to the climate in Victoria and Tasmania than it is to the climate in, say, Florida. The AER logic here would suggest that Florida comparables are, at least on this weather dimension, more relevant as a proxy for Queensland and Northern Territory regulated assets than are the betas for listed utilities whose operations are mostly/wholly in Victoria (such as SPN, DUET and SKI).
8. In actual practice, the AER not only makes no adjustment for these differences when assessing Australian comparables it, to the best of our knowledge, has never even mentioned the existence of most of these intra country differences as an issue that is relevant to an assessment of the cost of capital for Australian businesses.
9. The AER specifically raises vertical integration into generation and/or retail as a reason why US betas are likely to be different to Australian betas. I consider that there is no conceptual basis for such a conclusion – noting that there is no reason to believe that *regulated* provision of generation or retail activities is riskier than regulated provision of energy transport services. I also perform empirical analysis the results of which support my conceptual conclusion.
10. In my view the AER's rejection of the use of US comparables is based on the premise that there is sufficient Australian data to form a reliable estimate for the equity beta range. This is not correct. There are still only 6 businesses in the Australian sample reported by the AER in Table 6.1 of the issues paper. Even if all of these firms were, on all dimensions, better proxies for the idealised benchmark than all US firms, the small number of observations makes them unreliable as a final sample.
11. Moreover, none of the available proxies for the beta of a benchmark Australian regulated business are perfect. Indeed, restricting the comparables to Australian businesses makes the quality of the comparison potentially better in one dimension but worse in potentially more important dimensions. For example, in our data set there are 14 firms for whom regulated assets comprise greater than 98% of total assets.
12. The AER provides no logical basis for assuming that an Australian business with a smaller proportion of regulated activities is a better proxy for the benchmark than US companies with a larger proportion of regulated activities. The AER's approach amounts to assuming that any Australian proxy is better than any US proxy no matter how they perform on other criteria. In my view, this is not a reasonable approach.

1.1.2 AER reporting of international beta studies

13. The AER refers to a number of studies estimating the beta of international comparables. The AER concludes:

We have reviewed the studies referenced above which use international data sets. After taking into account the difficulty of adjusting for differing operating environments, we consider that the data nonetheless provides support to our estimate of an equity beta range for the benchmark efficient entity of 0.4 to 0.7. We also consider that this evidence is more supportive of a point estimate of equity beta that is located closer to the upper end of this range.²

14. However, there are a number of errors, omissions and inconsistencies in the AER's representations of these studies. I summarise the nature of the corrections and the impact of correcting for these in the below table.

² AER, Equity beta issues paper, October 2013, page 37

Table 1: Summary of AER reported range and corrected range for 60% geared equity beta based on studies of international comparables

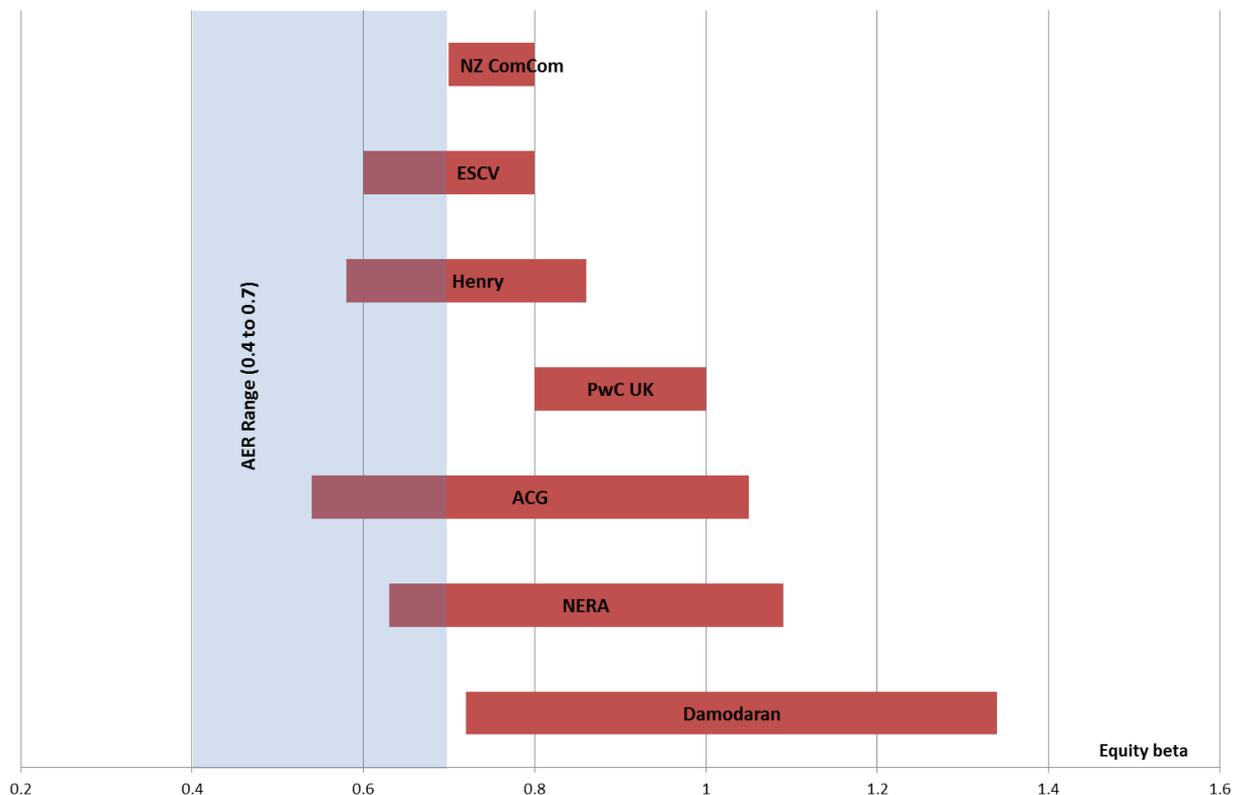
Study	AER range	Corrected range	Nature of correction
Damodaran	0.24 to 0.84	0.72 to 1.34	Incorrect gearing figure used by AER
NERA	0.52 to 1.09	0.63 to 1.09	AER reports bottom end of range based on leverage formula not proposed by NERA and inconsistent with AER methodology.
ACG	0.54 to 0.73	0.54 to 1.05	AER inconsistently ignores most recent 5 year beta estimates when setting the top of the range (despite using the most recent beta estimates from the NERA study to set the bottom of the range and in its own analysis describing post 2002 beta estimates as its 'core' estimates).
PwC UK	0.64 to 0.78	0.8 to 1.0	Corrected range is based on PwC recommendation to Ofgem. AER range is based on calculations that involve idiosyncratic reading numbers of PwC charts – calculations that PwC does not recommend or perform.
Henry	0.47 to 0.71	0.58 to 0.86	The AER incorrectly cites the bottom end of this range. The top end of the range fails to have regard to the most recent beta estimates reported by Henry (2003 to 2008). Once again, this is inconsistent with the AER's reporting of the NERA results and its own focus on the post 2002 beta estimates as 'core'. Arguably, the top and bottom of the Henry range should be based on estimates from the 'core' period – in which case the bottom of the range would be 0.65 rather than 0.58.
ESCV	0.60 to 0.80	No correction	The AER correctly characterises the ESCV conclusion. However, updated data suggests the top end of the ESCV's range would extend above 1.0 if repeated now .
NZ Commerce Commission	0.70 to 0.80	No correction	The AER correctly characterises the NZ Commerce Commission conclusion. However, there are fatal flaws in the NZ Commerce Commission analysis and correcting these would raise the best estimate using NZ Commerce Commission data to 1.0 .

15. The corrections to the AER's reporting of these studies are material. The AER's conclusion that the studies provide support for its estimate of an equity beta range for the benchmark efficient entity of 0.4 to 0.7 is, at best, tenuous even based on the uncorrected range.
 - The top end of the uncorrected range is in every case above the top end of the AER's range.
 - The bottom end of uncorrected range is, with the exception of the Damodaran beta estimates, always above the bottom end of the AER's range.
16. Implicit in the AER's conclusion that this uncorrected data supports its range is a belief that Australian utilities are lower risk than international utilities. This must be the case if the AER takes higher foreign utility betas as supporting a lower

Australian range. However, the AER provides no positive argument for why this is the case (other than that the handful of betas for Australian comparables happen to be lower than the foreign betas).

17. The tenuous nature of the AER's conclusion based on the uncorrected range becomes untenable based on the corrected range.
 - The only range that fell below the AER range (the Damodaran study) now falls entirely above the AER range;
 - The lowest corrected lower bound (0.54 for the ACG study) is effectively the midpoint of the AER range (0.55);
 - The average corrected lower bound is 0.65 – at the top of the AER's range of 0.40 to 0.70; and
 - The average corrected upper bound is 0.99 – almost as much above the AER's range (0.29) as the AER's range extends down (0.30 = 0.70 – 0.40).
18. These observations can be illustrated visually by superimposing the corrected ranges and the AER's proposed range in a diagram.

Figure 1: AER range versus corrected ranges for international studies





19. Moreover, all of these conclusions are strengthened by the inclusion of more recent data – noting that many of these studies are now old (e.g., the ESCV study relies on time series data that stops 7 years ago) and the inclusion of more recent data tends to materially raise beta estimates for US energy businesses. Based on SFG estimates of asset beta the average beta in the ESCV sample would be 0.86 (measured using data from January 2002 to November 2012).

2 AER critique of CEG report

2.1 AER critique

20. The AER issues paper argues that the US companies selected in our previous report are insufficiently reliable proxies for the benchmark firm to be used to determine the range of plausible values for the equity beta for a benchmark firm. The AER's reasoning is encapsulated in the following quotes.

... in the 2009 WACC review we noted the difference in the regulation of businesses, the regulation of domestic economy, geography, business cycles, weather and a number of different factors are likely to result in differences between equity beta estimates for similar businesses between countries.⁸⁸ It is difficult to assign quantitative impacts to each of these qualitative factors and as such the use of Australian securities data for equity beta estimation seeks to encompass all of the factors within the CAPM framework in a first-best approach. The use of a foreign proxy is a suboptimal outcome that can only be justified where there is evidence that this will produce more reliable estimates of the domestic equity beta than the Australian estimates.³

...

We consider that CEG did not provide satisfactory evidence to demonstrate that vertically-integrated US energy businesses (engaged in regulated activities other than energy transmission and distribution) present close comparators to 'a pure play, regulated energy network business operating in Australia'. Such vertically-integrated businesses engaged in a spectrum of regulated activities are likely to be exposed to different risks than businesses that are not vertically-integrated or businesses that are engaged in predominantly energy transmission or distribution. This could result in different beta estimates for those types of businesses. In addition, as stated earlier in this section, countries (and Australia and the US in particular) differ along a number of dimensions that can result in differences in the equity beta estimates for similar businesses. The CEG discusses only one of those factors, i.e., differences in regulatory environments. Therefore, we consider that empirical estimates of the equity beta produced by CEG and SFG should be interpreted with caution.

This does not imply that the empirical evidence based on overseas comparators should be discarded completely. Rather, we consider that such evidence can be

³ AER, Equity beta issues paper, October 2013, page 33.

*used as a cross check of domestic beta estimates – provided the choice of overseas comparators is based on solid reasoning.*⁴

...

*This equity beta range of 0.4 to 0.7 was informed by the average of individual equity beta point estimates for the comparable Australian-listed firms and various portfolios estimates based on these Australian-listed firms.*⁵

21. This is a departure from the AER’s past approach. In the 2009 WACC review the AER, while giving less weight to foreign equity beta estimates, nonetheless relied on them to form its estimate of the plausible range for the equity beta for an Australian regulated energy utility.

*In response to the view that there are a limited number of businesses in the sample to estimate the equity beta, the AER notes that consistent with past regulatory practice, the AER has also had regard to estimates from overseas jurisdictions. In particular, the AER examined beta estimates derived from a sample of electricity, and combined gas and electricity networks operating in the United States to confirm that the Australian equity beta estimates were appropriate. However, as discussed in section 8.5.2.2, the AER has placed limited weight on foreign estimates and **has used the foreign estimates to confirm the upper bound of the domestic equity beta estimates.**⁶ [Emphasis added]*

2.2 Response

22. The AER critique can be broken down into the following components:

- a. *The difference in the regulation of businesses, the regulation of domestic economy, geography, business cycles, weather and a number of different factors **are likely** to result in differences between equity beta estimates for similar businesses between countries. In particular the vertically integrated nature of many US regulated utilities means that they “...**are likely** to be exposed to different risks than businesses that are not vertically-integrated or businesses that are engaged in predominantly energy transmission or distribution”. [Emphasis added]*

⁴ AER, Equity beta issues paper, October 2013, page 34.

⁵ AER, Equity beta issues paper, October 2013, page 39.

⁶ AER Explanatory Statement, 2009 Review of electricity transmission and electricity and gas WACC parameters, page 259.

- b. It is difficult to quantitatively adjust the US beta estimates. Therefore, the “*use of Australian securities data for equity beta estimation seeks to encompass all of the factors within the CAPM framework in a first-best approach*”;
- c. The onus to establish the relevance of US beta estimates rests on those proposing to use foreign data instead of Australian data. Specifically, that “*the use of a foreign proxy is a suboptimal outcome that can only be justified where there is evidence that this will produce more reliable estimates of the domestic equity beta than the Australian estimates*”;
- d. In particular, such vertically-integrated businesses engaged in a spectrum of regulated activities are likely to be exposed to different risks than businesses that are not vertically-integrated or businesses that are engaged in predominantly energy transmission or distribution.

2.2.1 AER assertion that US utility equity betas are likely to be systematically different to Australian utility

- 23. The AER asserts that beta risk for a US regulated energy utility is likely to be different to an Australian regulated energy utility. However, the AER provides no conceptual mechanism by which any specific difference can be expected to affect beta risk for a regulated energy utility. Without any conceptual basis for its claim it is not reasonable for the AER to conclude that these differences *are likely* to give rise to different beta risk. The only claim that is open to the AER based on the analysis it has presented is that these differences *might* give rise to different beta risk.
- 24. The potential differences that the AER refers to are just as much differences between Australian companies as they are between Australian and US companies. The AER states:

...the difference in the regulation of businesses, the regulation of the domestic economy, geography, business cycles, weather and a number of different factors are likely to result in differences between equity beta estimates for similar businesses between countries.

- 25. Obviously, geography, business cycles and weather are different in different parts of Australia. The weather (and climate⁷) in the Northern Territory and Queensland is more different to the weather (and climate) in Victoria and Tasmania than it is to the climate in, say, Florida. Exposure to the risk of hurricanes/cyclones is a factor that utilities in Florida, Queensland and the Northern Territory have in common that is not shared by utilities in Victoria. The AER logic here would suggest that Florida comparables are, at least on this weather dimension, more relevant as a proxy for Queensland and Northern Territory regulated assets than are the betas for listed

⁷ It is not entirely obvious what the AER means by ‘weather’.

utilities whose operations are mostly/wholly in Victoria (such as SPN, DUET and SKI).

26. On a similar vein, factors such as demand for resources affect different Australian states business cycles differently. Businesses serving Queensland and Western Australia are more exposed to fluctuations in mining activity than businesses serving customers in the south west states of Australia. The AER logic would suggest that Nevada comparables, at least on this dimension, more relevant as a proxy for Queensland and Western Australian regulated assets than are the betas for listed utilities whose operations are in south west states of Australia (such as SPN, DUET and SKI).
27. Similarly, the geography in South Australia is likely more similar to many US states than it is to the geography of Victoria. The laws governing planning and other aspects of the local economy (such as payroll tax and stamp duties) are different across Australian states etc. In order to be consistent, the AER should be making as many adjustments within Australia as between Australia and the US for these factors.
28. Finally, there are very significant differences in the regulation of Australian businesses that would, if the AER was to apply this logic consistently, narrow the sample of Australian comparables that could be used in any given Australian decision.
29. For example, the financial exposure to regulatory service incentives differ between states, between distribution and transmission and between gas and electricity. There are also differences in form of regulation – some businesses operate under a revenue cap and some under a price cap.
30. These regulatory differences are as likely as any differences between regulation of Australian and US businesses to lead to differences in systemic risk exposure.
31. In addition, gas businesses that the AER regulates in Australia have, over most of the time period the AER uses to estimate betas, been regulated under different legislation and rules to electricity businesses. For example, the cost of capital methodology was previously codified in the National Electricity Rules but not in the National Gas Rules. The different nature of the rules confers different rights to businesses in appeals. Consistent logic would require that the AER not have regard to betas for electricity businesses when setting betas for gas businesses and *vice versa*.
32. In actual practice, the AER makes no adjustment for these differences when assessing Australian comparables. Furthermore, to the best of our knowledge, it has never even mentioned the existence of most of these intra country differences as an issue that is relevant to an assessment of the cost of capital for Australian businesses.

33. Moreover, as I note in our previous report,⁸ to the extent that there is debate about these relative risks faced by US versus other regulated energy utilities, the debate amongst researchers is about whether the nature of regulation in the US lowers risks for these businesses compared to Australian and UK style formal incentive regulation. Some researchers have found that it does lower risks and some that it does not. To the best of our knowledge, none have found that it raises risks relative to Australian/UK style regulation. One of the reasons commonly posited, including by the New Zealand Commerce Commission, for why US regulation does not lower risks is that US regulation is, in fact, very similar to Australian/UK style regulation. This literature is surveyed in section 5.1 of our previous report.

2.2.2 Vertical integration in US utilities

34. In its issues paper the AER has a particular focus on the fact, as set out in our previous report, that US regulated electricity utilities are commonly vertically integrated. This means that, in addition to providing regulated energy transport services, these businesses also provide regulated energy generation services and regulated retail services. This differs from arrangements in Australia where regulation tends to be limited to energy transport activities – with generation and retailing supplied in a competitive market.

2.2.2.1 Vertical integration into generation

35. If the firms in our set of US comparables engaged in significant competitively supplied generation activities then there would be a reason for believing that this might affect the beta of these firms. The profits on competitively supplied generation activities can be expected to be sensitive to supply and demand conditions in wholesale markets which in turn can be expected to be affected by systematic shocks to the local and US economies. It would be reasonable to hold the *a priori* view the beta on such activities would not be the same as the beta for regulated utility activities.

36. Of course, I have accounted for the existence of unregulated generation activities (and unregulated activities of all kinds) by using the percentage of total assets that are regulated as a criterion in selection of our sample. If a business has more than 50% of total assets that are unregulated then that business is excluded from our sample.

37. Where a business's generation activities are regulated, such that the business's investments in generation are included in the businesses regulatory asset base (RAB or 'rate base') then no *a priori* view is justified that the beta risk attached to those assets is different to the beta risk attached to energy transport assets. In such circumstances the revenue stream that a generation investment is allowed to earn is

⁸ CEG, *Information on equity beta from US companies*, June 2013.

set in precisely the same way as the revenue stream that an investment in a zone substation is allowed to earn. There is no more reason :

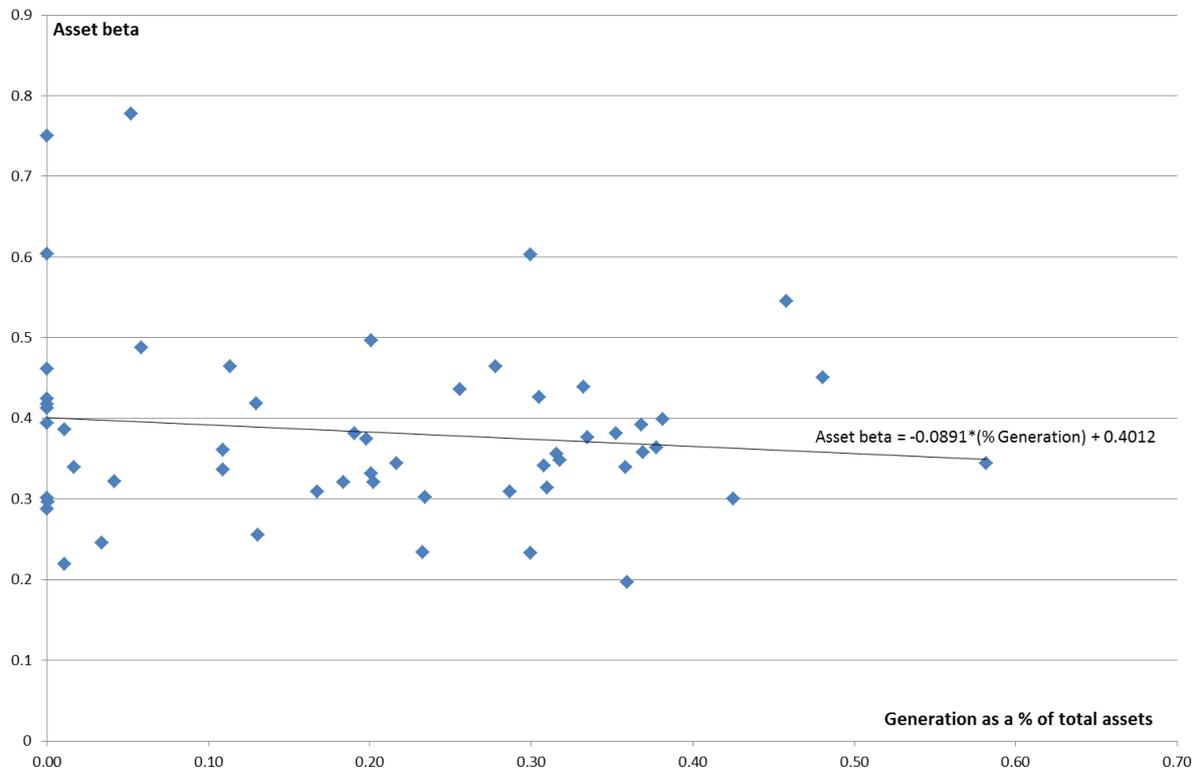
- to believe that regulated monopoly generation assets have different beta risk to regulated monopoly substation assets; than
- to believe that regulated monopoly substation assets have different beta risk to regulated monopoly poles and wire assets (or underground cable etc.).

38. Ultimately, the nature of the regulated cash-flows determine the risk profile of the underlying regulated assets. As already discussed, most debate on this topic is about whether the regulatory regime in the US is *lower risk* than that applied in countries such as the UK and Australia. The AER, in setting the top of its Australian beta range well below the mean observed betas in the US, is more or less alone in believing that US regulated energy assets are (materially) higher risk than Australian regulated energy assets.

39. In any event, it is possible to empirically explore whether a higher proportion of generation activity is associated with a higher beta for US companies. In our data set there are 60 companies that are classified as electric “Power” companies by SNL. For each of these companies I have collected data on the total “production plant” (which covers thermal (steam), nuclear and hydro generation) from filings with the US Federal Energy Commission (FERC). I have then divided this by total balance sheet assets.⁹ The relationship between asset beta and the generation plant as a proportion of total assets is illustrated in Figure 2 below.

⁹ These are both expressed on a before depreciation basis.

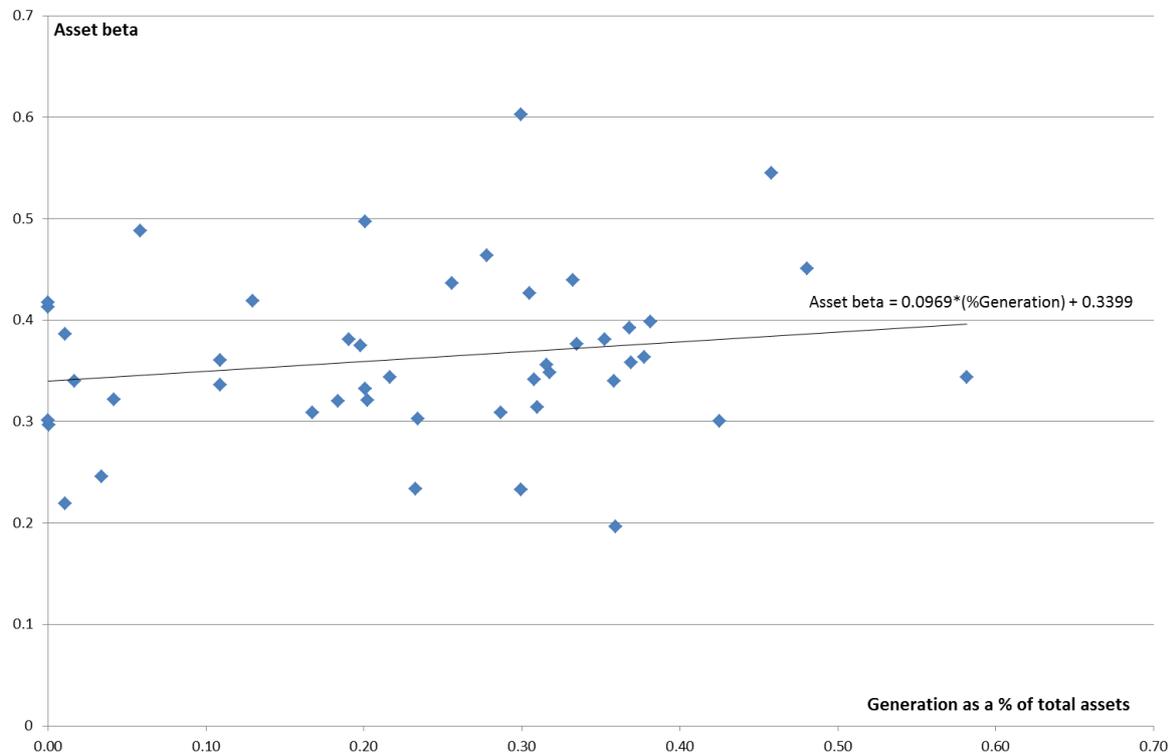
Figure 2 : Beta versus generation as a percentage of total assets



Source: SNL/FERC, CEG analysis

40. There is clearly no strong relationship between generation intensity and measured beta and, to the extent that it exists, the relationship is negative. I have performed the same analysis except we have also excluded businesses with less than 50% regulated assets and the following relationship is estimated (see Figure 2). This shows an upward slope but, as with the first chart, the relationship is weak. The coefficient on the generation variable in the fitted line is not statistically significant at the 10% level in either of these samples.

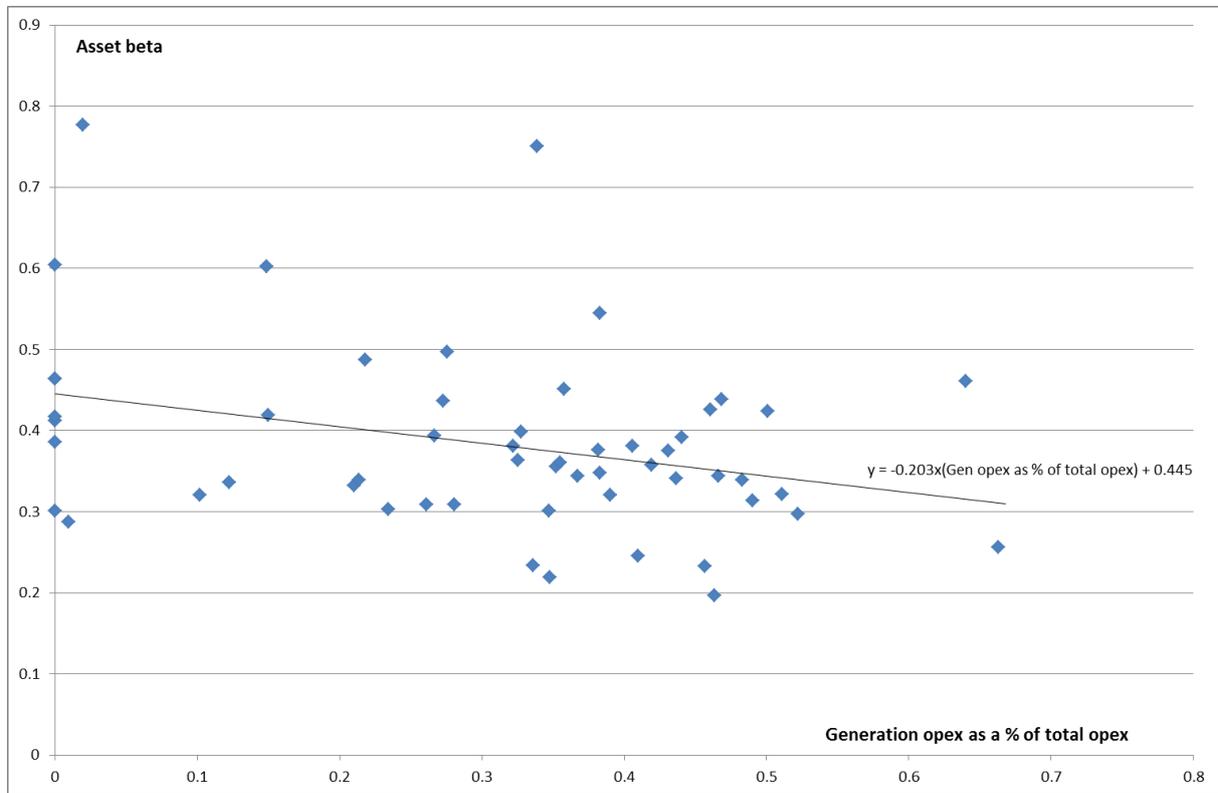
Figure 3 : Beta versus generation as a percentage of total assets (firms with 50% regulated assets)



Source: SNL/FERC, CEG analysis

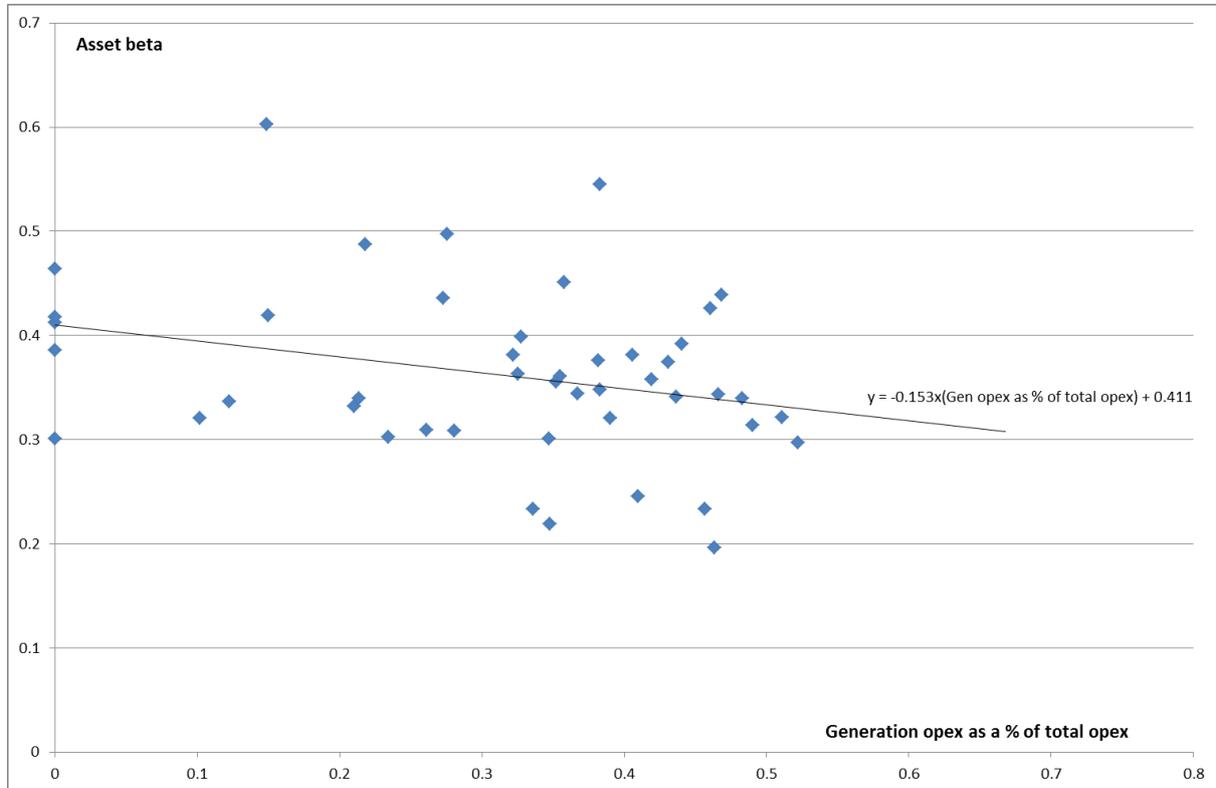
41. A clear conclusion from this analysis is that there is no basis for believing that a higher proportion of generation assets has a material effect on the level of beta risk for US regulated utilities.
42. I have also been able to obtain data from the same source on generation operating expenditure as a percentage of total operating expenditure. Figure 4 and Figure 5 (without and with a 50% regulated assets criterion applied) show that there is a negative relationship between this measure of generation intensity and measured asset beta. As presented in Figure 4, we estimated a negative coefficient that is statistically significantly different to zero at the 5% confidence level. Figure 4 presents the result where the 50% regulated assets criterion is applied, the negative coefficient is only statistically significantly different to zero at the 10% confidence interval.

Figure 4 : Beta versus generation opex as a percentage of total opex



Source: SNL/FERC, CEG analysis

Figure 5 : Beta versus generation opex as a percentage of total opex (firms with 50% regulated assets)



Source: SNL/FERC, CEG analysis

2.2.2.1 Vertical integration into retail

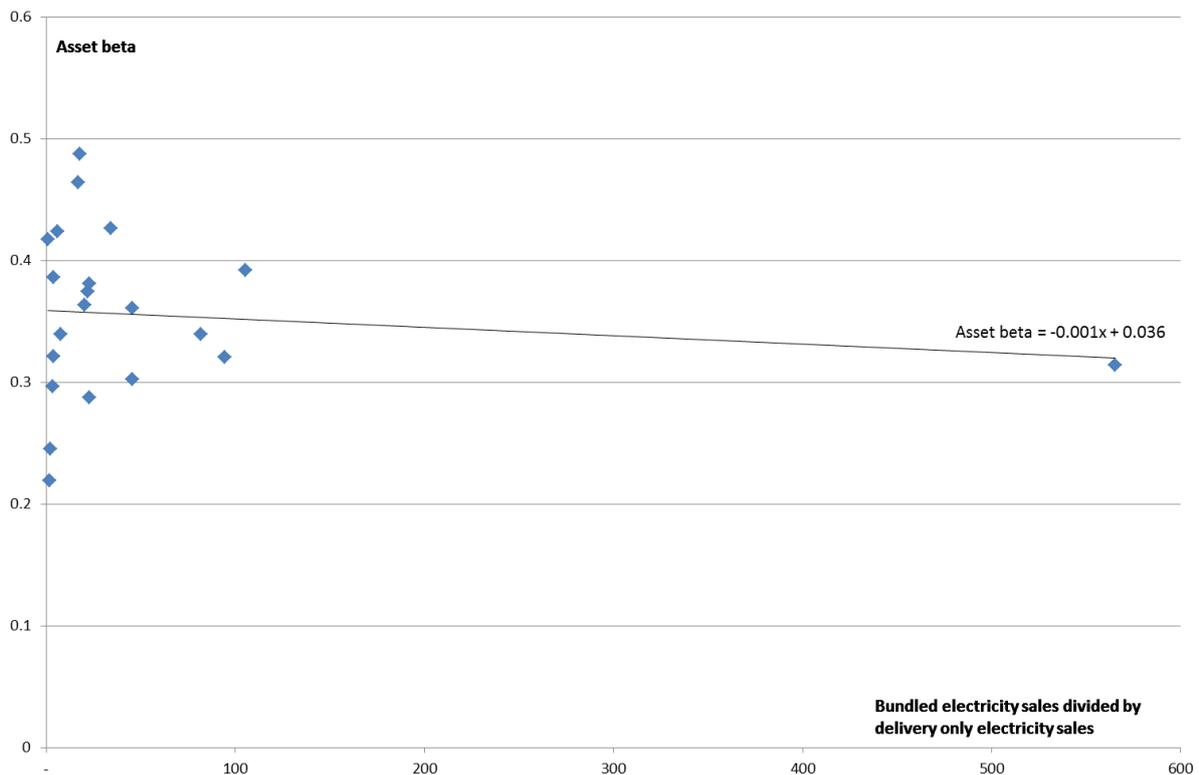
43. As is the case with regulated generation, there is no reason to believe that engaging in regulated retail supply of energy will increase beta risk for a utility compared to engaging in regulated generation/transmission/distribution. Indeed, retail activity involves only a small layer of costs on top of generation/transmission/distribution and incorporating these costs into a regulated retail tariff is no different to incorporating the costs of generation/transmission/distribution into the final regulated price.

44. Once more, it is possible to test this proposition using FERC data. This time using revenue from stand-alone electric delivery (transport) and total revenue from bundled supply of delivery, generation and retail. The following figures show the relationship between beta and the ratio of:

- bundled electricity sales (i.e., where transport and/or generation are bundled with retail); to
- stand-alone energy transport sales.

45. All firms in our wider sample (70 firms) that have positive reported values for “delivery only” revenues are included. All of these firms have greater than 50% regulated assets.
46. In the first chart I observe a weak negative relationship between beta and the ratio of bundled to delivery only revenues. This suggests that a higher proportion of retail activity actually lowers beta. However, the slope coefficient is not statistically different from zero at the 10% level. It can also be seen in the first chart that one observation (the firm with by far the highest ratio) has a disproportionate influence on the fitted line. The second chart removes that observation and the slope reverses to be very slightly positive (and still not statistically significantly different to zero).¹⁰

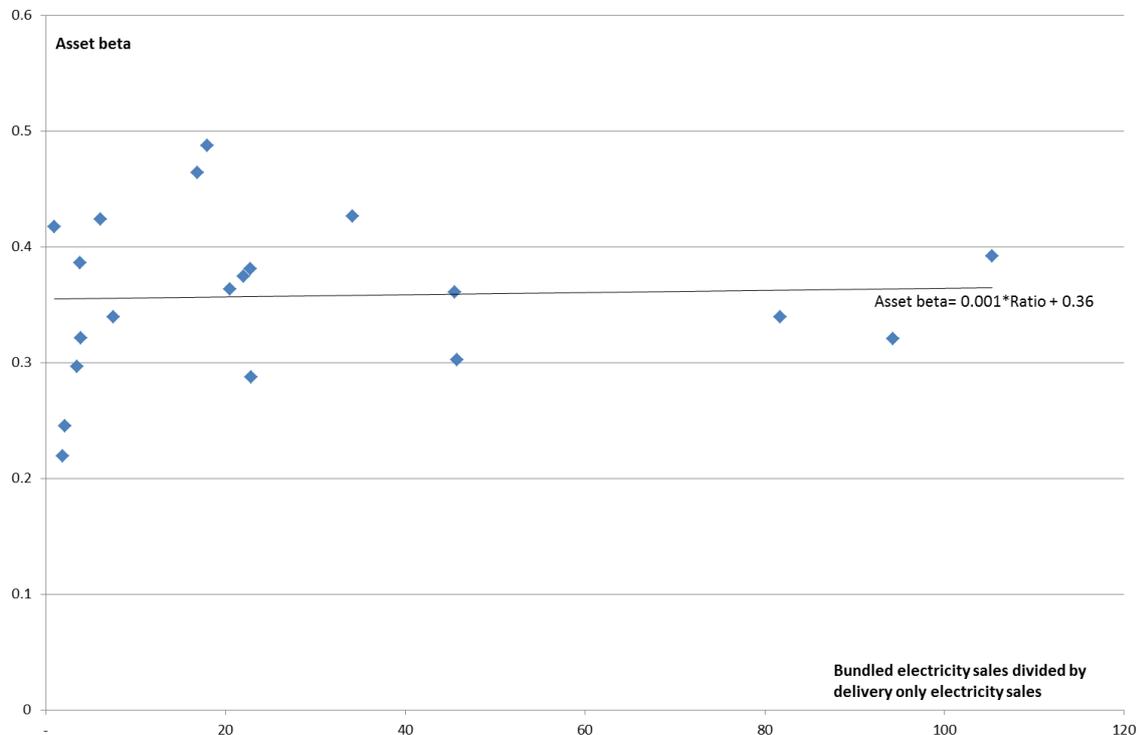
Figure 6 : Beta versus the ratio of bundled electric revenues to delivery only electric revenues



Source: SNL/FERC, CEG analysis

¹⁰ Similarly, I took the natural log of the ratio of bundled to delivery (not shown graphically) and the relationship to beta was also not statistically different from zero at the 10% level.

Figure 7 : Beta versus the ratio of bundled electric revenues to delivery only electric revenues (excluding firm with highest ratio)



Source: SNL/FERC, CEG analysis

47. This supports my prior view, based on conceptual reasoning, that the fact that many US utilities supply retail customers under regulated retail tariffs does not create any increased exposure to systematic risk.

2.2.3 Confusing the ideal and actual data availability

48. The AER states that:

- a. the “use of Australian securities data for equity beta estimation seeks to encompass all of the factors within the CAPM framework in a first-best approach”; and
- b. “the use of a foreign proxy is a suboptimal outcome that can only be justified where there is evidence that this will produce more reliable estimates of the domestic equity beta than the Australian estimates”;

49. These statements suggest logic along the lines that:

- the ideal situation would be where there was sufficient Australian¹¹ data to arrive at an accurate estimate of the beta for Australian regulated energy utilities. In

¹¹ As well as intra-Australian data where factors identified by the AER affected beta risk within Australia.

that situation there would be no need to have regard to betas for foreign regulated energy utilities; *therefore*

- using a foreign proxy is a '*suboptimal outcome*' which creates a burden of proof for any proposed use of foreign proxies.

50. Arriving at the second conclusion from the first involves a logical leap. It effectively assumes that an ideal situation of plentiful Australian data actually exists. Of course, this is not the reality.
51. There are still only six businesses in the Australian sample reported by the AER in Table 6.1 of the issues paper. Even if all of these firms were, on all dimensions, better proxies for the idealised benchmark than all US firms, the small number of observations makes them unreliable as a final sample. Moreover, these firms have substantial cross-holdings in each other¹² or the same assets – such that they are not truly independent observations.
52. Furthermore, none of the available proxies for the beta of a benchmark Australian regulated business are perfect. Indeed, restricting the comparables to Australian businesses makes the quality of the comparison potentially better in one dimension but worse in potentially more important dimensions. For example, in our data set there are 14 firms for whom regulated assets comprise greater than 98% of total assets. These firms have an average asset beta of 0.36. All of these firms are 'better' in this dimension (i.e. are closer to the 'pure play' regulated business the AER sets out in its benchmark) than most of the 6 Australian proxies. APA, for example, attributed only 85% of its revenues to energy infrastructure in financial year 2012 and much of this revenue is earned under long term contracts not subject to regulatory price setting.¹³ The AER provides no logical basis for assuming that an Australian business with a smaller proportion of regulated activities is a better proxy for the benchmark than US companies with a larger proportion of regulated activities. The AER position is to dismiss the relevance of some estimates because they are less good on one dimension (US versus Australian data) even though they are better on another dimension (percentage of regulated assets). The AER approach amounts to assuming that any Australian proxy is better than any US proxy no matter how they perform on other criteria. In my view, this is not a reasonable approach.
53. Finally, it is unreasonable to argue that there is a special onus of proof on a person who proposes that US data is relied on. An identical onus of proof should exist when considering the reliance on any evidence - namely, will relying on that evidence be likely to improve the quality of any final estimate?

¹² APA has a significant interest in both Envestra and HDF over the estimation period.

¹³ See APA 2012 Annual report, page 7.

3 AER survey of international beta estimates

3.1 Summary

54. The AER refers to a number of studies estimating the beta of international comparables. The AER concludes:

We have reviewed the studies referenced above which use international data sets. After taking into account the difficulty of adjusting for differing operating environments, we consider that the data nonetheless provides support to our estimate of an equity beta range for the benchmark efficient entity of 0.4 to 0.7. We also consider that this evidence is more supportive of a point estimate of equity beta that is located closer to the upper end of this range.¹⁴

55. However, there are a number of errors, omissions and inconsistencies in the AER's representations of these studies. I summarise the nature of the corrections and the impact of correcting for these in the below table. I provide a more detailed discussion of each study in each of the following subsections

¹⁴ AER, Equity beta issues paper, October 2013, page 37

Table 2: Summary of AER reported range and corrected range for 60% geared equity beta based on studies of international comparables

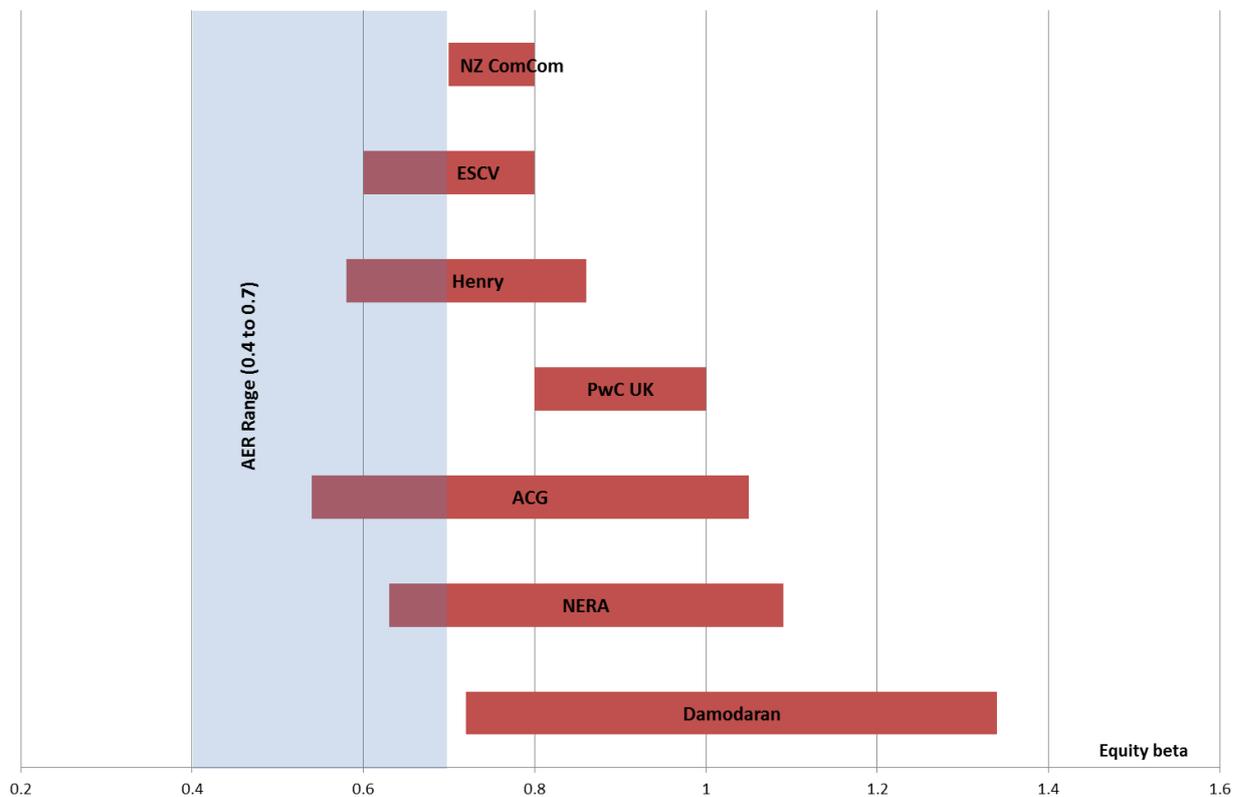
Study	AER range	Corrected range	Nature of correction
Damodaran	0.24 to 0.84	0.72 to 1.34	Incorrect gearing figure used by AER
NERA	0.52 to 1.09	0.63 to 1.09	AER reports bottom end of range based on leverage formula not proposed by NERA and inconsistent with AER methodology.
ACG	0.54 to 0.73	0.54 to 1.05	AER inconsistently ignores most recent 5 year beta estimates when setting the top of the range (despite using the most recent beta estimates from the NERA study to set the bottom of the range and in its own analysis describing post 2002 beta estimates as its 'core' estimates).
PwC UK	0.64 to 0.78	0.8 to 1.0	Corrected range is based on PwC recommendation to Ofgem. AER range is based on calculations that involve idiosyncratic reading numbers of PwC charts – calculations that PwC does not recommend or perform.
Henry	0.47 to 0.71	0.58 to 0.86	The AER incorrectly cites the bottom end of this range. The top end of the range fails to have regard to the most recent beta estimates reported by Henry (2003 to 2008). Once again, this is inconsistent with the AER's reporting of the NERA results and its own focus on the post 2002 beta estimates as 'core'. Arguably, the top and bottom of the Henry range should be based on estimates from the 'core' period – in which case the bottom of the range would be 0.65 rather than 0.58.
ESCV	0.60 to 0.80	No correction	The AER correctly characterises the ESCV conclusion. However, updated data suggests the top end of the ESCV's range would extend above 1.0 if repeated now.
NZ Commerce Commission	0.70 to 0.80	No correction	The AER correctly characterises the NZ Commerce Commission conclusion. However, there are fatal flaws in the NZ Commerce Commission analysis and correcting these would raise the best estimate using NZ Commerce Commission data to 1.0.

56. The corrections to the AER's reporting of these studies are material. The AER's conclusion that the studies provide support for its estimate of an equity beta range for the benchmark efficient entity of 0.4 to 0.7 is, at best, tenuous even based on the uncorrected range.
- The top end of the uncorrected range is always and everywhere above the top end of the AER's range;
 - The bottom end of uncorrected range is, with the exception of the Damodaran beta estimates, always above the bottom end of the AER's range.
57. Implicit in the AER's conclusion that this uncorrected data supports its range is a belief that Australian utilities are lower risk than international utilities. This must be the case if the AER takes higher foreign utility betas as supporting a lower

Australian range. However, the AER provides no positive argument for why this is the case (other than that the handful of betas for Australian comparables happen to be lower than the foreign betas).

58. The tenuous nature of the AER’s conclusion based on the uncorrected range becomes untenable based on the corrected range.
- The only range that fell below the AER range (the Damodaran study) now falls entirely above the AER range;
 - The lowest corrected lower bound (0.54 for the ACG study) is effectively the midpoint of the AER range (0.55);
 - The average corrected lower bound is 0.65 – at the top of the AER’s range of 0.40 to 0.70;
 - The average corrected upper bound is 0.99 – almost as much above the AER’s range (0.29) as the AER’s range extends down (0.30 = 0.70 – 0.40).
59. These observations can be illustrated visually by superimposing the corrected ranges and the AER’s proposed range in a diagram.

Figure 8: AER range versus corrected ranges for international studies



60. Moreover, all of these conclusions are strengthened by the inclusion of more recent data – noting that many of these studies are now old (e.g., the ESCV study relies on time series data that stops 7 years ago) and the inclusion of more recent data tends to materially raise beta estimates for US energy businesses. Based on SFG estimates of asset beta the average beta in the ESCV sample would be 0.86 (measured using data from January 2002 to November 2012).

3.2 Damodaran

61. The AER issues paper states:

Damodaran has calculated equity beta estimates for the various United States industry sectors each year since 1999, using a five year data window. The pattern across this analysis is that the electricity and gas network equity beta estimates are amongst the lowest observed. The results that are most comparable to the 2009 WACC review analysis are those ending in January 2007 and January 2008. The point estimates are:

- *0.86 in January 2007 (average gearing 61 per cent) [implied beta at 60% gearing is 0.84]*
- *0.85 in January 2008 (average gearing 62 per cent) [implied beta at 60% gearing is 0.81]”*

And

“The Damodaran equity beta estimates for United States industry groups have been updated across this time:

- *0.74 in January 2010 (average gearing 87 per cent) [implied beta at 60% gearing is 0.24]*
- *0.72 in January 2011 (average gearing 79 per cent) [implied beta at 60% gearing is 0.38]*
- *0.71 in January 2012 (average gearing 75 per cent) [implied beta at 60% gearing is 0.44]*
- *0.50 in January 2013 (average gearing 74 per cent) [implied beta at 60% gearing is 0.33].*

Contents of [...] are inserted by me and are my own calculations

62. The AER states in footnote 106 and in relation to the 2007 and 2008 estimates:

The equity beta for each firm is unadjusted for leverage. That is, it has not been de-levered and re-levered to the benchmark gearing (60 per cent), though there is minimal difference between the average leverage (61 or 62 per cent) and the benchmark in this case.

63. If the above analysis was correct then the AER would have a basis for believing that these US estimates, at least the most recent ones, are consistent with its estimated range for equity beta of 0.4 to 0.7 for a 60% geared utility. Indeed, since January 2010 all four of the equity betas would be below the top end of the AER range when adjusted to a benchmark gearing of 60%. Moreover, three of the four observations since January 2010 would be below the bottom end of the AER range.
64. However, the gearing reported by the AER has not been correctly calculated. The above reported average gearing is, in reality, the average debt to equity ratios for the relevant US businesses – not the average debt to enterprise value (debt plus equity). When correctly calculated the gearing figures are all much lower than 60% and the average equity betas, adjusted to 60% gearing, are all well above the top of the AER’s range of 0.4 to 0.7. The below dot points show the average equity beta adjusted to 60% gearing and the correct average gearing figure.
- 1.34 beta at 60% gearing - January 2007, (actual gearing of 38%)
 - 1.31 beta at 60% gearing - January 2008, (actual gearing of 38%)
 - 0.99 beta at 60% gearing - January 20010, (actual gearing of 47%)
 - 1.01 beta at 60% gearing - January 2011, (actual gearing of 44%)
 - 1.01 beta at 60% gearing - January 2012, (actual gearing of 43%)
 - 0.72 beta at 60% gearing - January 2013, (actual gearing of 43%)

3.3 McKenzie and Partington

65. McKenzie and Partington refer to the Damodaran data without making the same mistake as the AER. However, the AER refers to the following statement by McKenzie and Partington:¹⁵

Empirical support for this proposition may be found by looking at the industry beta tables of Damodaran (see Appendix 2). The equity betas for water, gas and electricity are the lowest in the table, while their debt to equity ratios are among the highest. Although this evidence is based on US companies, there is no reason to believe that a similar pattern would not exist in Australia.

66. This statement is not factually correct. In the table that McKenzie and Partington reproduce “Retail/Wholesale Food” has a lower beta than “Electric Utility (West)” or “Electric Utility (Central)” as does the “Thrift” industry.
67. Moreover, the conclusion that regulated utilities, when geared at the levels in the Damodaran data (43%), have relatively low betas compared to other industries is

¹⁵ McKenzie and Partington, Estimation of equity beta, April 2012, pp. 15, 29–32.

not particularly controversial. The relevant question is what is the right estimate of beta for a regulated utility geared at 60%? The Damodaran data that reported by McKenzie and Partington would suggest that the correct estimate of equity beta for a 60% geared regulated energy utility is 1.0.

68. Separately, it is worth noting that the Damodaran data reports simple average betas in each industry (not averages weighted by the size of the business). Therefore, the beta in each industry is disproportionately weighted to the smaller businesses in the industry (which get equal weight despite being smaller).
69. This tends to drag up the betas in each industry, because small firms tend to have higher betas than large firms, and, as a consequence, the average equity beta overall is well above 1.0 (1.15). However, this effect is not likely to be present in any material way for utilities which, due to economies of scale, all tend to be large firms (which tend to be lower risk than small firms). Consequently, the comparison to between industries using these unweighted averages is potentially misleading.

3.4 NERA report for the QCA

70. The AER equity beta issues paper states that

The NERA report for the QCA included equity beta estimates for UK and US energy networks for two different estimation periods ending in March 2011. NERA implemented two leverage adjustments, and used both equal-weighted and value-weighted portfolios to produce point estimates of:

- 0.52 to 1.09 for UK firms
- 0.70 to 0.96 for US firms

71. This characterisation of the NERA report is not faithful to that report. The bottom end of the range is based on the application of a Conine formula to de-lever and re-lever equity betas. However, NERA only reports these in an appendix and does not recommend using these beta estimates. NERA clearly states:

For these reasons, in what follows we use the AER's leverage formula rather than the Conine formula to de-lever and re-lever equity betas.

72. If the AER reports the NERA range based on NERA's recommended approach (which also happens to be the AER's own approach) then the correct range is:
 - 0.63 to 1.09 for UK firms

- 0.79 to 0.96 for US firms.¹⁶

73. That is, reporting the NERA results consistent with NERA's analysis and the AER's own precedent clearly lifts the US range above the AER's proposed range in its entirety and only the bottom end of the UK range is within the (top end) of the proposed AER range.

3.5 ACG reported betas

74. The AER equity beta issues paper states:

ACG also calculated equity beta estimates, using a comparator set that included electricity and gas networks. For the same period [1990 to 2008 (but excluding the technology bubble)], the average point estimates are:

- *0.65 to 0.73 as the average of individual firms (OLS, re-weighted OLS and LAD by ACG);*
- *0.54 to 0.68 as the average/median of portfolios (OLS, re-weighted OLS and LAD by ACG).*

75. The AER bases these ranges on a single estimation period 1990 to 2008. In doing so the AER is being inconsistent. When reporting the range for UK firms from the NERA study the AER set the bottom of its range based on 3 year (2009 to 2011) beta estimates reported by NERA (0.52 in Table C.1) and the top of its UK range based on 11 year beta estimates (1.09 in Table 5.1). That is, the effect of having regard to the shorter time period (more recent) betas was to lower the AER's reported range.

76. Applying the same approach in the context of the ACG study would have the opposite effect – it would raise the top end of the range. However, in this context the AER does not report the more recent ACG betas (5 year monthly betas from 2003 to 2008).¹⁷ Had the AER reported the ACG study in consistent manner it would have reported a range of:

- 0.73 to 1.00 as the average OLS betas for individual firms (0.67 to 0.98 for re-weighted OLS betas and 0.65 to 0.86 for LAD betas);
- 0.65 to 1.05 as the average/median of OLS portfolios (0.61 to 0.99 for re-weighted OLS betas and 0.54 to 0.72 for LAD betas)

77. I separately note that in the context of Australian beta estimates the AER states:

¹⁶ All figures taken from table 5.1 (Energy rows) of NERA, *Cost of capital for water infrastructure company: Report for the Queensland Competition Authority*, 28 March 2011, pp. 36–37.

¹⁷ ACG, *Beta for regulated electricity transmission and distribution*, Report to Energy Network Association, Grid Australia and APIA, 17 September 2008, Table 4.7, page 49.

The core regressions in the 2009 WACC review were based on the periods from January 2002 to September 2008 (six years and eight months) and September 2003 to September 2008 (five years).¹⁸ [see section 3.7.3 below for more detail]

78. If one derives a range using all of the reported values by ACG the widest range for the US betas is 0.61 to 1.05. Once more, while the bottom end of this range is within the (top end) of the AER's proposed range the middle of this range is well above the top of the AER's proposed range.

3.6 PwC 2009 for Ofgem

79. The AER states:

PricewaterhouseCoopers (PwC) produced international equity beta estimates for Ofgem in 2009. These estimates include five years of data up until the onset of the GFC. The sample included gas and electricity distribution and transmission firms in the USA, UK and Europe. The average equity beta is 0.64 (to December 2007) or 0.78 (to September 2008).¹⁹

80. The AER describes how it arrived at this estimate in footnote 102.

The average equity betas were computed by us based on visual inspection of figures 13, 16-19 and the methodology description provided in the PwC report. We adjusted for vertical integration for both UK and non-UK businesses in a manner consistent with the PwC methodology.²⁰

81. The figures ascribed to the PwC study by the AER (0.64 (to December 2007) or 0.78 (to September 2008)) cannot be found in the PwC study. Similarly, the sample used by the AER to derive its results does not correspond to the sample used by PwC. Neither does the date at which equity betas are estimated by the AER (December 2007 and September 2008) correspond to the date at which PwC reports equity betas (May 2009). Moreover, the AER adjusts the betas for a number of non-UK firms downward – mirroring an adjustment that PwC made for UK vertically integrated electricity businesses but which PwC did not apply to non-UK firms. Finally, because the AER chooses to report data not provided in tabular form in the PwC report it is necessary for it to ‘read off’ graphs provided by PwC to visually estimate the betas for the relevant companies on the relevant dates.

¹⁸ AER, Equity beta issues paper, October 2013, page 40.

¹⁹ AER, Equity beta issues paper, October 2013, page 35

²⁰ AER, Equity beta issues paper, October 2013, footnote 102, page 35

82. It is unorthodox to make so many adjustments to the methodology applied in a published report and then ascribe a resulting range to that published report.
83. It is useful to compare the AER's interpretation of the PwC study with PwC's interpretation. Based on its study PwC set a range:
- based on UK businesses an asset beta rang of 0.31 to 0.38 and an equity beta range of 0.7 to 1.1. However, this equity beta range is based on a range for gearing from 55% to 65%.²¹ The range for a constant gearing of 60% is 0.8 to 1.0;
 - based on non-UK businesses an asset beta rang of 0.22 to 0.45.²² The range for a constant gearing of 60% is 0.6 to 1.1.
84. The range ultimately recommended by PwC to Ofgem (expressed on a 60% gearing basis) was 0.8 to 1.0 which lies entirely above the AER's proposed range. One fifth of the wider range based on non-UK businesses (0.6 to 1.1) does fall within the top third of the AER's range. However, the midpoint of the PwC range is still more than 50% higher than the midpoint of the AER range.
85. The AER's interpretation of the PwC analysis is idiosyncratic in the sense that the figures arrived at by the AER (0.64 and 0.78) are not reported in the PwC report. These figures are also both below the bottom of the range recommended by PwC to Ofgem for the purpose of regulating UK electricity businesses.
86. Separately, I note that PwC did recommend an adjustment to the equity betas for Scottish Power and Scottish and Southern Energy based on the fact that both had material exposure to the wholesale generation market in the UK – with only 58%/39% of operating profits for these businesses relating to regulated network operations).²³ In the context of my earlier discussion of vertical integration, it must be recognised that the UK generation market is a competitive market. The fact that PwC came to the view²⁴ that exposure to *unregulated* competitive generation markets raised the measured beta for these firms does not imply that a firm who invests in *regulated* generation assets should have a similar adjustment made.

²¹ PricewaterhouseCoopers, Final report: Office of the Gas and Electricity Markets, Advice on the cost of capital analysis for DPCR5, 1 December 2009, page 47.

²² PricewaterhouseCoopers, Final report: Office of the Gas and Electricity Markets, Advice on the cost of capital analysis for DPCR5, 1 December 2009, page 47.

²³ PricewaterhouseCoopers, Final report: Office of the Gas and Electricity Markets, Advice on the cost of capital analysis for DPCR5, 1 December 2009, page 35, Table 14.

²⁴ I note that the basis for the PwC adjustment (page 38 and 39) is not, in my view, robust. It is based on a comparison of single company and a single time period/sampling interval. In this regard I note that I do not agree with the position taken by PwC in footnote 27 on page 39.

3.7 Henry report for the AER

87. The AER characterises the equity beta estimates commissioned by it from Olan Henry as follows:²⁵

For the period 1990 to 2008 (but excluding the technology bubble), the average point estimates are:

- *0.54 to 0.71 for simple averages of individual firms' betas (monthly/weekly by Henry)*
- *0.47 to 0.71 for fixed-weight portfolios (weekly/monthly by Henry).*

88. A number of observations can be made about this statement:

- First, the numbers are not a correct description of Henry's results. Specifically, the 0.54 lower end of the range should actually be 0.58 (i.e., this is the correct average of the LAD row in Table 6.6 in Henry 2009).²⁶ The fixed weight portfolio figures do not appear to be taken from Henry at all – certainly there is no such figures reported in the page references supplied by the AER.
- Second, the correct Henry lower bound estimate (of 0.58 not 0.54) is itself a biased estimate. Henry reports weekly betas in his 2009 report based on the (not transparently disclosed) definition of a week as the seven days ending Monday. As it just so happens, this definition of a week yields the lowest beta estimate of any of the five possible definitions of a weekly beta. The average of betas for the Henry sample when averaged across all possible sampling periods are materially higher.
 - As discussed in Appendix A, it appears that Henry altered his definition of a weekly beta from week ended Friday in his November 2008 report²⁷ for the AER to week ended Monday in his 2009 report.²⁸ No reason is provided for this change. However, the effect is such that, along with other changes made to Henry's methodology between reports, the weekly betas reported by Henry were the lowest possible in both reports.
- Third, the AER issues paper only reports beta estimates using data from 1990 to 1998. Henry also reports betas for the shorter time period, consistent with the time period Australian betas are available for, of 2002/03 to 2008. Elsewhere in the equity beta issues paper the AER refers to the estimates over the same time period (2002 to 2008) as the 'core' estimates in the context of

²⁵ AER, Equity beta issues paper, October 2013, page 34.

²⁶ Henry, Estimating β , April 2009, page 46.

²⁷ Henry, Econometric advice and beta estimation, November 2008.

²⁸ Henry, Estimating β , April 2009, page 46.

the Australian betas. It is peculiar that the AER did not have regard to this ‘core’ time period when developing a range for the US betas. Had it done so the betas it reported would have been much higher:²⁹

- 0.76 to 0.86 for the period 2003 to 2008; and
- 0.65 to 0.78 using data from 2002 to 2008.
- Fourth, the AER specified the sample that Henry should use. Notably, the sample specified results in lower beta estimates than other samples proposed by other regulators and or businesses. Moreover, the sample originally proposed by the AER includes vertically integrated firms despite the AER’s now arguing that such firms are poor proxies.

3.7.1 Error referencing Henry

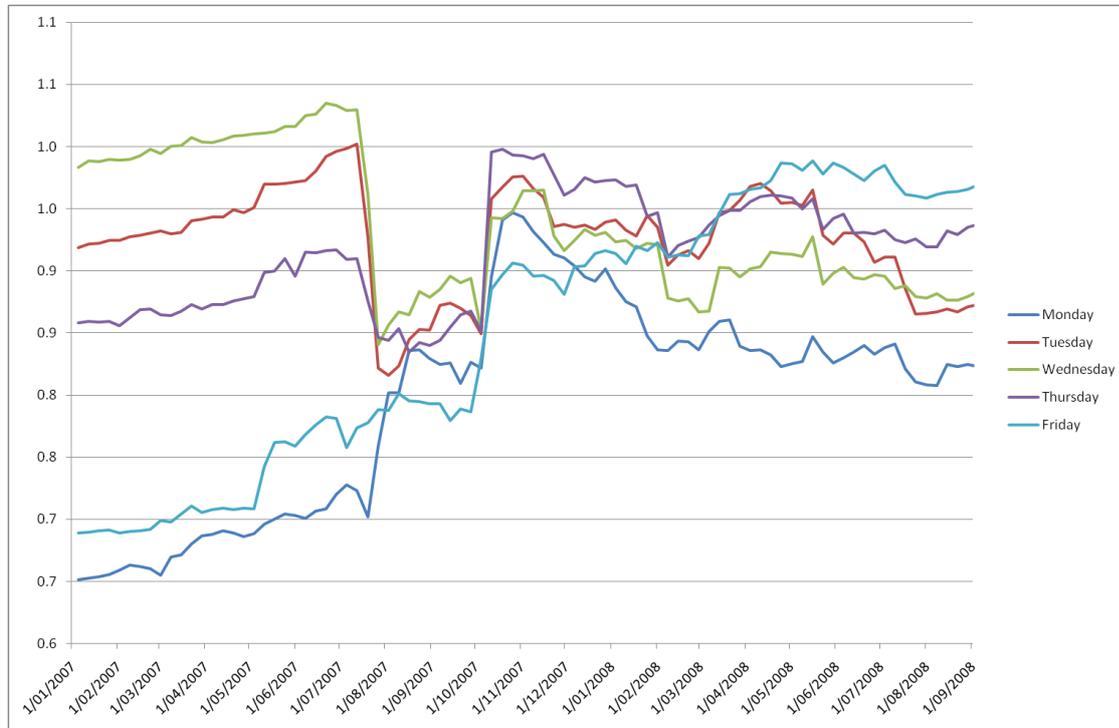
89. The AER’s reported lower bound estimate for the Henry simple averages of individual firm betas is taken from the bottom row and far right column of Table 8.11 of the AER 2009 final decision *Review of the weighted average cost of capital (WACC) parameters*. However, this figure is not correct. The correct average LAD beta over the period in question is 0.58 (average of the LAD row in Table 6.6 in Henry 2009).
90. The fixed weight portfolio figures do not appear to be taken from the Henry paper cited by the AER. There are no such figures reported in the Henry page references supplied by the AER.

3.7.2 Bias in Henry estimate

91. The chart below shows a time series for the average weekly betas for the firms in Henry’s sample – where each of the five possible definitions of a weekly beta are shown.

²⁹ Referencing the same table the AER references (Table 8.11 of AER, *Review of the weighted average cost of capital (WACC) parameters*, Table 8.12, page 330)

Figure 9: Re-levered weekly five year betas – Henry sample



Note: The betas have been re-levered to 60 percent
Source: Bloomberg, CEG analysis

92. The above chart is particularly relevant because Henry’s 2009 report, which the AER relies on in the above quote, appear to be consistent with selecting a Monday beta for the 5 year estimation period ending 1 September 2008. This happens to be the lowest of the five possible sampling periods. Had Henry reported weekly betas for the week ending Friday (being a natural interpretation of a week then he would have estimated an average beta of 0.97 for the US sample. Instead, Henry reports a beta for these 10 firms of 0.85. As explained in Appendix A, it is apparent that this is because Henry uses a definition of the week ending Monday in that report. As can be seen in Figure 9 above, Monday gives the lowest beta estimate of all of the possible definitions of a ‘weekly’ beta for the five years ending 2009.

3.7.3 Reliance on data from 1990 to 1998

93. The AER issues paper only reports the figures based on estimates using data from 1990 to 1998 and 2002 to 2008. Henry also reports betas for the shorter time period, consistent with the time period Australian betas are available for, of 2002/03 to 2008. These are much higher:³⁰

³⁰ Referencing the same table the AER references (Table 8.11 of AER, *Review of the weighted average cost of capital (WACC) parameters*, Table 8.12, page 330)

- 0.76 to 0.86 for the period 2003 to 2008; and
 - 0.65 to 0.78 using data from 2002 to 2008.
94. Clearly the very long time period estimates fall within the AER's range but the more recent estimates fall at the top or above the AER's range.
95. Elsewhere in the equity beta issues paper the AER refers to the estimates over the shorter more recent time period (2002 to 2008) as the 'core' estimates in the context of the Australian betas.

The core regressions in the 2009 WACC review were based on the periods from January 2002 to September 2008 (six years and eight months) and September 2003 to September 2008 (five years).³¹

96. It is unreasonable that the AER did not have regard to this 'core' time period when developing a range for the US betas.
97. I note that the 1990 to 1998 data is now 15 to 23 years old. Using such aged data is problematic unless one has reason to believe that the conditions in the period 1990 to 1998 are likely to be more informative of the conditions going forward than more recent data. Henry provides no basis for believing this to be the case and the empirical evidence that he presents suggests that measured betas using 1990 to 1998 data are much lower for his sample than using more recent data. In this regard I note that Professor Franks warned the NZ Commerce Commission against the use of long time series to estimate beta.³²

Professor Franks argues that there is much judgment involved when estimating betas (particularly when indirectly estimating these), but this is unavoidable. He also suggests that where there has been significant volatility in capital markets, as is the case currently, the real asset betas of some regulated companies may have undergone changes which will not be captured by a long historical time series.

3.7.4 Specification of the Henry sample

98. The Henry sample was originally specified by the AER and Henry was instructed to use this sample. The AER identified this sample from the UBS Utilities Index and only included businesses that operate electricity networks (although not all such businesses were included – for example Consolidated Edison was not included despite being on the UBS list and operating electricity distribution). It is noteworthy that this sample tends to result in lower beta estimates than the samples

³¹ AER, Equity beta issues paper, October 2013, page 40.

³² Franks, J., Lally, M. and Myers, S., *Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology*, December 2008, para. 27.

formed on other bases – including by other regulators such as the ESCV and the New Zealand Commerce Commission.

99. The figure below is from a 2011 CEG report³³ also compares the average of all five weekly sampling periods (i.e., week ended Monday, Tuesday, ..., Friday) for:

- the Henry sample;
- the sample of 46 US companies used by the NZ Commerce Commission in its beta estimation;³⁴
- the sample of 12 US companies used by the Victorian Essential Services Commission (ESCV sample);³⁵
- a sample based on all firms classified by US Regulatory Research Authorities (RRA) as listed electric and/or gas distributors.

Figure 10: Re-levered average weekly five year betas – RRA, Henry, NZCC and ESCV samples



Note: The betas have been re-levered to 60 percent

³³ CEG, WACC estimation, a report for Envestra, March 2011.

³⁴ NZ Commerce Commission, *Input Methodologies electricity distribution services Draft Reasons Paper*, June 2010, Appendix F.

³⁵ ESCV, Gas Access Arrangement Review 2008-2012, Draft Decision, 28 August 2007, p. 309.

Source: Bloomberg, CEG analysis

100. The Henry sample consistently gives the lowest betas – albeit well above the top of the AER’s range of 0.4 to 0.7. SFG has more recently estimated betas for US companies, including the companies in Henry’s sample. The period over which these betas are estimated is 2 January 2002 to 19 November 2012. The average SFG estimate of asset beta for the firms in the Henry sample is 0.32 (0.80 beta at 60% gearing). The Henry sample results in an equity beta at 60% gearing of 0.80 while the ESCV and the NZ Commerce Commission samples result in betas of 0.86 and 0.87 respectively. The CEG proposed sample, based on US businesses with more than 50% of their assets regulated energy assets, results in a beta of 0.85. This confirms the result identified in the above figure from CEG’s 2011 report that the sample the AER provided to Henry results in systematically lower beta estimates – albeit still well above the top the AER’s newly determined range of 0.4 to 0.7.
101. It is also notable that the sample the AER specified Henry should use included businesses with significant generation activities. For example, Nisource Inc:
- ...operates 3 coal-fired electric generating stations with a net capability of 2,574 megawatt (MW), 4 gas-fired generating units with a net capability of 203 MW, and 2 hydroelectric generating plants with a net capability of 10 MW, as well as a combined cycle gas turbine plant, Sugar Creek, with a capacity of 535 MW.³⁶*
102. Similarly, over 30% of Portland General Electric Corporation (ticker: POR) and NV Energy (ticker: NEV) electric assets are generation assets (as reported to the US Federal Energy Commission (FERC)).
103. For reasons outlined separately I consider that this is appropriate. However, I note that this is inconsistent with the position expressed by the AER in the issues paper which argues that vertical integration, even if assets are included in the regulated asset base, makes these firms imperfect comparables. It is noteworthy that this is a new criteria applied by the AER. That is, it is not a criterion the AER applied when originally specifying the sample that Henry was to have regard to.

3.8 ESCV analysis

104. The AER states:

Analysis by the ESC in 2008 presented equity beta estimates for United States energy networks together with analysis for equivalent Australian networks. The ESC’s key conclusion is that US estimates are slightly above

³⁶

<http://investing.businessweek.com/research/stocks/snapshot/snapshot.asp?ticker=NI>

the Australian estimates and that 'the US evidence suggests that the beta is between 0.6 and 0.8'.

105. This partial quotation from the ESCV does not adequately summarise the ESCV data or reasoning. The following discussion is taken from the ESCV draft decision³⁷ (which provides the analytical basis for the ESCV's statement in the final decision that the AER quotes).

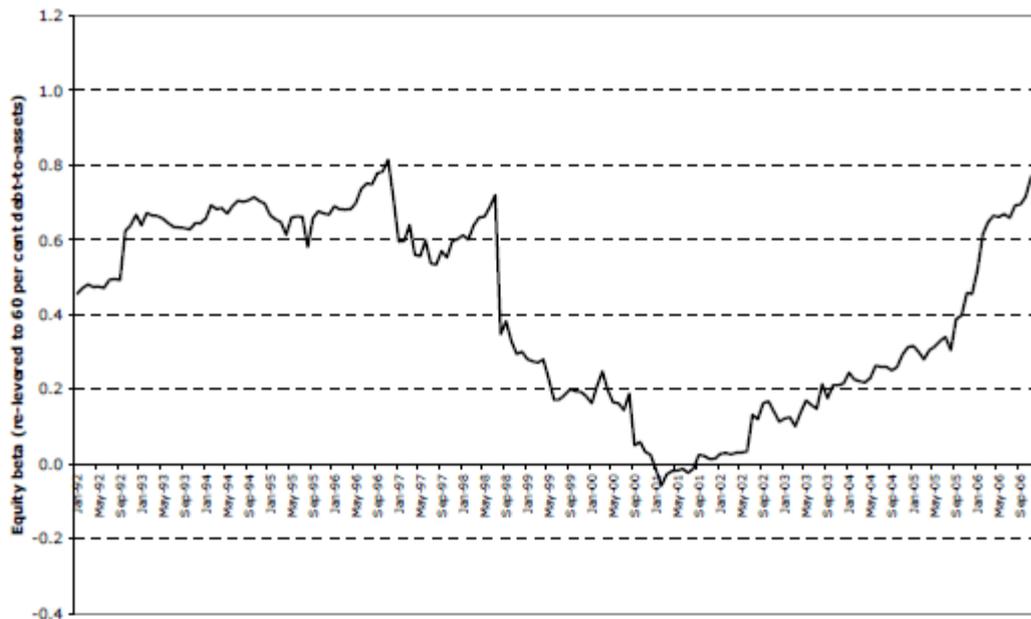
In previous decisions the Commission has had regard to the equity beta estimates of international comparators. For instance, in the 2005 EDPR (ESC, 2005) analysis of the behaviour of equity betas for USA electricity distribution businesses was conducted. In contrast to the Australian market, analysis of equity betas of firms in the USA has the advantage of being able to make use of a much larger set of listed entities over a longer time period.

Figure 10.2 illustrates that while the re-levered equity beta averaged across the sample of firms fluctuated within a range of approximately 0.6 to 0.8 prior to the impact of the 'technology bubble', equity beta estimates declined during a period coincident with the period of the 'technology bubble' before again recovering to levels within the range of 0.6 to 0.8.

³⁷

ESCV, Draft Decision, Gas Access Arrangement Review 2008-2012, Envestra, page 389 to 390.

Figure 10.2 **Average equity betas for USA electricity distributors**



Data source: The chart reflects the average equity beta (re-levered for gearing of 60 per cent debt-to-assets) across a group of 12 USA energy distributors, measured using monthly return observations to December 2006. The sample includes: Centrepunt Energy, Clesco Corporation, DTE Energy Corporation, Empire District Electric Company, El Paso Electric Corporation, Entergy Corporation, Elexon Corporation, FirstEnergy Corporation, FPL Group, MGE Energy, Progress Energy, Westar Energy. Data Source: S&P 500 Total return index, Bloomberg.

106. The ESCV's then clearly describes how it has used the US comparables data:

While a consideration of the Australian data alone may indicate a range for the beta that extends below 0.5 and not above 0.7, the Commission considers that the US evidence makes it less plausible that the beta would be below 0.5, but also makes it plausible that the beta may extend up to 0.8. Accordingly, the Commission considers that the empirical evidence suggests that the 'best estimate arrived at on a reasonable basis' that is consistent with 'prevailing conditions in the market for funds and the risk involved in delivering the Reference Services' for the beta lies between 0.5 and 0.8.³⁸

107. Two observations about this precedent are clearly relevant in the current context.

- Firstly, the ESCV believed that the US comparables data, such as was available at that time, was sufficient to raise the appropriate range for an Australian beta

³⁸ ESCV, Draft Decision, Gas Access Arrangement Review 2008-2012, Envestra, page 396.

from below 0.5 to 0.7 up to 0.5 to 0.8. Importantly, the ESCV uses US betas to determine a range for beta and then selects a point within that range (which happened to be at the top of that range). This is in direct contrast to the AER's proposed approach which is to set a range based on Australian data and then use US data to select a point within that range; and

- Secondly, the data that has become available in the seven years since the ESCV's beta estimates clearly supports a greater upward adjustment to the range for Australian beta. For example:
 - CEG has estimated the five year weekly betas for the ESCV sample have been above 1.0 since late 2007 (see Figure 10 above);
 - based on SFG beta estimates, over the entire period from 2 January 2002 to 19 November 2012 onwards, the ESCV sample gives rise to a beta estimate that is 0.86.

3.9 NZ Commerce Commission

108. The AER refers to a study by the NZ Commerce Commission and states:³⁹

For its Input Methodologies (electricity distribution and gas pipeline services) reasons paper New Zealand Commerce Commission estimated asset and equity betas for a set of comparator businesses, classified as either electricity utility or gas utility by Bloomberg. The sample of comparators included two NZ businesses (Horizon Energy and Vector), six Australian businesses (DUET, Spark Infrastructure, SP AusNet, APA, Envestra, and Hastings Diversified Utilities), one UK National Grid, and 70 US businesses. The sample periods included five-year intervals up to 31 May 1995, 31 May 2000, 31 May 2005, 31 May 2006, 31 May 2007, 31 May 2008, 31 May 2009, and 31 May 2010. The average estimates (over all sampling periods and all businesses in the sample) of the asset betas for the sample were as follows:

- *overall: 0.28, gas: 0.23, electricity: 0.30 using monthly data (correspond to the equity betas of 0.70, 0.58, 0.75, respectively, assuming 60% gearing zero debt beta)*
- *overall: 0.32, gas: 0.31, electricity: 0.32 using weekly data (correspond to the equity betas of 0.80, 0.78, 0.80, respectively, assuming 60% gearing zero debt beta).*

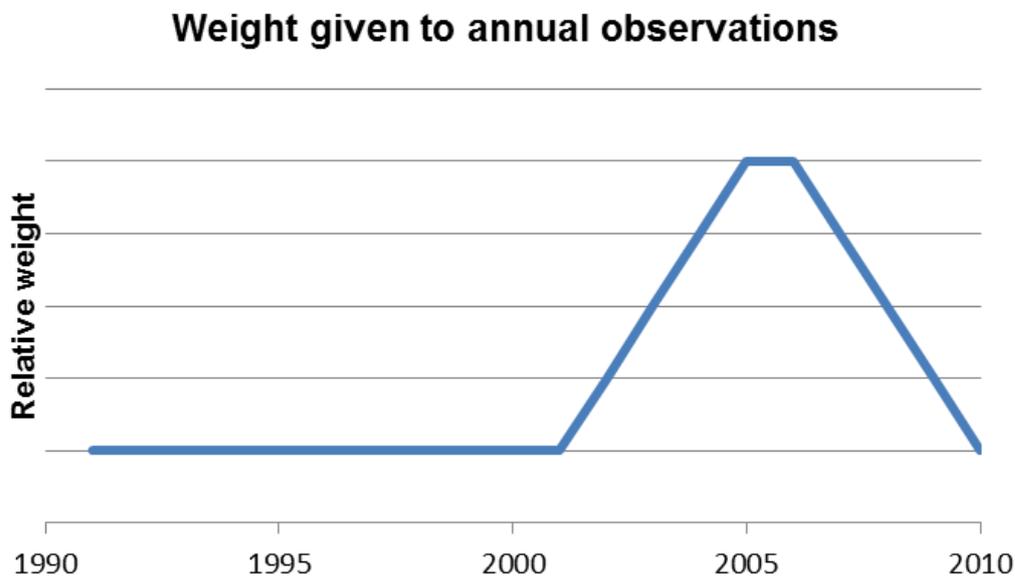
109. I note that these estimates from the NZ Commerce Commission (the Commission) are universally at or above the top of the AER's range. Moreover, these estimates are themselves problematic and biased downwards and are currently the subject of appeal.

³⁹ AER, Equity beta issues paper, October 2013, page 36.

3.9.1 Illogical weighting

110. For each comparator firm, the Commission obtained from Bloomberg unadjusted equity beta estimates (using both weekly and monthly observations) and reported average leverage, for the following periods:
- the five year period to 31 May 1995;
 - the five year period to 31 May 2000;
 - the five year period to 31 May 2005;
 - the five year period to 31 May 2006;
 - the five year period to 31 May 2007;
 - the five year period to 31 May 2008;
 - the five year period to 31 May 2009; and
 - the five year period to 31 May 2010.
111. The Commission's average asset beta figures from the study in the Final Reasons are calculated by averaging the beta estimates calculated for each of the periods referred to above. However, some of these periods overlap and some do not, with the result that observations that fall within more than one period are effectively given more weight than observations that fall within only one period. For example, stock price data from June 2004 to May 2005 falls within five of the periods referred above, but more recent stock price data from the year ended May 2010 falls within only one.
112. The result is an illogical implicit weighting scheme that, without reason or justification, effectively gives 2005 data five times the weight of the more recent 2010 data. The graph below illustrates the implicit weighting given to each year of data. The Commission does not give any reasons why it considers that this weighting scheme is appropriate.

Figure 11: Idiosyncratic weighting scheme applied by the Commission



3.9.2 Use of tech bubble data and older data

113. The NZ Commerce Commission gives weight to data from the tech bubble period (which the Henry estimates used by the AER previously exclude) and also earlier periods back to 1990 which is problematic for the reasons discussed in section 3.7.3 above.

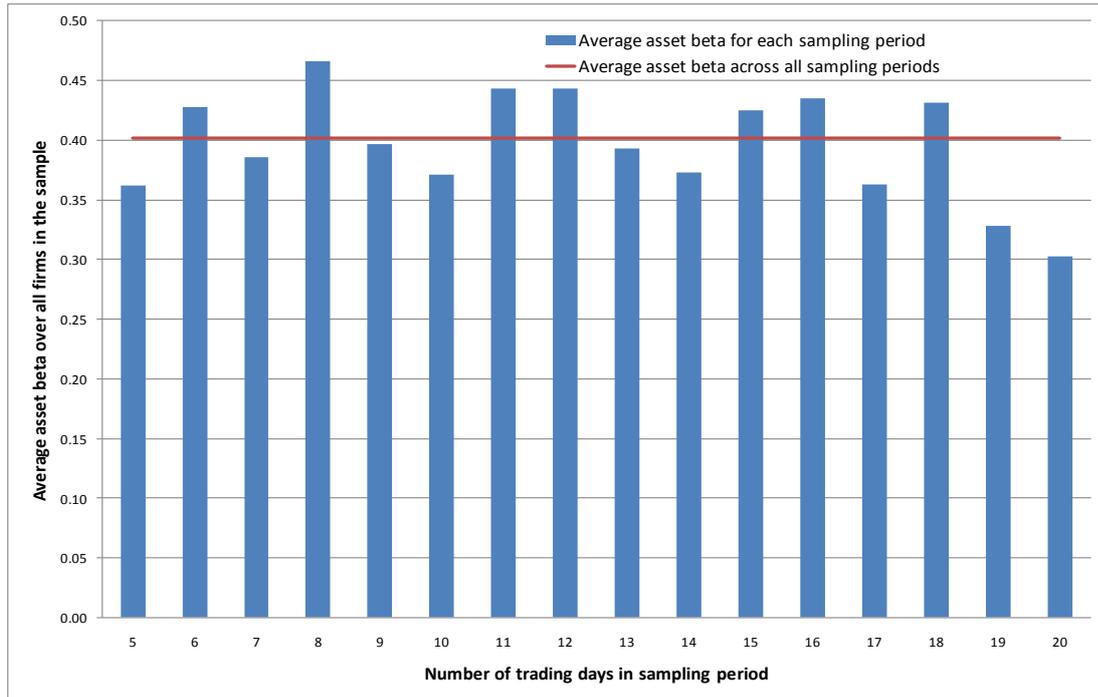
3.9.3 Arbitrary sampling period (definition of a month/week)

114. The Commission does not adjust or even check for sensitivity to choice of sampling periods. As already described, the day of week or month chosen for observation of the underlying stock prices can significantly influence the resulting beta estimate. In essence, the point is that it is possible to calculate five different "weekly" betas and over twenty different "monthly" betas, depending on the day of the week or month selected. Without appropriate checks, any particular choice of day can lead to unrepresentative results.
115. Figure 1 of CEG's August 2010 report⁴⁰ (reproduced below) illustrates the extent to which choice of sampling period influenced the beta estimate in the Draft Reasons. The figure depicts how the asset beta resulting from the sample of comparator companies in the Draft Reasons varies according to the sampling period chosen. For example, if a five trading day sampling period is used the asset beta estimated is 0.36 but if a six trading day period is used then average asset beta estimated is 0.43

⁴⁰ CEG, Cost of capital input methodologies, August 2010 (a report for Vector).

(20% higher). At 0.47 (eight trading days) the highest average asset beta is more than 50% higher than the lowest (0.30 at 20 trading days). The average asset beta across all sampling periods is 0.40, significantly higher than the Commission's estimate of 0.34 based on the same period.

Figure 12: Idiosyncratic weighting scheme applied by the Commission



116. Despite being alerted to this issue, the Commission did not check whether its calculations are sensitive to the day of the week or month it has selected when extracting beta estimates from Bloomberg.

Appendix A Day of the week in Henry beta estimation

117. Henry's 2009 report has lower raw weekly betas (for exactly the same estimation period) than does Henry's 2008 report.⁴¹ This is consistent with Henry changing the sampling period between the 2008 and 2009 reports. In his 2008 report it appears clear that Henry used a definition of a week being a week ending Friday. However, in his 2009 report it is equally clear that he has used the week ending Monday. In neither report does Henry state how he has defined a week or that he has changed this definition between reports.
118. Moreover, it is not obvious to the casual reader that the numbers have changed – as the 2008 report only provides raw betas and the 2009 report only provides betas levered to 60% gearing. In order to establish that the numbers are different one must perform some calculations (using Henry's gearing data and Henry's leverage formula) so that they are expressed on the same basis.
119. Henry does not discuss variation in beta estimates due to different definitions of a week/month etc. On the basis of the analysis that I present at Figure 9 above, this source of variation is potentially very significant.
120. I have come to the conclusion in examining Professor Henry's reports that it is likely that he has changed the basis of his estimates of US weekly betas from a Friday to Friday measure in his November 2008 report to a Monday to Monday measure in his April 2009 report
121. In his first and second reports for the AER, Professor Henry presented weekly betas for US firms estimated over the period from 1 January 2002 to 1 September 2008. These estimates are presented in Table 3 below.

⁴¹ This is not disclosed or discussed by Henry.

**Table 3: Henry's estimates of weekly US equity betas 1 Jan 2002–
1 September 2008**

Firm	Raw beta reported by Henry (2008 report)	Re-levered beta reported by Henry(2009 report - Table 6.1)	Raw beta calculated by CEG (2009 report)*	Change in raw beta
CHG	0.7054	1.0359	0.6114	-0.0940
CNP	0.6142	0.3345	0.5000	-0.1142
EAS	0.4801	0.5440	0.4748	-0.0053
NI	0.6802	0.7138	0.6803	+0.0001
NJ (NJR)	0.9593	0.9909	0.5808	-0.3785**
NST	0.5322	0.6029	0.4554	-0.0768
NU	0.5966	0.5518	0.5565	-0.0401
SRP (NVE)	0.9684	0.6494	1.0088	+0.0404
UIL	0.7191	0.7308	0.5166	-0.2025
POM	0.7447	0.6100	0.5957	-0.1490
PORT		0.6919	0.5933	

Source: Henry, November 2008, pp.17, April 2009, pp. 41

* Not disclosed in report but calculated using gearing reported by Henry and levering/delivering formula reported by Henry.

**The very significant change in NJ between 2008 and 2009 is not explained by Professor Henry in his 2009 report but may be due to an error in his 2008 report, since my own beta estimates are more in line with his 2009 estimates (discussed below).

122. Table 3 shows that Henry's raw weekly beta estimates for the same firms, over the same period, have changed significantly between his November 2008 and April 2009 reports. I note that Professor Henry has not disclosed any reason in his April 2009 report as to why his raw beta estimates might have changed. Indeed, Professor Henry does not directly report raw beta estimates in his April 2009 report – I have calculated these from his re-levered equity betas (using gearing reported by Henry and levering/delivering formula reported by Henry).
123. However, apart from NJR (and POM to a much lesser extent) his monthly betas have not changed, as shown in Table 4 below.

**Table 4: Henry's estimates of monthly US equity betas 1 Jan 2002–
1 September 2008**

Firm	Raw beta reported by Henry (2008 report)	Re-levered beta reported by Henry(2009 report - Table 6.2)	Raw beta calculated by CEG (2009 report)*	Change in raw beta
CHG	0.4402	0.7458	0.4402	-0.0000
CNP	1.4706	0.9835	1.4701	-0.0005
EAS	0.3657	0.419	0.3657	-0.0000
NI	0.6143	0.6446	0.6143	-0.0000
NJ (NJR)	0.8806	0.4005	0.2348	-0.6458
NST	0.4658	0.6167	0.4659	+0.0001
NU	0.5209	0.5165	0.5209	-0.0000
SRP (NVE)	1.7964	1.1562	1.7960	-0.0004
UIL	1.1663	1.6499	1.1664	+0.0001
POM	0.6091	0.6368	0.6219	+0.0128
PORT		0.9048	0.7758	

Source: Henry, November 2008, p.17 , April 2009, p. 41

* Not disclosed in report but calculated using gearing reported by Henry using gearing reported by Henry and levering/delivering formula reported by Henry.

124. The very significant change in NJ beta estimates between 2008 and 2009 is not explained by Professor Henry in his 2009 report but may be due to an error in his 2008 report, since my own beta estimates are more in line with his 2009 estimates (discussed below). It is important to note that although the AER changed the gearing assumptions that it supplied to Henry between his two reports, this has no effect on the raw betas calculated by Henry, only on the re-levered betas. Therefore I would expect the raw betas reported by Henry in 2008 and 2009 to be exactly the same if he had not changed the basis for his estimation of beta.
125. In Table 5 below I compare Henry's 2008 report and his 2009 report estimates of US weekly raw betas (estimates that relate to identical periods) to estimates I obtain from the same period but on five different bases from Bloomberg (week ending Monday, Tuesday etc). I have not been able to obtain full five year estimates of beta for POM and PORT from Bloomberg so I have not included these in the table. The differences between each set of Henry's estimates and each set of Bloomberg estimates is summarised in terms of the sum of differences and the sum of absolute differences at the bottom of the table.⁴²

⁴² I have excluded NJ from my summary of the 2008 data because it is clear from the data that the very significant change in NJ between 2008 and 2009 is due to reasons other than changing the estimation basis. Although not explained by Professor Henry in his report, this may be due to an error in his 2008 report, since the betas sourced from Bloomberg are more in line with his 2009 estimates.

Table 5: Comparison of Henry’s weekly US betas to Bloomberg betas

Firm	Henry Raw beta (2008)	Henry Raw beta (2009)	Monday raw beta	Tuesday raw beta	Wednesday raw beta	Thursday raw beta	Friday raw beta
CHG	0.71	0.61	0.62	0.75	0.75	0.68	0.71
CNP	0.61	0.50	0.51	1.12	1.43	1.02	0.63
EAS	0.48	0.47	0.47	0.61	0.65	0.60	0.48
NI	0.68	0.68	0.66	0.73	0.79	0.65	0.67
NJ (NJR)	0.96	0.58	0.58	0.63	0.58	0.54	0.61
NST	0.53	0.46	0.45	0.62	0.59	0.52	0.53
NU	0.60	0.56	0.54	0.65	0.70	0.55	0.58
SRP (NVE)	0.97	1.01	0.99	1.25	1.16	1.34	0.95
UIL	0.72	0.52	0.52	0.64	0.76	0.79	0.72
POM	0.74	0.60					
PORT		0.59					
Comparison to Henry 2008							
Sum of differences excl NJ			0.54	-1.07	-1.51	-0.84	0.02
Absolute sum of differences excl NJ			0.57	1.24	1.51	1.08	0.08
Comparison to Henry 2009							
Sum of differences excl NJ			0.04	-1.62	-2.01	-1.30	-0.50
Absolute sum of differences excl NJ			0.09	1.62	2.01	1.46	0.65

Source: Bloomberg, Henry, November 2008, p.17, April 2009, p. 41.

126. Table 5 strongly suggests that Henry has calculated his 2008 US raw weekly betas on a Friday to Friday basis and his 2009 US raw weekly betas on a Monday to Monday basis. It can be seen that the Friday raw betas presented are, with the exception of NJ (NJR) very similar to Henry’s 2008 reported raw betas. This is reflected in the very small sum of differences and sum of absolute differences shaded in the far right column. By comparison, the Monday raw betas are very close to Henry’s reported betas in his 2009 report.⁴³ . This is reflected in the very small sum of differences and sum of absolute differences shaded in the bottom rows under the “Monday” column.
127. Whilst there are slight variances between the estimates, these are small and might be expected given that these estimates are obtained from different sources. The differences between his estimates and all other methods of weekly estimation are degrees of magnitude higher than Friday to Friday and Monday to Monday for 2008 and 2009 respectively.
128. There are two important observations that must be drawn from this in relation to the Henry estimates. The first is that, in moving from a Friday beta to a Monday

⁴³ After they have been de-levered from 60% gearing back to the original gearing.

beta Henry has substantially reduced the estimated beta – the average 60% geared beta falls by 0.07 excluding POM and PORT for which I do not have data.

129. Secondly, and more importantly, this involves a move from the second lowest to the lowest beta. Had Henry moved from Friday to Wednesday rather than Monday the estimated beta would have been 0.21 higher.

Figure 13: Henry’s weekly beta estimates ended Monday vs alternative definitions of a week

