

**Submission to the Commerce
Commission on the Input
Methodologies Review Draft Decisions:
Comparative Company Analysis**

Made on behalf of Contact Energy Ltd.

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1. Executive summary

TDB Advisory Ltd (TDB) has been engaged by Contact Energy Ltd (Contact) to provide an independent submission to the Commerce Commission (the Commission) in the context of the Commission's review of the input methodologies. Our submission focuses on the Commission's choice of comparable companies (compcos) for determining an appropriate weighted average cost of capital (WACC) for regulated energy network services in New Zealand.

The regulated New Zealand energy network companies are: seventeen electricity distribution businesses (EDBs), five gas pipeline businesses (GPBs) and the electricity transmission company, Transpower. These companies are solely or primarily involved in the transportation of electricity or natural gas.

An ideal or model set of comparator firms for the New Zealand regulated services would include a large (statistically significant) number of firms that operate in the same business segments as the New Zealand regulated services, and that are subject to the same or similar regulatory environment.

Given that, in New Zealand, there is only one electricity or gas network firm (Vector) which is publicly listed, the Commission has had to look further afield to develop its set of comparator firms. As a result, it has had to make judgements about the suitability as comparators of companies that operate in different regulatory environments and that have quite differing lines of business to the regulated New Zealand services.

Ultimately the choice of an appropriate compco set involves making a trade-off between the comparability of the set with the regulated entities, and the statistical significance of the sample set (i.e., having a large enough sample).

The Commission has selected a sample set of 74 energy companies as its comparator set. Almost 90% (66) of the companies come from the United States (U.S.), with four from Australia, three from the United Kingdom (U.K.), and one from New Zealand.

Our assessment of the Commission's compco set is that the Commission may have adopted too large a set at the expense of a loss in accuracy in the appropriate asset beta. In particular, the Commission's compco set includes:

- 20 companies which we assess have higher systematic risk, largely through unregulated gas gathering, processing, liquids and commodity exposures not found in "pure-play" distribution or transmission;
- another 14 companies with material lines of business with higher systematic risk that are either unrelated to the NZ regulated services (as they involve non-energy activities), or they have energy revenues that are unregulated; and
- another 31 companies with energy activities that are regulated, but are engaged in activities outside the transport of electricity and gas (these companies are mostly generators, retailers, and transporters of electricity).

There are, in our assessment, 8 companies in the Commission’s sample set that are strictly comparable with the New Zealand energy network firms.

As Table 1 below indicates, the choice of sample set has a material impact on the estimated asset beta (and the resulting WACC) for the New Zealand regulated firms.¹

Table 1: Summary of compco refinement

	Sample set	Weekly asset beta		Average leverage	Number of firms in sample (N)
		Average	S.E.		
	Commission's energy set	0.34	0.14	41%	74
Step 1	Remove firms with unregulated gathering, processing, liquids and commodity exposures	0.29	0.09	42%	54
Step 2	Remove firms with other large unrelated/unregulated business segments	0.28	0.08	44%	39
Step 3	Remove firms with significant business segments that are not related to transmission or distribution	0.24	0.11	49%	8

The table indicates that:

- there is a marked decline in the average beta estimates when we control for the increased risk that firms face through unregulated gas gathering, processing, liquids and commodity exposures (Step 1). The mean asset beta declines from 0.34 (the Commission’s recommended number) to 0.29, the standard error declines from 0.14 to 0.09, the leverage increases marginally from 41% to 42% and the sample set declines from 74 to 54;
- removing also the firms with large unrelated or non-regulated revenues (Step 2) results in a further decline in the asset beta to 0.28, the standard error declines further to 0.08, the leverage increases further to 44% and the sample set declines to 39; and
- removing all but the eight largely “pure-play” energy lines businesses reduces the mean beta to 0.24, the standard error increases to 0.11 (reflecting the smaller sample set), the leverage increases to 49% and the sample set declines to 8.

Our classification of the Commission’s 74 compcos is indicative, and inevitably involves a degree of judgement based on the available information. Nevertheless, we consider our overall conclusions

¹ We focus in this summary on the weekly (rather than 4-weekly) betas because the Commission uses the weekly beta in its recommended WACC, and because this is the default method reported by Bloomberg and Value Line. Refer “Best Practices in Estimating the Cost of Capital: An Update”, W. Todd Brotherson et al, Journal of Applied Finance, Vol. 23, No. 1, 2013, p.11. Elsewhere in this submission we report both weekly and 4-weekly numbers.

that there are companies with significantly different risk profiles to the New Zealand regulated network companies in the Commission's compco set, and that this has a material impact on the estimated average beta, to be robust. Appendix 4 presents the results of our sensitivity analysis around the classification of the individual companies, and indicates the estimated betas still differ from the Commission's recommended 0.34.

To further test the robustness of our conclusions, we classified the Commission's 74 compcos solely on the basis of the country they are located in.² This analysis highlighted the importance of the country of origin, with the 66 USA companies having an average beta of 0.35, the three UK companies having an average beta of 0.25, and the five Australian/NZ companies having an average beta of 0.23.

Given the sensitivity of the estimated average betas to the choice of compco sample set, and the apparent inclusion in the Commission's sample of companies with quite different risk profiles, we recommend that the Commission review its compco set.

In our view, it is unnecessary and inappropriate to include firms with either unregulated gas gathering, processing, liquids and commodity exposures, or large unrelated/non-regulated revenues in the compco set for the New Zealand regulated energy network companies. If those two sets of firms are excluded, the Commission would still have a compco set of around 40 companies from which to derive an asset beta. Such a sample set is considerably larger than that used by the Australian Electricity Regulator (which has nine companies in its benchmark set for an energy network company)³, and would seem more than sufficient to generate meaningful estimates.

Indeed, we recommend that the Commission go further and consider the eight largely "pure-play energy transporters" as the appropriate benchmark group, and determine whether those companies may be from a statistically different population than the other 66 companies in its compco data set.

We note that from the Commission's original compco data set, there appears to be a statistically significant difference between the Commission's estimates of the mean betas for the gas and electricity companies; the average betas for the 16 electricity companies (and 40 integrated companies) are 0.29 to 0.30 respectively, while the average beta for the 18 gas companies is 0.44. We caution against the use of this result in isolation, given our concerns with the underlying comparators (as discussed above), and encourage the Commission to first review the appropriateness of the companies included within the electricity, gas, and integrated compco subsamples.

Finally, we note that the sample set leverage and standard error will change with the composition of the compco sample set (as demonstrated in Table 1 above), and the estimated WACC will change to reflect the relevant leverage.

² Country of origin could be a proxy for the regulatory environment and/or line of business as almost all US companies are involved in more than transporting energy.

³ AER, "Preliminary Decision. Jemena Distribution Decision 2016 to 2020. Attachment 3 – Rate of Return", October 2015 page 3-457.

2. Introduction

2.1 Purpose of the submission

This submission provides an independent review of aspects of the Commerce Commission's review of the input methodologies for services that are regulated under Part 4 of the Commerce Act. Our submission focuses on the Commission's choice of comparable companies (compcos) for determining an appropriate weighted average cost of capital (WACC) for regulated energy network services in New Zealand.

2.2 Structure of the submission

Following the executive summary and this introduction, our submission is structured as follows:

- Section 3 looks at the risk profiles of the 74 firms selected by the Commission as comparable to the New Zealand energy network services. We look at the distribution of the estimated asset betas and analyse in more detail the nature and risk characteristics of the individual companies at the higher and lower end of the electricity, gas and integrated company distributions. This analysis indicates the Commission's sample set includes many companies with markedly different systematic risk characteristics to New Zealand's regulated energy network services;
- Section 4 examines in more detail the potential difference between the mean asset betas for the electricity and gas companies;
- Section 5 provides a three-step process for determining a set of firms with comparable risk profiles to the regulated New Zealand energy network services, and applies the process to assess the sensitivity of the Commission's average beta and leverage estimates to the selected sample sets;
- Section 6 provides a test of the robustness of our analysis by classifying the Commission's 74 comparable companies solely on the basis of the country where they are located; and
- Section 7 provides the conclusions from our analysis.

3. Asset beta and leverage: comparable companies' analysis

The Commission employs a set of comparative companies (compcos) in order to obtain key risk and leverage metrics for regulated electricity and natural gas distribution and transmission services. The Commission uses each company's share price performance to estimate the level of systematic risk (equity beta). The Commission then allows for the capital structure unique to each firm to derive an estimate of each firm's asset (or un-levered) beta. The Commission then averages across the sample of comparators to find an estimate of the risk that the industry faces, and the average leverage within the industry. This process is common practice for estimating industry risk and capital

structure, which allows the Commission to estimate the return on equity that is appropriate for the regulated service, which in this case is the transportation and distribution of energy.

The Commission has identified 74 firms that are involved in gas and electricity transportation, in order to estimate the appropriate beta. Of the comparator firms, 66 are from the U.S., three are from the U.K., four are from Australia and one is from New Zealand. These firms have reported operations in electricity and natural gas distribution and transmission. Some are defined by the Commission as being made up of primarily electricity or natural gas operations, and some have been defined as integrated, meaning the firm in question is involved in both electricity and natural gas activities.

In the subsections below, we: analyse the comparator set used by the Commission; look at the distribution of the risk profiles of the firms the Commission has identified as appropriate; and recommend that further filtering of the comparator set would be useful to identify a set that is still statistically significant, but more closely matches New Zealand's electricity distribution businesses (EDBs), gas pipeline businesses (GPBs), and Transpower (the "energy network companies"). This report does not analyse the Commission's calculations of the betas for the compcos, as we agree with the Commission's updated methodology for conducting the regression analysis for the timeframe in question.

3.1 Selection of energy comparator set

The choice of the comparator set that the Commission uses has a significant bearing on the inputs to the Commission's assessment of the appropriate return on equity and WACC for the EDBs, GPBs, and Transpower. It is important that the comparator set be as close to the true nature of the New Zealand energy network firms as possible, with firms that operate in a regulatory environment similar to that of the New Zealand firms.

The Commission utilises the Bloomberg Industry Classification Benchmark system (ICB) to identify firms to include in the comparative firm sample set. The Commission identifies relevant firms that are classified by the ICBs as belonging to the 'Electricity', 'Gas Distribution', 'Pipelines' or 'Multiutilities' industries.⁴ The Commission then assesses the companies' profile descriptions from Bloomberg, and 'Segment Analysis' information to analyse the appropriateness of including the firm in its final energy comparator set.⁵ We consider this second step as very important given how general the ICB categories appear to be. Further to using this approach to identify its energy comparator set, the Commission classifies the firms into sub-sets identified as 'Electricity', 'Gas' or 'Integrated'. Presumably the electricity sub-set contains firms which have business segments that only relate to the electricity industry, the gas sub-set contains firms which have business segments

⁴ Commerce Commission "Input methodologies review draft decisions, Topic paper 4: Cost of capital issues (16 June 2016), para 273.

⁵ Commerce Commission "Input methodologies review draft decisions, Topic paper 4: Cost of capital issues (16 June 2016), para 260.

only related to natural gas, and the integrated sub-set contains firms with business segments related to both.⁶

While the Commission's methodology offers a standardised approach that attempts to account for each firm's particular operations, there are limitations. In particular, it is possible that the Bloomberg descriptions are not up to date, are inaccurate, and/or neglect certain aspects of a firm given the large number of firms and changing nature of the global market.

3.2 Distribution of the Commission's energy comparator set

To assess how comparable the Commission's energy comparator set is, it is useful to assess the distribution of the risk profiles of the firms. We expect that a comparable firm sample set would have a relatively normal looking distribution across the range of asset beta estimates. That is, we expect that the number of firms with the same un-levered risk profile to increase and then decrease about a mean. We would not expect to see evidence of uniform, or multimodal distributions, as this may indicate differences in the level of un-levered systematic risk that sub-sets of firms are subject to. This would potentially indicate that the firms operate in different industries.

Figure 1 depicts the distribution of the estimated betas for the set of 74 energy comparator firms identified by the Commission. On the x-axis is the estimated asset betas, and on the y-axis is the number (frequency) of firms associated with that asset beta. The two plotted lines represent the weekly asset beta estimates and 4-weekly asset beta estimates provided by the Commission. The firms have been tallied by their beta estimates starting at 0 and increasing at a rate of 0.05.⁷ These frequencies are tabulated in the final column of Table 9 in Appendix 1. The full sample set of weekly estimates has a mean asset beta of 0.34, with a standard error of 0.14, and average leverage of 41%.⁸

⁶ This seem somewhat unclear in the Commissions "Input methodologies review draft decisions, Topic paper 4: Cost of capital issues (16 June 2016)

⁷ This frequency analysis is carried out to gain a high-level understanding of the distribution of the comparator sample set. We group the estimates by a 0.05 change in the asset beta and recognise that a higher or lower adjustment may change the shape of the distribution. However, we consider that the 0.05 adjustment is reasonable for this high-level overview: if the adjustment is too small outcomes effectively become binary while if the adjustment is too large the data may be misrepresented.

⁸ Leverage is not obtained from the commission but has been sourced from the Commission's released spreadsheet from Bloomberg provided through Contact.

Figure 1: Distribution of the estimated betas of the Commission’s energy comparator set (2011-2016) estimates

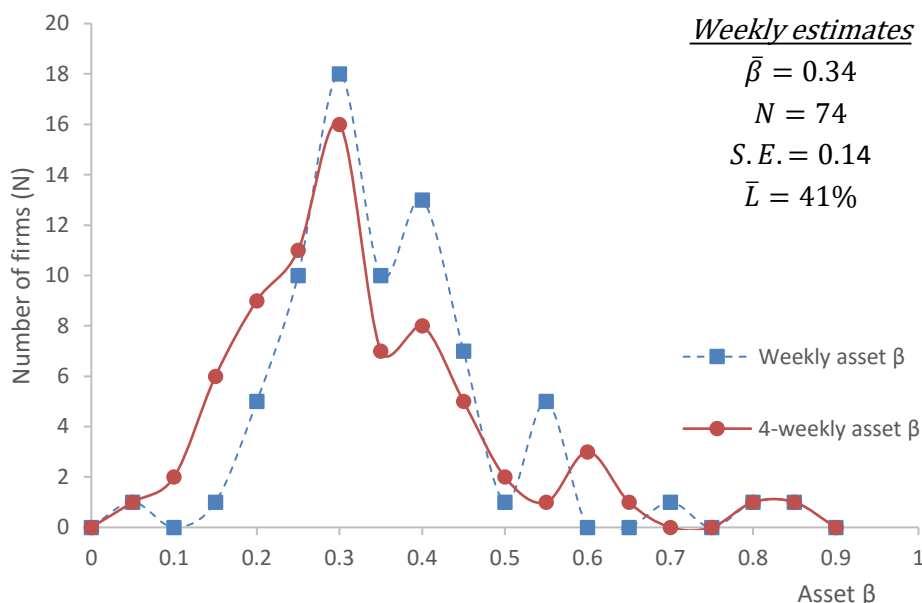


Figure 1 depicts what might be considered a reasonable frequency distribution for a comparator set. However, there appears to be a long tail at the upper end of the distribution. This skew is interesting, and warrants further investigation. To conduct this, we also disaggregate the firms by the Commission’s sub-set classifications. Table 2 presents, firstly, the average beta estimates, leverage, and sample size for the Commission’s full energy comparator set, followed by the Commission’s industry sub-sets. It shows that, as presented above, the average weekly beta estimate for the full set is 0.34 with leverage of 41% and a sample size of 74. It then shows the electricity sub-set has an average weekly estimate of 0.29, average leverage of 40%, and a smaller sample size of 16 firms. The integrated sub-set has an average weekly beta estimate of 0.30, average leverage of 44%, and a sample size of 44. Finally, the gas sub-set has an average weekly beta of 0.45, an average leverage of 34%, and a sample size of 18.

Table 2: Estimated mean asset betas by industry group

2011-2016 estimates	Daily asset beta	Weekly asset beta	4-Weekly asset beta	Leverage	Number of firms in sample
Commission's energy set	0.39	0.34	0.30	41%	74
Sub-sets of Commission's set					
Electricity	0.33	0.29	0.26	40%	16
Integrated	0.37	0.30	0.26	44%	40
Gas	0.50	0.45	0.44	34%	18

Table 3 then presents the standard error calculations with weekly estimates being 0.14, 0.12, 0.09 and 0.21 for the full set, electricity sub-set, integrated sub-set, and the gas sub-set respectively.⁹

Table 3: Estimated standard errors by industry group

Standard errors	Daily average S.E.	Weekly average S.E.	4-Weekly average S.E.	Number of firms in sample
Energy set	0.14	0.14	0.14	74
Sub-sets of Commission's set				
Elcetricity	0.12	0.11	0.12	16
Intergrated	0.11	0.09	0.09	40
Gas	0.17	0.21	0.20	18

We note that in the summary of this submission we have reported the weekly point estimates for the betas and attached standard errors. This is primarily because the Commission applies a weekly beta in its draft decision. We do not express a view on the relative merits of weekly and 4-weekly betas and report the results of both the weekly and 4-weekly betas throughout the body of this submission. The only exception is section 3.3 below where, for simplicity, we present the distribution analysis using the 4-weekly estimations. For completeness we have carried out the same analysis in Appendix 2 using weekly betas and find no differences in the estimates, apart from the magnitude of the point estimates and their standard errors.

3.3 Disaggregation of the Commission's energy comparator set

To analyse the distribution of the Commissions comparator set more closely, we present the distribution of the full set broken into the sub-sets of electricity, gas and integrated in Figure 2. This provides a graphical representation of how the beta estimates are distributed across the three industry groups. For instance, at the peak of the distribution (being the total of firms with an estimated asset beta of 0.25-0.3) the sixteen firms incorporated include six firms the Commission has classified as electricity, eight firms the Commission has classed as integrated, and two firms which have been classified as gas. Furthermore, now we are applying 4-weekly estimates, the average beta is 0.3, consistent with Table 2 (and specified in the graph summary statistics).

⁹All standard errors are calculated following the Commission's working. Then average over the 2006-2011 and 2011-2016 periods consistent with the 0.14 that the Commission reports for the full set.

Figure 2: Distribution of the Commission’s (4-weekly beta) energy comparator set with industry breakdowns

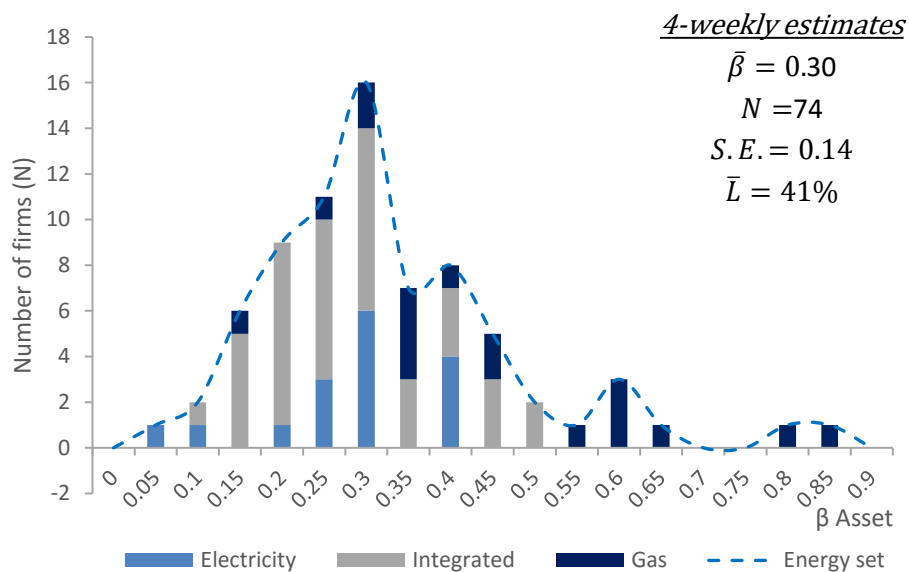


Figure 2 indicates that the distributions of the betas for the three industry sub-sets defined by the Commission may not be the same:

- the highest seven asset beta estimates belong to the gas industry;
- the electricity firm beta estimates appear to be skewed towards the lower end of the distribution; while
- the integrated firms seem to be fairly evenly spread across the distribution.

To investigate these apparent differences in the betas between the three industry sub-sets further, Figure 3, Figure 4 and Figure 5 break down the distributions for each of the industry sub-sets.¹⁰

Figure 3 depicts the frequency plot for the asset betas of the electricity firms in the Commission’s comparator set.¹¹ The maximum for the electricity sample is less than 0.4, and the minimum is less than 0.05, making the range of the electricity firms in the sample noticeably smaller than that of the full set. It is noticeable that the estimated asset betas of all the electricity firms are less than the estimated average gas asset beta.

Figure 3: Distribution of the Commission’s electricity asset betas

¹⁰ The frequency tables of the betas for Figures 1 – 5 can be found in Table 9 in Appendix 1 of this report. 4-weekly beta estimates have been adopted for simplicity.

¹¹ The distribution is flat to begin with, then rises to two modes. These rises may be somewhat artificial when the points are joined. The fact that there are no observations of electricity firms with asset betas between 0.25 and 0.3 may not indicate that the distribution is separated, particularly considering that the frequency of observations between 0.35 and 0.4 is similar to that of the number of observations from 0.2 to 0.25 before the rise to the peak of 0.25 to 0.3. If the two points from 0.25 and 0.4 were connected, the distribution for that region would look quite smooth. This highlights the small sample errors that might be encountered.

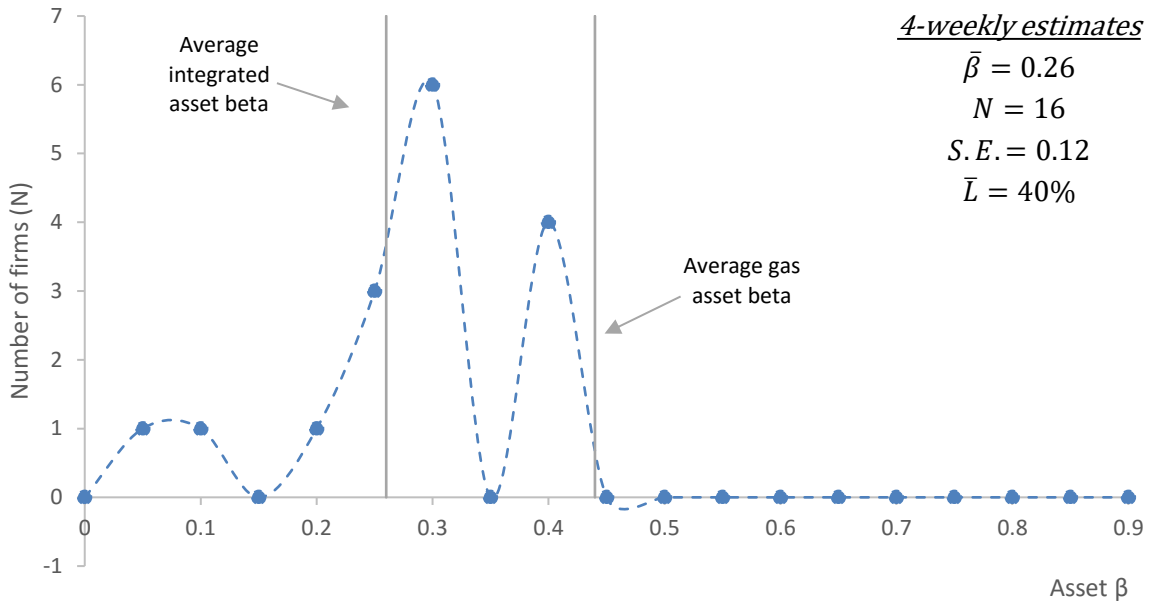
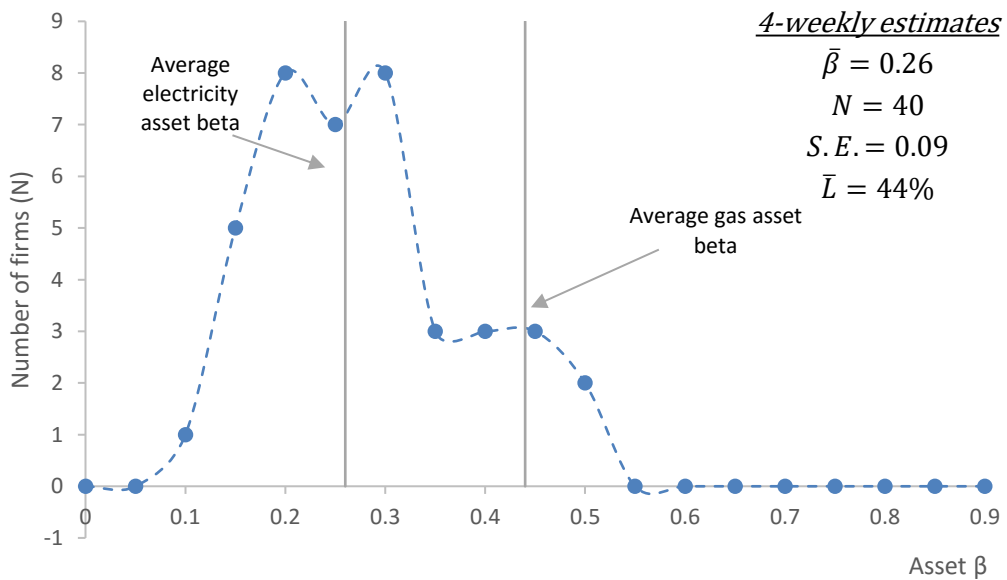


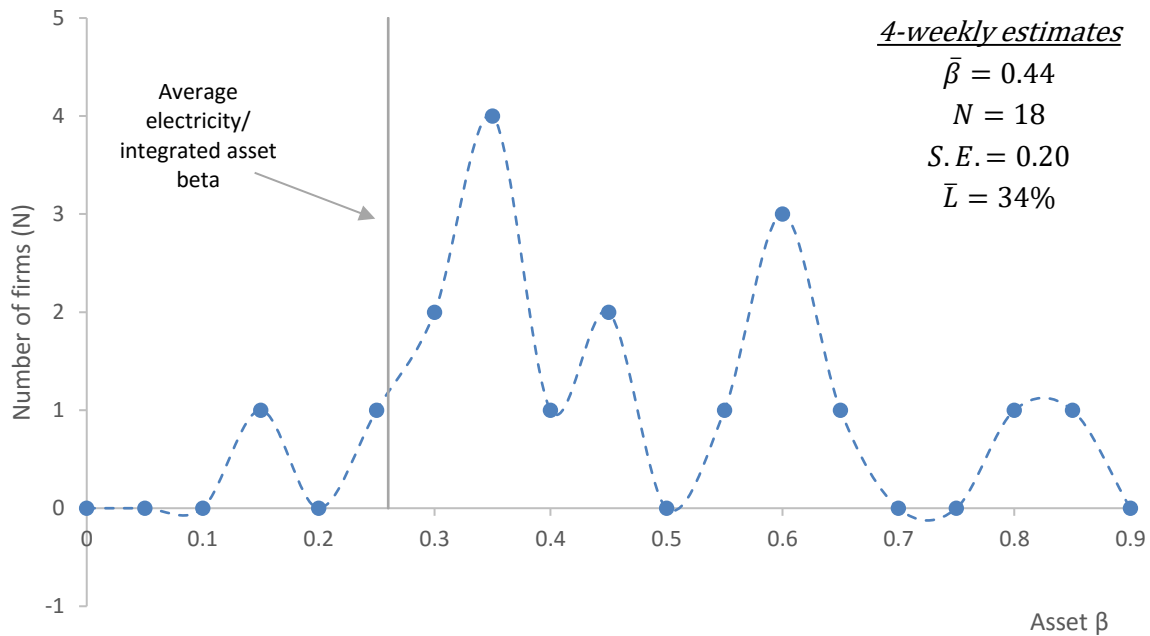
Figure 4 presents the frequency plot for the “integrated” sub-set asset beta estimates. The graph shows a general peak (with some variation) between approximately 0.2 and 0.3. There do appear to be two firms that are very low, at the lower end of the distribution. This is interesting, as they may not contain the same risk profile.

Figure 4: Distribution of the Commission’s integrated asset betas



Finally, Figure 5 shows the frequency plot for the asset betas for the “gas” sub-set of the Commission’s energy set. As noted above, the mean asset beta for the gas firms is 0.44. The gas betas have the widest distribution, and appear better fitted to a uniform distribution than a normal distribution. However, the sample size may be too small to infer any true characteristics.

Figure 5: Distribution of the Commission’s gas asset betas



3.4 Statistical inferences

The distributions presented above have highlighted some key features of the Commission’s adopted energy comparator set, and possible differences between the industry groups.

As noted above, the maximum beta in the Commission’s electricity sub-set (0.4) is below the average for the gas firms sub-set (0.44). Furthermore, only four of the sixteen firms classified by the Commission as electricity firms have an estimated asset beta higher than the Commission’s mean estimate (0.3) for the sector.¹²

At first glance, this suggests that the gas firms may be subject to higher systematic risk than the electricity firms. The distribution of the estimated asset betas for the integrated firms could reinforce this point. If the disjointed nature of the integrated firms is due to the level of integration between gas and electricity, then the electricity and gas business segments could have different risk profiles. However, the wide multimodal distribution of the gas firms indicates that there is a large discrepancy between the business segments and risk profiles of the firms within the gas sub-set. If the firms at either end of the distribution of the gas sub-sample are partly, or primarily involved in more or less risky activities than a typical GPB in New Zealand, this could explain the discrepancy.

The differences between the electricity and gas sub-samples could also be due to the sample sizes being too small and not statistically representative of the true distributions, or, conversely, due to the sample sizes being too large and the comparative significance of the firms being too low.

We do not want to overstate the statistical significance or reliability of the distribution analysis presented above. Our analysis is intended to indicate issues that may warrant further analysis by the Commission.

¹² This holds true for the weekly estimates presented in Appendix 2

To investigate the issues further, we turn to a more detailed analysis of the firms within the Commission's energy comparator set. In particular, we examine the firms at the high and low ends of the distribution for each sub-sample to see if there are fundamental differences in the risk profiles, as identified by their business segments and operations. Section 3.5 selects a few firms in the Commission's electricity sub-set on either end of the distribution to analyse more closely, by comparing and contrasting the Bloomberg descriptions to the most recent 10-K or Annual Report of each firm identified.¹³ Section 3.6 repeats this for the integrated sub-set, section 3.7 then analyses the gas distribution and section 3.8 presents a detailed summary of the findings and concludes.

3.5 Electricity company betas

We consider below the companies in the Commission's electricity sub-set that have the highest and lowest estimated betas, in order to see if there may be fundamental systematic differences between the firms with high and low betas. On the high end of the distribution, we identify ALLETE Inc. (ALE), IDACORP Inc. (IDA), Hawaiian Electric Industries (HE) and AES Corp. (AES). On the low end, we identify Jersey Electricity PLC (JEL) and Southern Company (SO).

3.5.1 High beta estimate firms

ALLETE Inc. (ALE)

Location = U.S. $\beta_A = 0.4$ Avg. L = 30%

The Bloomberg description for ALLETE Inc. states "ALLETE Inc. provides energy services in the upper Midwest United States. The Company generates, transmits, distributes, markets, and trades electrical power for retail and wholesale customers".

Consistent with the Bloomberg description, ALLETE's 10-K reports that 67% of its revenue is from regulated operations. However, ALLETE also has two other business segments that would likely not be picked up in the Bloomberg description. One segment is 'ALLETE Clean Energy' which invests in capital projects involving "clean energy solutions by way of wind, solar, biomass, hydro, natural gas, shale resources, clean coal technology and other emerging energy innovations".¹⁴ The other business segment, that represents approximately 8% of the firm's revenue, is U.S. Water Services, which is an integrated water management company. This business segment was only purchased early in 2015, so the effect on the estimated risk profile may not be large. Nevertheless, this business line is not picked up in the Bloomberg description. Putting the missing segment information aside, ALE's 10-K shows the breakdown of its regulated operating income. It shows that ALLETE purchases power and fuel, and also reports expenses for transmission services. Its 10-K also notes that these revenues come from sales to residential, commercial, industrial, and municipals in the form of kilowatt-hours sold.¹⁵ It therefore appears that ALLETE is selling the products that it

¹³ All 10-Ks have been sourced from the Security Exchange Commission's EDGAR database and Annual Reports (when used) have been sourced from the individual company's website. In conjunction other sources have been utilised such as investor presentations.

¹⁴ P. 84 of ALE's 2015 10-K.

¹⁵ P. 38 of ALE's 2015 10-K.

generates and distributes, and is not simply a pure play transporter of energy (as is the service that is subject to regulation by the Commission).

IDACORP Inc. (IDA)

Location = U.S. $\beta_A = 0.38$ Avg.L = 43%

The Bloomberg description for IDACORP states “IDACORP Inc. is the holding company for Idaho Power Company, an electric utility, and IDACORP Energy, an energy marketing company. Idaho Power generates, purchases, transmits, distributes, and sells electric energy in southern Idaho, eastern Oregon, and northern Nevada. IDACORP Energy maintains electricity and natural gas marketing operations”.

Consistent with the Bloomberg description, IDA is involved in generation, transmission and sales to both retail and wholesale markets. From its segmented income statement, it seems that IDACORP generates all revenue from retail sales, with a large part (approximately half) of that being residential. This indicates that IDACORP also is selling the products that it generates and distributes, and is not simply a transporter of energy, consistent with ALLETE above.

Hawaiian Electric Industries (HE)

Location = U.S. $\beta_A = 0.37$ Avg.L = 24%

The Bloomberg description for HE states “Hawaiian Electric Industries, Inc. is a diversified holding company that delivers a variety of services to the people of Hawaii. The Company's subsidiaries offer electric utilities, savings banks, and other businesses, primarily in the state of Hawaii”.

As highlighted in the Bloomberg description, as well as offering electricity utilities, HE is also involved in banking. However, according to its 10-K, the banking segment only makes up approximately 10% of its total revenue. Therefore, this level of exposure may not alter the market’s perception of its systematic risk exposure away from the utilities arm of the firm. HE’s income statement for its energy segment appears consistent with ALLETE and IDACORP above. HE generates and purchases power through various means, then distributes and sells that power directly to end-users. That is, the company owns what it distributes.

AES Corp. (AES)

Location = U.S. $\beta_A = 0.37$ Avg.L = 63%

The Bloomberg description for AES states “The AES Corporation acquires, develops, owns, and operates generation plants and distribution businesses in several countries. The Company sells electricity under long term contracts and serves customers under its regulated utility businesses. AES also mines coal, turns seawater into drinking water, and develops alternative sources of energy”.

As reported in Table 1 of the Commission’s Topic paper 4, AES generates approximately 47% of its revenues from electricity utilities. The core of that business is generation (seemingly included under utilities) that is organised into six small business units, all operating in different countries and facing varying regulatory regimes. Also, as reported in a recent investor presentation, 84% of its business is contracted generation or utilities.

3.5.2 Low beta estimate firms

Jersey Electricity PLC (JEL)

$$\text{Location} = U.K. \quad \beta_A = 0.02 \quad \text{Avg. L} = -13\%$$

The Bloomberg description for JEL states “Jersey Electricity PLC generates, imports, and distributes electricity. The Company is also involved in electrical appliance retailing, property management, and building services contracting. Its other business interests include telecommunications and Internet data hosting”.

JEL’s Annual Report shows that its business operations involve five key operations: energy; building services; retail; property; and other. JEL’s 2015 Income Statement by business segment shows that, as noted by the Commission¹⁶, approximately 80% of JEL’s revenue comes from its energy segment. This segment includes generation, transmission and distribution of energy. The generation aspect of JEL’s business may alter the risk profile compared to a pure play distribution business. However, the proportion of generation versus transmission and distribution is unclear from JEL’s reporting. JEL notes that the State of Jersey owns 62% of the company’s ordinary share capital, that it is the sole supplier of electricity in Jersey, Channel Islands, and that it has activities in other parts of the U.K.

Further, perhaps due to the high State ownership in JEL, the stock is illiquid and for this reason we exclude the company from the data set.

Southern Company (SO)

$$\text{Location} = U.S. \quad \beta_A = 0.09 \quad \text{Avg. L} = 38\%$$

The Bloomberg description for SO states “The Southern Company is a public utility holding company. The Company, through its subsidiaries, generates, wholesales, and retails electricity in the southeastern United States. The Company also offers wireless telecommunications services, and provides businesses with two-way radio, telephone, paging, and Internet access services, as well as wholesale fiber optic solutions”.

SO’s 2015 10-K shows that the firm is primarily a generator, distributor and transmitter of energy. However, based on an assessment of its income statement, retail revenue accounts for approximately 93% of SO’s total revenue, it appears that the retail revenues generated through its subsidiaries are regulated. There is no report of revenues stemming from generation or distribution. SO appears to be involved in the entire process for its electricity distribution, right to end-users, consistent with that seen for the higher risk firms. This indicating that SO is a fully integrated, regulated monopoly, as is consistent in the U.S. system.

3.5.3 Summary of electricity comparators

The electricity comparators used by the Commission seem to have similar business makeups across the upper to the lower end of the distribution for the asset betas. It does appear that the firms in the

¹⁶ Table 1, Commerce Commission, op. cit., p. 66.

higher end of the distribution are more diversified and have greater portion of revenue being generated from non-regulated activities.

It appears, from the 10-K and Annual Reports analysed, that none of the companies above are 'pure play' distribution firms, and each have some form of generation and retail operation. In most cases, the companies operate from generation to end-user sales, and many functions appear regulated. The complexity of many of these firms may mean we are over-simplifying their operations. However, the 10-K reports seem quite clear; the companies at both ends of the beta distribution tend to own the product they sell and are not simply transporters of electricity, however the firms with higher risk profiles appear more diversified and have more non-regulated revenue streams.

3.6 Integrated company betas

In assessing the distribution for the integrated sub-set presented earlier, we identify OGE Energy Corp (OGE) and Black Hills Corp. (BKH) on the high end. This is followed by Consolidated Edison Inc. (ED) and FirstEnergy Corp (FE) on the low end.

3.6.1 High beta estimate firms

OGE Energy Corp (OGE)

Location = U.S. $\beta_A = 0.46$ Avg. L = 36%

The Bloomberg description for OGE states "OGE Energy Corp., through its principal subsidiary Oklahoma Gas and Electric Company, generates, transmits, and distributes electricity to wholesale and retail customers in communities in Oklahoma and western Arkansas. The Company, through Enogex Inc., operates natural gas transmission and gathering pipelines, has interests in gas processing plants, and markets electricity".

Consistent with the Bloomberg description, OGE's reporting confirms that it is involved in generating, transmitting, distributing and selling electricity which is mostly regulated at both the state and federal level. Furthermore, it is involved with gathering, transporting, and processing of natural gas. From its 10-K, it operates approximately 12,400 miles of natural gas gathering pipelines, and owns/operates 13 natural gas processing plants through a subsidiary. It also has operations in oil gathering. Within OGE's 10-K, it appears that the gathering and processing functions are not regulated. The transportation and storage function generates fee-based revenue. Also, two of the risks OGE specifically states it is subject to are: "the fees and gross margins realized with respect to the volume of natural gas and crude oil handled"; and "the prices of, levels of, production of, and demand for natural gas and crude oil".¹⁷ This suggests its risk exposure within its gas and liquids business segment is subject to increased commodity price fluctuations through the presence of gathering, processing and finally marketing.

It appears that the mostly regulated electricity operations of OGE make up a majority of its operations (approximately 96%). Also, the purchase of its midstream operation subsidiary is recent.

¹⁷ P. 24 of OGS 2015 10-K

It therefore seems that OGE is primarily an electricity firm with a small and growing natural gas, NGLs and oil midstream segment.

Black Hills Corp. (BKH)

Location = U.S. $\beta_A = 0.46$ Avg. L = 43%

The Bloomberg description for BKH states “Black Hills Corporation is a diversified energy company. The Company generates wholesale electricity, produces natural gas, oil and coal, and market energy. Black Hills serves customers in Colorado, Iowa, Kansas, Montana, Nebraska, South Dakota and Wyoming”.

From its Bloomberg description, BKH appears to have similar business segments to that of OGE above. It has activities that involve both generating wholesale electricity and producing natural gas and oil. According to its Annual Report, gas utilities made up 25.7% of total operating income, and electricity utilities made up 64.6% of its operating income. BKH also reports that it has exploration and reserves under its control as part of its natural gas and oil segment, along with gathering and production. Again, this seems to be consistent with a different risk profile than if the firm was a regulated pipeline business.

3.6.2 Low beta estimate firms

Consolidated Edison Inc. (ED)

Location = U.S. $\beta_A = 0.06$ Avg. L = 42%

The Bloomberg description for ED states “Consolidated Edison, Inc., through its subsidiaries, provides a variety of energy related products and services. The Company supplies electric service in New York, parts of New Jersey, and Pennsylvania as well as supplies electricity to wholesale customers”.

According to its 10-K, ED has three key utility business segments: electricity operations (accounting for a reported 70% of revenue generation); gas operations (14% of revenue); steam operations (5% of revenue); and non-utility (11% of revenue). The electricity operations include distribution, transmission, generation, sales and delivery. The gas operations include supply, sales, and delivery, and the steam operations include steam sales and deliveries. As seems typical, the company’s electricity supply comes from a mixture of its own generation and purchases that it makes on the wholesale market. Its gas supply reportedly comes from gas purchases from wholesale pipeline operators which is then piped in ED’s own lines to its customers. This seems typical of U.S. utilities firms which own or purchase what they distribute and buy at volumes that reflect demand.

ED’s 2015 Annual Report notes three higher level major business segments: regulated utilities, regulated transmission, and competitive energy businesses. It appears that the competitive energy businesses are involved in retail, wholesale, and energy infrastructure projects. The regulated sectors seem to have functions that relate directly to the transportation of customer owned gas.

FirstEnergy Corp (FE)

$$\text{Location} = U.S. \quad \beta_A = 0.12 \quad \text{Avg. L} = 50\%$$

The Bloomberg description for FE states “FirstEnergy Corp. is a public utility holding company. The Company's subsidiaries and affiliates are involved in the generation, transmission, and distribution of electricity, exploration and production of oil and natural gas, transmission and marketing of natural gas, and energy management and other energy-related services”.

The Bloomberg description of FE indicates that the firm is involved with oil and gas production and sales. This business segment appears to be associated with higher systematic risk. However, in assessing FE's 10-K, most references to production refer to electricity, with the one mention that relates to gas being: “we also have current or previous ownership interests in sites associated with the production of gas, and the production and delivery of electricity”¹⁸. Furthermore, there is no mention of gathering or extraction of gas in the report. FE's summary of operations in its 10-K shows that approximately 71% of its revenue is attributed to regulated electricity utilities. In addition, FE seems to have a pure-play transmission business segment.

3.6.3 Summary of integrated comparators

Our integrated comparator analysis indicates that both the high and low asset beta firms are involved in similar operations within the electricity segments. However, there seems to be a distinction between firms that operate as gas utility firms and those that extend into up and midstream operations, and as such take on commodity and exploration risk. In the above, we note that we have only considered the two ends of the distribution in detail. However, our analysis suggests there is different systematic risk even within the sample sets. Particularly firms with significant commodity risk are of concern as this is significantly different to the regulated service.

3.7 Gas company betas

As noted in the distribution analysis, the distribution of the estimated asset betas for the gas firms is the most volatile of the energy sub-samples. We identify Williams Partners LP (WPZ); TC PipeLines LP (TCP); ONEOK Inc (OKE); National Fuel Gas Co (NFG); Kinder Morgan Inc (KMI); and Enbridge Energy Partners (EEP) at the high end of the distribution. Followed by AGL Resources Incorporated (GAS) and North West Natural Gas Company (NWN) on the low end.

3.7.1 High beta estimate firms

Williams Partners LP (WPZ)

$$\text{Location} = U.S. \quad \beta_A = 0.82 \quad \text{Avg. L} = 9\%$$

The Bloomberg definition of WPZ states “Williams Partners LP owns, operates, develops, and acquires natural gas gathering systems and other midstream energy assets. The Company is principally focused on natural gas gathering, the first segment of midstream energy infrastructure that connects natural gas produced at the wellhead to third-party takeaway pipelines”.

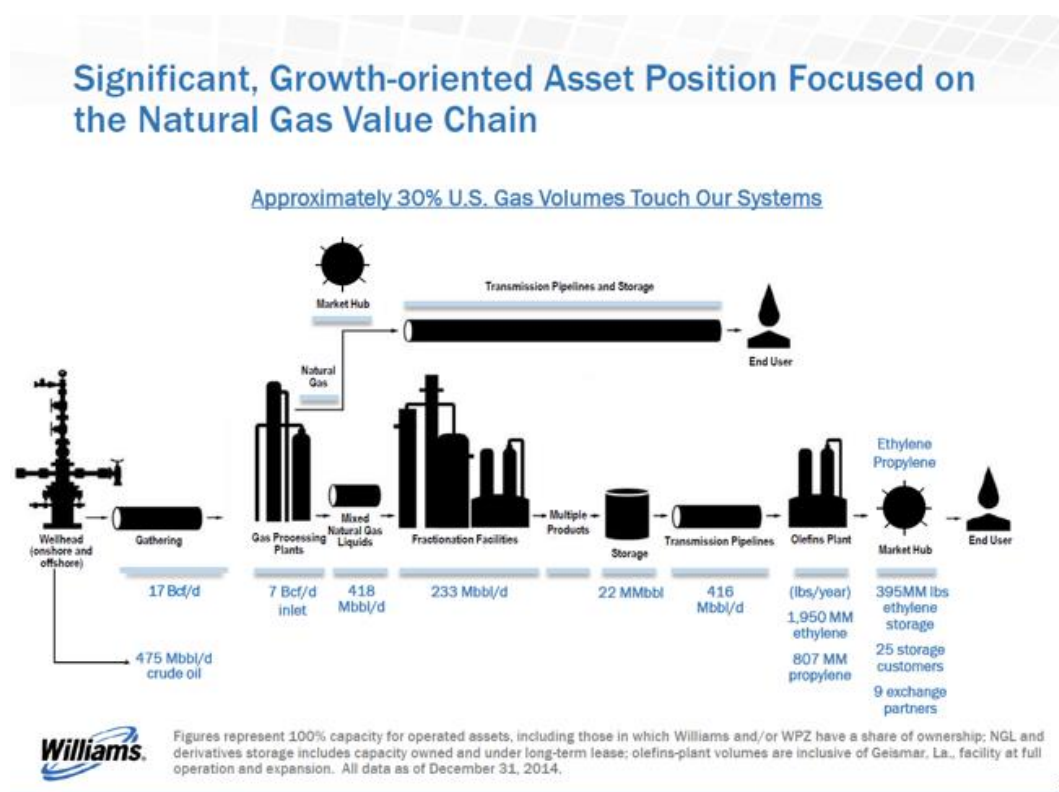
¹⁸ P. 37 of FE's 2015 10-K.

WPZ's 2015 10-K shows its current business segments consist of a Central segment which provides domestic natural gas gathering, treating, and compression services to producers under long-term, fixed-fee contracts. The Northeast G&P segment includes natural gas gathering and processing, and natural gas liquids (NGL) fractionation businesses in the shale region. The Atlantic-Gulf segment includes the company's interstate natural gas pipeline ("Transco"), as well as significant natural gas gathering and processing, and crude oil production and transportation. The company's West business segment includes natural gas gathering and processing, and an interstate natural gas pipeline (Northwest Pipeline). Lastly, there is an NGL & Petchem Services segment which has an interest in production/gathering and refining of natural gas, oil, and NGL.

As recognised by the Bloomberg description, WPZ is heavily involved in gathering and generation of raw materials. Furthermore, it is involved in the transportation of crude oil and NGL, as well as natural gas. It is unclear how much of the transportation operation of WPZ is fee for contract and how much is for WPZ's product and the products of WPZ's subsidiaries.

WPZ's service lines that exceed 10% of consolidated revenue by segment have no natural gas distribution revenues. Service revenues make up 70% of the firm's total revenues. However, it is unclear what "service revenue" consists of. The company's business segments also have fee-for-contract transportation of oil and NGL as well as gathering and processing components. However, according to Bloomberg research approximately 30% of U.S. gas volumes touch WPZ's systems, which includes all aspect of the gas value chain as depicted in Figure 6.¹⁹

Figure 6: WPZ gas value chain



¹⁹ <http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=22236226>

National Fuel Gas Co (NFG)

$$\text{Location} = U.S. \quad \beta_A = 0.79 \quad \text{Avg. L} = 22\%$$

The Bloomberg description for NFG states “National Fuel Gas Company is an integrated natural gas company with operations in all segments of the natural gas industry, including utility, pipeline and storage, exploration and production, and marketing operations. The Company operates across the United States”.

Consistent with the Bloomberg description, NFG reports in its 10-K five business segments: Exploration and Production, Pipeline and Storage, Gathering, Utility, and Energy Marketing. As with many of the other large interstate/international firms within these segments, the company owns and operates many subsidiary firms. NFG’s largest reported revenue generating segments are Exploration (accounting for 39%), Utilities (accounting for 40%), and Transportation (accounting for 11.5%), with the remainder being made up of energy marketing and gathering. According to its statement of income, NFG is also a gas purchaser (assumedly for its Utilities segment).

Enbridge Energy Partners (EEP)

$$\text{Location} = U.S. \quad \beta_A = 0.62 \quad \text{Avg. L} = 38\%$$

The Bloomberg description for EEP is “Enbridge Energy Partners, L.P. transports and stores hydrocarbon energy. The Company offers crude oil and natural gas liquids to refineries in the Midwestern United States and Eastern Canada”.

Consistent with the description EEP’s 2015 Annual Report shows that the firm has two business segments being natural gas and liquids. However, as shown in The firm’s 10-K shows that only 3.8% of the company’s operating revenues were attributed to the natural gas segments “transportation and other services”. As noted in Table 1 of the Commission’s paper²⁰, the natural gas segment accounted for approximately 55% of the firm revenue. However, this is made up of approximately 51% commodity sales which could alter the risk profile of the firm from a GPB due to the firm’s exposure to commodity risk. Furthermore, in Q3 of 2015 EEP’s liquids segment contributed approximately 89% to the company’s EBITDA.

TC Pipelines LP (TCP)

$$\text{Location} = U.S. \quad \beta_A = 0.6 \quad \text{Avg. L} = 28\%$$

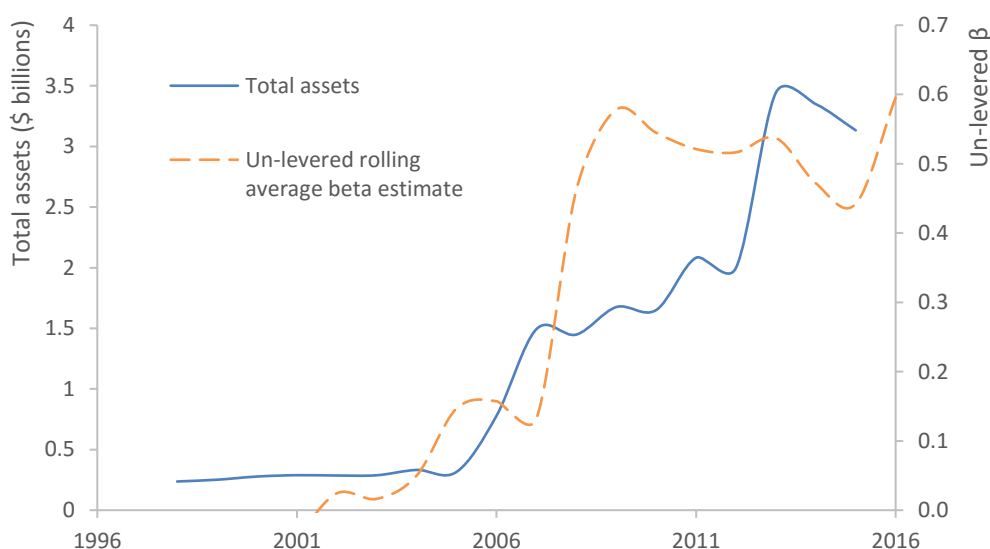
The Bloomberg description of TCP states “TC Pipelines LP acquires, owns, and participates in the management of United States-based pipeline assets. The Company owns interest in the Northern Border Pipeline Company, the owner of an interstate pipeline system that transports natural gas from the Montana-Saskatchewan border to natural gas markets in the Midwestern United States”.

TCP’s 10-K does not report any other business segments. The company appears to own/operate genuine fee-based transportation services only for natural gas. This is also highlighted in its statement of income that shows a majority of its revenues generated by natural gas transportation.

²⁰ Commerce Commission, op. cit., p. 66.

A note that is consistent throughout TPCs Bloomberg description and 10-K is that TCP invests in but does not operate the pipelines. Given this, it is noted that TCP's total assets increased from \$0.78b in 2006 to \$1.65b in 2010 to \$3.12b in 2015. This seems very expansionary. Figure 7 shows this total asset growth over time. If the asset betas over each period that the Commission estimates are considered, the 1996-2001 asset beta estimate was -0.04, coinciding with flat asset growth. For the period from 2001-2006 the asset beta estimate rose to 0.16, possibly reflecting the asset growth between 2005 and 2006. From 2006-2011 the asset beta estimate increased significantly to 0.52 at the same time that the company's assets grew by 168%. By 2015, the asset beta increased to 0.6 and the company's total assets had approximately doubled. This graph does not show the changes in leverage of the company over the period. However, our analysis indicates a possible correlation between the asset growth and the estimated asset beta for TCP that should be considered when including it in the Commission's set for the New Zealand GPBs.

Figure 7: TCP total asset growth



ONEOK Inc. (OKE)

$$Location = U.S. \quad \beta_A = 0.58 \quad Avg.L = 47\%$$

The Bloomberg description for OKE states "ONEOK, Inc. is a diversified energy company. The Company is involved in the natural gas and natural gas liquids business across the United States".

OKE reports its business segments in its 10-K as natural gas gathering and processing. The company's Natural Gas Liquids segment gathers, treats, fractionates and transports NGLs and stores, markets and distributes NGL products. The Natural Gas Pipelines segment operates regulated interstate and intrastate natural gas transmission pipelines and natural gas storage facilities.

OKE appear to have a relatively small operation of fee-driven transportation and distribution of natural gas (approximately 4.3% of the firm's total revenue as shown by its Annual Report). The remaining 95.3% is reported to come from natural gas gathering and processing, natural gas liquid sales and other. As with many of the other firms presented at the high end of the comparator set,

OKE owns the pipelines for natural gas and NGL but it also owns the product that it is transporting, altering the systematic risk in the business.

Kinder Morgan Inc (KMI)

Location = U.S. $\beta_A = 0.56$ Avg.L = 41%

The Bloomberg description for KMI states that “Kinder Morgan Inc. is a pipeline transportation and energy storage company. The Company owns and operates pipelines that transport natural gas, gasoline, crude oil, carbon dioxide and other products, and terminals that store petroleum products and chemicals and handle bulk materials like coal and petroleum coke”.

KMI’s 10-K reports three main business segments. Firstly, “Natural Gas Pipelines” which includes ownership and operation of interstate pipelines and storage facilities, natural gas and crude oil gathering and processing and NGL fractionation facilities and LNG facilities. Secondly, the CO₂ segment which produces, transports and markets CO₂ to oil fields. Lastly it has a “Terminals” segment which owns and/or operates liquids and bulk terminal facilities as well as owning and operating ‘Jones Act’ tankers, which according to KIM’s website are oil tankers that operate under the Jones Act.

KMI’s Consolidated Income Statement show that approximately 62% of KMI’s revenue is attributed to ‘services’. There is no obvious further break down of the services component. As specified in the business segments reporting, it is likely to be some weighting of pipeline transportation of natural gas, NGL and crude oil, tanker transportation of oil, fractionation and processing services and possibly marketing of CO₂. As is consistent in this more detailed analysis, the other revenue generating activities include ‘product sales’ and ‘natural gas sales’. This indicates that KMI, while owning pipelines for natural gas, is a natural gas generator, processor and wholesaler, rather than a gas pipeline business which charges a fee for the transportation of a third party’s product.

3.7.2 Low beta estimate firms

Our assessment above of the firms at the higher end of the asset beta distribution for the gas sub-sample has identified that the firms included in the Commission’s energy comparator set has quite different risk profiles from the New Zealand GPBs. Many of the firms appear to be subject to unregulated gas gathering, processing, liquids and commodity price risk because they either have an ownership stake in the product they are distributing/transporting or they appear to operate more as an investment, MLP with partial stakes in many natural gas pipeline businesses. These firms could be disproportionately skewing the distribution of risk profiles as seen in Figure 1. However, as stated previously, the statistics are not conclusive and it is possible that the ‘pure play’ natural gas companies are merely subject to a wider range of risks. Because of this it is important to consider not only the firms at the upper end of the distribution but also those at the bottom in order to assess whether or not there are fundamental differences in the comparator firm sample or whether the un-levered risk of any one gas pipeline business may have a high level of uncertainty.

The two gas firms at the lower end of the sample identified by the Commission are AGL Resources Incorporated (GAS) and North West Natural Gas Company (NWN). These two firms have estimated asset betas of 0.13 and 0.24 respectively.

AGL Resources Incorporated (GAS)

$$\text{Location} = U.S. \quad \beta_A = 0.12 \quad \text{Avg. } L = 44\%$$

The Bloomberg description for GAS states “AGL Resources Inc. primarily sells and distributes natural gas to customers in Georgia and southeastern Tennessee. The Company also holds interests in other energy-related businesses, including natural gas and electricity marketing, wholesale and retail propane sales, gas supply services, and consumer products”.

The description above indicates that GAS could be similar to the firms analysed as being in the upper part of the distribution. GAS has a retail and wholesale (albeit in propane and not NGL or crude) gas sales component and is involved in energy marketing and other consumer products. This seems like a diversified firm.

Figure 8 is taken from AGL’s 10-K and depicts the firm’s regulated and non-regulated operations. It indicates that the regulated activities are solely focused on distribution. However, its non-regulated activities also involve wholesale services, retail operations and midstream operations. Further to this, GAS’s income statement by segment sourced from its 2015 10-K shows that distribution revenues account for a majority (73%) of the company’s operation revenues. Furthermore, the description related to the segmented income statement states that the retail segment provides natural gas marketing to end users and protection products. Its wholesale services segment “engages in natural gas storage and gas pipeline arbitrage and related activities” along with “natural gas asset management and/or related logistics services”. Its midstream segment activities involve non-utility storage and pipeline operations and the operation of natural gas storage assets.

Figure 8: AGL regulated and non-regulated activities

Regulated	Non-Regulated
Distribution operations	Wholesale services
	Retail operations
	Midstream operations

While the Bloomberg description seems to incorporate similar descriptions for GAS as firms that are at the higher end of the distribution, on further analysis, GAS does not seem to have large additional exposure to commodity risk. Its distribution operations are return regulated. Its wholesale operation appears to be involved in arbitraging and not speculation. However, its retail operation is competitive and accounts for approximately 20% of Gas’s total revenue.²¹²² It does not appear to have generation or gathering activities which are characteristic of the high beta firms.

North West Natural Gas Company (NWN)

$$\text{Location} = U.S. \quad \beta_A = 0.24 \quad \text{Avg. } L = 38\%$$

The Bloomberg description of NWN states “Northwest Natural Gas Company distributes natural gas to customers in western Oregon, as well as portions of Washington. The Company services

²¹ It should be noted that it is unclear what ‘other’ revenue is involves (p. 93 GAS 2015 10-K).

²² Intercompany eliminations have been ignored from the total as they do not represent business activities (p. 93 GAS 2015 10-K)

residential, commercial, and industrial customers. Northwest Natural supplies many of its non-core customers through gas transportation service, delivering gas purchased by these customers directly from suppliers”.

The description above indicates that NWN is a pure-play distribution firm. It indicates that NWN is not involved in extraction, generation or commodity sales. The firm’s 10-K reports that it has two core business segments. Firstly, its regulated local gas distribution businesses, referred to as the utility segment, and secondly gas-storage businesses that provide natural gas storage services to utilities, gas marketers, electric generators and large industrial users. It reports that its local gas distribution segment is “a regulated utility principally engaged in the purchase, sale, and delivery of natural gas and related services to customers”.²³ It reports that the “gas storage segment includes natural gas storage services provided to customers primarily from two underground natural gas storage facilities”. There is no evidence in its 10-K to indicate that NWN has a long-term exposure to commodity prices through generation or gathering or sales and transportation of its own natural gas. Also, it has no exposure to NGL or crude oil which seemed to be a common trend in the higher risk set. NWN’s 2015 income statement²⁴ by segment shows that 97% of its operating revenue is generated through its regulated utilities segment.

3.7.3 Summary of assessment of the gas comparators

As noted above, our assessment of the gas firms at the higher end of the distribution has identified that the firms appear to be subject to quite different risk profiles from the New Zealand GPBs, either because they are subject to unregulated gas gathering, processing, liquids and commodity price risk or because they operate more as investment firms.

Our assessment of the activities of the two gas firms that are at the lower end of the distribution (GAS and NWN) suggests that these firms have quite different operations and risks to the firms at the higher end of the distribution. The two low beta gas firms analysed appear to have some, albeit minor, functions that mean they are not ‘pure play’ GPBs in the New Zealand environment. However, these two firms do not have generation, gathering or production capacity and do not generate revenues from wholesale commodities sales in the way that the firms at the upper end of the spectrum do. Much of the time this important detail does not seem to be picked up by the Bloomberg descriptions. Therefore, we would recommend that, when selecting the comparator set, that more detailed investigations are made into the lines of business and risk profiles of the individual companies before they are considered appropriate for inclusion.

3.8 Firm-specific analysis summary

Our analysis of the firms in the Commission’s energy comparator set that sit at the higher and lower end of the asset beta distributions for each of the industry sub-samples indicates some common patterns between the business activities undertaken by the firms and the estimated risk profiles of the firms. In particular, firms that are involved in the production and gathering, as well as the wholesale distribution, supply and marketing of natural gas and NGLs, tend to have higher un-

²³ P. 63 of NWN’s 2015 10-K.

²⁴ P. 64 of NWN’s 2015 10-K.

levered beta estimates than the other firms in the sample. The inclusion of these firms in the Commission's energy comparator set is skewing the distribution up of the estimated betas for the New Zealand energy network companies. It seems likely that the natural gas producing firms have an exposure to commodity price risk that is not applicable to the regulated services.

The analysis of the firms has also highlighted differences with the regulatory environment which electricity, integrated and gas companies are subject to. Most of the U.S. firms in the Commission's energy comparator set that have electricity business segments will not just have distribution and transmission but also generation and retail. This may be perceived as introducing risks to the firm that are unrelated to NZ operations who do not have such functions. However, in the U.S. these firms operate as complete geographic monopolies and all business segments are regulated. This likely realigns the risk profile of these firms. The same appears to be true for the gas distribution utilities business segments. Gas utilities firms in the U.S. appear to purchase the gas from wholesale pipelines where they in-turn distribute and sell directly to (in the cases analysed) the end-user. Regulated generation is the difference between electricity and gas operations in the U.S. Upstream natural gas consists of exploration, gathering and production, followed by wholesaling and marketing, which is unregulated and therefore subjecting the firms involved to different systematic risks.

The cost of capital being determined by the Commerce Commission is for the pure lines or gas distribution service only (i.e., they are distributors and do not own the product they are transporting). In contrast, every firm in the Commission's electricity sub-set that we considered in detail have generation and retail functions. It could be that the Commission's comparator firm set for electricity over-estimates the risks associated with a typical New Zealand EDB because the typical New Zealand EDB simply runs a tolling operation and does not own the product.

The same could apply for gas firms. As seen in the analysis, there seems to be a positive correlation between owning/producing the commodity and systematic risk. New Zealand GPBs' systematic risk is likely to be largely driven through decreased throughput, whereas the comparator firms hold the additional risk of price fluctuations while they are holding that asset (before it has been consumed by their customers).

In addition, our analysis indicates that ownership of gas fields or other upstream pipeline or processing assets may entail greater systematic risk than ownership of electricity generation and retail assets.

Overall, our analysis suggests the appropriateness of the Commission's energy comparator set is worth further detailed investigation by the Commission.

3.9 High-level refinement of the Commission's energy set

The findings above indicate that within the integrated and gas sub-sets there may be firms that are subject to different systematic risk than would be typical for a NZ EDB or GPB. These risks appear to be only affecting the gas firms and the gas segments of the integrated firms. The increased risk (as noted previously) appears to stem primarily from commodity price risk exposure for firms which

produce natural gas and own and operate gathering pipelines.²⁵ This seems to be because these firms either extract the gas themselves or purchase the gas from the wellhead and transport it to producing plants before wholesaling the commodity to a distributor. This ownership increases the risk of the firms involved consistently and the increased risk in most cases does not seem trivial.

To illustrate this, Tables 4 and 5 present summary statistics of the comparator set after removing the six gas firms we identified as being outliers in the gas sub-set and the full energy set specified by the Commission. These firms are WPZ, NFG, EEP, TCP, OKE and KMI. One other firm identified as being an outlier is JEL which is an electricity firm in the U.K. The stock is illiquid and is likely producing a lower estimate of risk than what would be truly representative of the operation.

These firms are only identified as they look to be outside the expected distribution, and when analysed more closely do appear to be subject to different systematic risks than would be (to our understanding) different to a typical NZ operation. More thorough analysis and filtering of the rest Commissions energy set motivated largely by these findings will be presented in Section 4.

Table 4: Summary statistics for the Commission’s comparator set with deemed outliers removed

2011-2016 estimates	Daily asset beta	Weekly asset beta	4-Weekly asset beta	Leverage	Number of firms in sample
Commission's full set					
Commission's energy set	0.39	0.34	0.30	41%	74
Energy set excluding outliers	0.38	0.31	0.28	41%	67
Commission's gas sub-set					
Commission's sub-set	0.50	0.45	0.44	34%	18
Sub-set excluding outliers	0.46	0.36	0.34	36%	12
Commission's electricity sub-set					
Commission's sub-set	0.33	0.29	0.26	40%	16
Sub-set excluding outliers	0.36	0.30	0.28	44%	15

²⁵ With the exception of TCP which has been excluded for these purposes due to its different business structure.

Table 5: Standard errors for the Commission’s comparator set with deemed outliers removed

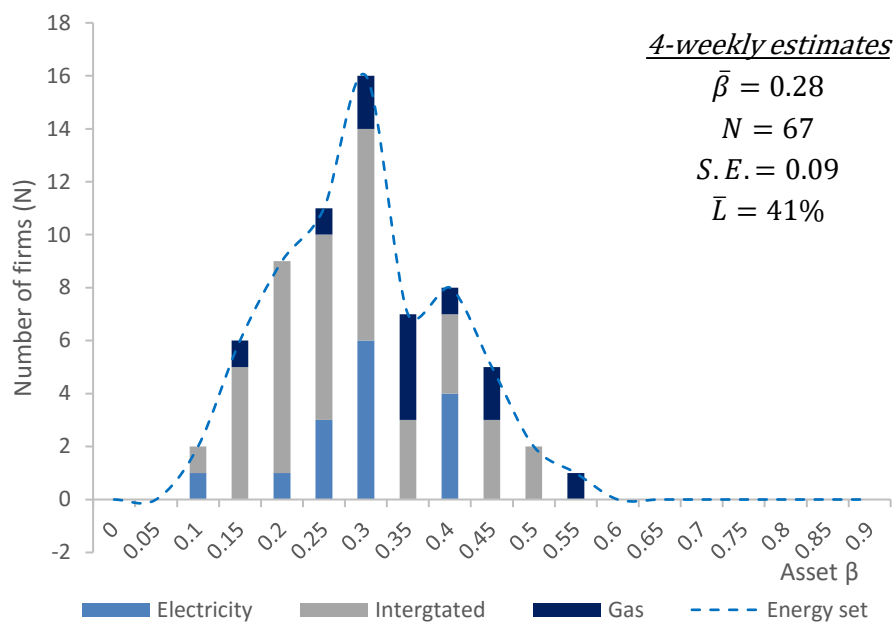
Standard errors	Daily average S.E.	Weekly average S.E.	4-Weekly average S.E.	Number of firms in sample
Commission's full set				
Commission's energy set	0.14	0.14	0.14	74
Energy set excluding outliers	0.12	0.10	0.09	67
Commission's gas sub-set				
Commission's sub-set	0.17	0.21	0.20	12
Sub-set excluding outliers	0.18	0.15	0.14	18
Commission's electricity sub-set				
Commission's sub-set	0.12	0.11	0.12	16
Sub-set excluding outliers	0.07	0.06	0.06	15

Table 4 and Table 5 indicate that removing the six gas and one electricity firms that seem to be outliers from the Commission’s sample decreases the average asset beta by 0.02 for both the weekly and 4-weekly estimates, and the mean daily asset beta by 0.01. This also decreases the standard errors for the samples to 0.13, 0.11 and 0.10 for the daily, weekly and 4-weekly estimates respectively while keeping the leverage estimate the same.

The gas asset beta estimates decrease by 0.06 while the electricity asset beta estimates increase by approximately 0.02.

Figure 9 presents the distribution of the Commission’s energy comparator sample with the seven outliers removed. Removing only the seven firms from the sample has improved the symmetry of the distribution and is likely more representative while only having lost a small number of firms from the overall sample set.

Figure 9: Distribution of the Commission’s energy set without outliers

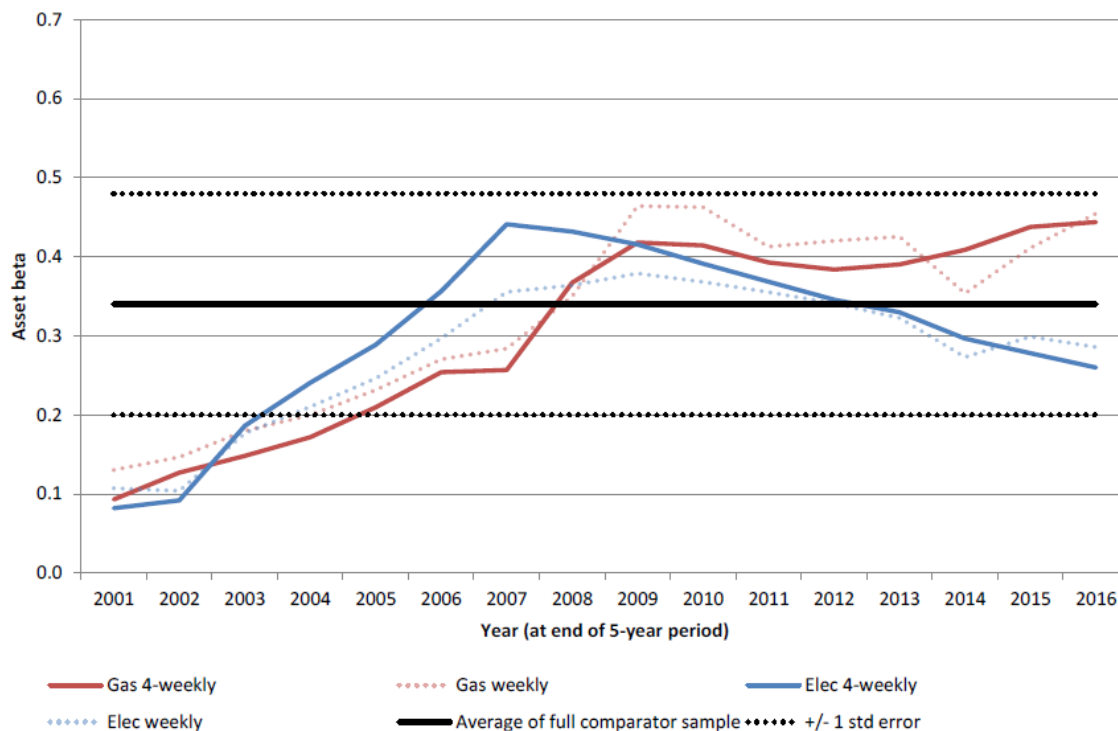


4. Gas versus electricity betas

The preceding analysis has indicated that there are possible differences in the level of systematic risk as it relates to electricity and gas businesses as seen in the comparator set defined by the Commission. As noted in Section 3.3, the electricity firms are distributed mostly in the lower half of the Commission’s estimated betas, and the gas industry firms appear to be distributed disproportionately in the upper end of the total set. When these are broken down and analysed individually the electricity firms have an average 4-weekly beta estimate of 0.26 with a standard error of 0.12 and the gas firms have an average 4-weekly beta estimate of 0.44 with a standard error of 0.20. It is also noted in Section 3.3 that the point estimate for the average gas beta sits at the 100th percentile of the electricity distribution, meaning that all observed electricity comparators have estimated betas that are less than the average from the gas sample. This seems to give a strong indication that if the comparator set gives a truly representation of the industry risk then the gas beta applied in NZ regulation should be higher than electricity.

Figure 10: The Commission’s Figure 7

Figure 7: Five-year rolling asset betas for gas and electricity sub-sets of our comparator sample



The Commission has analysed the breakdown between the gas and electricity betas and has presented it in as a time series rolling average in the Commission’s Figure 7 (and presented above in our Figure 10) of its IM review Cost of Capital paper. In its analysis the Commission notes that while the electricity beta estimates are now lower they have been higher in the past, the current sub-set estimates are both within one standard error of the whole energy sample average. This appears to us to be reasonable reasoning. However, qualitatively assessing the Commission’s Figure 7, the estimates for the electricity and gas betas appear to have a diverging trend beginning in approximately 2009 and continuing more or less consistently to the most recent estimates. Further, there may be a case to be made that pre-2009 had a fundamentally different economic makeup and the CAPM is forward looking (albeit based on historical data).

To more accurately address the empirical question of differences in the market’s perception of the systematic risk (as depicted in the beta calculations) between gas and electricity, the errors for the sub-samples should be analysed. Furthermore, if the average estimates of the sub-samples are rolling through time (as in Figure 7 of the Commission’s paper) then so too should the error calculations. This may give more insight to the true relationship between the two sub-sets.

Figure 11 below presents the electricity and gas asset beta averages with the attached standard errors for the Commission’s entire energy sample. The diagram shows the average asset beta estimate for each sector and presents the range of plus and minus one standard error for each sub-set. Figure 11 highlights the differences in the two distributions noted in Section 3.3 above. It shows

that the average gas asset beta estimate is more than one electricity standard error away from the average electricity estimate. Figure 11 also highlights the differences in the distribution widths (as represented by +/- 1 standard error). The electricity distribution is much narrower than the gas which could possibly indicate discrepancies during the sampling process.

Figure 11: 4-weekly beta estimates with +/- 1 standard error for the Commission's energy firm sub-sets

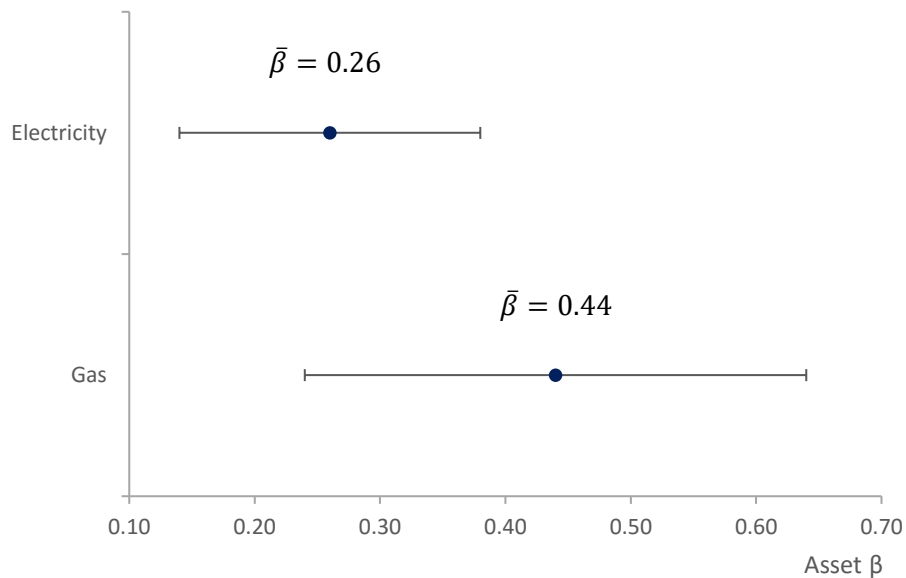


Figure 12 presents the estimates and the errors of the electricity and gas asset betas after excluding (what we have loosely deemed) the outliers. As in Section 3.9, only the six firms analysed as being in the upper part of the gas distribution and the one firm in the lower part of the electricity distribution have been excluded. At this point we have not excluded or conducted further analysis of the firms remaining in the gas sub-set.

Figure 12: 4-weekly beta estimates with +/- 1 standard error for the outlier-reduced comparators sub-set

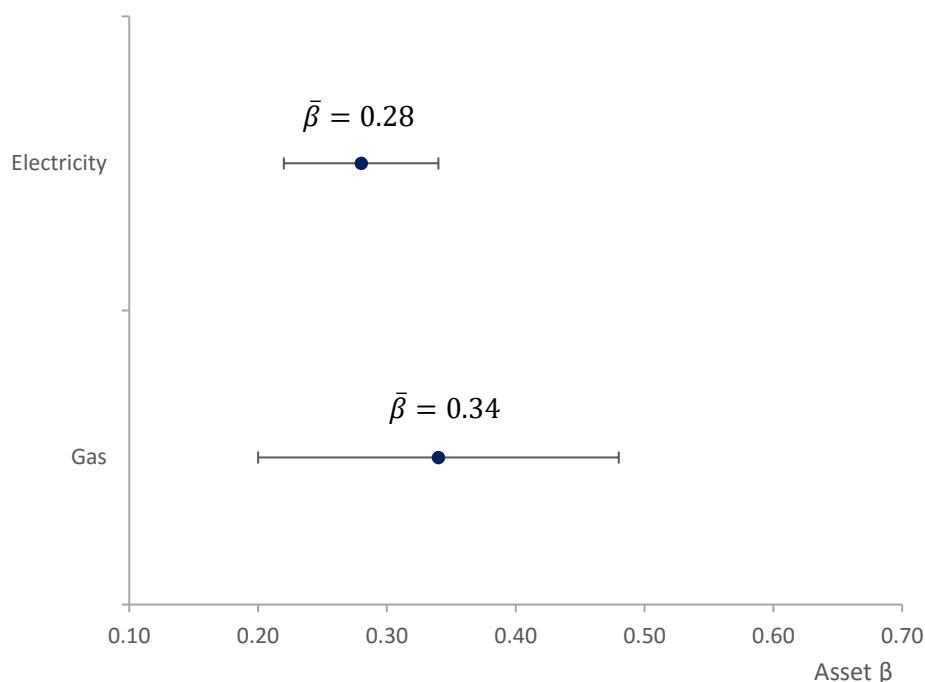


Figure 12 indicates a much closer spread between the gas and electricity distributions once the seven outlier firms are removed from the sample. By removing only six gas firms that we have inferred to be exposed to different systematic risks, the average gas asset beta estimate has fallen by 0.1 (to 0.34). Both the electricity and gas averages sit within one standard error of each other. The average electricity asset beta is still 0.05 lower than that of the gas average and the standard error of the electricity sub-set reduced considerably. However, the difference between the two sub-sets is less conclusive than that presented in Figure 11.

In its analysis, the Commission notes that while the electricity beta estimates are now lower they have been higher in the past, the current sub-set estimates are both within one standard error of the whole energy sample average. This appears to us to be reasonable reasoning. However, qualitatively assessing the Commission’s Figure 7, the estimates for the electricity and gas betas appear to have a diverging trend beginning in approximately 2009 and continuing more or less consistently to the most recent estimates. Further, there may be a case to be made that pre-2009 had a fundamentally different economic makeup and the CAPM is forward looking (albeit based on historical data).

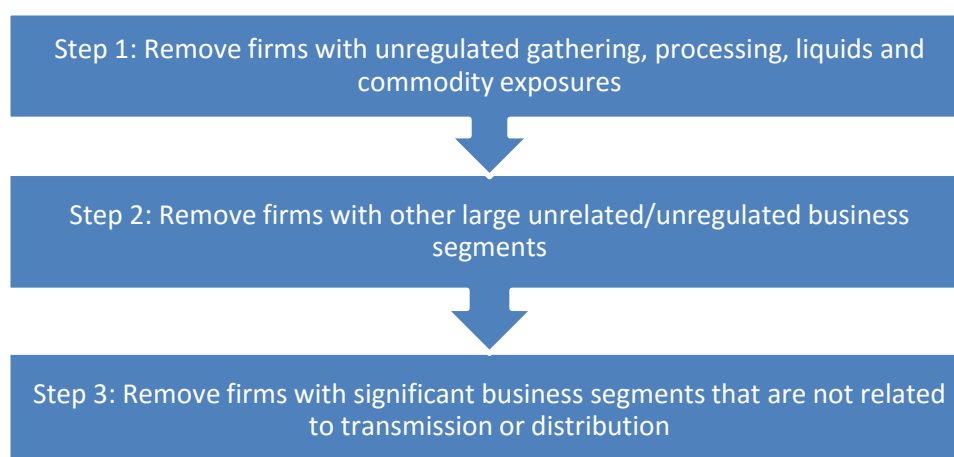
5. Filtering and refining the sample set

The previous sections of the analysis have indicated that further filtering of the Commission’s energy comparator set may be useful in determining a truly comparable set of firms that can help the Commission set an appropriate return (or returns) on equity for the regulated New Zealand gas and electricity firms. We have identified what appears to be a theme that firms with high estimated unlevered systematic risk seem to be subject to greater commodity risk exposure. Further, firms that

have un-regulated or non-comparable business segments and firms that are subject to different regulatory environments may also have different risk profiles than the New Zealand energy network companies.

This paper has firstly taken a high-level approach to assessing the distributions of the firms within the Commerce Commission's samples. We then analysed more closely the firms specific to the high and low ends of each distribution to assess whether or not there appear to be fundamental differences between the firms with high and low risk or whether the differences in risk are just market behaviour and a large enough sample size would naturally converge to the true distribution. We now explore the characteristics of the firms that sit somewhere within each of the distributions. We propose a filtering system, as defined in Figure 13 below, based on observations made in the earlier analysis. Firstly, we see an exposure to unregulated gas gathering, processing, liquids and commodity price fluctuations as the highest contributor to skewing the distribution of firms and risk profiles and we therefore exclude those firms with such an exposure. Second, we filter out firms that have large nonregulated or unrelated business segments or firms that have business structures that appear to be incomparable to the New Zealand regulated entities. Lastly, we remove firms that have regulated operations that are not regulated in NZ. For the most part this last step involves removing U.S. firms which are highly involved in regulated generation and/or retail electricity.

Figure 13: Filtering system



Our assessment is based on an analysis of each firm's 10-K and Annual Report. It is important to note that through this process we have used our best judgment when classifying each firm. There are areas where the firms and the regulations they are subject to is unclear and where firms' business segments are highly complicated. For instance, in the U.S. most firms we looked at have rate-regulated generation functions under FERC. However, some firms declare unregulated generation functions. In these cases, it is unclear whether the revenue was generated by the firm outside the US or if some states have overridden FERC. Another point to note relates to the regulation surrounding gathering and production of natural gas and related NGLs. In most cases this is reported as unregulated revenue but this does not always appear to be the case. However, as demonstrated in Appendix 4, a conservative sensitivity analysis indicates there are not large discrepancies if 10% of the highest beta firms are misclassified at each step.

Caveats aside, the filtering process outlined above is not aimed to give the Commission an absolute final set of comparators but to help understand further the trade-off between comparability of the set and statistical significance (i.e., having a large enough sample).

Table 6 presents the results of the three step filtering process.

Table 6: Filtering process and resulting sample sets

	Sample set	Weekly asset beta		4-Weekly asset beta		Average leverage	Number of firms in sample (N)
		Average	S.E.	Average	S.E.		
	Commission's energy set	0.34	0.14	0.30	0.14	41%	74
Step 1	Remove firms with unregulated gathering, processing, liquids and commodity exposures	0.29	0.09	0.26	0.10	42%	54
Step 2	Remove firms with other large unrelated/unregulated business segments	0.28	0.08	0.24	0.07	44%	39
Step 3	Remove firms with significant business segments that are not related to transmission or distribution	0.24	0.11	0.21	0.07	49%	8

Step 1, which removes all firms with unregulated gathering, processing, liquids and commodity exposure, reduces the estimates for the weekly and 4-weekly average betas to 0.29 and 0.26 respectively, and increases the average leverage to 42%. The sample size reduces to 54 firms. The firms that are excluded include many of the firms covered in the firm specific analysis such as Williams Partners limited and Kinder Morgan.

Step 2, which removes all firms which have large unrelated or unregulated revenues, reduces the estimates for the weekly and 4-weekly average betas to 0.27 and 0.24 respectively. The average leverage increases to 43% and the sample size reduces to 39 firms. This reduction is due to the exclusion of firms like SSE, a U.K. electricity firm which has around 44% of its assets in transmission and distribution activities, with the rest its revenue coming from unregulated generation and retail activities. Other firms that are removed include APA group from Australia which operates for the most part in contracted pipelines and not regulated pipelines and T C Pipelines which has grown rapidly in recent years through mergers and acquisitions, as discussed in Section 3.7.3 above.

Step 3 removes firms that have regulated activities that are not regulated in NZ. As noted above these firms are for the most part U.S. firms but also include special cases such as Jersey Electricity PLC which is a monopoly for all electricity on Jersey island with illiquid stock. This leaves eight firms that are close to, if not absolute, 'pure-play' distribution and transmission firms. The average weekly and 4-weekly asset betas estimates for this set are 0.24 and 0.21 respectively with an average leverage of 49%.

Figure 14 presents the findings of the average asset betas from this filtering process and Figure 15 presents the standards errors.

Figure 14: Sensitivity of average asset beta comparability to sample size

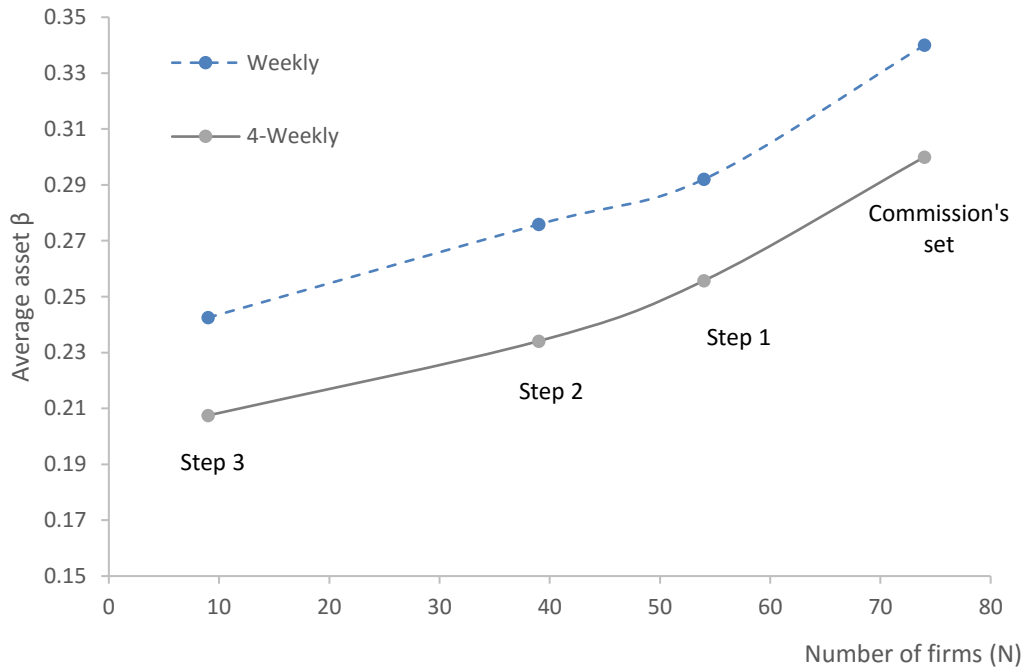
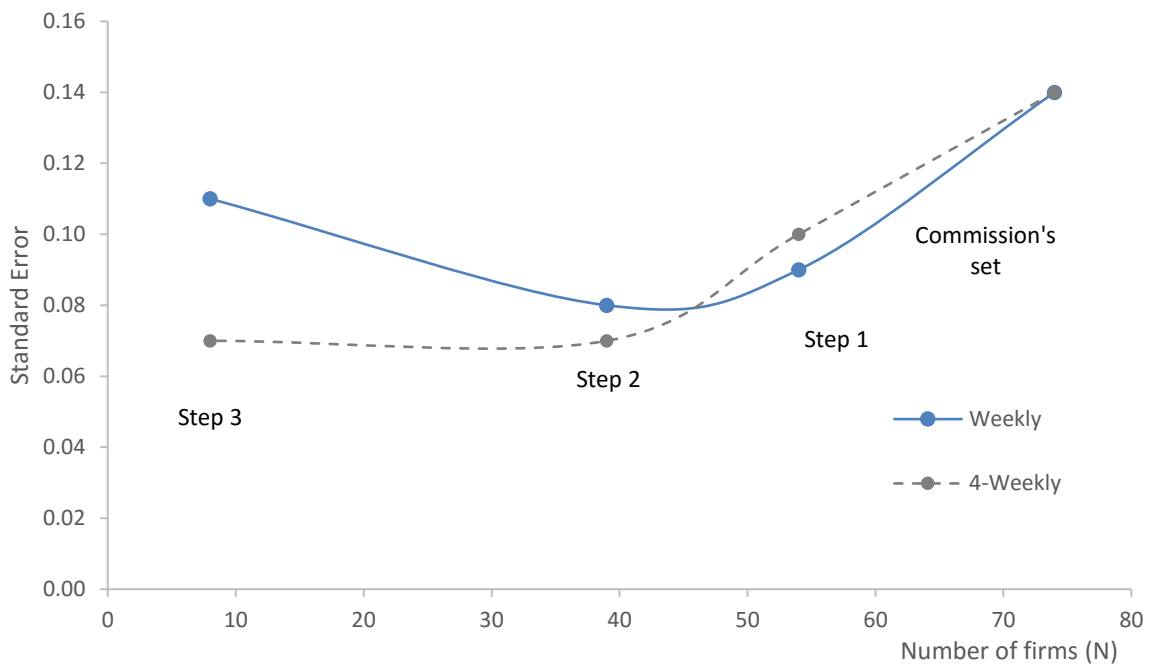


Figure 15: Sensitivity of standard error comparability to sample size



This analysis indicates that there is a steep decrease in the average beta estimates as a result of step 1 when we control for the increased risk that firms face through unregulated gas gathering, processing, liquids and commodity price exposure. The average beta estimates do not then plateau but there appears to be a decreased rate of decline with the subsequent steps. It seems that somewhere along the range there is an optimal trade-off between reduced sample size and the comparability of the set.

6. Regulatory environment

One key impact on the firms of the comparator set that we have noted above during our analysis of their Annual Reports and 10-K is the regulatory environment which the firms are subject to. Table 7 presents the Commission’s energy set by country/region. It shows that the U.S. firms in the set have on average higher beta estimates than the U.K. and New Zealand and Australian firms. Furthermore, the New Zealand /Australian sub-sample seems to have lower standard errors. This may be due to lower cross-sectional errors for New Zealand/Australian firms calculated by the Commission. It also shows that the estimates that come from the U.S. firms, which seems to have the least comparable regulatory regime, dominates the estimates of the final sample (including the estimates of the asset beta and leverage).

Table 7: The Commissions energy comparator set by country/regulatory regime

Country	Weekly asset beta		4-Weekly asset beta		Average leverage	N
	Average	S.E.	Average	S.E.		
U.S.	0.35	0.13	0.31	0.13	40%	66
U.K.	0.25	0.29	0.23	0.31	20%	3
NZ/Aus	0.23	0.083	0.22	0.078	55%	5
Simple average	0.27		0.26		39%	74

Table 8 below presents the estimates for all the non-U.S. firms. It indicates average asset beta estimates in the range of 0.23 to 0.24.

Table 8: The Commissions energy comparator set by most comparable regulatory regime

	Weekly asset beta		4-Weekly asset beta		Average leverage	N
	Average	S.E.	Average	S.E.		
U.K./NZ/Aus	0.24	0.14	0.23	0.14	42%	8

Focusing on those countries with a similar regulatory environment results in a small sample (of only eight firms) but does indicate that a beta of 0.34 may be too high to accurately reflect the New Zealand regulatory environment.

7. Conclusions

This submission reviews the Commission’s choice of comparable companies for determining an appropriate WACC for regulated energy network services in New Zealand.

The choice of an appropriate comparable company set involves a trade-off between the comparability of the set with the regulated entities and the size of the sample set.

Our assessment of the Commission’s compco set suggests the Commission may have adopted too large a set at the expense of a loss in accuracy in the appropriate asset beta. In particular the Commission’s compco set includes companies which we assess have higher systematic risk largely through unregulated gas gathering, processing, liquids and commodity price exposures; involvement in lines of business that are either unrelated to the NZ regulated services (as they involve non-energy activities) or have energy revenues that are unregulated; and involvement in energy activities that are regulated but are outside the transport of electricity and gas.

Our re-classification of the Commission's 74 company dataset is indicative and inevitably involves a degree of judgement based on the available information. Nevertheless, we consider our overall conclusions that there are companies with significantly different risk profiles to the New Zealand regulated network companies in the Commission's set and that this has a material impact on the estimated average beta and leverage are robust. To further test the robustness of our conclusions we classified the Commission's 74 compcos solely on the basis of the country they are located. This analysis highlighted the importance of the country of origin, with the 66 USA companies having an average beta of 0.35, the three UK companies having an average beta of 0.25 and the five Australian/NZ companies an average beta of 0.23.

Given the sensitivity of the estimated average betas to the choice of compco sample set and the apparent inclusion in the Commission's sample of companies with quite different risk profiles we recommend that the Commission review its compco set.

If firms with either unregulated gas gathering, processing, liquids and commodity price exposure or large unrelated or non-regulated revenues are excluded, the Commission would still have a comparable companies set of around 40 companies from which to derive an asset beta. Such a sample set is considerably larger than that used by the Australian Electricity Regulator and would seem more than sufficient to generate meaningful estimates.

We also recommend that the Commission go further and consider whether the eight largely "pure-play energy transporters" is the appropriate benchmark group and test whether those companies may be from a statistically different population than the other 66 companies in its compco data set.

Appendix 1: 4-weekly estimated frequency data

Table 9: The Commission's samples (4-weekly beta estimates)

4-Weekly estimates	Electricity sub-sample	Intergrated sub-sample	Gas sub-sample	Commission's energy comparator set
Asset beta range	Number of observations	Number of observations	Number of observati	Number of observations
0 - 0.05	1	0	0	1
0.05 - 0.1	1	1	0	2
0.1 - 0.15	0	5	1	6
0.15 - 0.2	1	8	0	9
0.2 - 0.25	3	7	1	11
0.25 - 0.3	6	8	2	16
0.3 - 0.35	0	3	4	7
0.35 - 0.4	4	3	1	8
0.4 - 0.45	0	3	2	5
0.45 - 0.5	0	2	0	2
0.5 - 0.55	0	0	1	1
0.55 - 0.6	0	0	3	3
0.6 - 0.65	0	0	1	1
0.65 - 0.7	0	0	0	0
0.7 - 0.75	0	0	0	0
0.75 - 0.8	0	0	1	1
0.8 - 0.85	0	0	1	1
0.85 - 0.9	0	0	0	0
Mean	0.26	0.26	0.44	0.3
Standard error	0.12	0.09	0.2	0.14
N	16	40	18	74

Appendix 2: Weekly frequency data and distribution plots

Table 10: The Commission's samples (weekly beta estimates)

Weekly estimates	Electricity sub-sample	Intergrated sub-sample	Gas sub-sample	Commission's energy comparator set
Asset beta range	Number of observations	Number of observations	Number of observatio	Number of observations
0 - 0.05	1	0	0	1
0.05 - 0.1	0	0	0	0
0.1 - 0.15	0	1	0	1
0.15 - 0.2	1	4	0	5
0.2 - 0.25	1	7	2	10
0.25 - 0.3	7	10	1	18
0.3 - 0.35	2	6	2	10
0.35 - 0.4	3	7	3	13
0.4 - 0.45	1	4	2	7
0.45 - 0.5	0	0	1	1
0.5 - 0.55	0	1	4	5
0.55 - 0.6	0	0	0	0
0.6 - 0.65	0	0	0	0
0.65 - 0.7	0	0	1	1
0.7 - 0.75	0	0	0	0
0.75 - 0.8	0	0	1	1
0.8 - 0.85	0	0	1	1
0.85 - 0.9	0	0	0	0
Mean	0.29	0.3	0.45	0.34
Standard error	0.11	0.09	0.21	0.14
N	16	40	18	74

Figure 16: Distribution of weekly beta estimates of Commission's energy set

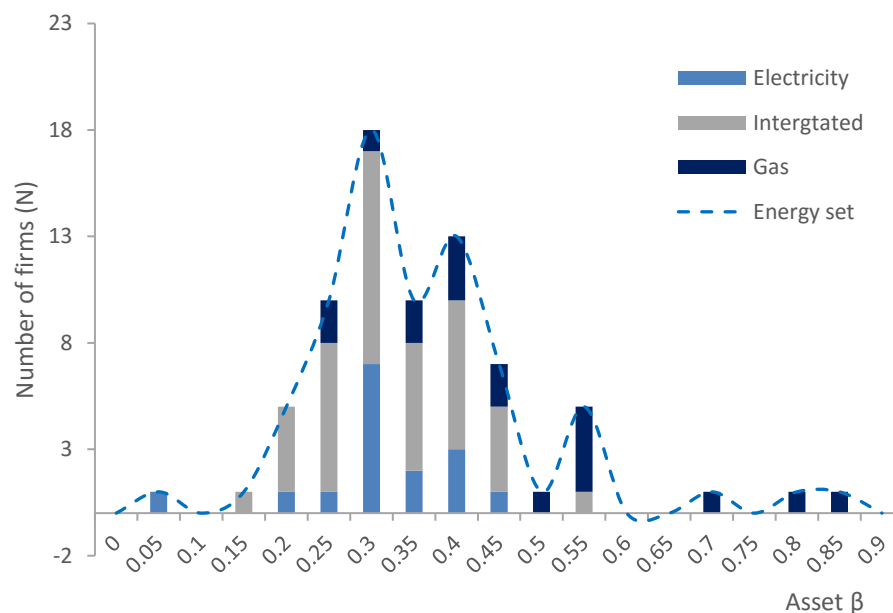


Figure 17: Distribution of the Commission's electricity firm with weekly estimates

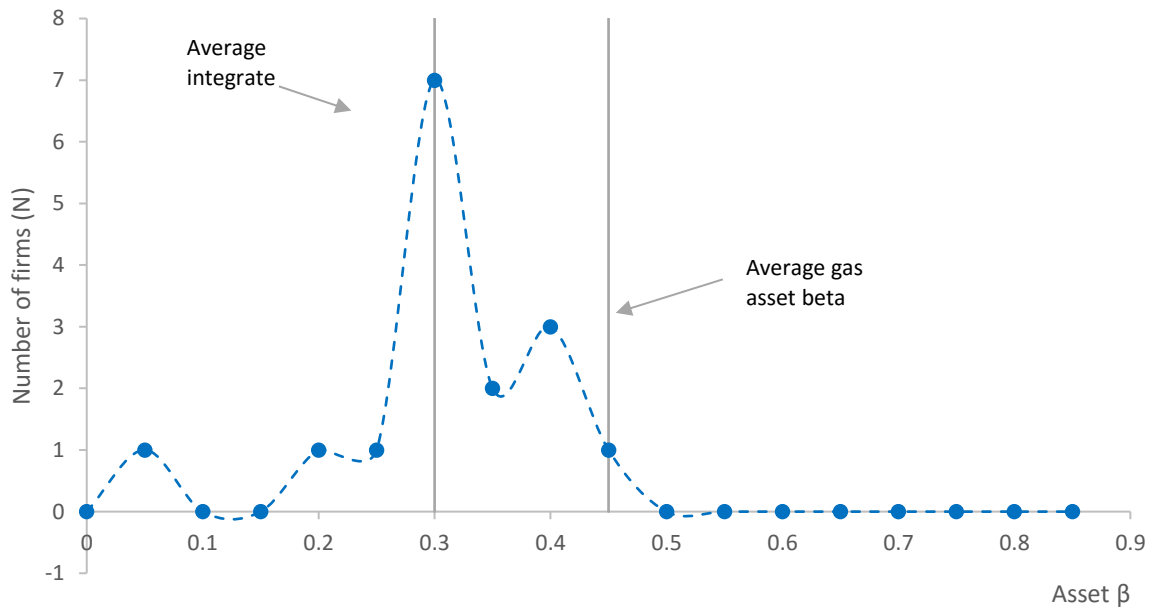


Figure 18: Distribution of the Commission's integrated firm with weekly estimates

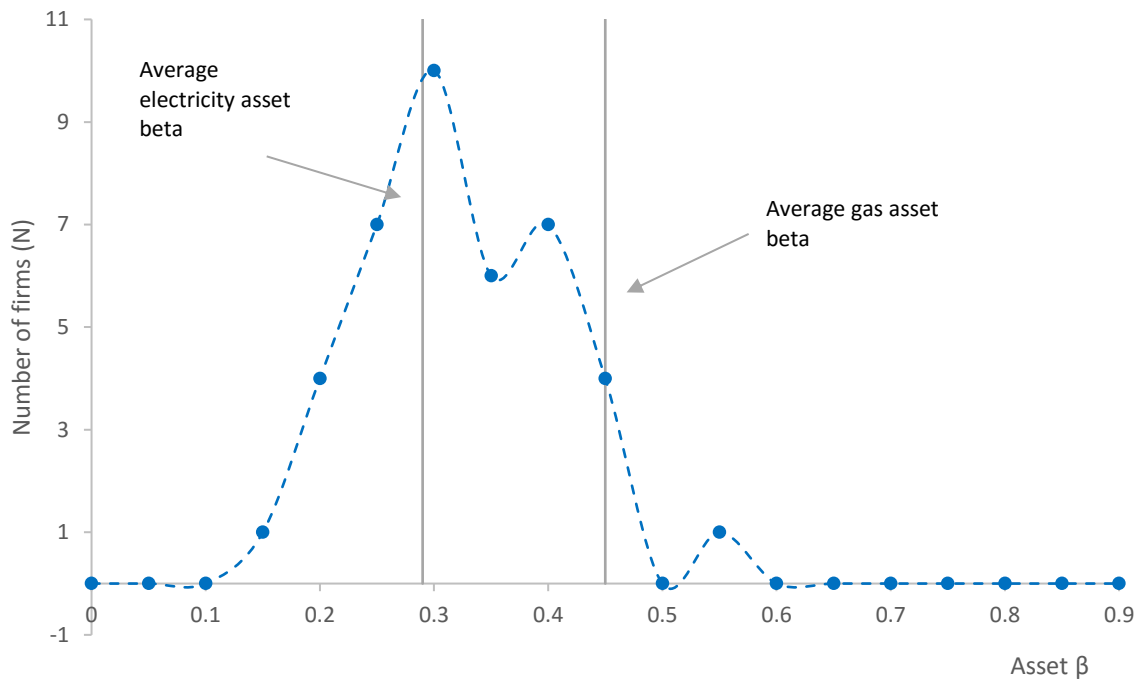


Figure 19: Distribution of the Commission's gas firm with weekly estimates

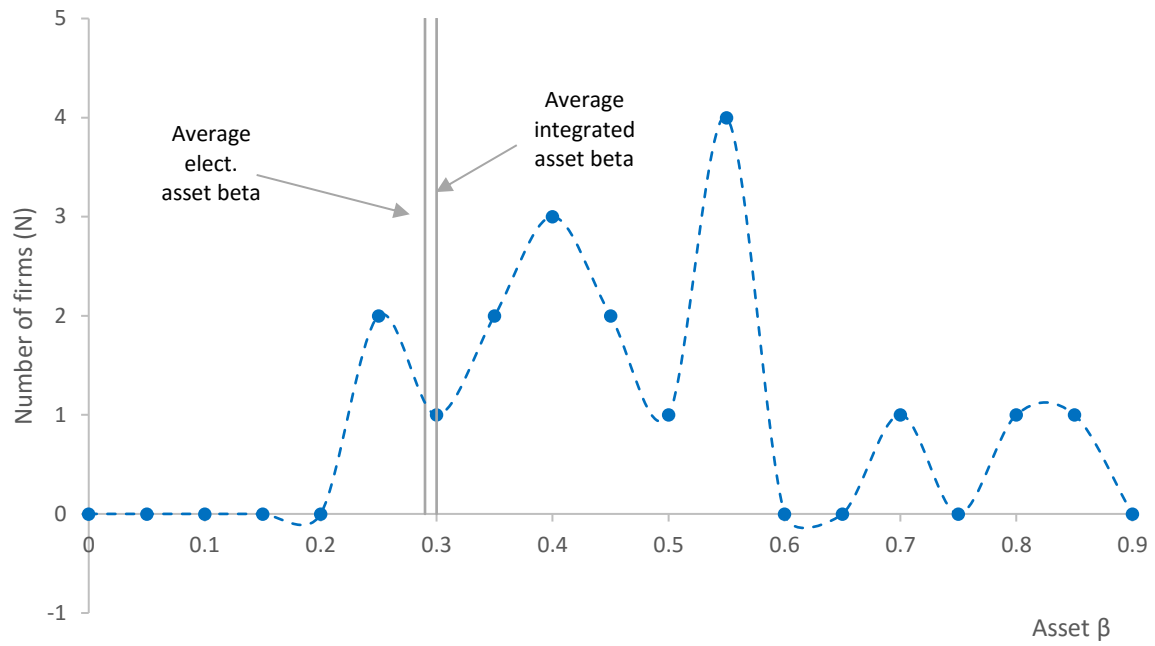
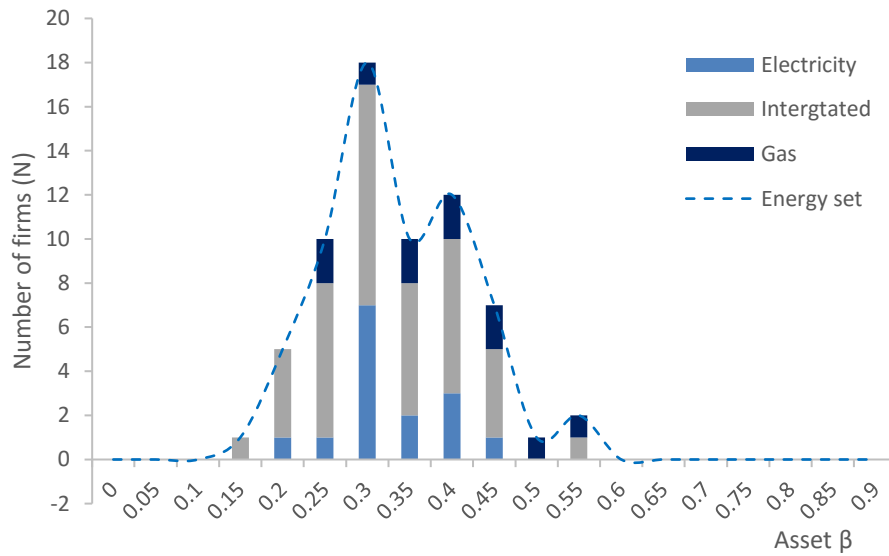


Figure 20: Refined weekly beta distribution



Appendix 3: Filtering process - firms excluded at each step

Table 11: Set constituents after filtering steps

N	Commission's set	Non-commodity exposed firms	Regulated/related firms - including non-transport functions	"Pure-Play" distribution/transmission firms
1	AES Corp	AES Corp		
2	AGL Resources Inc	AGL Resources Inc	AGL Resources Inc	
3	ALLETE Inc	ALLETE Inc	ALLETE Inc	
4	Alliant Energy Corp	Alliant Energy Corp	Alliant Energy Corp	
5	Ameren Corp	Ameren Corp	Ameren Corp	
6	American Electric Power Co	American Electric Power Co		
7	APA Group	APA Group		
8	Atmos Energy Corp			
9	AusNet Services	AusNet Services	AusNet Services	AusNet Services
10	Avista Corp	Avista Corp	Avista Corp	
11	Black Hills Corp			
12	Boardwalk Pipeline Prtnrs-LP			
13	CenterPoint Energy Inc			
14	Chesapeake Utilities Corp			
15	Cleco Corporate Holdings LLC	Cleco Corporate Holdings LLC	Cleco Corporate Holdings LLC	
16	CMS Energy Corp	CMS Energy Corp	CMS Energy Corp	
17	Consolidated Edison Inc	Consolidated Edison Inc	Consolidated Edison Inc	
18	Delta Natural Gas Co Inc			
19	Dominion Resources Inc			
20	DTE Energy Co			
21	DUET Group	DUET Group	DUET Group	DUET Group
22	Duke Energy Corp	Duke Energy Corp	Duke Energy Corp	
23	Edison International	Edison International	Edison International	
24	El Paso Electric Co	El Paso Electric Co	El Paso Electric Co	
25	Empire District Electric Co	Empire District Electric Co	Empire District Electric Co	
26	ENBRIDGE ENERGY PRTRNS -LP			
27	Entergy Corp	Entergy Corp	Entergy Corp	
28	Eversource Energy	Eversource Energy	Eversource Energy	
29	Exelon Corp	Exelon Corp		
30	FirstEnergy Corp	FirstEnergy Corp		
31	Great Plains Energy Inc	Great Plains Energy Inc	Great Plains Energy Inc	
32	Hawaiian Electric Inds	Hawaiian Electric Inds	Hawaiian Electric Inds	
33	IDACORP Inc	IDACORP Inc	IDACORP Inc	
34	ITC Holdings Corp	ITC Holdings Corp	ITC Holdings Corp	ITC Holdings Corp
35	Jersey Electricity PLC	Jersey Electricity PLC		
36	Kinder Morgan Inc			
37	MGE Energy Inc	MGE Energy Inc	MGE Energy Inc	
38	National Fuel Gas Co			
39	National Grid	National Grid	National Grid	
40	New Jersey Resources Corp	NextEra Energy Inc		
41	NextEra Energy Inc			
42	NiSource Inc	NiSource Inc	NiSource Inc	
43	Northwest Natural Gas Co	Northwest Natural Gas Co	Northwest Natural Gas Co	Northwest Natural Gas Co
44	NorthWestern Corp			
45	OGE Energy Corp			
46	ONEOK Inc			
47	Pepco Holdings inc	Pepco Holdings inc	Pepco Holdings inc	
48	PG&E Corp	PG&E Corp	PG&E Corp	
49	Piedmont Natural Gas Co			
50	Pinnacle West Capital Corp	Pinnacle West Capital Corp	Pinnacle West Capital Corp	
51	PNM Resources Inc	PNM Resources Inc	PNM Resources Inc	
52	PPL Corp	PPL Corp		
53	PUBLIC SERVICE ENTRP GRP INC	PUBLIC SERVICE ENTRP GRP INC		
54	Questar Corp			
55	SCANA Corp	SCANA Corp	SCANA Corp	
56	SCOTTISH & SOUTHERN ENERGY	SCOTTISH & SOUTHERN ENERGY		
57	Sempra Energy	Sempra Energy	Sempra Energy	
58	South Jersey Industries Inc	South Jersey Industries Inc		
59	Southern Co	Southern Co	Southern Co	
60	Southwest Gas Corp	Southwest Gas Corp		
61	Spark Infr Group	Spark Infr Group	Spark Infr Group	Spark Infr Group
62	Spectra Energy Corp			
63	Spire Inc	Spire Inc	Spire Inc	Spire Inc
64	TC PipeLines LP	TC PipeLines LP		
65	TECO Energy Inc	TECO Energy Inc	TECO Energy Inc	
66	UGI Corp			
67	Unitil Corp	Unitil Corp	Unitil Corp	Unitil Corp
68	Vector Ltd	Vector Ltd	Vector Ltd	Vector Ltd
69	Vectren Corp	Vectren Corp		
70	WEC Energy Group Inc	WEC Energy Group Inc	WEC Energy Group Inc	
71	Westar Energy Inc	Westar Energy Inc	Westar Energy Inc	
72	WGL Holdings Inc	WGL Holdings Inc		
73	Williams Partners LP			
74	Xcel Energy Inc	Xcel Energy Inc	Xcel Energy Inc	

Appendix 4: Filtering process sensitivity

To analyse the sensitivity of misclassification of a firm at each step of the filtering process we estimate the effect on the average betas, leverage and sample size if 10% of the companies were misclassified at each step. We take a prudent approach and assume that the firms misclassified are those firms which have the highest betas in the previous set. Table 12 below presents the results of the sensitivity analysis. It shows that even on our conservative assumptions, there are still significant changes in the estimated average betas from the Commission’s recommended 0.34.

Table 12: Effect of 10% of the firms being misclassified

	Sample set	Asset Beta		Average leverage	Number of firms in sample (N)
		Weekly	4-Weekly		
	Commission's energy set	0.34	0.3	41%	74
Step 1	Remove firms with unregulated gathering, processing, liquids and commodity exposures	0.31	0.28	41%	56
Step 2	Remove firms with other large unrelated/unregulated business segments	0.28	0.24	42%	40
Step 3	Remove firms with significant business segments that are not related to transmission or distribution	0.28	0.25	43%	11