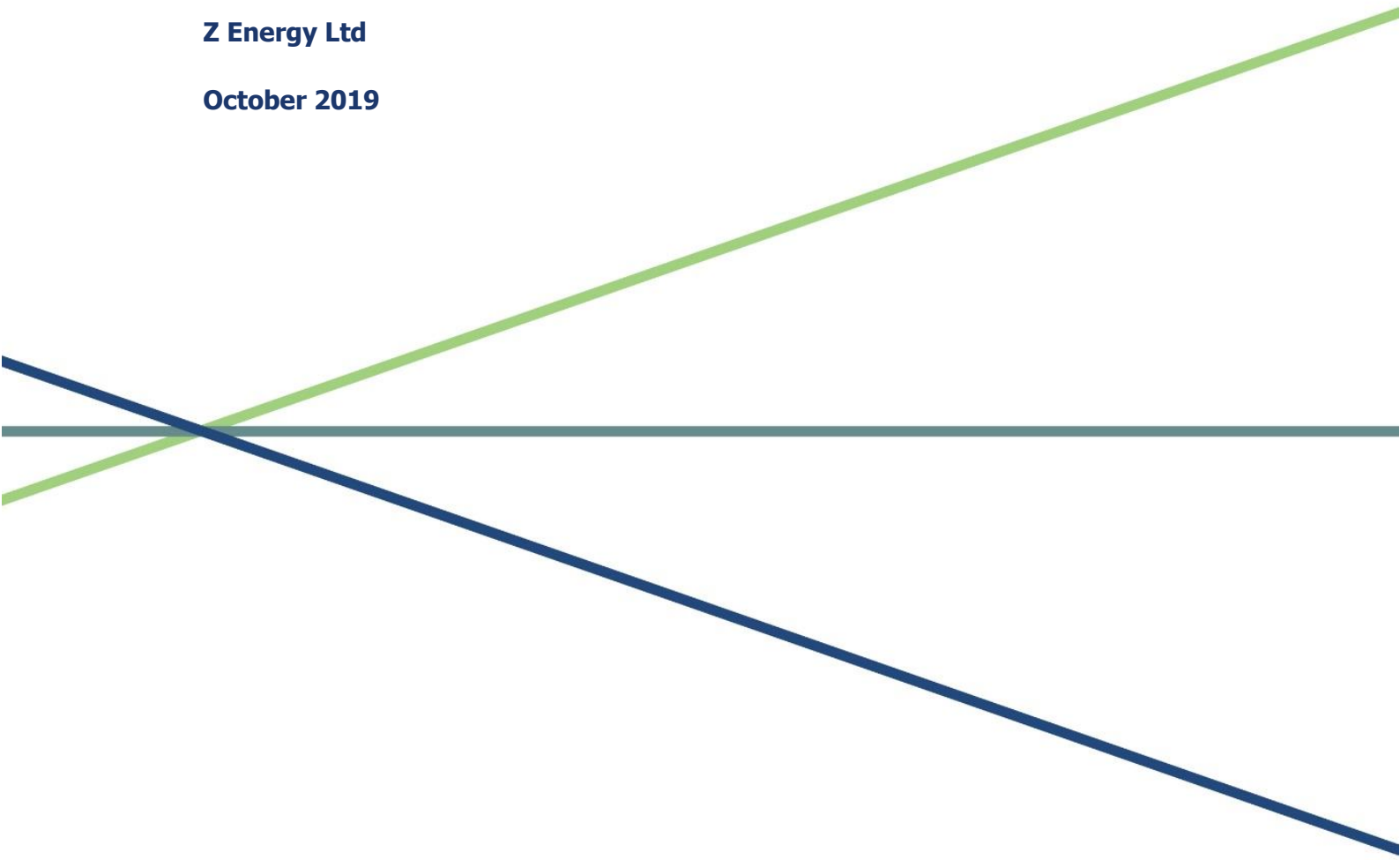
Retail fuel inquiry: cross submission

Z Energy Ltd

October 2019



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1. Introduction and summary

1.1 Purpose

1. This report provides additional commentary and material at the request of Z Energy Ltd arising from the discussion during the consultation conference on 24 September 2019 in relation to the following matters:

   a. Clarifying remarks in relation to the estimation of Tobin's q values and applying these estimates to judge whether excess returns are being made, and specifically:

      i. the variability of estimates of Tobin's q and what this means for drawing inferences from such estimates

      ii. the recognition of intangible assets in Tobin's q estimation, and

      iii. whether the time series of Tobin's q estimates that I reported reflect book values rather than estimates of current replacement cost, and whether this would affect the conclusions drawn.

   b. Additional empirical evidence in relation to the magnitude of intangible assets, which is relevant equally to the estimation of Tobin's q values as well as ROACE.

   c. Treatment of provisions for future restoration, and

   d. Treatment of revaluation gains.

1.2 Authorship

2. My name is Jeff Balchin of Unit 1, 19-35 Gertrude Street, Fitzroy, Victoria, Australia. I am an economic consultant with over 25 years of experience advising on economic regulation issues, in which capacity I have worked for policy makers, regulators, major customers and infrastructure owners across a range of sectors in Australia and New Zealand. My full curriculum vitae is available on request.

1.3 Summary of findings

1.3.1 Tobin's q

Messages in earlier report

3. The intention of my earlier report was to make two separate comments about the estimation of Tobin's q values and their application to assess whether excess returns are being made:

   a. First, that substantial variability is expected in estimates of Tobin's q across time for individual firms and even entire markets, and this variability is observed in practice. This makes it difficult to draw inferences about market power from estimates that span only a short period.

i. It was also observed that systematic factors may raise the Tobin's q for firms on average, and further that it is possible that the current environment of very low interest rates may be having this effect at the present time.

ii. This would suggest that comparing a single firm's Tobin's q against a value of unity at the present time may be inappropriate.

b. Secondly, that a major theme of more recent research into Tobin's q is that the intangible assets of modern firms may be substantial, and omitting them from the calculation of Tobin's q would impart a material upward bias.

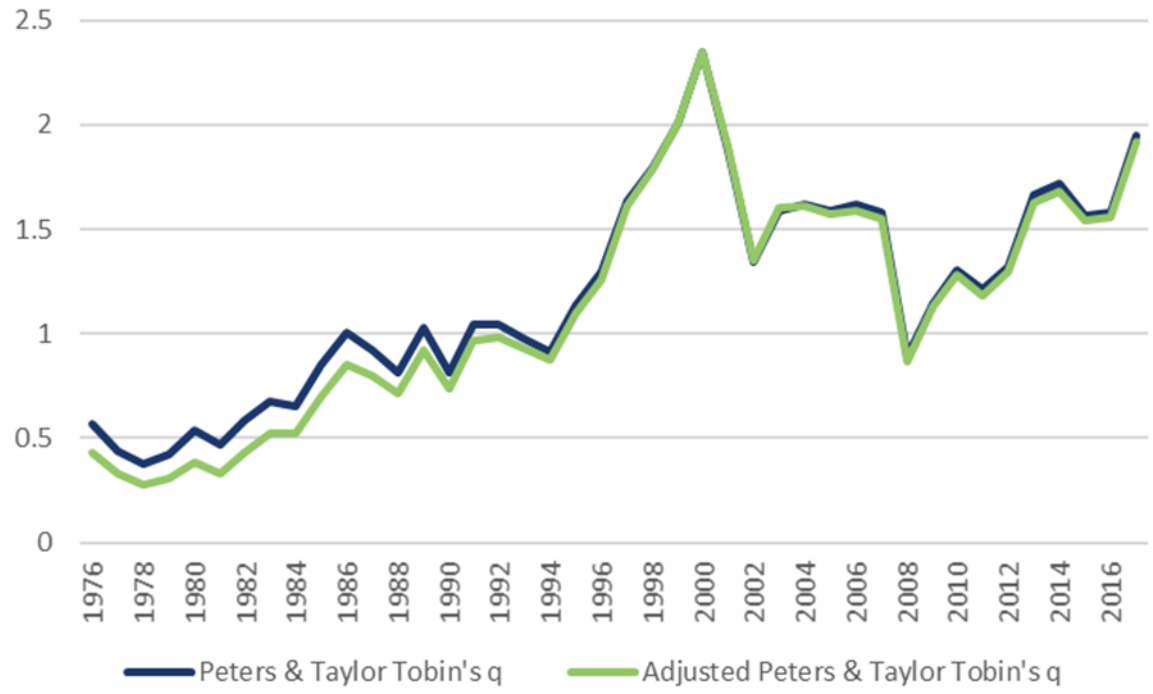
Basis of calculation of the time series that I presented

4. I confirm the Commission's suspicion that the time series that I presented was based upon accounting book values that had not been adjusted to create replacement cost estimates. However, on reflection, I do not think that this is likely to cause a material (upward) bias in the estimated Tobin's q values for firms in the US market over the period since around the mid 1990s.[1] This is because the rate of inflation in the price for capital goods has been very low since the start of the 1990s. The observation that there is unlikely to be a material wedge between historical cost and replacement cost of the physical of US firms seems to be an accepted position in the literature.

5. That said, I have adjusted the time series of US Tobin's q values that I presented in the earlier report for an estimate of the difference between replacement and historical costs, and the adjusted figure is as follows:

[1] I have not tested properly whether the same proposition can be made for NZ firms, but my initial analysis suggests that price inflation of capital goods in NZ has been somewhat higher than in the US.

Figure 1 – Adjusted historical Tobin's q for the US S&P 500 series (including intangible assets, Winsorised at 1 per cent)[2]



Source: Professor Ryan Peters, US National Income and Product Accounts, Bloomberg and Incenta analysis.

6. Thus, the observations that were drawn in my earlier report remain justified, namely that:

   a. the evidence suggests that the Tobin's q for the average firm has varied materially over time, and

   b. moreover, there is evidence to suggest that the Tobin's q for the average firm is inflated at the current time, which may be a response to the current environment of very low interest rates combined with sluggish investment.

1.3.2 Intangible assets

7. In the body of the report I describe a new source of research on the value of "organisational capability" intangible assets, and I apply this to the case of the current Z Energy business. I have also revised certain aspects of my earlier estimation techniques, namely applying the correct depreciation rate for these intangible assets and applying a

[2] "Winsorising" is a process for reducing the effect of outliers, under which observations outside of a selected confidence interval (in this case, the 98 per cent confidence interval, which implies 1 per cent of the distribution in each tail) are recoded to equate to the outer limits of that confidence interval. Compared with the corresponding figure in my previous report, Winsorising at the 1 per cent level (which was not done for the earlier report) has caused the material spike previously observed in 1983 to disappear. On further examination, that spike was caused by one firm recording a Tobin's q estimate of 1,675.

more sophisticated method of generating an assumed series of past operating expenditures for the current Z Energy business.

8. The key conclusions of this are that:

   a. The new research suggests that 28 per cent of "selling and general administration" expenditure is investment in intangibles, which is very close to the 30 per cent I had assumed previously,[3] and

   b. Applying this to the case of the current Z Energy business results in an estimate of Z Energy's organisational capability intangible assets of $235 million, as at the end of financial year 2019.[4]

1.3.3 Restoration provision

9. I demonstrate via a simple model that calculating annual ROACE values without adjusting earnings to reflect recoveries being made for future restoration works will lead to measured returns being overstated.

10. I acknowledge, however, that it would be appropriate to net off any amounts that may be obtainable for the relevant assets after the restoration,[5] where that potential has not otherwise been taken into account in the measurement of returns.

1.3.4 Revaluation gains

11. The most material of the revaluation gains that Z Energy reported in its accounts resulted from its change from accounting for assets on a historical cost basis to a fair-value basis. These should not be treated as a source of income when calculating returns because they merely arose as a consequence of the asset accounting moving to a method that has greater meaning for the Commission's task (i.e., to a valuation basis whose key components are more akin to the cost structure of a hypothetical new entrant into the industry). Indeed, it would be unsafe in my view to rely upon rate of return estimates that are based upon asset values prior to those revaluations being conducted.

12. In relation to ongoing revaluation gains, whilst I acknowledge that a coherent treatment of revaluations is required, this issue is more complex for firms whose prices are set in a competitive market than it is for price regulated firms, as it is only the latter whose pricing bears a direct relationship to accounting entries. I observe further that:

   a. The relevant question is the anticipated future revaluation gains that a firm would incorporate into its pricing rather than the actual revaluation gain that is calculated

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3 The new research also suggests that this proportion varies across sectors. However, I was unable to relate Z Energy easily into any of the industry groups, and so prefer the overall average. As a sensitivity, applying the estimated proportion for the "consumer" industry group would imply a range of $160 million to $180 million for Z Energy's organisational capability intangible assets.

4 This value would include the organisational capability intangible asset included in the "goodwill" associated with the purchase of Chevron NZ, and so the latter would need to be omitted to avoid double-counting.

5 For example, the sale of land where this was owned.

after the event, noting that firms in competitive markets bear the consequences of surprises (whether they be positive or negative), and

b. When considering their pricing, a firm in a competitive market would be expected to consider revaluation gains indirectly given that such gains would affect the cost structure of a hypothetical new entrant, and hence the constraint that the prospect of such entry would offer. However, when considering their pricing, firms in a competitive market would also be expected to apply some caution about the prospect of actually recovering the accounting revaluation gains through greater future revenue. For example, retail fuel suppliers would be expected to consider whether the risk of a quicker transition to alternative energy sources for land transport than expected may affect the recovery of these accounting revaluation gains.

2. Estimation and application of Tobin's q for assessing excess returns

2.1 Clarification of the views expressed in my earlier report

2.1.1 Difficulties with interpreting a Tobin's q estimate

13. As I remarked during the conference, the intention in my earlier report was to make two comments about the interpretation of Tobin's q estimates when considering whether firms exercise market power.

    a. First, that at any point in time, the estimated Tobin's q for a firm would be expected to vary from one due to the fact that product markets and financial markets move with different speeds.

    b. Secondly, and related to the above, there may also be systemic factors that move the estimated Tobin's q for all firms away from unity.

14. In relation to the first of these points, there are a myriad of reasons as to why product markets cannot respond instantaneously to investment opportunities, which include the real-life requirements for planning approvals and the additional concern that comes when investment is irreversible. Moreover, I also noted that the Commission previously expressed a similar degree of scepticism as to whether one would ever expect to observe a product market in the long run equilibrium state that a q-value of 1 would suggest, observing as follows:[6]

Empirical evidence … demonstrates that while asset values in workably competitive markets characterised by specialised assets may occasionally converge with replacement costs, they only very rarely if ever equate and will normally diverge by a significant amount for a prolonged period of time, including in some cases indefinitely.

15. In relation to the second of the points, I also remarked that the current very low interest rate environment could cause an inflation of q-values for all firms, but especially those that deliver high dividend yields like Z Energy. The logic of this proposition is that the low interest rates may have flowed through quickly into firms' share prices – and indeed, have been exacerbated by clientele effects as investors switch from bonds to high-yielding equities (like Z Energy) to supplement their income – but may have yet to have had the stimulatory effect on physical investment that ordinarily would be expected.

16. The implications of these points are that substantial care is required when interpreting Tobin's q estimates. In particular that:

[6] Quoted in Wellington International Airport Ltd & Ors v Commerce Commission [2013] NZHC [11 December 2013], para.521. This proposition was accepted by the merit review body (para.524).

a. it is very difficult to draw inferences about the effectiveness of competition from q-values estimated for a firm at a single point in time or over a short period,[7] and

b. care is also required to adjust for any systematic factors that may cause q-values to depart materially from unity for the average firm.

2.1.2 Importance of intangible assets when estimating Tobin's q

17. A separate observation that I intended to make was that there has been an increasing recognition of the importance of intangible assets when estimating Tobin's q in the relevant academic literature over the past two decades.

18. The principal implication of this observation is that, when estimating the q-value for any firm (such as Z Energy), it is essential that an appropriate allowance for intangible assets be made.

19. A second implication is that, if a comparison is to be made against an estimate of the average market-wide q-value – for example, to test for any systematic trend in q-values (as discussed in the previous section) – then likewise it would be important to include an appropriate allowance for intangible assets when calculating that market-wide q-value. The time-series reported in my earlier report – and re-reported here with adjustments – includes such an allowance. Indeed, researchers who have investigated the presence of estimation error when estimating Tobin's q have commented that, in the absence of an appropriate estimate of the value of intangible assets, the Tobin's q estimates would not be expected to tend towards unity. For example, Ericksen and Whited noted that:[8]

In fact, however, the median and mean of average q should be greater than one for several reasons… For example, we suspect strongly that the higher means and medians for the macro proxies result from failing to subtract intangible assets from the numerator of equation (1).

20. I also said at the conference that I had become aware of more recent empirical work on the quantum of intangible assets. Given the relevance of this work to both Tobin's q and ROACE estimates, this is considered separately in section 3.

2.2 Replacement cost vs. accounting book values when estimating Tobin's q

2.2.1 Assumptions within the Tobin's q estimates I provided

21. During the conference the Commission questioned whether the estimates of Tobin's q were based upon replacement cost (as I assumed) or accounting book values. I confirm

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7 I observe that Lindenberg and Ross's work was based on an analysis of q-values over an 18 year period.

8 Timothy Erickson and Toni M. Whited (Autumn, 2006), "On the Accuracy of Different Measures of q", *Financial Management*, Vol. 35, No. 3, pp.5-33 (p.15). While the error caused by the absence of an estimate of the value of intangible assets was expressed as a need to subtract from the numerator (to derive a version of Tobin's q that relates purely to physical assets), this issue is better addressed by adding the value of intangible assets to the denominator (in which case the Tobin's q measure relates to both physical and intangible capital).

the Commission's suspicion that the estimates that I provided did use accounting asset values for the valuation of "property, plant and equipment" in the denominator as the Commission suggested, and that my assumption was incorrect.

22. My assumption that the estimates applied replacement cost estimates were based on the incorrect belief that the requirement that had applied for large US firms to report replacement cost estimates – and that were relied upon in the work by Lindenberg and Ross[9] – continued to apply today, and so had simply been applied in the Wharton School series. In fact, the legal requirements to publish replacement cost estimates that were relied upon by Lindenberg and Ross applied only between 1976 and 1985,[10] and since that time there has been no general disclosure of replacement estimates by US firms, and hence no readily available data series.

23. One remark that I would make, however, is that if it is not possible to estimate the Tobin's q for the market as a whole (or at least for a proxy market, like the US) as this discussion suggests, then applying Tobin's q to test for excess returns becomes more fraught. Specifically, the ability to test whether there may be systemic factors that have affected all firms' Tobin's q's would be lost. Having said that, however, I have considered further whether Tobin's q values calculated using accounting information in the US would provide a reasonable proxy for the true Tobin's q, and I think it would. This issue is addressed next.

2.2.2 Does accounting information provide a reasonable Tobin's q?

24. The question of whether accounting information provides a reasonable proxy for replacement cost has been the subject of some consideration in the literature. Around the time of the work of Lindenberg and Ross, the use of accounting information would be expected to have caused a substantial upward bias in estimates of Tobin's q. A study by Perfect and Wiles found that for their sample of 64 firms over the period 1979 to 1987, the largest difference across their range of replacement cost estimates for the mean (median) value of assets between the depreciated historical cost value and estimated depreciated replacement cost was 34 per cent (19 per cent).[11] They also found that the principal determinant of the differential between replacement cost and historical costs was the price inflation of capital goods.[12]

25. However, in the period preceding the Perfect and Wiles study, the price inflation observed for capital goods was substantial. Figure 2 shows the change in the price of capital goods, using the same price index applied by Lindenberg and Ross in their work.

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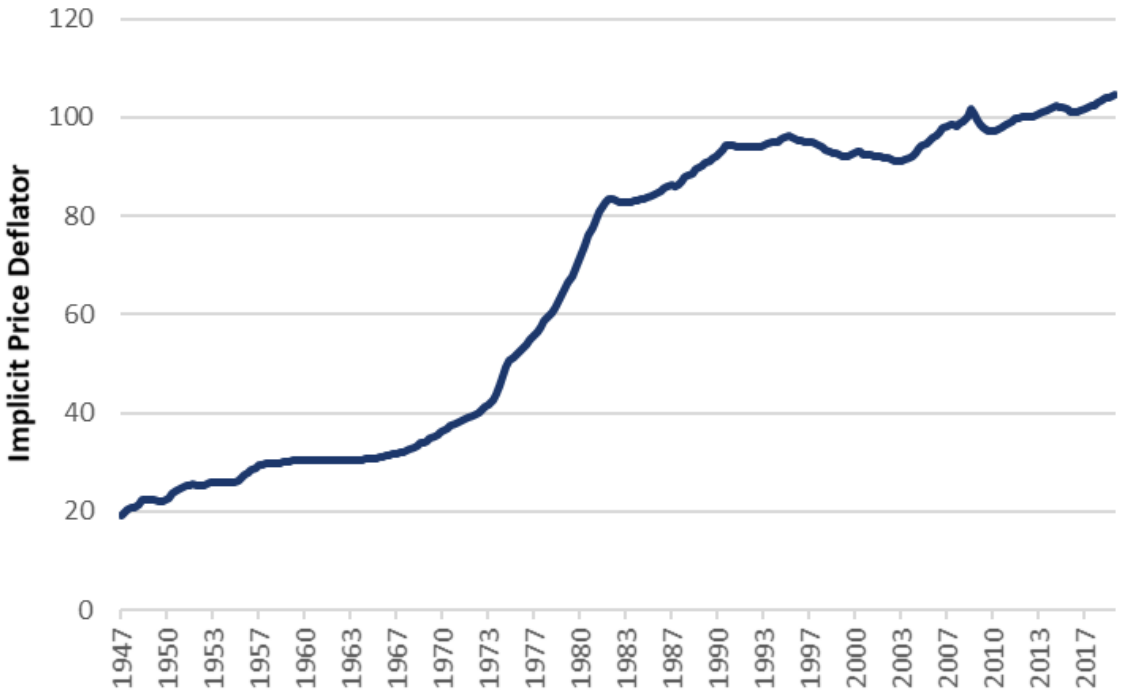
9 Eric B. Lindenberg and Stephen A. Ross (1981), "Tobin's q ratio and industrial organization," *Journal of Business*, Vol. 54, pp.1-32.

10 Whilst Lindenberg and Ross obtained Tobin's q estimates for an earlier period, this was based upon applying estimates of the prices of capital goods and technological change to create a pseudo replacement cost data series from accounting information.

11 Steven B. Perfect and Kenneth W. Wiles (1994), "Alternative constructions of Tobin's q: An empirical comparison," *Journal of Empirical Finance*, Vol.1, pp.313-341.

12 Lindenberg and Ross posited that the difference between historical cost and replacement cost would be a function of (i) input price inflation, which raises replacement cost, and (ii) technological change, which reduces replacement cost.

Figure 2: US fixed investment: non-residential implicit price deflator, 1947-2019



Source: US National Income and Product Accounts (A008RD3Q086SBEA), Gross private domestic investment: Fixed investment: Non-residential (implicit price deflator), Index 2012=100, Quarterly, Seasonally Adjusted

26. What can be observed from this figure is that the inflation in the price of capital goods in the US was substantial in the period prior to the 1990s, but since declined substantially and indeed there have been periods of price deflation.

27. Figure 3 shows my estimate of the effect that historical price inflation would have had on the relationship between gross replacement cost and gross historical cost (i.e., both undepreciated) at each point in time. For this analysis, I have:

    a. applied the same price index for capital goods as Lindenberg and Ross, as referenced above

    b. assumed that the (total) life of the average asset is 14 years and have applied this average to all firms[13]

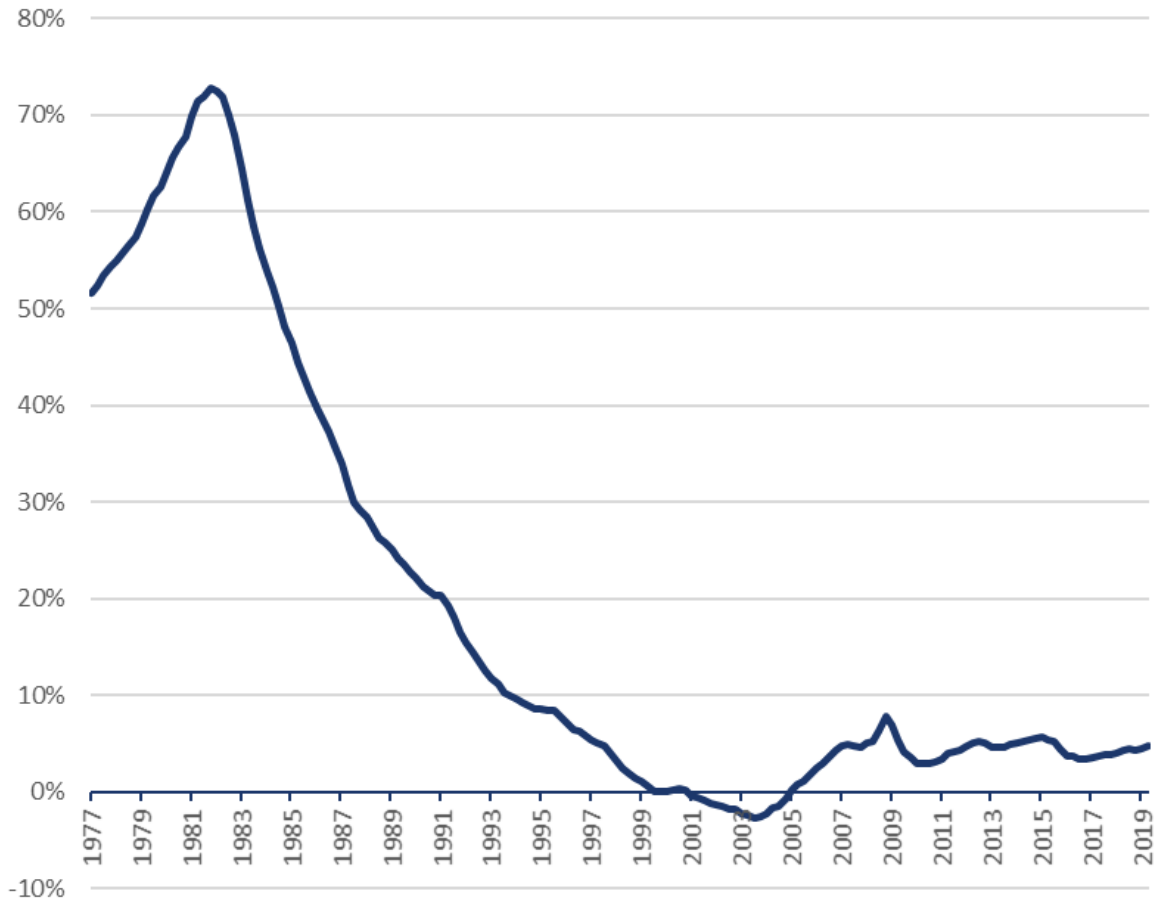
[13] To estimate the life of assets for the average non-financial S&P500 firm, I calculated the ratio of accumulated depreciation to the depreciation expense in the financial years ending December 1990, 2000, 2010, and 2018, and multiplied by 2, reflecting the assumption of a steady state. A few very long implied terms of more than 50 years were excluded. The resulting respective average lives at the chosen dates were 13.6 years, 14.2 years, 12.7 years and 16.1 years, with an average of 14.2 years. Time constraints precluded the application of firm-specific estimates of asset lives.

c. assumed that firms are in a stationary situation, meaning that the current stock of capital (in units) had been uniformly accumulated over the preceding 14 years

d. assumed zero technological change, and

e. focussed on gross (undepreciated) asset values to be consistent with the data series on Tobin's q that I presented in my earlier report.

Figure 3 – Ratio of (gross) replacement cost to (gross) historical cost



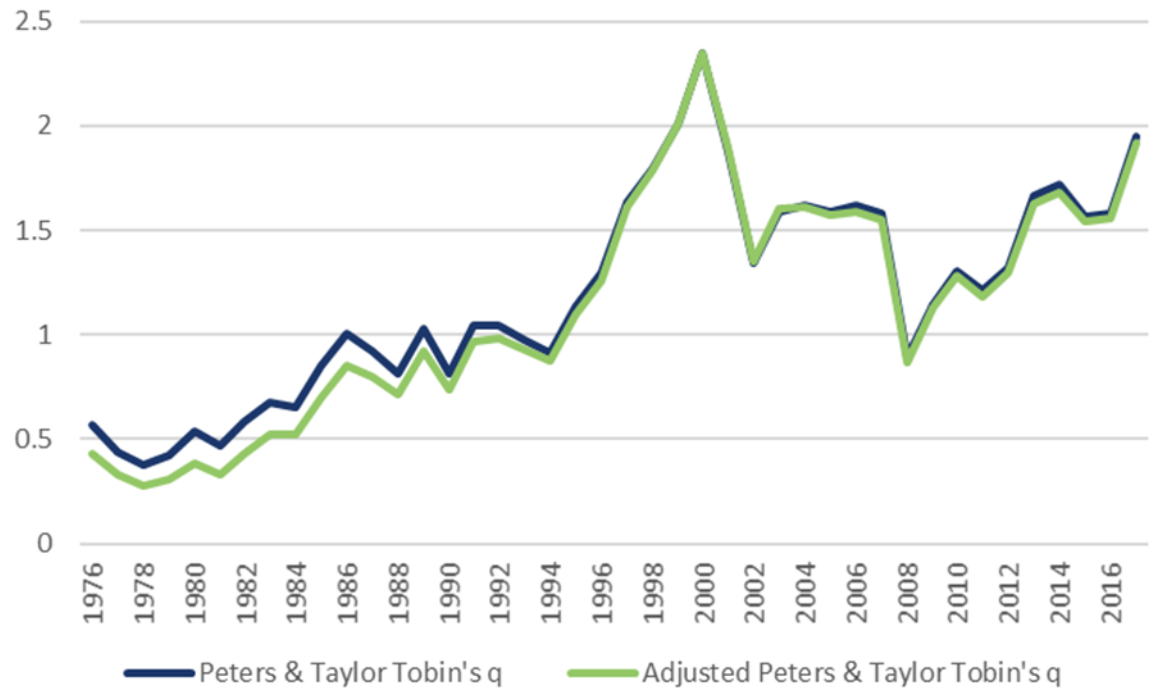
Source: US National Income and Product Accounts (A008RD3Q086SBEA), Bloomberg, Incenta analysis Note: Series represents Margin of Replacement Cost over Historical Cost for PPE – 14-year average asset life (0% annual technological change, Gross book value).

28. As the figure shows, while a large gap between replacement cost and historical cost would have been found during the 1980s and early part of the 1990s,[14] this would have largely disappeared after about the mid 1990s. My estimate of the difference between gross replacement cost and gross historical cost as at the end of calendar year 2018 is approximately 4.5 per cent. Thus, using historical costs would only be expected to cause a small upward bias in the estimation of Tobin's q at the present time (noting also that

[14] The estimate of the differential between net replacement cost and net historical cost for the period considered by Perfect and Wiles (1994) provided by this method is 32 per cent, which is very similar to the 34 per cent differential found by Perfect and Wiles (1994) as reported above.

this differential only arises in relation to tangible assets, which account for only 39 per cent of the denominator in the series that I have presented). Figure 4 below displays the Adjusted Peters and Taylor historical Tobin's q series, which applies the scaling factor shown in Figure 3 to estimate the effect of using estimates of the replacement cost of property, plant and equipment rather than historical cost.[15]

Figure 4 – Adjusted historical Tobin's q for the US S&P 500 series (including intangible assets, Winsorised at 1 per cent)[16]



Source: Professor Ryan Peters, US National Income and Product Accounts, Bloomberg and Incenta analysis.

29. Thus, the observations that were drawn in my earlier report remain justified, namely that:

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15 This figure presents the average Tobin's q across all firms on the S&P 500 index apart from (i) financial firms, (ii) regulated utilities, (iii) firms categories as public service, international affairs or non-operating establishments, (iv) those with missing or non-positive book values of assets or sales and (v) firms with less than $5 million in physical capital (as described in Ryan H. Peters and Lucian A. Taylor (2017), "Intangible capital and the investment-q relation", *Journal of Financial Economics*, Vol. 123, p.256).

16 "Winsorising" is a process for reducing the effect of outliers, under which observations outside of a selected confidence interval (in this case, the 98 per cent confidence interval, which implies 1 per cent of the distribution in each tail) are recoded to equate to the outer limits of that confidence interval. Compared with the corresponding figure in my previous report, Winsorising at the 1 per cent level (which was not done for the earlier report) has caused the material spike previously observed in 1983 to disappear. On further examination, that spike was caused by one firm recording a Tobin's q estimate of 1,675.

a. the evidence suggests that the Tobin's q for the average firm has varied materially over time, and

b. moreover, there is evidence to suggest that the Tobin's q for the average firm is inflated at the current time, which may be a response to the current environment of very low interest rates.

30. Moreover, the observation above that only a little gap currently exists between replacement costs and historical costs is consistent with findings in the literature. Indeed, it is my understanding that accounting book values are seen currently in academic research to be a sufficiently good proxy for replacement cost that the much greater effort required to estimate the latter is considered unwarranted. For example, Erickson and Whited (2012) summarised their position in favour of using historical cost data rather than continuing with replacement cost estimation as follows:[17]

It is possible to use a perpetual inventory algorithm to estimate the replacement cost of capital or a recursive algorithm to estimate the market value of debt. However, Erickson and Whited (2006) demonstrate that these types of algorithms add little in terms of measurement quality of various proxies for marginal q, or even more directly, for the replacement value of the capital stock. We therefore stick with book values.

2.2.3 Application of gross book values rather than net book values

31. One further aspect of the historical data series on Tobin's q for US firms that was presented above that was not emphasised in my earlier report is that gross (i.e., undepreciated) book values have been employed rather than net (i.e., depreciated) book values. Recall also that the data series that I reported is the one that underpins recent published work in this area.

32. I observe that the use of gross book values:

a. By academics when researching in this area is consistent with my belief that accountants tend to (materially) over-depreciate fixed assets, and

b. As a benchmark for comparing the estimate of Tobin's q for Z Energy is consistent with the argument I made in my earlier report that undepreciated asset values should be employed.

[17] Timothy Erickson and Whited (2012), "Treating Measurement Error in Tobin's q", *The Review of Financial Studies*, Vol.25, Issue 4, p.1325, referencing Timothy Erickson and Toni M. Whited (Autumn, 2006), "On the Accuracy of Different Measures of q", *Financial Management*, Vol. 35, No. 3, pp.5-33.

3. Estimating the value of intangible assets

3.1 My earlier report

33. My earlier report pointed to the method applied in a published finance article[18] that estimated the intangible assets of a firm as the sum of:

    a. *Organisational capital* – where it was assumed that 30 per cent of "selling and general administration" operating expenditure was in fact investment in intangible assets, and that this was depreciated at a 20 per cent rate, and

    b. *Research and development*[19] – where this was also assumed to create an intangible asset, and further assumed to depreciate at the rates assumed by the US Bureau of Economic Analysis.[20]

34. The time series of Tobin's q for US firms included intangible assets calculated using this method and I estimated that this method would imply intangible assets of approximately $154 million for the current Z Energy business, which was based (amongst other things) on applying the 20 per cent depreciation rate as a straight-line rate.

3.2 New research

35. Most recently, Ewen, Peters and Wang (2019) have sought to derive a more solidly empirically based estimate of the value of intangible assets. The authors examined over 1,500 acquisitions and over 400 business failures, and from this:[21]

    a. First derived an estimate of the market price for intangible assets that were traded as part of each transaction.[22]

    b. Secondly, assumed that organisational intangible assets depreciate at a 20 per cent geometric depreciation rate (which if different to the depreciation method I had assumed in my earlier report), and

    c. Thirdly, estimated the combination of (i) the depreciation parameter on R&D expenditures and (ii) the proportion of historical selling and general administration

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18 Ryan H. Peters and Lucian A. Taylor (2017), "Intangible capital and the investment-q relation", *Journal of Financial Economics*, Vol. 123, pp.251-272.

19 This element of intangible assets was not highlighted in the earlier report because Z Energy has not reported any research and development expenditure.

20 The US Bureau of Economic Analysis (BEA) began to capitalise R&D expenditures in its supplemental "satellite accounts" in 1994 and in the core National Income and Product Accounts (NIPA) in 2013.

21 Michael Ewens, Ryan H. Peters and Sean Wang, (May, 2019), *Acquisition Prices and the Measurement of Intangible Capital*, Working paper.

22 Adjustments to the purchase price were first made for estimates of over/under payment and synergies reflected in the price.

expenditure that was in reality organisational capability investment, that most closely delivers the estimated value of the intangible assets traded.[23]

36. Table 1 sets out the results across the five Fama and French industry groupings.[24]

Table 1 – Estimated depreciation rate for R&D and proportion for "selling and general administration" expenditure that is intangible investment

Coefficient (for intangibles capitalisation)	All	Consumer	Manufacturing	High Tech	Health	Other
All Firms:						
Estimated R&D depreciation rate	0.32	0.30	0.34	0.46	0.34	0.25
Estimated proportion of SG&A	0.28	0.20	0.23	0.45	0.51	0.35
Excluding Failed Firms:						
Estimated R&D depreciation rate	0.26	0.28	0.25	0.38	0.24	-0.21
Estimated proportion of SG&A	0.42	0.36	0.24	0.57	0.63	0.49

Source: Ewens, Peters and Wang, (May, 2019), Table 4, p.59.

37. My view is that it is difficult to slot Z Energy easily into any of the industry groupings. Whilst the operation of retail sites would clearly fit into the "consumer" category, Z Energy's midstream operations involve a substantial logistics capability that is more akin to the healthcare and IT sectors. Accordingly, my view is that the market average of 28 per cent is appropriate for Z Energy, although I show the results of using a 20 per cent fraction below as a sensitivity.[25]

3.3 Updated (and corrected) estimated range for intangible assets for Z Energy

38. The derivation of the organisational capability intangible asset requires a historical data series on expenditure on "selling and general administration" activities so that the historical intangible capital expenditure can be estimated using the proxy relationship above. However, this is a challenge for Z Energy because:

a. Z Energy changed its reporting of operating expenditure in its annual reports between 2018 and 2019, and as a consequence Bloomberg has not reported expenditure in the "selling and general administration" activity for 2019.

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23 Michael Ewens, Ryan H. Peters and Sean Wang, (May, 2019), p.3. As noted earlier, the authors assumed that the 20 per cent (geometric) rate of depreciation that Peters and Taylor (and others) had applied to intangible organisational capital was appropriate and did not test this parameter.

24 Fama and French defined 5 broad industry groups, with the "Consumer" industry being comprised of "Consumer Durables, Non Durables, Retail, and Some Services (Laundries, Repair Shops)." The Fama and French industry specifications may be downloaded from: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/changes_ind.html.

25 The authors also report the results using surviving firms, and get a materially higher proportion of SG&A being reflected in intangible investment than when all firms are considered – for example, the proportion for all (consumer) industries increases to 42 per cent (36 per cent).

b. Z Energy is the combination of several businesses that, while they have a long history of operation in New Zealand, have only recently been operating collectively as the Z Energy Ltd entity (financial year 2018 being the first full year). Moreover, as the predecessors to Z Energy were parts of larger entities, historical information about the separate entities is sparse.

39. In relation to the issue of 2019 selling and general administration expenditure, whilst Z Energy did report operating expenditure at a more aggregated level in its financial accounts in 2019, it did provide the same breakdown as in previous years in its investor presentation. From this information, I was able to recreate the "selling and general administration" expenditure that Bloomberg's method applied in prior years would have generated for 2019, which is $232 million.[26]

40. In relation to past SG&A expenditure, I have used a 20 year historical series ending with 2019 when estimating Z Energy's intangible assets, which required estimates of the relevant category of operating expenditure for the 18 years prior to 2018. I have estimated these values as follows.

a. First, I have commenced with the actual SG&A expenditure for 2018 of $205 million (sourced from Bloomberg).

b. Secondly, I have then applied an assumed historical trend growth in expenditure to create an estimate of the past expenditure for the combined entity. I have in turn calculated this trend factor as the sum of:

i. historical average growth rate of fuel sales for land transport over the 18 year period since 2001 (approximately 2 per cent per annum),[27] and

ii. an allowance for input price inflation, for which I have used the approximate annual growth rate of the PPI over the same period of 2 per cent per annum.

c. Thirdly, I also report as a sensitivity the effect of the historical trend growth in SG&A expenditure being 2 percentage points higher or lower (i.e., growth of 2 per cent and 6 per cent per annum).

41. From these assumptions, the assumed capital expenditure on organisation capability was established, recalling from the previous section that my central case is that 28 per cent of selling and general administration expenditure is intangible capital expenditure (reflecting the average across all industries), with a sensitivity of 20 per cent also tested (which is based on the "consumer" broad industry group). These capital expenditure values were then carried forward to the end of financial year 2019 by applying a 20 per

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26 I observe that there are some idiosyncrasies in the Bloomberg estimate of the SG&A expenditure that may result in it being understated. Notably, none of the "employee benefits" have been included, notwithstanding that this item for Z Energy comprises all wages and salaries, a substantial share of which is associated with head office functions.

27 MBIE "Data tables for oil" (2018) https://www.mbie.govt.nz/building-and-energy/energy-and-naturalresources/energy-statistics-and-modelling/energy-statistics/oil-statistics/#data-tables-for-oil (Viewed on 9 October 2019).

cent geometric depreciation rate (as discussed in the previous section). The results of this analysis are presented in the table below.

Table 2 – Estimated organisation capability intangible asset (end FY2019)

		Proportion of SG&A expenditure that is intangible capex	
		28%	20%
Assumed historical trend in opex	2.00%	249	178
	4.00%	237	169
	6.00%	227	162

42. The shaded cell shows the estimated organisation capability intangible asset under my preferred assumptions, which is approximately $235 million as at the end of financial year 2019. My recommendation is that this be applied when estimating the Tobin's q value and ROACE for Z Energy at these dates.[28] Moreover, these results show that:

    a. The estimated value of the intangible asset is reasonably insensitive to plausible changes in the assumed historical trend in selling and general administration expenses, and

    b. Even if the lower capitalisation rate of 20 per cent is applied, a material intangible asset (in the order of $160 million to $180 million) would still result.

[28] This value would include the organisational capability intangible asset included in the "goodwill" associated with the purchase of Chevron NZ, and so the latter would need to be omitted to avoid double-counting.

4. Other issues

4.1 Decommissioning and restoration costs

43. I commented at the conference that if the Commission's calculations of ROACE do not include an allowance in respect of future decommissioning and restoration costs, then there is a risk that the Commission will incorrectly find excess returns when none are present (or, more generally, that returns will be overstated). I present below a simple model to demonstrate this proposition.

44. It is assumed in this model that an investment is made and recovered over 10 years, and that a material restoration cost is then incurred (i.e., after the service has ceased). Specifically, it is assumed that:

    a. The initial cost (incurred prior to year 1) is 1000, and there is no further capital expenditure during the project's life

    b. The restoration cost (incurred in year 11) is 200

    c. The project is expected to generate NPV=0, with the restoration cost factored into this analysis, and with revenue expected to be constant over the period

    d. Revenue is assumed to be received, and expenditure incurred, at the end of each year for simplicity, and

    e. The WACC is 10 per cent and there is no taxation nor operating expenditure, again for simplicity only.

45. The results of this simple example are set out in the figure below. The key conclusions are as follows.

    a. The discounted total cost of the project including the restoration is $1,070.10 (row 8, shaded column) and the constant revenue stream that will deliver NPV=0 is 174.15 per annum (row 9).

    b. If the allowance included in the prices for the restoration is included in the calculation of profit, then an excess return would be found in each year, commencing at 1.41 per cent (i.e., 11.41% - 10%) and rising to 7.71 per cent in the last year (row 20).[29]

        i. The finding of material excess returns would be spurious given that the prices are consistent with delivering NPV=0 precisely.

    c. The correct course of action would be to deduct from revenue the allowance that is included in prices in respect of restoration after the project had ceased operation, namely 11.41 (row 25).

[29] I have applied annuity depreciation rather than, for example, straight line depreciation, to be consistent with the profile of recovery of that is implicit in the assumptions that revenue is constant and that there is no ongoing expenditure (apart from the restoration after the project has ended).

i. Once this adjustment is made, the measured return in each year equates precisely with the WACC, as it should in this example (row 35).

Figure 5 – Effect of restoration costs on measured returns

[1]	Initial project cost	1,000.00												
[2]	Cost of future restoration	200.00												
[3]	WACC	10%												
[4]														
[5]	Year		0	1	2	3	4	5	6	7	8	9	10	11
[6]	Discount factor (to start year 1)		1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386	0.350
[7]		NPV												
[8]	Costs	1,070.10	1,000.00											200.00
[9]	NPV = 0 revenue (constant over the propject's life)	1,070.10		174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	0.00
[10]														
[11]	**1. ROA - ignoring the restoration**													
[12]														
[13]	Opening asset value			1,000.00	937.25	868.23	792.31	708.80	616.93	515.88	404.72	282.45	147.95	
[14]	Depreciation (annuity)			62.75	69.02	75.92	83.51	91.87	101.05	111.16	122.27	134.50	147.95	
[15]	Closing asset value			937.25	868.23	792.31	708.80	616.93	515.88	404.72	282.45	147.95	0.00	
[16]														
[17]	Revenue			174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	
[18]	Depreciation			62.75	69.02	75.92	83.51	91.87	101.05	111.16	122.27	134.50	147.95	
[19]	**Return on assets**			**111.41**	**105.13**	**98.23**	**90.64**	**82.29**	**73.10**	**63.00**	**51.88**	**39.65**	**26.20**	
[20]	**Return on assets %**			**11.14%**	**11.22%**	**11.31%**	**11.44%**	**11.61%**	**11.85%**	**12.21%**	**12.82%**	**14.04%**	**17.71%**	
[21]														
[22]	**2. ROA - allowance for future restoration**													
[23]														
[24]	Restoration liability	70.10												200.00
[25]	Annual contribution to restoration (constant to match the revenue stream)			11.41	11.41	11.41	11.41	11.41	11.41	11.41	11.41	11.41	11.41	
[26]														
[27]	Opening asset value			1,000.00	937.25	868.23	792.31	708.80	616.93	515.88	404.72	282.45	147.95	
[28]	Depreciation (annuity)			62.75	69.02	75.92	83.51	91.87	101.05	111.16	122.27	134.50	147.95	
[29]	Closing asset value			937.25	868.23	792.31	708.80	616.93	515.88	404.72	282.45	147.95	0.00	
[30]														
[31]	Revenue			174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	174.15	
[32]	Depreciation			62.75	69.02	75.92	83.51	91.87	101.05	111.16	122.27	134.50	147.95	
[33]	Contribution to restoration			11.41	11.41	11.41	11.41	11.41	11.41	11.41	11.41	11.41	11.41	
[34]	**Return on assets**			**100.00**	**93.73**	**86.82**	**79.23**	**70.88**	**61.69**	**51.59**	**40.47**	**28.25**	**14.80**	
[35]	**Return on assets %**			**10.00%**	**10.00%**	**10.00%**	**10.00%**	**10.00%**	**10.00%**	**10.00%**	**10.00%**	**10.00%**	**10.00%**	

46. I acknowledge, however, that it would be appropriate to net off any amounts that may be obtainable for the relevant assets after the restoration,[30] where that potential has not otherwise been taken into account in the measurement of returns.

4.2 Treatment of revaluation gains

47. As I observed at the conference, the most material of the revaluation gains that Z Energy reported in its accounts resulted from its change from accounting for assets on a historical cost basis to a fair-value basis, with the amounts being reported for financial years 2014 and 2016. In my view, these revaluation gains should not be treated as a source of income when calculating returns.

a. This is because these revaluation gains reflect the effect of changing the basis of asset accounting to one that has a much greater meaning for the Commission's task (i.e., to a valuation basis whose key components are more akin to the cost structure of a hypothetical new entrant into the industry).

b. Thus, these revaluation gains are more properly interpreted as the accounting for the removal of an error. Indeed, it would be unsafe in my view to rely upon rate of return estimates that are based upon asset values prior to those revaluations being made.

30 For example, the sale of land where this was owned.

48. In relation to the ongoing asset revaluations, I acknowledge that the proper measurement of earnings over a period of time requires a coherent treatment of revaluation gains. Having said that, I also think that how revaluation gains are treated when attempting to detect excess returns for firms that are subject to competition is a more challenging task than it is for price regulated businesses, as it is only for the latter that there is a mechanistic (or near mechanistic) relationship between the accounting for revaluation gains and economic returns.[31] To this end, I note that:

    a. The relevant question is the anticipated future revaluation gains that a firm would incorporate into its pricing rather than the actual revaluation gain that is calculated after the event, noting that firms in competitive markets bear the consequences of surprises (whether they be positive or negative), and

    b. When considering their pricing, a firm in a competitive market would be expected to consider revaluation gains indirectly given that such gains would affect the cost structure of a hypothetical new entrant, and hence the constraint that the prospect of such entry would offer. However, when considering their pricing, firms in a competitive market would also be expected to apply some caution about the prospect of actually recovering the accounting revaluation gains through greater future revenue. For example, retail fuel suppliers would be expected to consider whether the risk of a quicker transition to alternative energy sources for land transport than expected may affect the recovery of these accounting revaluation gains.

[31] I addressed the specific case of revaluation gains that may accrue against assets that may be sold at the ends of their lives after restoration / remediation in the previous section.