



COMPETITION
ECONOMISTS
GROUP

Asset beta for gas transport businesses

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1 Overview

1. We have been engaged by the Australian Pipeline and Gas Association (APGA) to provide our estimate of the asset beta relevant for gas transport businesses. Based on the analysis in this report, we estimate the relevant asset beta for gas transport businesses to range between 0.47 and 0.61.
2. Our estimate is based on adopting the comparator set and methodology used by the New Zealand Commerce Commission (NZCC) for gas transport businesses.¹ We note that our estimated range of asset betas is significantly higher than the 0.24 asset beta adopted by the AER in the 2018 Rate of Return Instrument (RoRI) and as reflected in its recent determination for Jemena Gas Networks.²
3. The following table summarises our results. We provide asset beta estimates over the most recent 5-, 10- and 15-year periods, ending 30 June 2021.³ We provide asset beta estimates for different comparator samples based on whether the stock was trading in the relevant period.

Table 1-1: Summary of estimated asset beta

	15-year asset beta	10-year asset beta	5-year asset beta
Currently listed comparators at 30 June 2021	0.471	0.484	0.525
Whole sample (at least 1 year trading in the relevant period)	0.507	0.533	0.606
Whole sample (at least 2 years trading in the relevant period)	0.484	0.499	0.538
Weighted using number of years trading in the relevant period	0.484	0.502	0.544

CEG Analysis using Bloomberg data, period ending 30 June 2021

4. The results suggest that the relevant asset beta has been increasing over time. The following figure shows the change in the 5-year asset beta from 30 June 2016 to 30 June 2021 for each firm trading in this period (firms trading for less than the full five

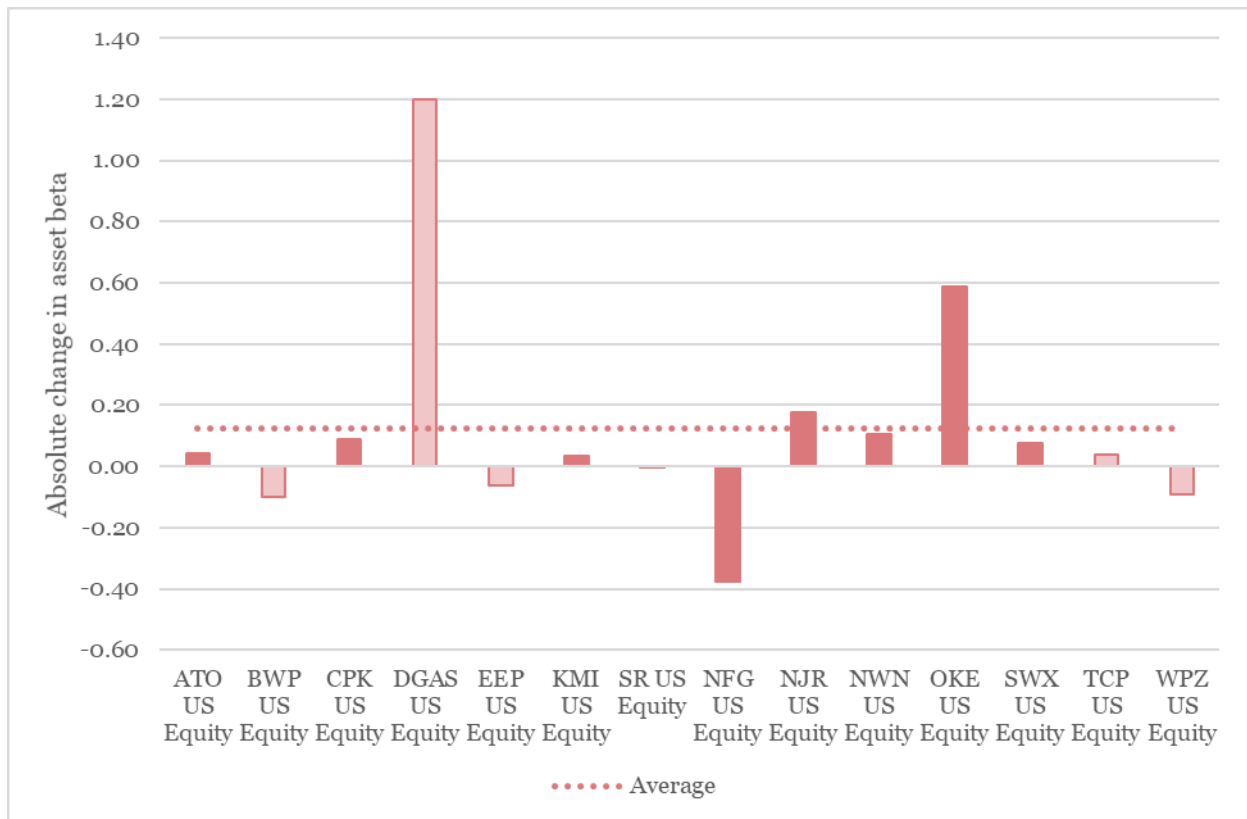
¹ NZCC (2016), Input methodologies review decisions Topic paper 4: Cost of capital issues, 20 January 2016.

² AER applied a re-levered equity beta of 0.6 using a gearing of 60%. The asset beta can be obtained using the equation $0.6 \times (1-60\%)$. See Table 3-1 in AER (2020), "FINAL DECISION Jemena Gas Networks (NSW) Ltd Access Arrangement 2020 to 2025 Attachment 3 Rate of return" June 2020

³ We estimate asset betas for firms in the sample for each 5-year window (i.e., the 5 years to 30 June 2021, the 5 years to 30 June 2016 and the 5 years to 30 June 2011). The 10-year asset beta is the average of the estimated beta for the two most recent 5 year windows. The 15-year asset beta is the average of the estimated beta for the three most recent 5 year windows.

most recent years are lightly shaded). It shows an average increase in asset beta of 0.08 for firms trading for the full period (these firms are shown in dark pink).

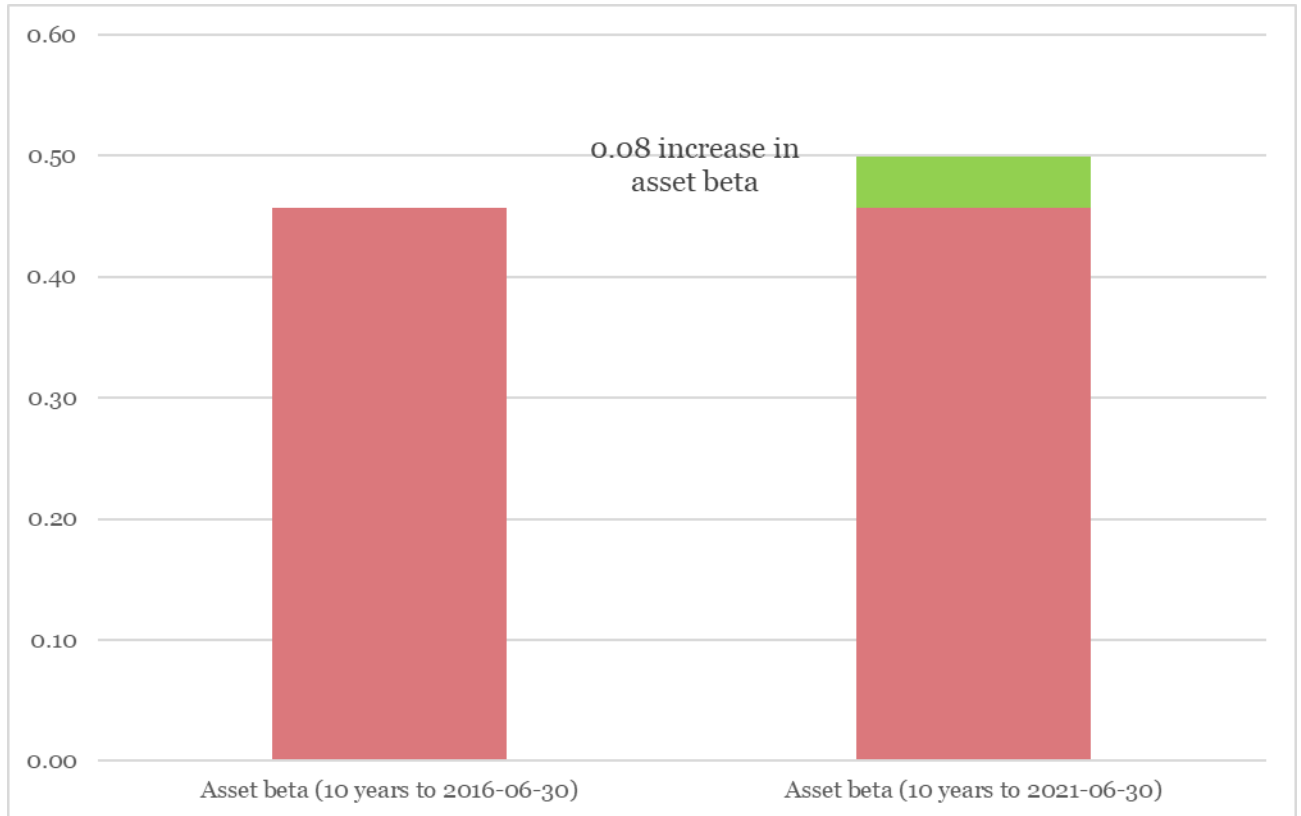
Figure 1-1: Change in 5-year asset betas, 2016 to 2021



Source: CEG analysis using Bloomberg data

5. We also observe a 0.08 increase in the 10 year asset beta from the 10 year period ending in 2016 to 2021 - as shown in Figure 1-2 below.

Figure 1-2: Change in average 10-year asset betas, 2016 to 2021



Source: CEG analysis using Bloomberg data. The 10 year average is calculated using the average of the two five year estimation windows. Firms with at least one year of observation in the 5 year window are included in calculating the average asset beta of the 5 year window.

6. Applying the same 0.08 increase on the asset beta adopted by the AER, would implying an increase in the asset beta from 0.24 to 0.32.

1.1.1 Contrast to Economic Insights betas based on 2016 data

7. We have been provided with a copy of an Economic Insights (2021) report for the AER which calculates an asset beta for gas transport businesses.⁴ Economic Insights (EI) analysis indicates an asset beta of 0.32. We observe that this estimate is higher than the asset beta applied by the AER in 2018 RoRI.
8. EI uses the comparator sample from CEG (2013).⁵ The CEG sample from 2013 was constructed based on the comparator sample in the NZCC 2010 cost of capital

⁴ Economic Insights (2021), “Methodological issues in estimating the equity beta for Australian network energy businesses”, 30 June 2021

⁵ CEG (2013), “Information on equity beta from US companies”, June 2013.



decision⁶ while the sample in this report is based on the NZCC 2016 decision. EI, using the earlier sample, do not take into consideration additional gas transport businesses that NZCC has included in its 2016 decision on cost of capital.

9. In addition, we note that EI appears not to have estimated its own asset betas. Rather than estimating asset betas to take into account the most recent data, it appears EI have relied on the equity betas estimated in 2016 by Frontier (2016).⁷
10. We consider Economic Insights (2021) asset beta to be outdated and less reliable compared to the estimates in this report.

⁶ Para 30 in CEG (2013).

⁷ Frontier (2016), “Estimating the equity beta for the benchmark efficient entity,” January 2016.

2 Introduction

11. CEG has been retained by the Australian Pipelines and Gas Association (AGPA) to advise on the level and trend in asset betas for gas pipeline businesses internationally. The structure of this report is as follows:
 - Section 3.1 sets out the comparator sample we have relied on;
 - Section 3.2 describes our method for estimating asset betas;
 - Section 3.3 presents our results;
 - Section 3.4 compares our results to asset betas for gas pipelines reported in a recent Economic Insights report;
 - Appendix A describes the trading periods for firms in the comparator set.

3 Beta for gas transport businesses

12. In this chapter we set out estimated asset betas for gas transport businesses. We begin by setting out the comparator set we adopt and our methodology. We then present our estimates.

3.1 Comparator set of gas transport businesses

13. The first step in estimating asset beta is to identify a set of comparators that share similar risks. Comparable firms ought to have similar exposure to market risks. Gas transport business may face a different set of risks from electricity transport businesses due to the different income elasticity of demand for gas compared to electricity. We note the NZCC allowed an uplift to gas asset betas for this reason.⁸ This is consistent with the academic literature.⁹
14. It may be argued that the best comparator for Australian gas utilities is Australian gas transport businesses. However, there is currently only one listed Australian business whose primary operation is gas transport, APA Group. Estimating asset beta based on a single firm is statistically unreliable and APA Group has additional non-gas related business interests such as wind farms, solar farms and electricity interconnectors.¹⁰ We therefore utilise international gas transport businesses, identified by the NZCC, as the relevant set of comparators for estimating a gas transport asset beta.¹¹
15. The comparators used in the NZCC 2016 decision is an update of the comparator set used in its 2010 decision.¹²

⁸ NZCC (2016), Input methodologies review decisions Topic paper 4: Cost of capital issues, 20 January 2016.

⁹

¹⁰ See page 68 in Economic Insights (2021).

¹¹ NZCC (2016), Input methodologies review decisions Topic paper 4: Cost of capital issues, 20 January 2016.

¹² See Attachment A in NZCC (2016).

3.2 Methodology for estimating asset beta

16. We adopt the methodology used by the NZCC to estimate asset beta.¹³ For each stock we estimate two sets of asset betas. The first using weekly returns and the second using 4 weekly return frequencies.
17. For weekly frequency, five reference points are adopted, one for each weekday. For example, the first reference point for a weekly return is a beta for week ended Monday, based on the returns from the previous Monday. The next reference point is Tuesday, and so on. The weekly asset beta is then calculated as the average of the five asset betas estimated using each of the five reference points.
18. For the 4-weekly frequency, 20 reference points are adopted for each of the weekdays over a four-week period. The average asset beta is then calculated using the 20 estimated asset betas.
19. The two average asset betas, weekly and 4-weekly, are further averaged to obtain a single asset beta estimate for the firm. Daily returns are not given significant weight by the NZCC. In the opinion of the NZCC, daily return can be distorted due to liquidity issues:¹⁴

Daily asset beta estimates can be distorted by low liquidity stocks. To calculate an accurate asset beta estimate, it is important to measure contemporaneous changes in the individual firm's share price and the relevant market index. The shorter the estimation interval used (e.g. daily), the more difficult it is to capture a contemporaneous link, particularly where shares are infrequently traded.

20. The NZCC estimates of asset beta are based on 5-year windows with the simple average across the firms used to determine the average asset beta of each 5 year window. To estimate a longer period asset beta, for example 10-year asset beta, the average of two 5 year windows are calculated. For example, to examine the asset beta for the 5 years from 1 July 2011 to 30 June 2021 (10 years), we estimate two 5-year asset betas from 1 July 2011 to 30 June 2016 and from 1 July 2016 to 30 June 2021. We then take the average across the two five-year windows.
21. In this report, we present the 15-, 10- and 5-year asset betas for the period ending 30 June 2021.

¹³ See Chapter 4 in NZCC (2016).

¹⁴ Para 306.1 in NZCC (2016), Input methodologies review decisions Topic paper 4: Cost of capital issues, 20 December 2016

3.3 Presentation of results

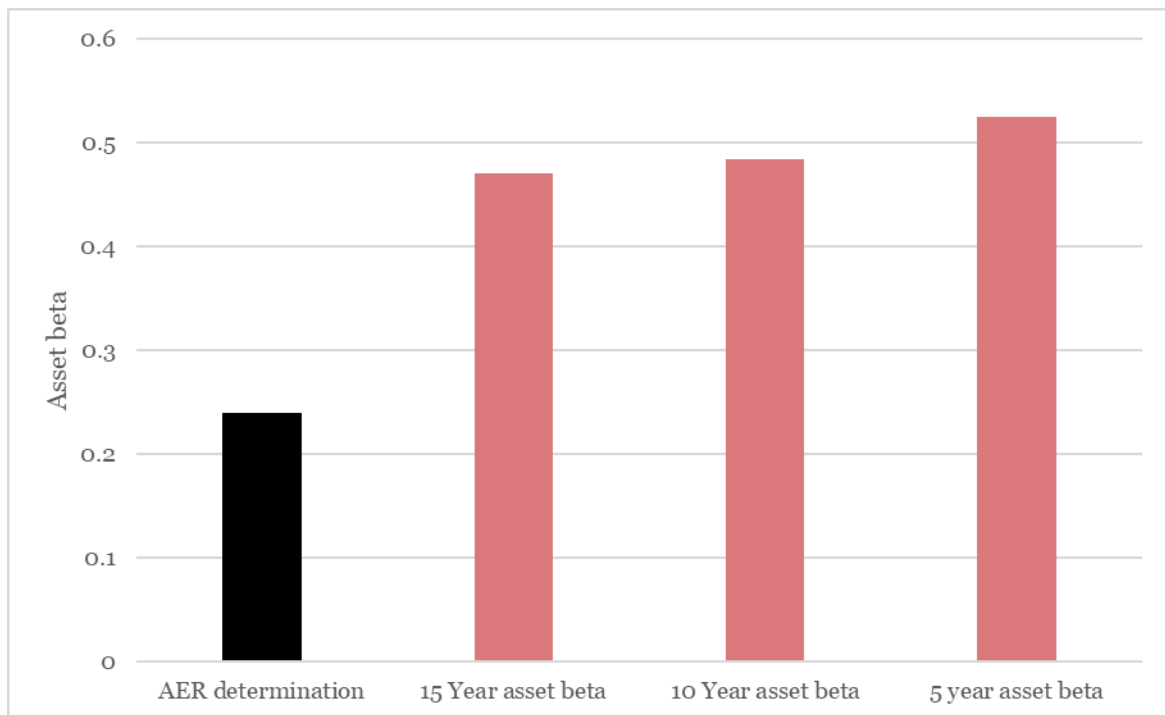
22. This section summarises our asset beta estimates. We first present the results for the firms that are trading at 30 June 2021. We then present results for the full sample. We note that around half the comparator sample trading at 30 June 2016 are no longer trading (see Appendix A for detail).

3.3.1 Results for firms trading at 30 June 2021

23. There are nine gas transport businesses in the NZCC comparator set listed and trading as at 30 June 2021. We first examine the asset beta of these nine firms.

24. The average estimated betas for currently listed gas transport businesses are shown in Figure 3-1. The 15-year asset beta for these nine firms is 0.47. The 10-year asset beta is slightly higher at 0.48. The 5-year asset beta is 0.52.

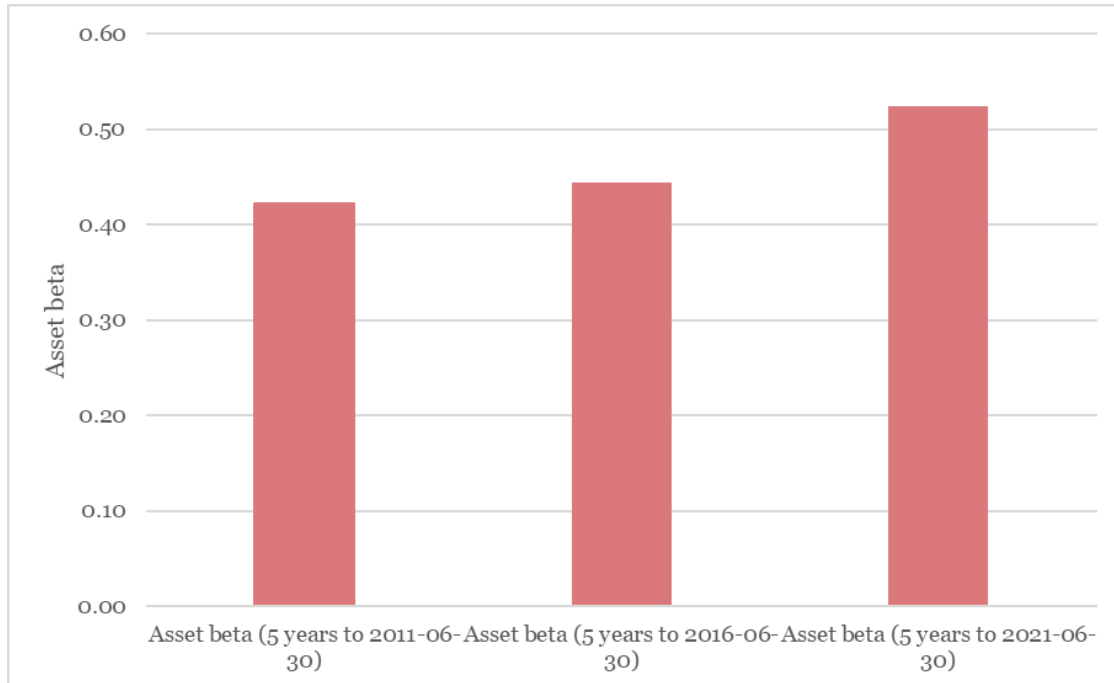
Figure 3-1: Average asset beta, firms trading 30 June 2021



Source: CEG analysis using Bloomberg data. KMI US Equity became publicly traded in 2011, so it is not dropped from the sample.

25. The higher asset beta for the shorter periods is due to the increase in asset beta in the most recent 5 years. The average asset beta of these nine firms has increased from 0.42 in the 5 years from 1 July 2006 to 30 June 2011 to 0.52 in the 5 years from 1 July 2016 to 30 June 2021. This is shown in Figure 3-2.

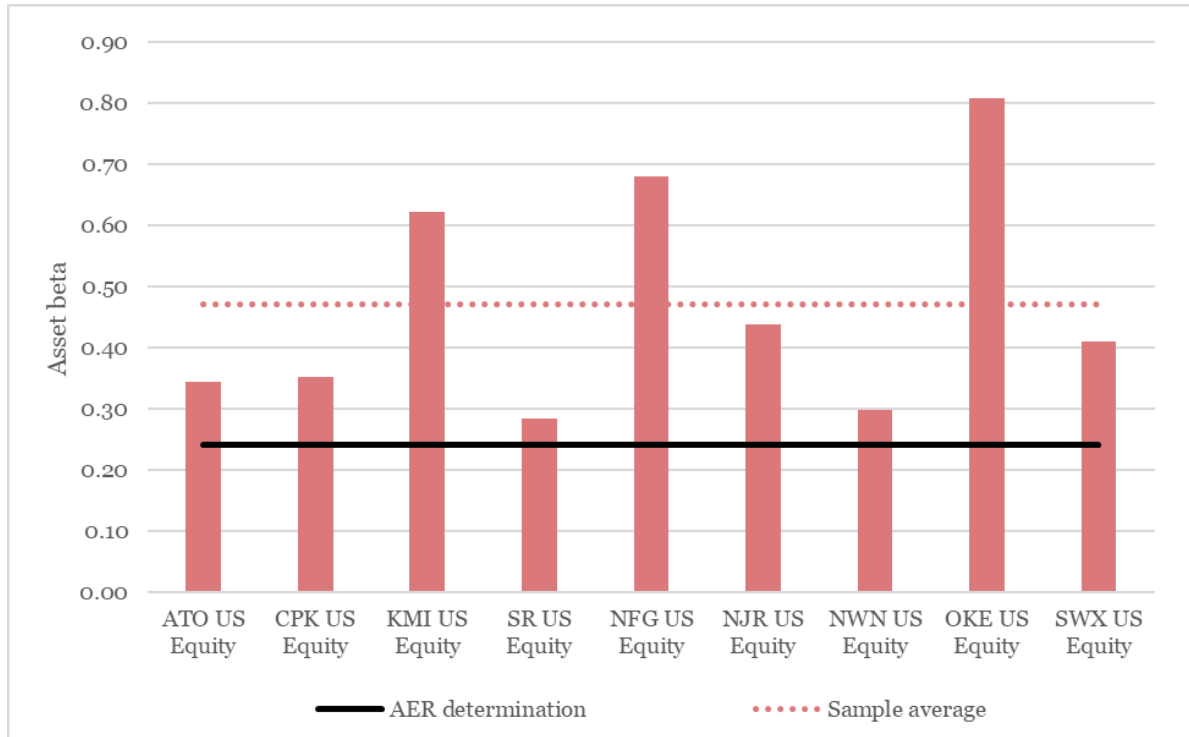
Figure 3-2: Increase in asset beta, firms trading at 30 June 2021



Source: CEG analysis using Bloomberg data. KMI US Equity became publicly traded in 2011, so it is not dropped for the 5 year window ending in June 2011.

26. We observe that the 15 year asset betas of each of the nine firms is higher than the AER's recent determination of 0.24. This is shown in Figure 3-3. The same result holds for both 10 year asset betas and 5 year asset betas.

Figure 3-3: 15-year asset beta, firms trading at 30 June 2021



Source: CEG analysis using Bloomberg data. Average of the three 5-year periods ending in June 2011, 2016 and 2021

3.3.2 Results for full sample

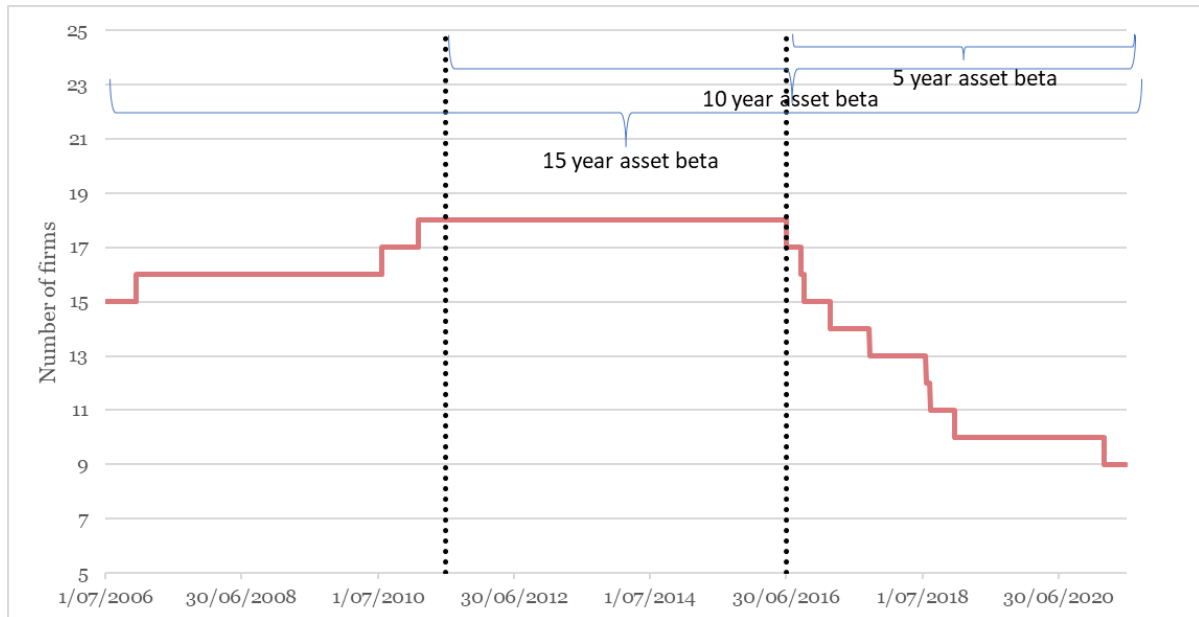
27. Looking only at firms that are trading at the end of the period risks losing information on firms that were trading earlier in the sample period.¹⁵ Equally, if a firm is only trading for a fraction of a 5-year period, then its asset beta may be unreliable due to the small number of observations.¹⁶
28. In the following analysis we expand to the full sample of firms that were traded in the 15-year period. The figure below shows the number of firms trading at each point in time. The black dotted lines show how the 15-year asset beta is obtained from the average of three 5 year estimation windows and the 10 year asset beta is obtained from the average of two 5 year estimation windows.

¹⁵ For example, if a stock is traded in 14 of the 15 year sample, it may be unreasonable to exclude that firm's information.

¹⁶ For example, for an asset beta estimated using monthly returns, 6 months of trading implies 5 observations (an observation is lost when the price is converted to returns) for each reference point. Regressions using only 5 observations may be statistically unreliable.

29. The figure shows a large number of firms delisted in the period from 30 June 2016 to 30 June 2018. We test the effect of excluding firms that became delisted from the 5-year window from 1 July 2016 to 30 June 2021. We do this by adopting a cut-off on the minimum number of observations required in a 5-year window.

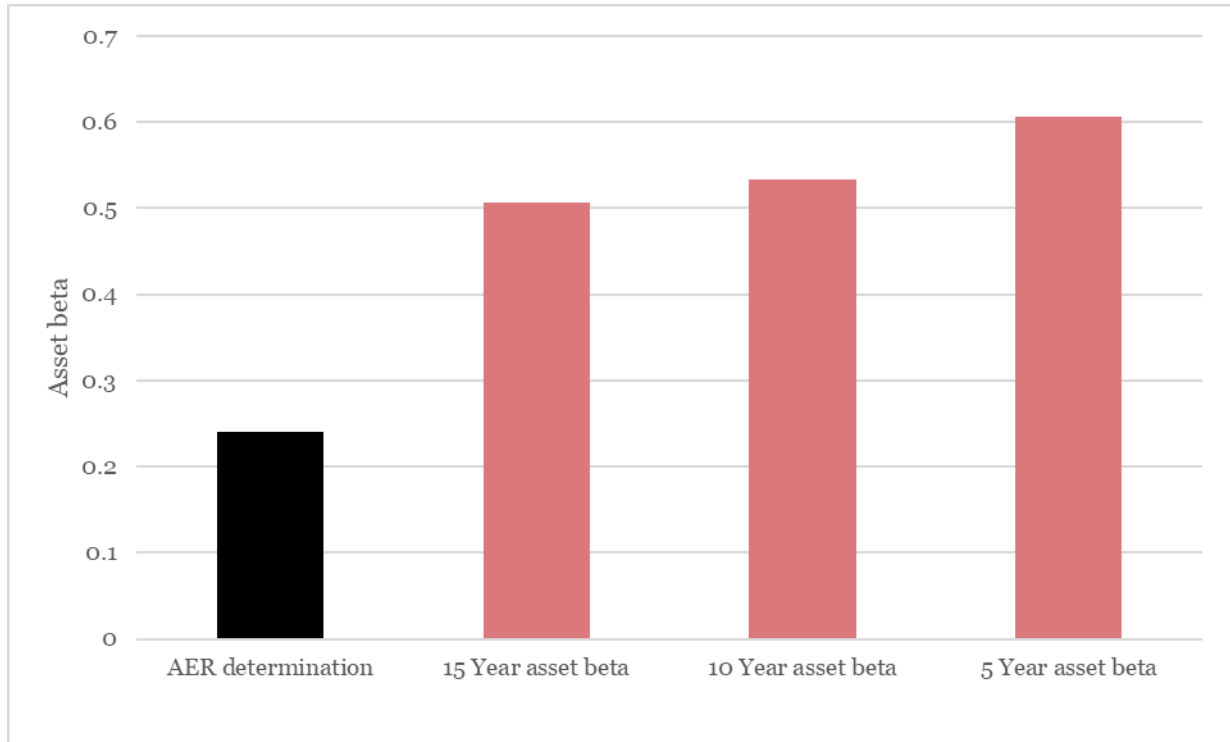
Figure 3-4: Number of trading gas transport businesses in NZCC sample



Source: CEG analysis using Bloomberg data.

30. The result using the whole sample with a cut-off of at least one year of trading in a 5-year window is shown in Figure 3-5. The 15-year asset beta for these 5 firms is 0.51. The 10-year asset beta is slightly higher at 0.53. The 5-year asset beta is 0.61.

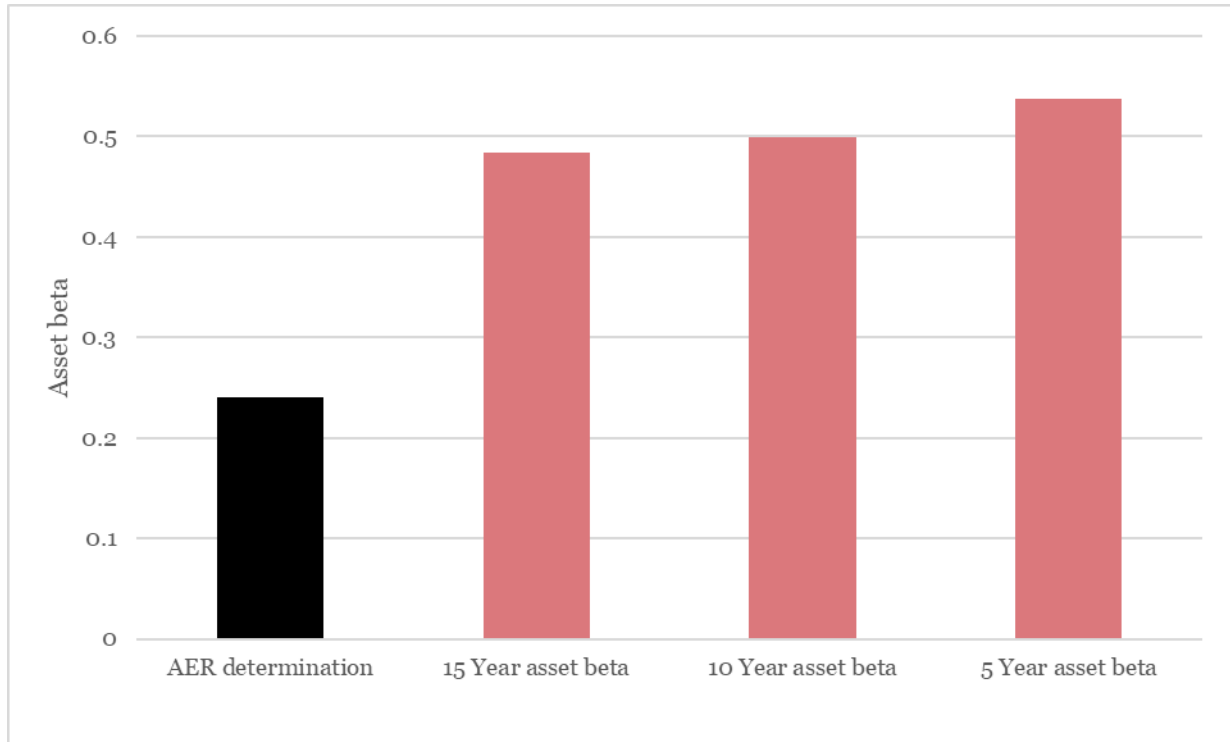
Figure 3-5: Whole sample (at least 1 year trading in the 5-year window)



Source: CEG analysis using Bloomberg data.

31. When two years of trading data are required. The 15-year asset beta for these 5 firms is 0.48. The 10-year asset beta is slightly higher at 0.50. The 5-year asset beta is 0.54. This is shown in Figure 3-6.

Figure 3-6: Whole sample (at least 2 years trading in the 5-year window)

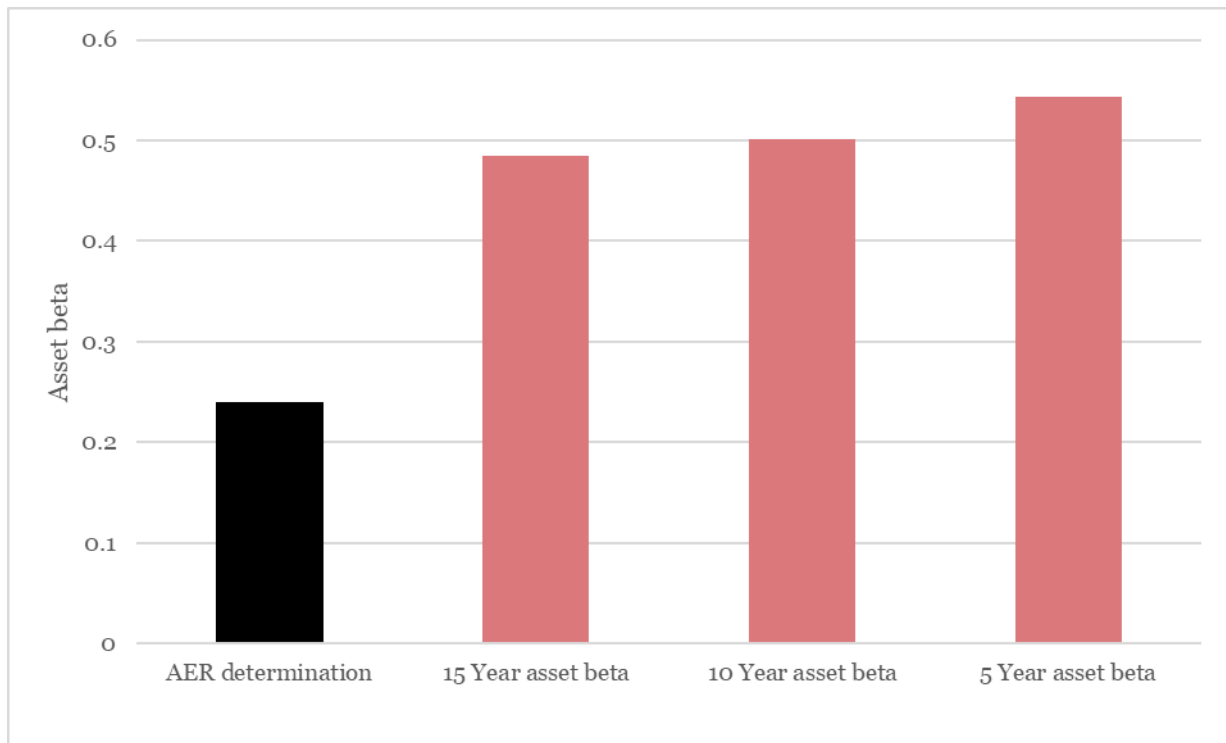


Source: CEG analysis using Bloomberg data.

3.3.2.1 Weighted average

32. As an alternative to removing firms based on a cut-off for the number of years trading in each 5 year window, we can calculate a weighted average using the number of years trading as weights. Firms with a greater number of years trading will have a higher weight. For example, a firm that is trading for all five years in a 5-year window has a weight of 5. A firm that is only trading for 6 months will only have a weight of 0.5.
33. The result is shown in Figure 3-7. Using a weighted average does not materially change the results from using only firms trading at 30 June 2021. The 15-year asset beta for these 5 firms is 0.48. The 10-year asset beta is slightly higher at 0.50. The 5-year asset beta is 0.54.

Figure 3-7: Weighted average asset beta (weights based on the number of observations)



Source: CEG analysis using Bloomberg data.

3.4 Review Economic Insights (2021) estimates

34. We have been provided with a report by Economic Insights (EI).¹⁷ The report was undertaken for the AER.

3.4.1 EI's asset beta is above the asset beta determined by the AER

35. EI do not report asset betas for firms in its sample, only average equity betas by regulation type and for its full sample. We derive its asset betas using a gearing of 45% which EI says it uses to re-lever its asset betas to provide an equity beta estimates. Based on this we derive an asset beta of 0.32 for the average between weekly and monthly data.

¹⁷¹⁷ Economic Insights (2021), "Methodological issues in estimating the equity beta for Australian network energy businesses", 30 June 2021



Table 3-1: Economic Insights calculated asset beta

	Re-levered equity beta	Asset beta (45% gearing)
Monthly data	0.51	0.28
Weekly data	0.67	0.37
Average	0.59	0.32

Source: *Economic Insights (2021)*

36. EI’s analysis therefore implies an asset beta that is higher than the asset beta applied by the AER in its 2018 RoRI and in its recent determination for Jemena Gas Networks.

3.4.2 EI’s sample is outdated

37. EI indicates that its sample of nine gas transport businesses are from the comparators used in CEG (2013). EI does not identify which nine gas transport businesses it used.¹⁸ We assume that EI adopted the following criteria described in CEG (2013), from which we can isolate nine firms:

- Classified as gas utility instead of power based on SNL classification;
- Regulated assets make up at least 50% of total assets;
- Asset betas that could be reliably estimated in CEG (2013).

38. Using these criteria, four of the nine firms in this sample were subject to incentive based regulation, one is non-incentive-based regulation and four are both. This matches EI’s description of its sample in its Table 6.6. The nine firms are listed below.

¹⁸ According to EI (2021), the firms are reported in Appendix C, “*The data used here is listed in Appendix C, Table C.1.*”. However, we are unable to find Table C.1 in Appendix C as Appendix only contains the declaration.



Table 3-2: Economic Insights sample

Regulation type	Name
Incentive	Spire Inc (Laclede)
	Northwest Natural Gas Co
	South Jersey Industries Inc
	New Jersey Resources Corp
Non-Incentive	Piedmont Natural Gas Co Inc
Both	WGL Holdings Inc
	Atmos Energy Corp
	Southwest Gas Corp
	AGL Resources Inc

Source: CEG (2013), *Economic Insights* (2021)

39. The CEG (2013) sample, which the EI sample is based on, was constructed based on the comparator sample in the NZCC 2010 cost of capital decision.¹⁹ By using the same sample, EI does not take into consideration additional gas transport businesses that NZCC has included in its 2016 decision on cost of capital.²⁰

3.4.3 The estimated asset beta from EI's sample has increased

40. EI does not report how the equity beta in its Table 6.9 are estimated. We observed that EI's estimates match the equity betas estimated by Frontier (2016) based on the average for each regulation type and the standard error of the average.
41. Frontier (2016) estimates are shown in Table 3-3 and EI results are shown in Figure 3-8. One example of the correspondence between the two sets of results is Frontier (2016) estimated an average equity beta of 0.38 for incentive-based gas transport businesses using monthly data. EI also reports an equity beta of 0.38.

¹⁹ Para 30 in CEG (2013).

²⁰ See Attachment A in NZCC (2016).

Table 3-3: Equity beta estimated by Frontier (2016)

Regulation type	Name	Monthly equity beta	Weekly equity beta
Incentive	Spire Inc (Laclede)	0.24	0.52
	Northwest Natural Gas Co	0.39	0.56
	South Jersey Industries Inc	0.46	0.62
	New Jersey Resources Corp	0.43	0.57
	Average	0.38	0.57
	Standard error	0.05	0.02
Non-Incentive	Piedmont Natural Gas Co Inc	0.54	0.7
	Average	0.54	0.70
Both	WGL Holdings Inc	0.44	0.58
	Atmos Energy Corp	0.53	0.61
	Southwest Gas Corp	0.75	0.74
	AGL Resources Inc	0.38	0.58
	Average	0.53	0.63
	Standard error	0.08	0.04

Source: Frontier (2016), Economic Insights (2021), CEG (2013)

Figure 3-8: Equity beta reported by Economic Insights (2021)

Table 6.9: Beta by Electricity, Gas and Form of Regulation*

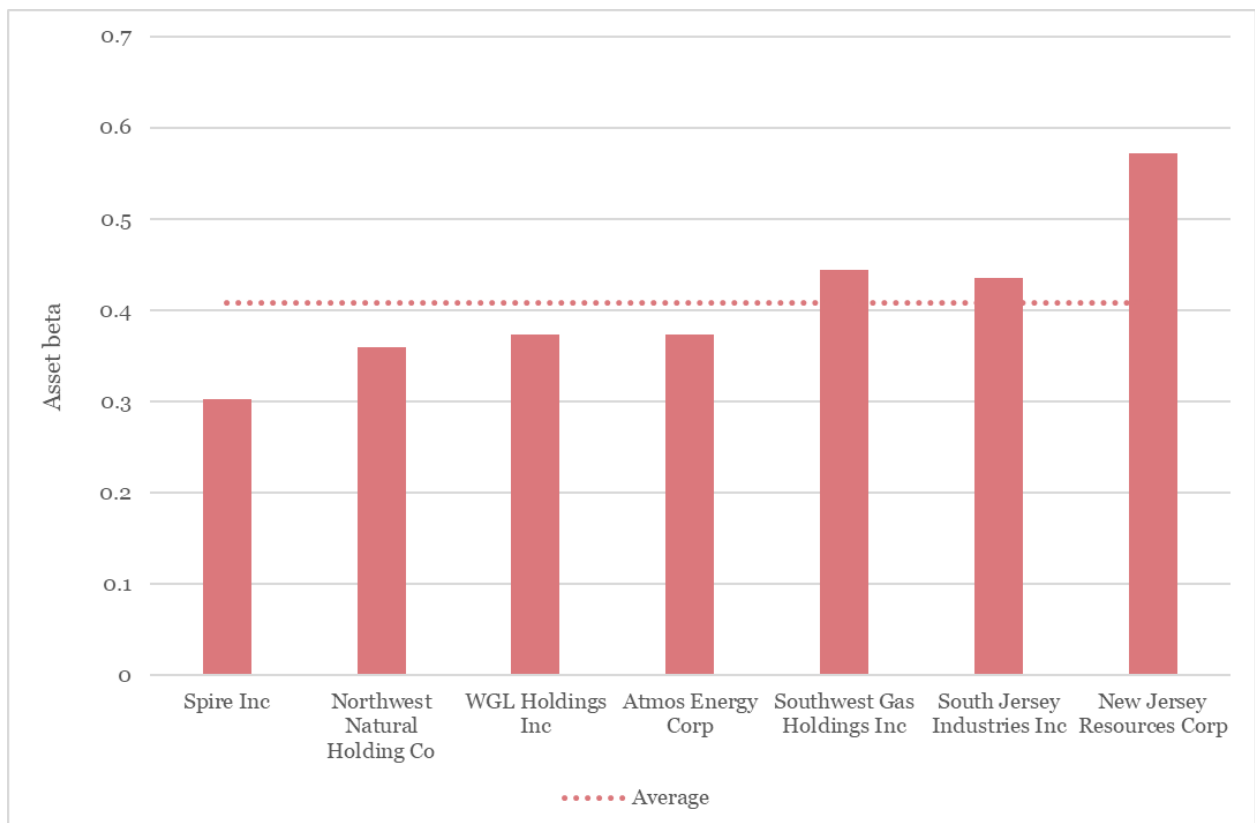
Form of regulation	Electric utility	Gas utility	Total
A. Monthly data			
Incentive	0.60 (0.04)	0.38 (0.05)	0.56 (0.04)
Non-incentive	0.58 (0.05)	0.54 .	0.58 (0.04)
Both	0.56 (0.05)	0.53 (0.08)	0.55 (0.04)
NA	0.56 (0.08)	. .	0.56 (0.08)
Total sample	0.58 (0.03)	0.46 (0.05)	0.56 (0.02)
B. Weekly data			
Incentive	0.66 (0.03)	0.57 (0.02)	0.64 (0.02)
Non-incentive	0.64 (0.04)	0.7 .	0.65 (0.04)
Both	0.63 (0.04)	0.63 (0.04)	0.63 (0.03)
NA	0.61 (0.02)	. .	0.61 (0.02)
Total sample	0.64 (0.02)	0.61 (0.02)	0.64 (0.02)

* Standard error of mean in parentheses.

Data source: CEG (2013); Frontier (2016).

42. Therefore, we conclude that EI, rather than estimating an updated asset beta for 2021, has relied on the equity beta estimated by Frontier (2016) in 2016. In Frontier (2016), the asset beta is estimated based on a 10-year period ending in December 2015.²¹
43. The 10-year asset beta ending in December 2015 does not account for more recent data and cannot account for changes in the business risks associated with gas transport businesses in recent years. This is illustrated in Figure 3-9. Figure 3-9 shows the asset beta of EI's sample²² in the 5-year period ending in 30 June 2021. It shows that their average asset beta (dotted line) is above 0.40. This contrasts with EI's asset beta estimate of 0.32.

Figure 3-9: Updated 5-year asset beta, Economic Insights sample



Source: CEG analysis using Bloomberg data. Piedmont Natural Gas and Southern Gas are dropped because they have less than 4 months of observation.

²¹ Para 32 in Frontier (2016).

²² Piedmont Natural Gas and Southern Gas are no longer traded so are dropped because they have less than 4 months of observations.



44. Given the historical nature of the estimates and the fact that the sample has not been updated to take into consideration the additions made by the NZCC to its comparator set, we consider that the gas asset betas reported by EI are less reliable than those reported in this report.

Appendix A Comparator set trading periods

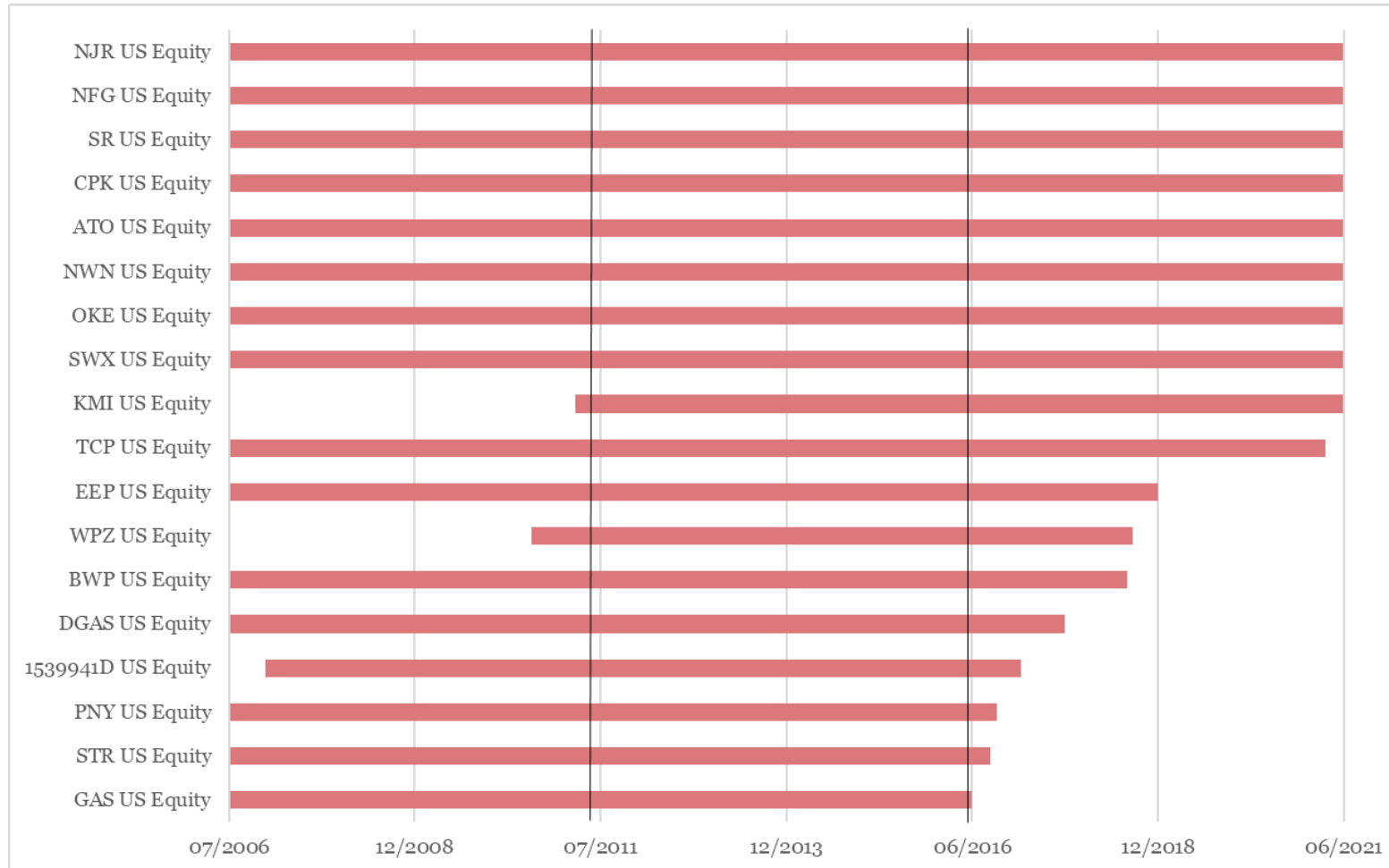
Table 3-4: NZCC list of gas transport businesses

Bloomberg Ticker	Name	Still trading at 30 June 2021
ATO US Equity	Atmos Energy Corp	Yes
BWP US Equity	Boardwalk Pipeline Partners LP	No
CPK US Equity	Chesapeake Utilities Corp	Yes
DGAS US Equity	Delta Natural Gas Co Inc	No
EEP US Equity	Enbridge Energy Partners LP	No
GAS US Equity	AGL Resources Inc	No
KMI US Equity	Kinder Morgan Inc/DE	Yes
SR US Equity	Spire Inc	Yes
NFG US Equity	National Fuel Gas Co	Yes
NJR US Equity	New Jersey Resources Corp	Yes
NWN US Equity	Northwest Natural Gas Co	Yes
OKE US Equity	ONEOK Inc	Yes
PNY US Equity	Piedmont Natural Gas Co Inc	No
1539941D US Equity	Spectra Energy Corp	No
STR US Equity	Questar Corp	No
SWX US Equity	Southwest Gas Corp	Yes
TCP US Equity	TC PipeLines LP	No
WPZ US Equity	Williams Partners LP	No

Source: NZCC (2016) and Bloomberg



Figure 3-10: Listing period for comparator set



Source: NZCC (2016) and Bloomberg