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RAB growth since the AER's 2013 Rate of Return Guideline

ENA-AER Rate of Return Consumer Reference Group Joint Project

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Executive Summary

i. This is a jointly commissioned report for Energy Networks Australia (ENA) and the AER's Consumer Reference Group (CRG) for the purpose of assisting the AER in its final determination process for its 2018 Rate of Return Guideline Review.

ii. The project is intended to provide a common basis for assessing the impacts on Regulated Asset Bases (RABs) of existing regulatory rates of return since 2013. The joint Terms of Reference (TOR) asked three questions:

(1) What are the drivers of the increases in the regulatory asset bases for energy networks and what implications can be drawn from these increases as input to the AER's task of reviewing its rate of return guideline under the National Electricity and Gas Rules?

(2) What is the set of empirical evidence and verifiable indicators that could reliably indicate that the AER's rate of return approach since 2013 may have led to higher or lower than efficient network Regulatory Asset Bases?

(3) Do these indicators show a consistent pattern of evidence that is sufficiently robust to enable conclusions to be drawn that AER allowed rates of return are either too high or too low? Why or why not?

iii. We note at the outset that since 2013, RAB growth has levelled off in NSW and Queensland, the states that saw the most dramatic RAB growth prior to 2013. In all states except Victoria, where RAB growth has been relatively consistent over time, RAB growth has slowed since 2013. This has coincided with a reduction in network capex across the NEM (or a flattening of capex growth in the case of Victoria) since 2013.

iv. The overarching answer to the first question in the TOR depends on the operation of the regulatory accounting regime and past AER decisions. The AER indexes the RAB for energy networks to inflation: the RAB increases each year by the rate of inflation and capital expenditure allowed into the RAB, less the depreciation charges for historical investment. As a result, the RAB will only increase in real terms if capital expenditure (which is added to the RAB) exceeds depreciation.

v. An excessive rate of return is, in principle, one factor that could cause capex to be systematically higher than depreciation if network companies responded by gold-plating their networks and the AER allowed inefficient capital expenditure to enter the RAB. In practice, however, a wide range of factors compete to explain why capital expenditure (and the inflation of the RAB) have been higher than depreciation in recent years. Table 1 below sets out our findings on the various factors that have been driving RAB growth, i.e. factors which have caused capex to be higher than depreciation since 2013. Taken together, these factors suggest that it would be incorrect to interpret RAB growth since 2013, in isolation, as evidence that the allowed rate of return has been set too high.

Table 1: Our Conclusions on Factors Driving RAB Growth

Factor	Channel through which RAB growth is affected	Findings	Effect on RAB growth since 2013?
Impact of demand forecasts versus actual demand.	If NSPs invest in anticipation of new demand that doesn't materialise, the RAB will grow and appear too large after the fact.	At the time of the last resets, total demand[1] facing DNSPs was initially less than forecast, though demand has largely "caught up" and doesn't currently exceed historic levels.	N
Expected cyclical trends in asset lives and replacement needs.	When assets reach the end of their life and need to be replaced, replacement capex is incurred.	Prior to 2013 growth capex exceeded replacement capex (repex) and asset age was falling. Since 2013 the asset fleet has grown older and replacement capex now exceeds growth capex, though repex has also fallen since a peak in 2012/13. So to the extent the RAB is still growing, this is largely driven by replacement activity.	↑
	If the cost of like for like assets has increased in real terms, the RAB will grow when they are replaced.	Australian and international evidence suggests that the cost of network assets has likely risen in real terms over the last 20-40 years.	↑
Impact of enhanced reliability and safety standards and the form of those standards.	Reliability standards may be most efficiently met, or required to be met, by physical infrastructure (i.e. capex) as opposed to, e.g. demand response.	Public data held by the AER does not capture whether capex has been driven by reliability standards since 2013. However, augmentation expenditure has fallen sharply since 2013 in all states except Victoria.	N
Impacts of mandatory obligations to serve or connect.	If networks have mandatory obligation to connect customers, and do not recover the cost of connections from new customers, the RAB will grow.	Capital contributions are generally less than expenditure on connections.	↑
Proposed depreciation allowances, and AER decisions on depreciation.	Decisions which defer depreciation will increase RAB growth and vice versa for decisions which accelerate depreciation.	The use of forecast depreciation instead of actual depreciation will slow RAB growth given NSPs have been underspending their allowances capex allowances.	↓
Any impacts of current post-tax revenue model (PTRM) and RAB roll-forward approaches in deferring investment cost recovery.	The choice between indexing and not-indexing the RAB affects whether capital recovery is front loaded or spread evenly over time.	The AER's approach to indexing the RAB to inflation defers depreciation relative to a non-indexed approach. This will increase RAB growth.	↑
Impacts of the AER's Capital Expenditure Efficiency Sharing Scheme (CESS) and other relevant incentive schemes.	Incentive schemes, to the extent that they encourage or discourage capex can affect RAB growth.	The demand management incentive scheme (DMIS)[2] and CESS should encourage non-capex solutions, which all other things equal would slow RAB growth.	↓
		The Service target performance incentive scheme (STPIS) may encourage capex solutions.	↑

Source: NERA analysis. Key: Upward-facing blue arrow means factor has led to RAB growth since 2013. Downward-facing green arrow means factor has led to RAB reductions since 2013. "N" means no or insufficient evidence in either direction.

vi. The second question in the TOR required consideration of evidence/indicators which can be used to assess whether the rate of return set by the 2013 guidelines may have resulted in RAB growth that is "too high" or "too low".

vii. We identified five categories of indicators which may suggest that allowed returns are too high or too low. These included:

- **the variance between approved capital expenditure and actual capital expenditure:** NSPs consistently underspending their allowances may indicate that returns were too low and NSPs were reluctant to invest;
- **observed historical returns for firms with similar betas:** if similar firms earned higher returns than NSPs, the allowed return for NSPs may be too low;
- **RAB Multiples:** a RAB multiple is the price that an investor is willing to pay for a network divided by the Regulated Asset Base (i.e. the nominal worth of the business under the regulatory regime). Holding all other factors constant, RAB multiples beneath 1 could suggest that investors are unable to get a return which covers their cost of capital and may result in underinvestment. RAB multiples above 1 could suggest that the allowed rate of return is too high.
- **realised returns for the NSP:** realised returns in and of themselves shed no light on whether the allowed rate of return is too low. Instead, realised returns may aid with the interpretation of other market evidence. I.e. if realised returns consistently exceed that allowed return, that may explain RAB multiples greater than 1 or the ease with which finance is raised.
- **analyst reports and capital raising:** evidence that NSPs were unable to raise finance would suggest that the allowed rate of return was too low.[3]

viii. Table 2 describes the evidence base for each of these indicators and sets out our view on the extent to which they can be relied upon to assess whether the allowed rate of return is too high for NSPs.

ix. The third question in the TOR required forming a view on whether the indicators in question 2 show a consistent pattern of evidence that is sufficiently robust to enable the conclusion to be drawn that AER allowed rates of return are either too high or too low. In summary, the evidence does not present a clear picture. There is evidence that could be interpreted to suggest returns are either too high, too low or at the correct level – and none of the evidence is particularly robust. The conflicting picture stems from the difficulty disentangling:

- *realised* returns in excess of the *allowed* rate of return[4]; from
- whether the *allowed* rate of return is greater than the return required by investors to finance the activities of an NSP.[5]

x. This is particularly problematic when considering market evidence such as RAB multiples, because the price that an investor will pay for a network will reflect both the allowed rate of return and investors' expectation on levels of outperformance.

[1] We have however only analysed system wide demand, when localised demand and constraints are the true driver of investment

[2] Note that this scheme does not apply to transmission.

[3] While we have not assessed it in this report, another important factor is the cost of finance for NSPs.

[4] E.g. the allowed return is 7% and NSPs expect to earn 10% by beating the regulatory assumptions.

[5] I.e. whether the allowed return of 7% is above the true return cost of capital required by investors.

Table 2: Summary of Indicators Considered on Whether the WACC is Too Low or Too High

Indicator	Result	Discussion of strengths and weaknesses	Suggests allowed return is too high / too low?
Variances between approved capital expenditure allowances and actual capital expenditure since 2013 for network businesses	▪ DNSPs were underspending their allowances prior to 2013 and have continued to underspend, though some have overspent ▪ TNSPs overspent allowances prior to 2013 and have underspent since. ▪ The $ allowances, and $ of capex spent, have generally declined since 2013 ▪ On a % basis there is no clear evidence that "under spending" has increased for DNSPs, while the picture for TNSPs is clouded by spikes in expenditure prior to 2013.	▪ NSPs might defer or scale back capex if the allowed RoR < expected WACC. ▪ However, there are other reasons why NSPs might be under spending their allowance. ▪ For example, the uncertain regulatory environment and concerns about assets being stranded could mean there is option value in deferring investment. ▪ NSPs may also have an incentive to submit upwardly biased expenditure forecasts, in which case the allowance is not the level NSPs were planning on spending. However allowances are approved by the AER, and the AER can substitute its own forecast if it believes the NSP's proposal isn't efficient.[6] ▪ Allowances also reflect forecasts, and therefore deviation from allowances may simply reflect forecasting error.	Ambiguous
Observed historical returns for firms with similar betas	▪ We define similarity as firms that the AER would have estimated an equity in the same range it set for NSPs (0.4 – 0.7) as at the time of the 2013 guideline. ▪ The allowed cost of equity set by the AER appears to be lower than outturn returns for firms with a similar beta.	▪ Large variability in observed returns and the established limitations of the *ex post* empirical performance of the CAPM means inferences should be drawn with caution. ▪ Using equity returns allows for direct market evidence to be used across a very broad cross section of companies. ▪ However, *ex ante* expected returns can diverge from *ex post* realised returns over a persistent period of time. ▪ To the extent that the data used to estimate beta and calculate observed returns is the same, one might expect the observed RoE for comparable firms to be the same as the AER's estimated cost of equity. ▪ Equity betas and observed equity returns are also influenced by other factors such as leverage, incentive schemes etc. So our similarity criterion identifies firms whose equity holders face similar systematic risks, rather than identifying comparator firms based on the risks (systematic or otherwise) faced by the firm as a whole. ▪ If leverage differs between the sample used to estimate beta and the period over which observed returns are measured, leverage could drive trends in observed returns.	Too low

[6] Technically, the AER assesses whether an NSPs proposal reasonably reflects the "expenditure criteria" under the National Electricity Rules (NER). See, e.g. AER, *Expenditure Forecast Assessment Guideline for Electricity Distribution*, November 2013.

Indicator	Result	Discussion of strengths and weaknesses	Suggests allowed return is too high / too low?
Realised returns for the NSPs	▪ The AER's return on asset (ROA) figures show that most NSPs have realised returns greater than the allowed rate of return between 2014 and 2017. ▪ This outperformance has on average been less than 1% excluding incentive payments and slightly above 1% on average including incentive payments.	▪ The purpose of incentive based regimes is that firms may earn higher returns from reducing costs (including financing and tax) or providing higher quality service. ▪ If investors expect the realised return to persistently exceed the allowed return, this could explain RAB multiples greater than 1. ▪ Persistent outperformance should trigger a review of the incentive regime or other elements of the building block framework, rather than seeking to "claw back" these gains through a lower allowed forward-looking return. ▪ Setting a lower allowed return on the assumption there will be outperformance would risk deterring efficient investment for projects where outperformance is likely to be lower than average and would also assume that out performance can be predicted, which is questionable. ▪ Robust conclusions cannot be made on the basis of the limited income data (four years) the AER has collected to date, some of which relates to price control periods where the 2009 rate of return guideline applied.	N/A, informs other measures
RAB multiples	▪ RAB multiples for trade sales of firms regulated by the AER have been materially in excess of 1, and this figure has increased since 2013.	▪ Under a set of extremely tight assumptions, that are unlikely to hold in practice, the RAB multiple is a *direct* measure of the ratio of the *allowed* return to the *expected* return *required* by investors. ▪ Observed, unadjusted, RAB multiples provide information on whether the expected return (which is based on expected net cash flows) is greater than the true cost of capital. ▪ The various factors affecting market value besides the allowed RoR, such as expected potential outperformance, can *in theory* be controlled for, but in practice this may be quite difficult and transaction or firm-specific. ▪ Adjustments to RAB multiples to account for non-RoR factors result in wide ranges. ▪ This raises questions about the robustness of drawing inferences from RAB multiples in relation to the allowed RoR.	Ambiguous
Equity analyst research and observed capital-raising behaviour	▪ Analysts appear to have generally remained positive on NSPs since the 2013 guideline. ▪ Some even cited the permissiveness of the regime. ▪ Spark Infrastructure (SKI), AusNet Services (AST) and DUET (DUE) and the network businesses they invest in appear to have been able to raise capital.	▪ Positive analyst coverage and a continued ability to raise capital suggests at the very least that *realised* returns are sufficient. ▪ We have not however assessed whether the cost of raising these funds has changed. ▪ It is hard to separate whether the allowed RoR is too high from the ability of firms under incentive-based regulation to earn realised returns above the allowed level. ▪ Academics and commentators have observed 'optimism' bias in equity analyst ratings.	Not too low/ambiguous

Source: NERA analysis

1. Introduction

1. As part of the AER's 2018 review of the Rate of Return guidelines ("2018 RoR Guidelines"), we have been engaged to address a joint terms of reference ("joint TOR") prepared by Energy Networks Australia (ENA) and the AER's consumer reference group (CRG). The joint terms of reference ("joint TOR") contains three questions we have been asked to address:

   - What are the drivers of the increases in the regulatory asset bases for energy networks and what implications can be drawn from these increases as input to the AER's task of reviewing its rate of return guideline under the National Electricity and Gas Rules?
   - What is the set of empirical evidence and verifiable indicators that could reliably indicate that the AER's rate of return approach since 2013 may have led to higher or lower than efficient network Regulatory Asset Base?
   - Do these indicators show a consistent pattern of evidence that is sufficiently robust to enable conclusions to be drawn that AER allowed rates of return are either too high or too low? Why or why not?

2. This assignment is motivated by a debate over whether recent RAB growth has been excessive, which in return has resulted in increased prices to consumers. Some consumer groups hold the view that the allegedly excessive growth in the RAB has partly been driven by an excessive allowed rate of return. The network service providers (**NSPs**) on the other hand are of the view that the rate of return set by the 2013 is "about right (if not a little low)".[7]

3. This assignment is an opportunity to collect a common fact base on what has been driving RAB growth, which both the CRG and ENA may rely on going forward to inform the debate about the appropriate rate of return.

4. The real RAB will grow over time if capex is greater than depreciation. This will occur if:

   - the networks are expanding geographically or increasing the number of connections, so capex relates to new assets;
   - existing assets are replaced with higher capacity/quality assets;
   - the real cost of "like for like" replacements of existing assets has increased relative to assets dropping out of the RAB at the end of their regulated asset lives;
   - depreciation is set in such a way that capital recovery is deferred, resulting in assets still being in the RAB when they are physically replaced;
   - replacement investment is cyclical and lumpy, such that the RAB will fall for periods of time and then increase when assets are replaced.[8]

5. All other things being equal, if the allowed rate of return is set higher than the true cost of capital expected by investors, and investors expected this to persist over the life of the asset, this would manifest itself in at least two ways:

   - NSPs would have the incentive to over build or "gold plate" the network, i.e. spend more capex than is necessary to efficiently serve consumers (which may occur through any of the routes set

[7] AER (July 2018), *Draft Rate of Return Guidelines – Explanatory Statement*, p.25.

[8] In the final year of an asset's operational life, only a small portion of its original cost will feature in the RAB. In the first year of an asset's operational life, its full cost will feature in the RAB. As a result, asset replacement causes the RAB to spike if it is not uniform over time.

out in paragraphs 4 to ▪ above). For NSPs to gold plate the network, the AER would also have to approve capex plans which included excessive investment. If NSPs have an informational advantage over the AER in understanding the network's needs, the AER may be unwilling to disapprove potentially important capex necessary to ensure system reliability; and

- Investors would be willing to pay materially more for the assets of NSPs than the value recorded for the RAB and provide finance to NSPs at rates lower than the allowed cost of capital set by the AER.

6. Conversely, if the rate of return is lower than the true cost of capital, all other things being equal

- NSPs would defer capex and sweat existing assets; and
- NSPs would struggle to raise finance and defer paying dividends.

7. The consequences outlined in the previous two paragraphs assume that the expected *realised* returns that can be earned through the regulatory regime are equal to the *allowed* rate of return set by the AER.[9] What investors truly care about is their expectation of the *realised* rate of return, which is the net effect of all the assumptions and incentives in place in the regulatory model, as opposed to a single, albeit material, assumption. The presence of incentive mechanisms and the ability of firms to over/under perform the regulatory assumptions means that the *realised* return, both in an expectations sense and *ex post*, could differ from the *allowed* rate of return set by the AER. That is to say, if investors *expected* to persistently achieve returns that differ from the allowed rate of return, this could mask the fact that the allowed rate of return is too low. For example, as the AER notes:[10]

> *We do expect there to be some level of outperformance of regulatory benchmarks due to the operation of incentive mechanisms, as well as there being some level of returns from unregulated activities. It is possible that the allowed rate of return could be too low, but that other unregulated returns (from outperformance of other allowances or from unregulated activities) are large enough to outweigh this effect and result in a multiple greater than one. However, given the RAB multiples recently observed we consider it unlikely that the allowed rate of return would be too low.*

8. This complicates using market outcomes to assess whether the *allowed* rate of return meets the National Electricity and Gas Objectives (NEO and NGO respectively) and the allowed rate of return objective. For example, if the regime allowed NSPs to consistently earn realized returns above the *allowed* rate of return, it will difficult to disentangle whether the *allowed* rate is too high or too low, relative to the cost of capital required by investors.

9. That is to say, if the allowed rate of return is 7% and realized returns are 10%, market evidence may reflect this outperformance, rather than (or in addition to) any premium in relation to the 7% being greater than the return required by investors.

10. We interpret the inclusion of the allowed rate of return objective in the National Electricity Rules (NER) in addition to the NEO as suggesting that the allowed rate of return should be assessed on a stand-alone basis. That is to say, the AER sets the allowed rate of return such that *AROR = expected return required by investors* as opposed to *AROR + expected incentives = expected return required by investors.* This appears to broadly be the approach the AER has taken, through its approach of setting

[9] As we explain in paragraph 10 below, while it is ultimately a legal question, we interpret the statutory framework as requiring the AER to set the allowed rate of return equal to its estimate of the return required by investors. This appears to be the framework the AER has applied.

[10] AER, *Presentation on achieving the NEO*, p.2. Available at: https://www.aer.gov.au/system/files/AER%20presentation%20on%20achieving%20the%20NEO%20.pdf .

a benchmark return based on market parameters and placing the risk over/under performing that benchmark on the NSPs:[11]

> *We apply a benchmark approach and an incentive regulatory framework. We estimate a benchmark rate of return which is then applied to a specific service provider, rather than determining the returns of a specific service provider based on all of its specific circumstances.*
>
> *The service providers' actual returns could differ from those of the benchmark regulatory allowance depending on how efficiently it operates its business. This is consistent with incentive regulation. That is, our rate of return approach drives efficient outcomes by creating the correct incentive by allowing (requiring) service providers to retain (fund) any additional income (costs) from outperforming (underperforming) the efficient benchmark.*

11. Therefore, the preceding issues only in arise in practice if the AER unintentionally mis-calibrates its incentive mechanisms and cost allowances, such that all NSPs systematically outperform their allowances.[12]
12. Regulatory best practice would separate returns from incentives, and thus if it is the case that persistent returns are being earned elsewhere in the regime, the source of that should be investigated rather than clawing them back through the allowed rate of return.
13. Our approach is therefore to first examine whether the growth or otherwise of the RAB since the 2013 guidelines, appears to have been driven by factors other than the rate of return.
14. We then assess empirical indicators on whether the rate of return is too high or too low, by which we mean whether the allowed rate of return differs from the expected return required by investors.
15. As per the joint ToR, we have primarily relied on data contained in the AER's regulatory information notice (RIN) database.
16. The remainder of this report is structured as follows:

- Section 2 provides a brief overview of current debate on rate of return and RAB growth, with a focus on the positions of parties during the 2018 Guidelines process and external considerations of whether networks have been over investing;
- Section 3 provides an overview of recent high-level trends in RAB growth;
- Section 4 considers what the drivers of recent growth in the RAB are;
- Section 5 considers empirical indicators for the whether the AER's approach to the rate of return since the 2013 guideline may have led to a higher or lower than efficient network RAB; and
- Section 6 concludes.

[11] AER, *2018 Draft rate of return guidelines – explanatory statement*, p.74.

[12] That is to say, individual NSPs may systematically outperform because they have superior management, and this isn't necessarily indicative of a flaw in the regime.

2. Recent debate on RAB growth and the WACC

17. In this section we briefly outline the recent considerations of RAB growth in Australia, as well as set out the views on the rate of return that have been put forward during the development of the 2018 guidelines.

18. Our intent is not to provide a detailed review or critique of these studies, now to assess in detail the views put forward by various parties. Rather, it is to briefly describe the context within which the analysis in our report sits.

2.1. Views of the parties put forward during the 2018 Guidelines process

19. In its draft decision paper on the 2018 Rate of Return Guideline, the AER notes the consumer position with Respect to the *2013 Guideline:*[13]

> *The CRG, ECA, MEU, and EUAA referred to the following indicators that the 2013 Guidelines have not been contributing to achieving the legislative objectives to the greatest degree:*
>
> > *The parameter values we have chosen in our decisions are too high given the low risk in providing regulated services*
> >
> > *The current rate of return is too high and has not achieved the NEO*
> >
> > *Energy prices have increased substantially resulting in price stress for some customers, increased disconnections, and switching to alternative fuels*
> >
> > *Regulatory asset bases (RABs) have increased substantially while utilisation has declined and reliability has not been an issue*
> >
> > *Service providers have been able to achieve supernormal profits*
> >
> > *Recent sales and acquisitions of service providers have been at RAB multiples materially greater than 1*

20. In response to the 2018 guidelines, NSPs stated that they considered:

> *The current rate of return is about right (if not a little low) and the 2013 Guidelines have been contributing to achieving the NEO and NGO.*[14]

21. The ENA noted in response to the guidelines that reductions in the allowed return on equity in the 2013 guidelines have negatively impacted investment levels, evidenced by actual expenditure levels below approved allowances.[15]

[13] AER (July 2018), *Draft Rate of Return Guidelines – Explanatory Statement*, p. 82

[14] AER (July 2018), *Draft Rate of Return Guidelines – Explanatory Statement*, p.25.

[15] AER (July 2018), *Draft Rate of Return Guidelines – Explanatory Statement*, p.25.

2.2. Recent considerations of RAB growth

22. RAB growth for electricity networks in electricity is a well-trodden topic in Australian regulation. Three recent studies are of particular relevance to our task and thus warrant a brief summary:

- the Grattan Institute's 2018 Report "Down to the wire: A sustainable electricity network for Australia";
- the ACCC's final report from the 2018 Retail Electricity Price Inquiry; and
- the AEMC's 2018 Economic regulatory framework review.

23. According to the 2018 Grattan Institute study,[16] up to 50 per cent of total investment by NSPs since 2006 could be considered excessive. The Grattan Institute study defines excess growth as the growth in assets (RAB) that exceeds growth in network usage. Network usage is defined as aggregate of growth in customer numbers and growth in maximum demand. This measure is therefore a "top-down" measure of usage and therefore doesn't assess the "bottom-up" localised growth and constraints that drive investment or whether non-growth-related investment may still have positive net benefits to consumers.[17] They consider asset growth above this level to place additional costs on the consumer without a clear improvement in service or benefits. They estimate excess growth of up to $20bn, of which $18.5bn came from NSW and Queensland.[18]

24. The Grattan Institute identifies rising capex from 2003-2010 in NSW and QLD as the primary cause of excess RAB growth, with Ausgrid being the single largest NSP responsible. They point to the implementation of new reliability standards in these regions from 2005 to 2014 as a major cause of excess growth.[19] They consider that actual peak demand exceeding forecast demand was a likely contributing factor in NSW, QLD and Tasmania. Public ownership was also cited as a structural cause of overspending.[20]

25. Grattan also place the burden on NSPs of the fact that historic forecasts of demand approved by regulators have turned out to be excessive with hindsight:[21]

> *…demand growth was actually lower than expected. Excessive expenditure associated with changing demand was largely the fault of network businesses' own demand forecasts. Consumer groups and the AER did not have the resources to effectively dispute these forecasts*

26. The Australian Competition and Consumer Authority (ACCC) published its Retail Electricity Pricing Inquiry in June 2018. The ACCC found that retail electricity prices have risen by 56% in real terms since 2007. Of this increase, 38% was found to relate to network costs, 27% to wholesale electricity costs, 15% to environmental costs, 8% to retail costs and 13% to retail margins. Outside of network costs, the ACCC identified generation market power, retail discounting[22] & penalty charges[23] and disengaged customers as particular issues.

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[16] Grattan Institute (March 2018), *Down to the wire: A sustainable electricity network for Australia*.

[17] For example, continued growth in a specific area of the network may drive large augmentation costs, but when measured against demand for the network as a whole, this growth may seem small.

[18] Grattan Institute, *Down to the wire*, Section 1.1, p.7.

[19] Grattan Institute, *Down to the wire*, Section 2.3, p.20.

[20] Grattan Institute, *Down to the wire*, Section 2.2.2, p.15.

[21] Grattan Institute, *Down to the wire*, Section 4.3, pp. 29-30.

[22] Specifically, that discounts are opaque, so even active customers aren't getting the best deal.

[23] I.e. excessive late payment fees.

27. Regarding the increase in network costs, the ACCC attributes this increase in prices to an increase of the overall RAB across the NEM, with the NEM-wide RAB growing 75 percent in real terms between 2006 and 2015. The ACCC recognised that this increase was largely concentrated in New South Wales, Queensland and Tasmania.

28. The ACCC observed, citing the AEMC, that the sharp increase in RAB growth and ongoing substantial capex, albeit at lower than historic levels, is inconsistent with the flattening of demand that has occurred in recent years. [24]

29. The ACCC considers that following factors "seem to be the most likely reasons for excess investment":[25]

- Increase in network reliability standards, mainly in NSW and Queensland between 2005 and 2014, when they were repealed for being "overly cautious"
- Incentives based on a high rate of return, which might foster excessive investment / a bias toward capex
- Potential inefficiency stemming from public ownership of networks in Queensland and Tasmania, as well as in NSW before privatisation.

30. Earlier in the paper (page 165), the ACCC also notes in relation to RAB growth that

> *Reasons for this investment included investments to replace ageing assets, meeting stricter reliability and bushfire safety standards, and responding to forecasts at the time of rising peak demand.*

31. However, by basing their estimate of excess RAB growth on *ex post* network usage, any investment that was made in anticipation of forecasts that were not realised is considered "excess". In the context of our present task of assessing whether the allowed rate of return is too high, this is an important feature to account for.

32. In addition to recommending RAB write downs in New South Wales and Queensland (Recommendation 11), the ACCC make the following recommendations that are relevant for our current task:

- An explicit process whereby network assets can be stranded and the costs of stranding are shared between users and networks (Recommendation 13); and
- Responsibility for setting reliability standards should be placed on the AER or other NEM market body (Recommendation 16).

33. As part of the recent 2018 Economic Regulatory Framework Review,[26] the AEMC has considered whether the historical performance of NSPs provides any indication of a bias towards capex. While not identical, this analysis (considering whether there is a capex bias) overlaps with our task (assessing RAB growth, which is determined by capex). The AEMC found that the capex-to-opex ratio was volatile, but increasing until 2010, after which it has been steadily falling.[27]

34. The AEMC described its analysis and conclusions as follows:

> *This analysis was conducted using publicly available data as well as expenditure data provided by the AER as part of the monitoring aspect of this review. The Commission*

[24] ACCC (June 2018), *Retail Electricity Pricing Inquiry - Final Report*, para. 7.1.2.

[25] ACCC, *2018 REPI Final Report*, p.165.

[26] AEMC (26 July 2018), *2018 Economic Regulatory Framework Review*.

[27] AEMC, *2018 Economic Regulatory Framework Review*, Figure 3.12.

> *reviewed indicators such as capex-opex ratios, actual expenditure against regulatory allowance for the most recently completed regulatory period and NSPs' consideration of non-network solutions.*
>
> *The Commission acknowledges that NSPs' investment decisions could be influenced by factors other than financial incentives. However, it is difficult to disentangle their influence from a handful of expenditure indictors. Coupled with the changes in operating environment and the regulatory framework the Commission concludes that examination of past performance is not able to provide conclusive evidence on whether NSPs' investment decisions exhibit a bias towards capex [footnotes excluded]*.

35. That is, the AEMC considered it was unable to disentangle trends in observed expenditure from:

- regulatory reforms allowing greater scrutiny of regulatory proposals in 2012;
- the introduction of the CESS and DMIS; and
- significant departures from actual demand.

36. The AEMC further noted that if the actual cost of capital for NSPs is less than the allowed rate of return, then their financial modelling indicated NSPs would have a strong bias towards capex solutions.[28]

[28] AEMC, *2018 Economic Regulatory Framework Review*, Para 34.

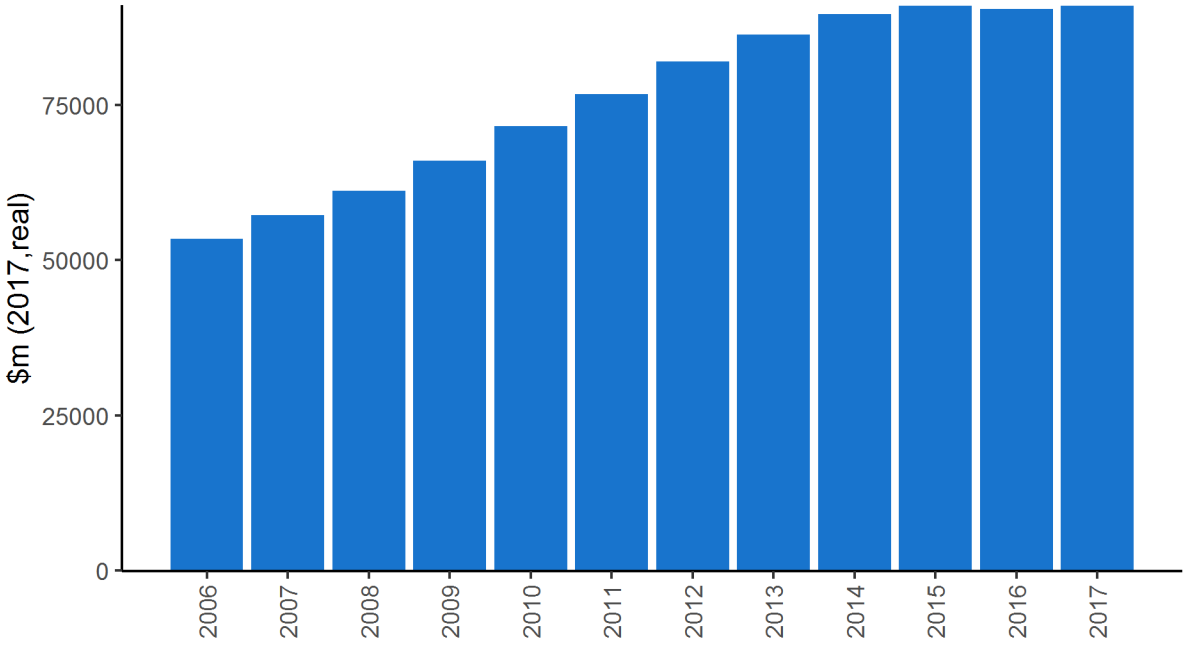
3. High level trends in RAB growth

37. In this section we set out recent trends in RAB growth for electricity distribution and transmission network service providers, considering both high level trends and the composition of the RAB.

38. Australian regulation relies on Current Cost Accounting (CCA) to define the returns and depreciation earned by investors. By relying on CCA, the AER has determined that the costs of NSPs' assets shall be spread between current and future generations of consumers in constant real terms.[29] Under CCA, the RAB rises in nominal terms over time with inflation even for a network otherwise in a steady state.[30] Nonetheless, even after accounting for inflation, the combined RAB for NSPs in Australia has risen in Australia over the last decade and reached its historical maximum of c. $90 billion in 2017 (see Figure 3.1 below).

39. The growth in the real RAB has not been stable over time. From 2006 to 2013 the average annual growth rate of the RAB across NSPs was 7.1 per cent in real terms. After the AER introduced the new rate of return guidelines in 2013, real growth in the RAB fell to just 2.3 per cent per annum. The last few years have seen some of the slowest growth in the RAB: The RAB fell by 0.6 per cent in real terms in 2016 and grew just 1.5 per cent in 2017.

Figure 3.1: Total real RAB across all Australian NSPs 2006-2017



Source: AER RFM

40. The pattern of RAB growth has been uneven across Australia over the last ten years. Queensland and New South Wales have made the largest contribution to overall RAB growth as a result of having both higher growth rates and higher initial RABs (see Figure 3.2 below).

41. The growth the RAB in each jurisdiction has also varied across time:

- Between 2006 and 2013, NSW/ACT had the fastest average rate of real RAB growth of 9.7 per cent per annum, followed by Queensland and Tasmania with annual growth of 8.4 per cent and

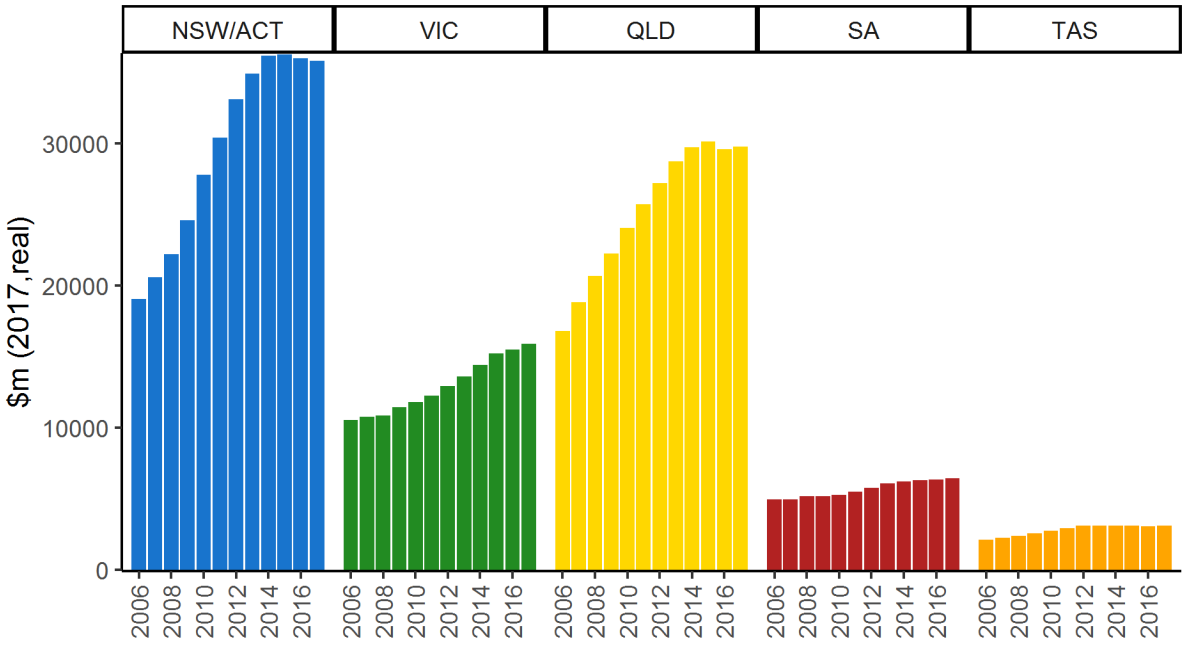
[29] We discuss the impact of indexation on RAB growth in section 4.5.1.

[30] Historical Cost Accounting (HCA), the principal alternative, would imply lower RAB growth and a different allocation of the costs of network investments across consumers such that the current generation of consumers would pay a higher proportion of the costs of investment.

6.4 per cent, respectively. During the same period, the RAB grew on average only 3.5 per cent a year in Victoria and 2.6 per cent a year in South Australia.

- After 2013, this rapid accumulation of RAB slows in NSW/ACT and QLD. For the subsequent period from 2013 to 2018, the real RAB grew only 1.6 per cent in NSW/ACT, 1.8 per cent in QLD and 0.2 per cent in TAS. However, in Victoria – the only state along with SA to have had steady RAB growth in the prior years – the RAB begins to increase quickly in this year. From 2013 to 2018, the RAB grew 5.3 per cent a year on average in VIC. SA is the only state to maintain steady growth between the two periods, with the RAB expanding 2.2 per cent per year after 2013.

Figure 3.2: Total real RAB growth by state 2006-2017



Source: AER RFM

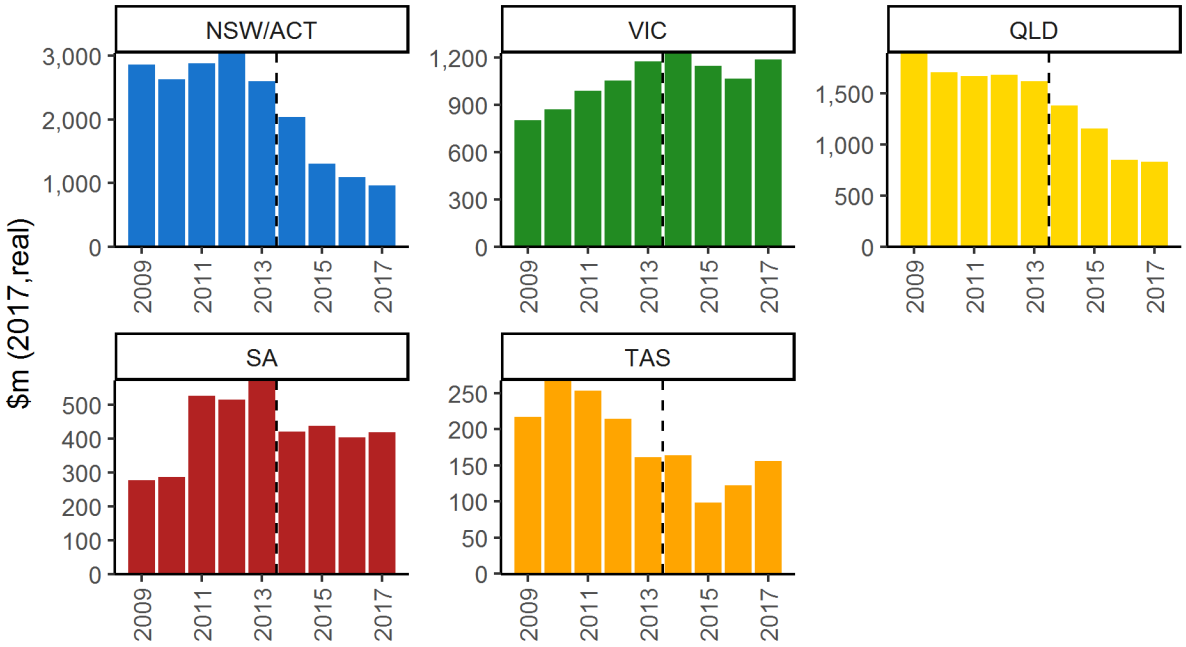
42. Consistent with the trend of slowed RAB growth, total capital expenditure has also generally fallen since 2013. Figure 3.3 below shows combined (transmission + distribution) total capital expenditure by state.

43. The historical rate of RAB growth varies across NSPs. Comparing growth before and after 2013, being the introduction of the *2013 Guideline*, we find that real RAB growth has slowed (or the RAB has decreased) since 2013 for all NSPs except the Victorian distribution businesses. Firm level RAB and capex figures are presented in Appendix A.

44. The same trends exist when the RAB is considered in per customer terms. Figure 3.5 shows total real RAB per customer by state from 2006 to 2017. NSW and QLD display the same persistent rapid growth in RAB prior to 2013. Thus, this expansion is not simply a result of growing populations in this region. The expansion in the RAB since 2013 in Victoria appears more moderate in per customer terms, indicating that some of it may have been a results of increased market size.

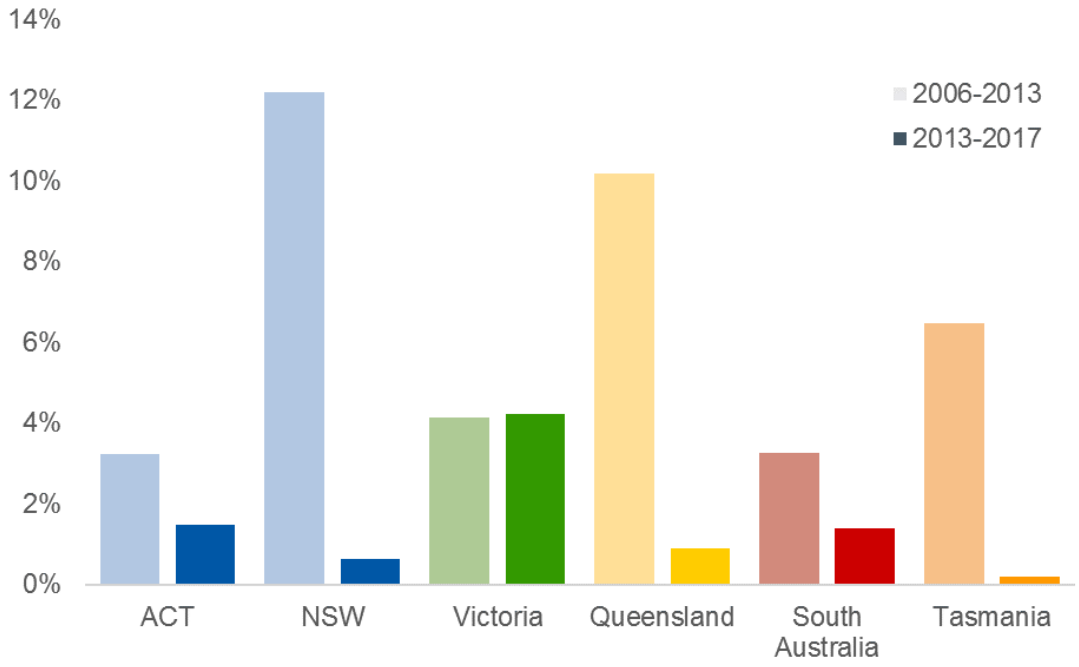
45. Consistent with a trend of increasing RAB per customer, the AER's measure of aggregate utilisation for DNSPs has been falling gradually over time (Figure 3.6). Similarly, measures of quality for distribution (SAIDI/SAIFI) and transmission (loss of supply events) have generally been falling over time, though the measures are volatile (see Figure 3.7).

Figure 3.3: Total capex (transmission & distribution) by state, 2009-2017



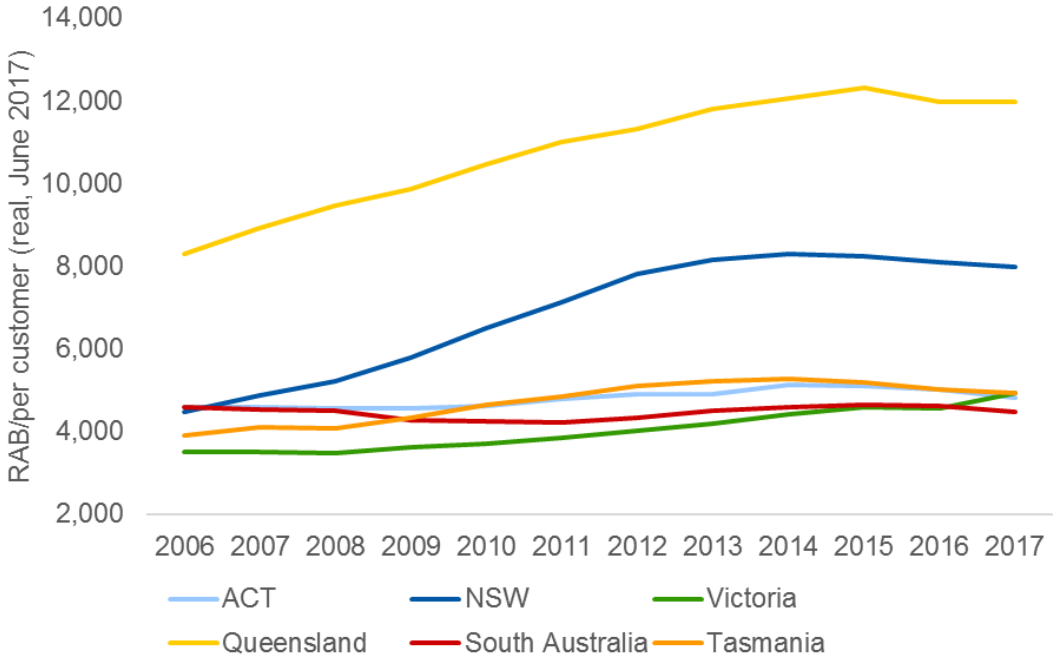
Source: AER CA RIN.

Figure 3.4: Average annual real RAB (transmission + distribution) growth, 2006-2013 vs 2013-2017: Since 2013 RAB growth has slowed in all states outside of Victoria



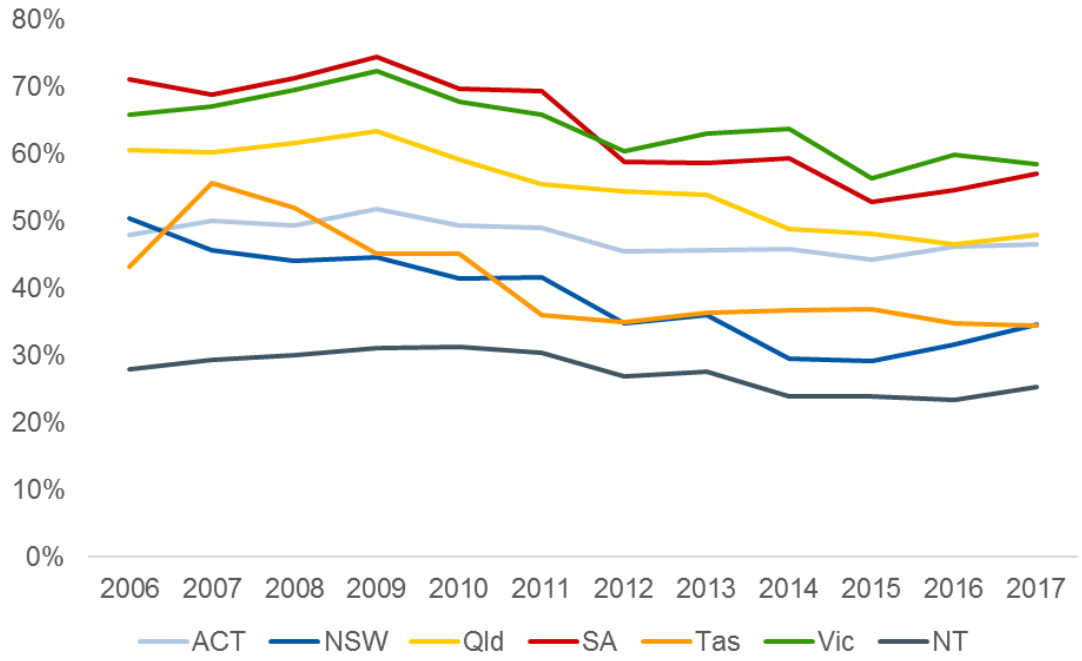
Source: AER RFM

Figure 3.5: Real RAB (transmission and distribution) per customer by state 2006-2017



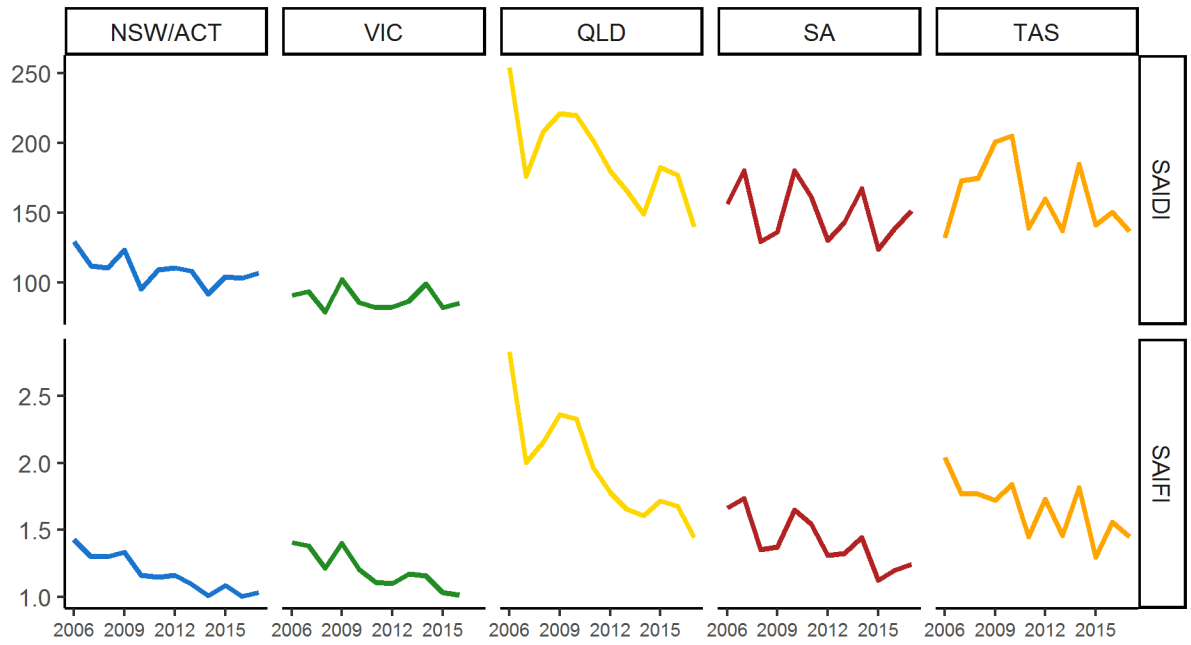
Source: Closing RAB values from RFM and Customer Numbers from EB RIN

Figure 3.6: AER measure of DNSP utilisation: aggregate utilisation has been falling



Source: AER. Note: The AER utilisation calculation is derived by comparing maximum demand to the total capacity of the distribution network, at the zone substation level. We have calculated the state figures as the simple average of the individual NSP figures in each state.

Figure 3.7: SAIDI and SAIFI for DNSPs by state: the duration and frequency of interruptions has generally been falling



Source: AER EB RINs

46. Regarding the composition of the RAB, Figure 3.8 and Figure 3.9 below show the distribution and transmission RAB for each state, broken down by asset class.

47. This shows that for distribution, growth in the RAB was largely proportional (i.e. the asset classes grew relatively evenly), suggesting there wasn't a skew in investment towards certain types of assets. The exception to this observation is Victoria, where there appears to have been proportionally more investment in overhead, as opposed to underground network assets and South Australia where RAB has becomes slighted more weighted towards substations.

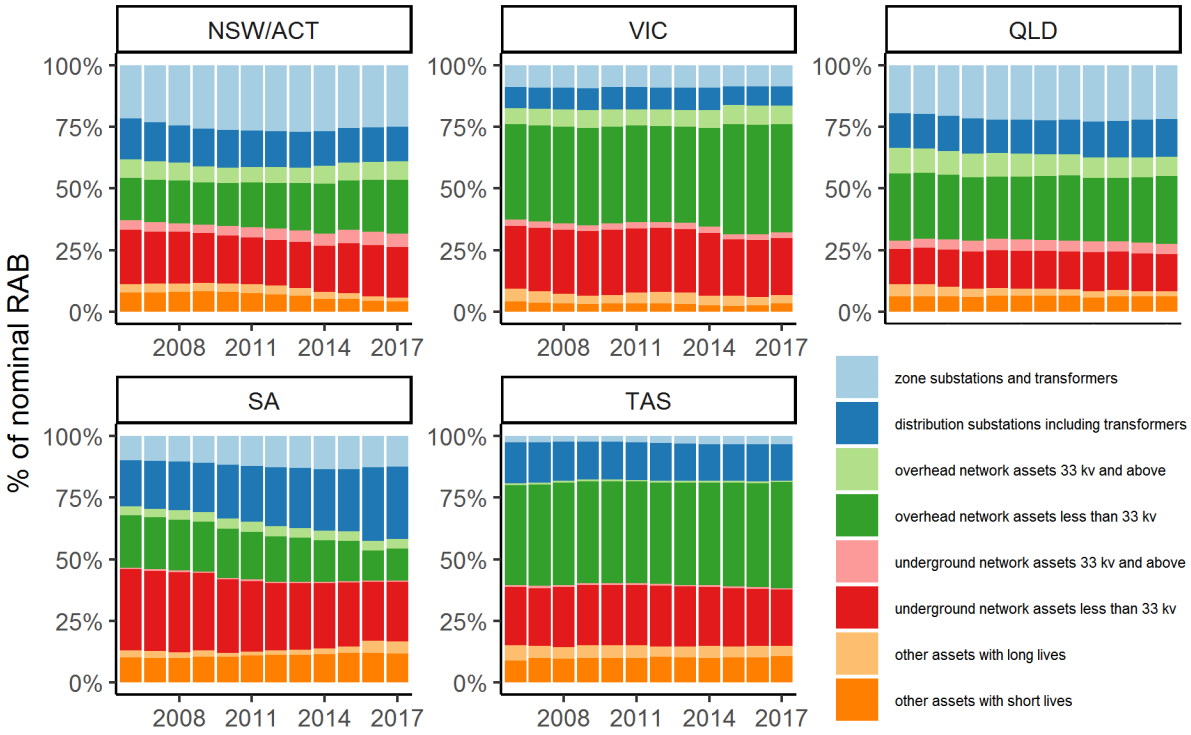
48. For transmission, the story is similar, with growth across asset classes largely proportional, bar a gradual shift towards switchyards & substations at the expense of overhead transmission assets in NSW and Victoria and an increase in undergrounding and switchyards & substations in SA after 2011.

49. Another important compositional (and absolute $ value) trend is the mandatory roll out of Advanced Metering Infrastructure (AMI) in Victoria.[31] This, and metering in general, sit outside what is typically meant by "the RAB" for network businesses, which is what is defined as "standard control services". [32] Outside of Victoria where smart meter roll-out has not been mandated, the "metering asset base" or MAB is small relative to the RAB. Figure 3.10 and Figure 3.11 below show the step change in the size of the MAB that occurred in Victoria as a result of the AMI program.

[31] See http://www.smartmeters.vic.gov.au/.

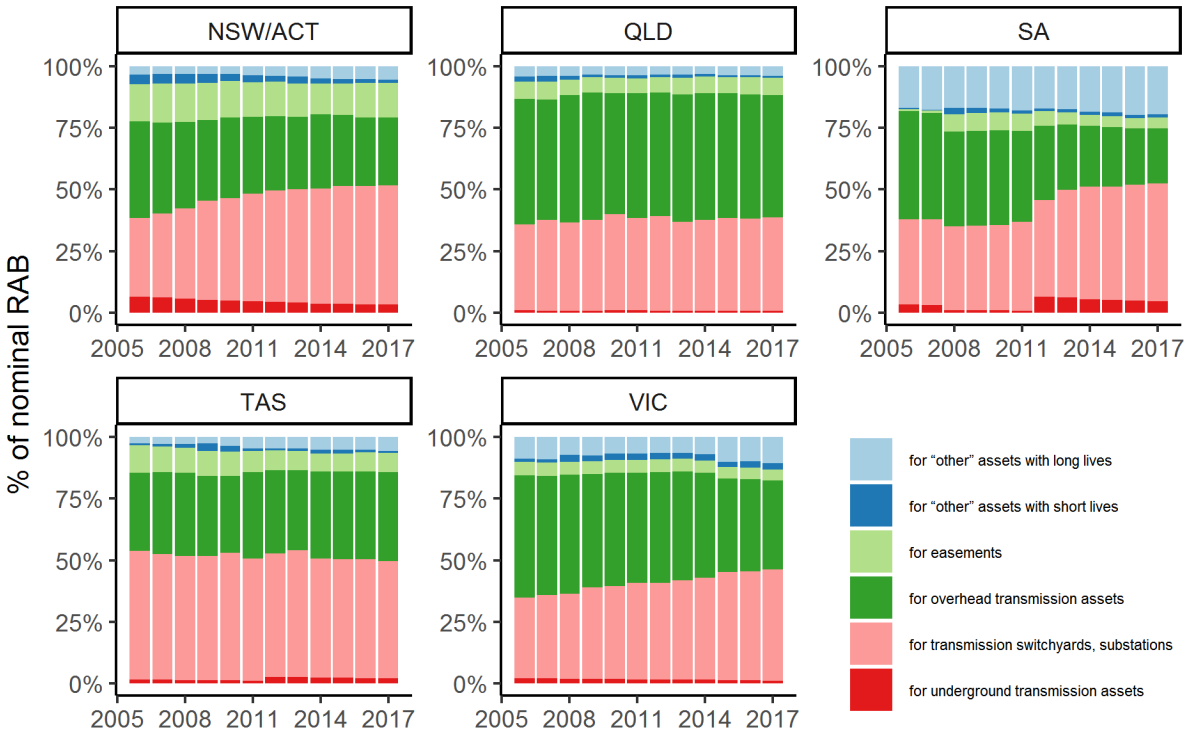
[32] Metering is now an "alternative control service" (ACS) whereas references to the RAB typically refer to "standard control services."

Figure 3.8: Disaggregated distribution RAB (standard control services, excl metering), by state



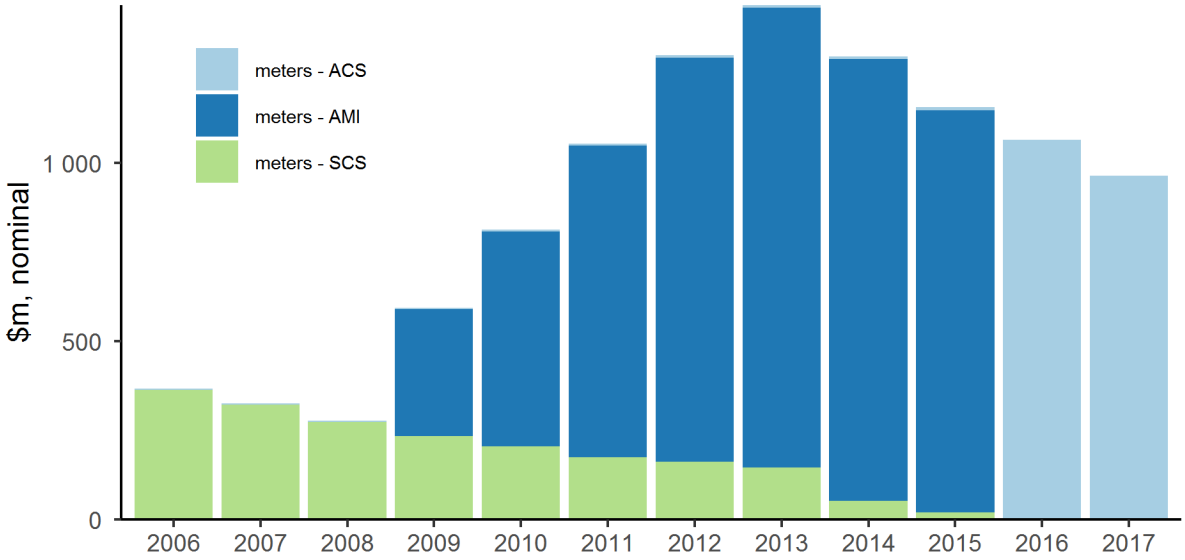
Source: AER EB RIN.

Figure 3.9: Disaggregated transmission RAB (standard control services), by state



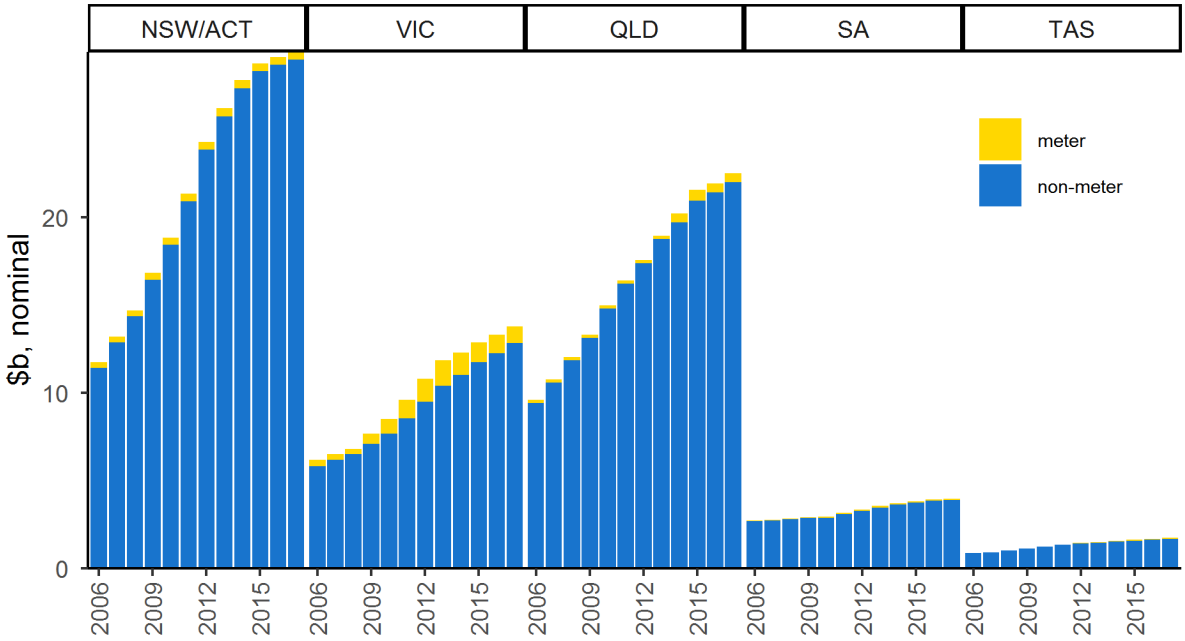
Source: AER EB RIN.

Figure 3.10: The metering asset base (MAB) in Victoria: impact of the mandatory AMI rollout



Source: AER EB RIN, AMI transitional charge models and AusNet Serices metering PTRM.
Note: The AMI RAB doesn't appear in the SCS or ACS data prior to 2016, after which point is disclosed in alternative control services, except for AusNet, where we have taken the metering RAB values from metering PTRM.

Figure 3.11: DNSP RAB, metering vs non-metering: The AMI program was material both relative to the RAB in Victoria and the RAB in other states



Source: AER EB RIN, AMI transitional charge models and AusNet Serices metering PTRM.
Note: The AMI RAB doesn't appear in the SCS or ACS data prior to 2016, after which point is disclosed in alternative control services, except for AusNet, where we have taken the metering RAB values from metering PTRM.

4. Non-ROR drivers of RAB growth

50. The previous chapter set out high level trends in RAB growth before and after the 2013 Rate of Return guideline. The allowed rate of return being too high is one explanation for RAB growth over time. We appraise that explanation in Section 5. There of course reasons the RAB may grow unrelated in to the rate of return. In this section, we examine alternative reasons for the growth (or otherwise) in the RAB, including some factors which may have decreased RAB growth.

51. Our findings are as follows:

- **Forecast vs actual demand:** From the limited evidence available it is unclear that excess demand forecasts have driven RAB growth since 2013. Prior to 2013, any over forecasting appears to have reflected a market wide belief that demand would be higher (Section 4.1)
- **Cyclical trends in asset lives and replacement needs:** To the extent the RAB is still growing, replacing what is an ageing portfolio of assets is now the primary driver of RAB growth. The evidence suggests that the link between measures of average asset age and investment requirements is weak. The real cost replacing assets may have also increased over time, which can result in RAB growth when assets are replaced (Section 4.2)
- **Reliability and safety standards:** Reliability and safety measures adopted by State governments have led to additional investment and increased RAB growth, though this was much more material pre 2013 (Section 4.3);
- **Mandatory obligations to connect:** DNSPs have not typically been able to recover the full cost of new connections from those wishing to connect to the grid. As a result, some of the costs of new connections have been socialised and increased the RAB (Section 4.4);
- **Depreciation, indexation and the PTRM/RFM:** Indexation of the RAB defers depreciation and therefore makes RAB growth more likely. The move to using forecast depreciation may also slow RAB growth if NSPs continue to underspend their allowances (Section 4.5); and
- **Incentive mechanisms:** Financial incentives such the STPIS may promote growth in the RAB if the targets which are rewarded are most efficiently achieved by capex (i.e. RAB solutions). (Section 4.6);

52. Given the data that was available for the development of this report, it is not possible to precisely decompose the extent to which RAB growth follows from each of the above factors. Nonetheless, taken together, the factors described in this chapter suggest that at least some of the growth in the RAB is due to factors other than the rate of return.

4.1. Impact of demand forecasts versus actual demand

53. Demand for electricity, especially coincident peak demand, drives the need for investment in electricity networks. All else equal, the RAB would grow fastest when demand was also growing. Yet all else is not always equal: The ACCC's final report in the 2018 Retail Electricity Prices inquiry noted that demand growth and consumption had slowed down in the late 2000s when capital expenditure was at high levels relative to those prevailing historically.[33]

54. Electricity network companies make long-lived investments to support the transport of electricity and making and planning those investments may take multiple years for both the timing of construction and to obtain regulatory approvals. The value of lost load from forced disconnections is typically

[33] ACCC, *REPI Final Report*, p.167, Box 7.2.

high relative to the costs of transporting it.[34,35] Accordingly, energy network businesses may efficiently invest ahead of demand based on their expectation of the outturn level of demand. However, if forecast demand at the time investments must be made ends up being materially larger than outturns, investments that NSPs efficiently incurred based on the best information available at the time may look excessive ex post.

55. We reviewed two indicators of whether over-forecasting of demand may have resulted in RAB growth in recent years:

- A comparison of DNSP forecasts and outturn peak demand to assess whether DNSP's had over-forecasted demand. To the extent that NSPs were forecasting demand above current levels, this may have driven increased investment. Our analysis suggests that whilst DNSPs did forecast demand that did not materialise, in practice, demand levels had caught up with those forecasts by 2017 in the limited sample we had available; and

- Forecasts provided by the Australian Energy Market Operator (AEMO) and outturn peak demand. Forecasts provided by AEMO provide a reasonable proxy for market expectations of demand growth and were arguably the best information that would have been available to DNSPs. AEMO forecasted consistent demand growth in 2012 and 2013 whilst demand fell in practice and did not recover in line with AEMO's expectations. Only the lower forecast published in 2014 remained close to recent outturns. Accordingly, the evidence from AEMO's forecasts suggests that it would have been reasonable for DNSPs to expect a higher rate of demand growth than in fact materialised when planning capital expenditure, at least for the period considered.

4.1.1. Outturn Demand Caught Up With Forecasts Made at the Last Reset by 2017

56. A full time series of outturn demand and DNSP's forecasts over time since 2006 would be necessary to appraise the impact of forecast demand on the evolution of the RAB, particularly over the period between 2006 and 2013 when the RAB was growing most quickly (see section 3 above). In addition, the focus of our report is on RAB growth since the *2013 Guidelines*.

57. Figure 4.1 therefore presents:

- the evolution of outturn demand over time as reported in the Regulation Information Notices (RINs) that the AER uses to support the benchmarking of DNSPs during reset processes; and

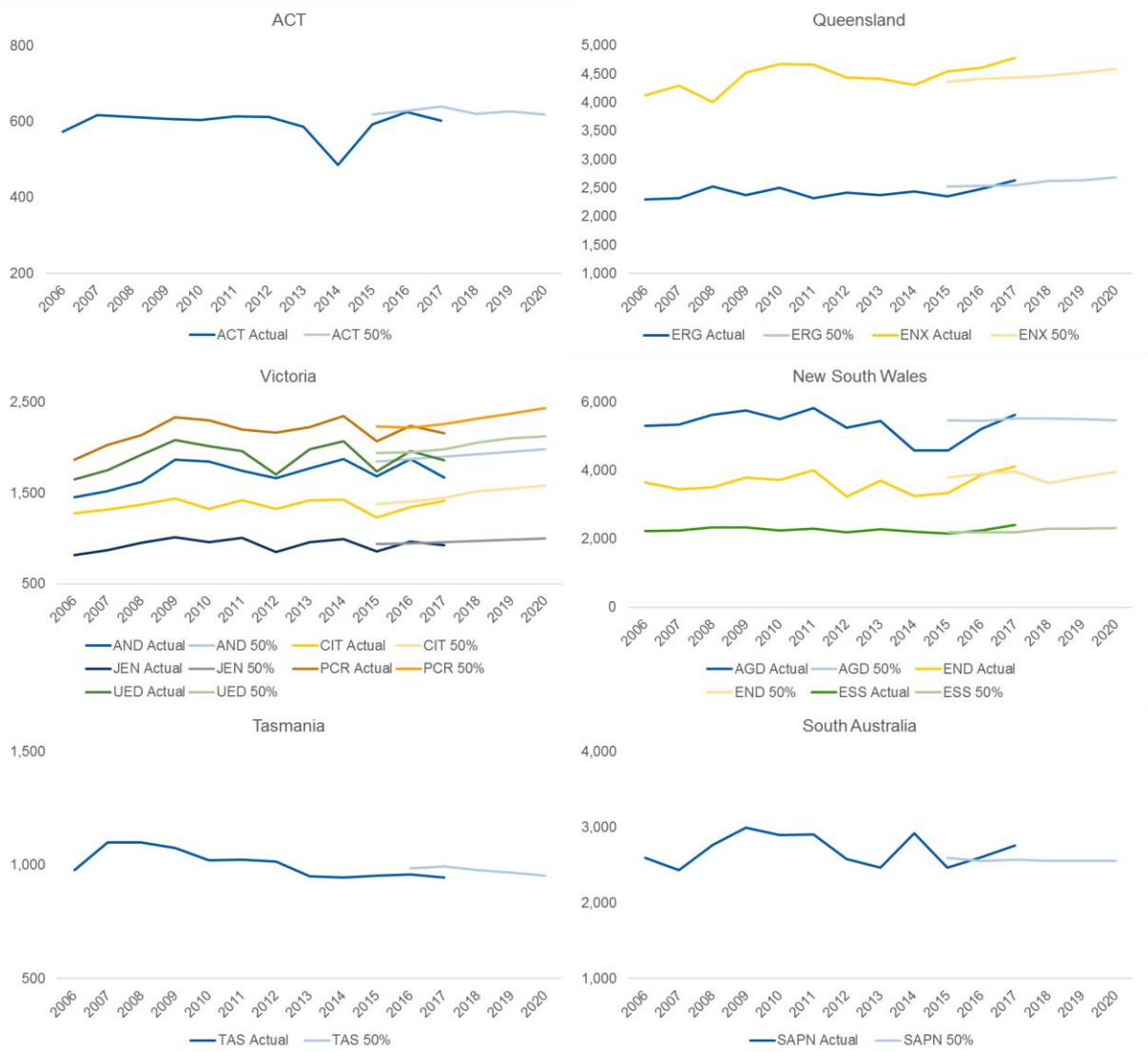
- forecasts for the current regulatory period taken from the RINs provided by each DNSP to support their business plans during the last reset process.

58. As a whole, networks overestimated coincident and non-coincident demand in their forecasts at the last reset; however, this error appears to have only persisted for the early part of the current regulatory period: by 2017 maximum demand had caught up or overtaken the median forecast (50% Probability of Exceeding or POE).

[34] The single examination to date of the value of customer reliability (VCR) was carried out by AEMO in 2014, and estimated at $33,460/MWh. See AEMO, *Value of Customer Reliability Review*, 2014.

[35] Following a 2018 rule change, responsibility for determining a NEM wide consistent VCR methodology now sits with the AER. The AER will publish its first estimates of the VCR by 31 December 2019. See https://www.aemc.gov.au/rule-changes/establishing-values-of-customer-reliability

Figure 4.1: Coincident demand at the transmission connection point (MW), Actual v. Forecast (50% POE)

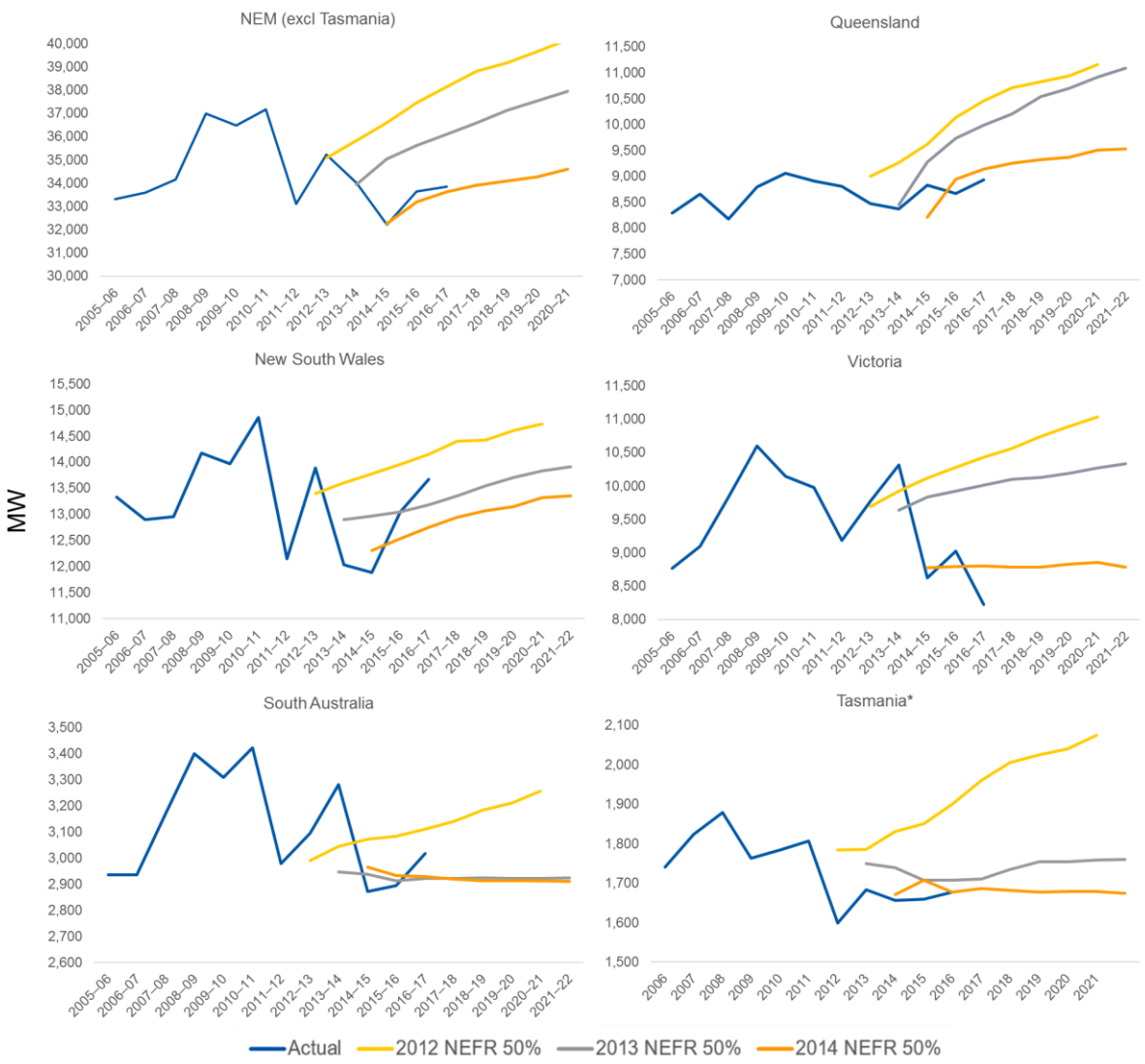


Source: AER EB and Reset RINs.
Note: 50% POE refers to the probability of exceeding the forecast. I.e. 50% POE is a demand projection that is likely to be exceeded 5 years in 10.

4.1.2. AEMO forecasted demand growth that failed to materialize

59. The Australian Energy Market Operator (AEMO) also provides independent forecasts of electricity demand. Figure 4.2 sets out the median demand forecasts that AEMO published in the National Electricity Forecasting Report (NEFR) between 2012 (the earliest report on AEMO's website) and 2014 and outturn maximum electricity demand by state. As can be seen from the Figure, AEMO anticipated in 2012 that demand for the NEM as a whole would increase in each successive year by 1.7 per cent per annum on average. In practice, the total demand in the NEM failed to materialise and demand fell by around 10 per cent by 2014-15. Outturn demand in the last two years shown increased by around 1GW and was broadly in line with AEMO's forecast. AEMO's forecasts at state level have been both above and below outturn demand at state level.

Figure 4.2: AEMO forecasts of maximum demand (MW) in the lead up to previous DNSP resets



Source: AEMO National Electricity Forecasting Report (NEFR) 2012, 2013, 2014, 2016, 2017 reports.
**All figures are summer maximum demand except for Tasmania, where maximum demand occurs in Winter.*

4.2. Expected cyclical trends in remaining asset lives and replacement needs

60. Asset age influences and is influenced by investment by DNSPs. On the one hand, ageing equipment can imply higher replacement expenditure because assets are reaching the end of their operating lives or require augmentation to meet required network standards. On the other hand, measures of the average age of assets on the network also reflect recent capital expenditure because a recently-invested network will have a low asset age and high remaining life.

61. Our analysis of the relationship between asset age and RAB growth suggests that:

- The replacement expenditure by DNSPs is likely to be insufficient to keep the average age of assets stable at current levels. The reduction in average asset age before 2013 appears to result from load-related investment, rather than higher replacement; and
- Asset age for TNSPs is more stable on average across the NEM, though the NEM wide average masks falling asset age in SA and TAS, a relatively stable age in VIC and NSW and a rising age in QLD;
- The relationship between repex and asset age is empirically weak in practice.

62. Two further factors in relation to asset life cycles we have not considered, but which could be important are:

- Whether governments or regulators have written down asset values in the past, or otherwise excluded in service assets from the RAB; and
- The extent to which NSPs have been gifted assets.

63. Both of these issues will mean there are assets in the RAB at a discounted (or zero) value that will be replaced at a non-discounted value, with a resulting increase in the RAB.

4.2.1. Distribution assets grew younger (in some states) before 2013 and have grown older since. Transmission asset age was relatively stable across the NEM, though trends vary by state

64. Figure 4.3 below sets out the weighted average asset age across the NEM expressed as the difference between the expected service life of new assets and the residual life of current assets.[36] As can be seen from the Figure, the distribution assets in the RAB became consistently younger between 2006 and 2013. From 2013 onwards, DNSPs began to sweat the assets and invest less in new assets and the average asset on the network began to age. Looking at transmission at a national level shows a more stable age.

65. Examining trends on a state-by-state basis shows some exceptions to the national trends. For example, Figure 4.4 below shows that for:

- **Distribution:** age has been rising since 2013 in all states except SA and QLD;
- **Transmission:** age has been relatively stable in VIC (bar a spike in 2014) and NSW, consistently falling in SA and TAS and rising in QLD.

66. The figures in Appendix B set out the same measure of average asset age by asset class across the NEM for distribution and transmission. Average asset age decreased from 2006 to 2017 for most

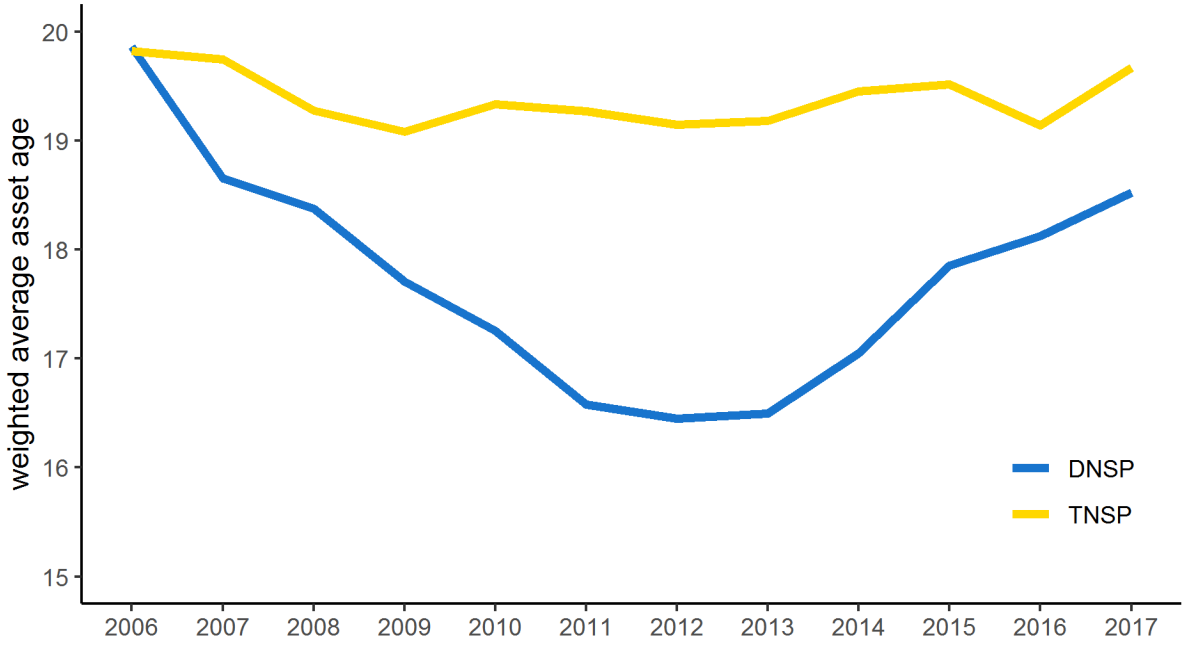
[36] To obtain a weighted average across DNSPs, we weighted each asset class by its depreciated value in the RAB of each DNSP.

distribution asset classes. However, low voltage assets embodied in the RAB became older over the period due to an increase in asset age after 2014. The ageing of low voltage assets suggests that the majority of capex in the latter part of the period was upstream network reinforcement. For Transmission, this analysis shows that overhead assets have been getting older over the period while substations and transformers have been getting younger.

67. As shown in Figure 4.5, capital expenditure to support load growth appears to have been the principal driving force behind the reduction in asset age over the period to 2013. The period to 2013 saw growth-related expenditure materially exceed replacement and non-network expenditure for both transmission and distribution (except for transmission in Victoria).This coincided with a fall in asset age for both distribution and transmission, though the fall for transmission was far less material (see Figure 4.3 below). From 2013 onwards, growth-related capex fell below replacement expenditure except for distribution in Victoria. Firm level figures on capex by driver are presented in Appendix B.

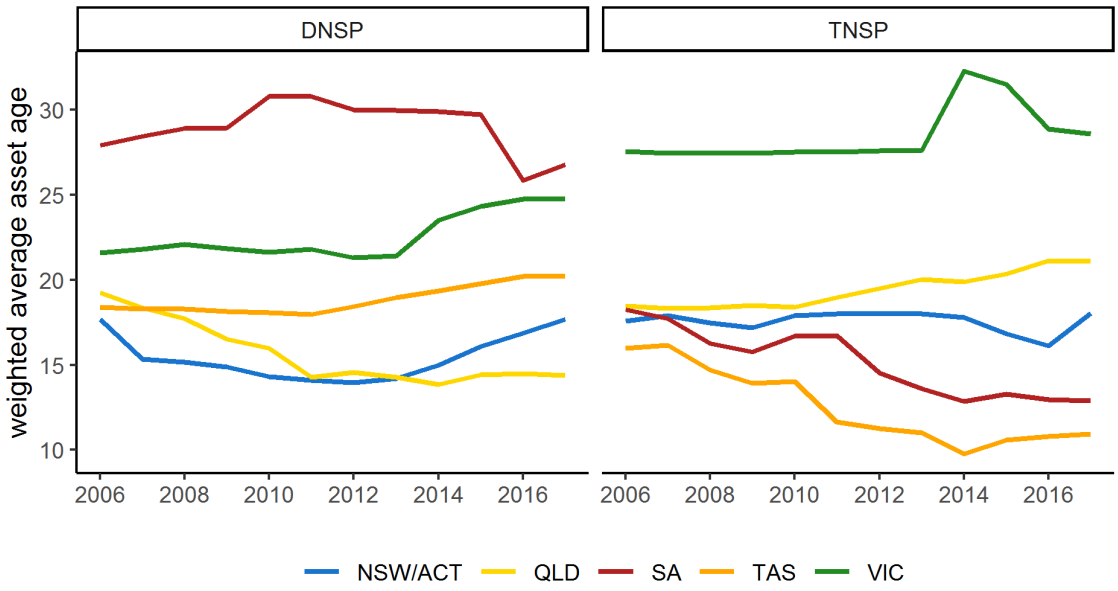
68. The fact that distribution assets on the network have begun to grow older on average suggests existing levels of replacement expenditure are insufficient to maintain the network at a constant average age.

Figure 4.3: NEM average asset age, weighted by asset value



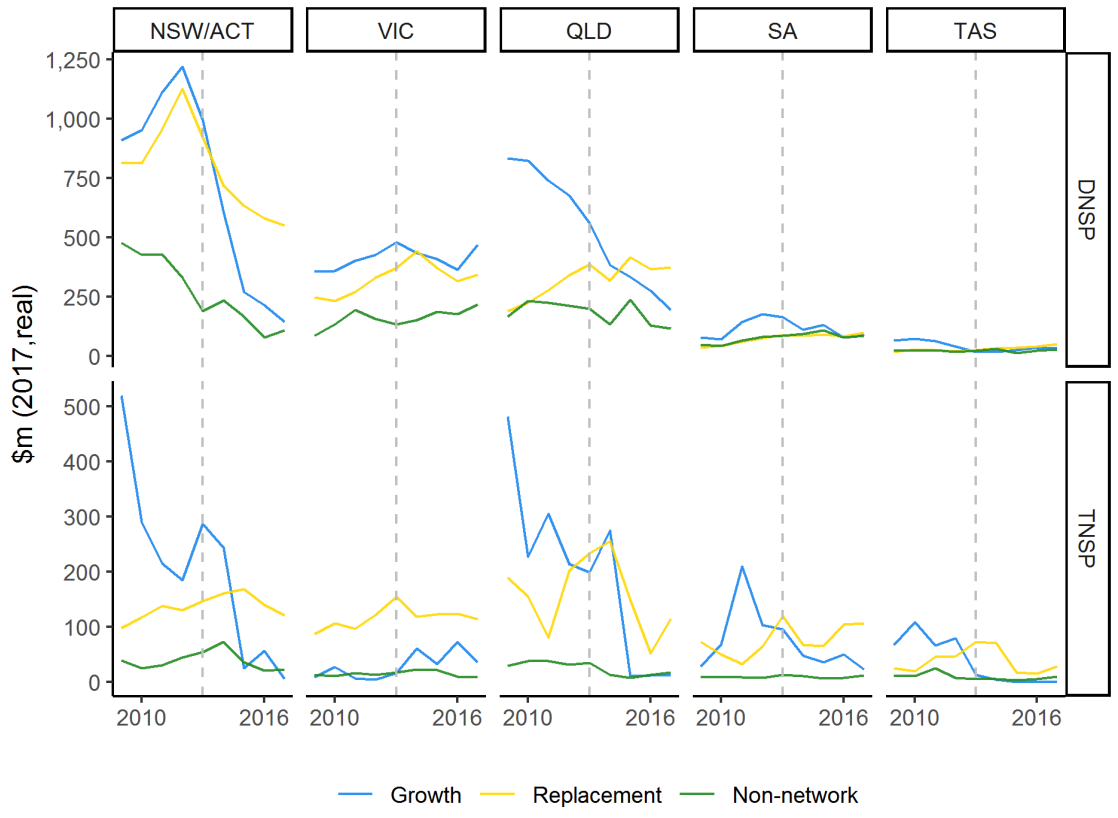
Source: AER EB RIN. Note: Age is defined as the "estimate service life of new assets" minus "estimated residual service life". Analysis excludes Power and Water

Figure 4.4: State average asset age, split by transmission and distribution, weighted by asset value



Source: NERA analysis of AER EB RIN. Note: Age is defined as the "estimate service life of new assets" minus "estimated residual service life". Analysis excludes Power and Water

Figure 4.5: Capex by driver: Prior to 2014, the majority of capex was growth related, since then it has been driven by replacement expenditure, except in Victoria

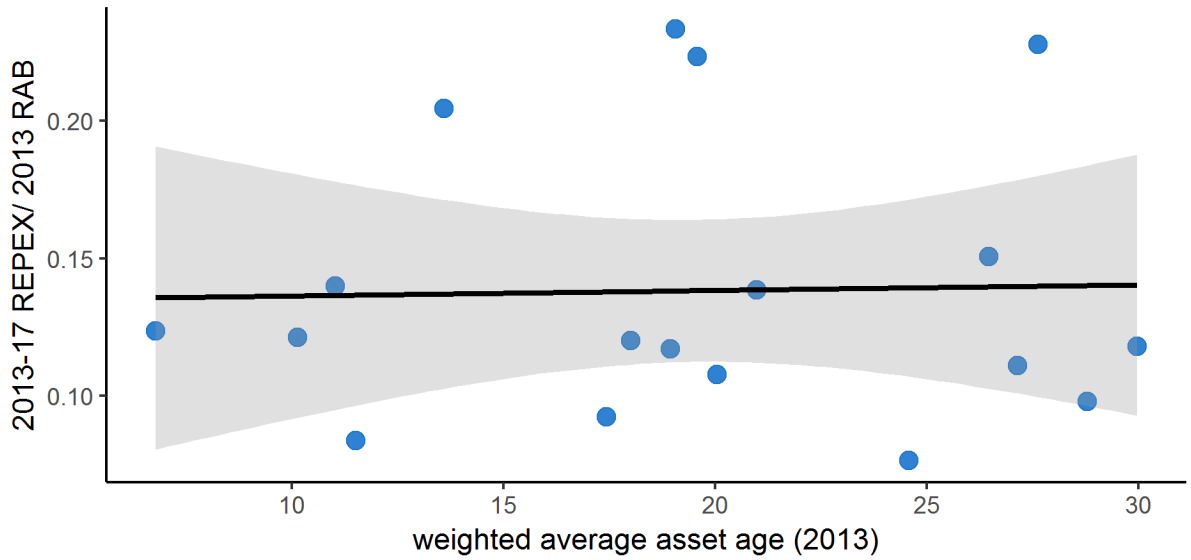


Source: AER CA RIN

69. First, for a network invested gradually over time and in steady state, both RABs and asset age will be stable and replacement offsets depreciation exactly (apart from any cost differences in the replacement of assets in real terms see section 4.2.2 below). In practice, the regulatory depreciation on an asset does not tend to reflect changes in its performance: electricity assets do not wear evenly in a straight-line fashion over assumed technical asset lives. Instead, they perform with efficiency within tolerance until they fail and are replaced. Assuming that regulatory asset lives reflect technical lives, the asset will drop out of the RAB fully depreciated and the RAB will reduce by an annual depreciation charge. The replacement investment however will be the full asset cost, which the DNSP will add to the RAB.

70. Second, where DNSPs have invested in assets in cycles historically (e.g. to accommodate expansion), those assets may simultaneously fail or threaten to fail and need replacement. In such circumstances, the average asset age on the network is less relevant than the distribution of those asset ages for driving RAB growth. Large volumes of historically-invested assets at close to failure point will require a block of replacement expenditure, which will inflate the RAB in the short term.

Figure 4.6: Total Repex 2013-2017 as a proportion of the 2013 RAB (real, June 2017), compared with the weighted average asset age in 2013



Source: AER CA RIN, Roll Forward Model (RFM) and EB RIN. Note: repex is sourced from the CA RIN and the 2013 RAB values are taken from the Roll Forward Models. Both variables are in 2017 real dollars, The weighted average asset is the difference between the estimated residual life and the estimated life of a new asset. This is taken from the calculations underlying figures Figure 4.3 *&* Figure 4.4 *above which use the nominal RAB to calculate weights.*

4.2.2. Real Price Effects May Have Increased the RAB

71. In the case of electricity distribution networks, assets may be acquired as underpriced or gifted, and therefore enter the RAB at a lower value (or at zero value) and then increase in value (or materialise entirely) at the point of replacement.

72. In the ACCC retail price inquiry, the ACCC noted the submission by networks that the RAB could increase if the real cost of assets had increased by more than inflation over time.[37] This is because the RAB is rolled forward using CPI, so if the actual cost of replacing the assets increases by more than CPI, when existing assets are replaced the RAB will increase. This is known in regulatory economics

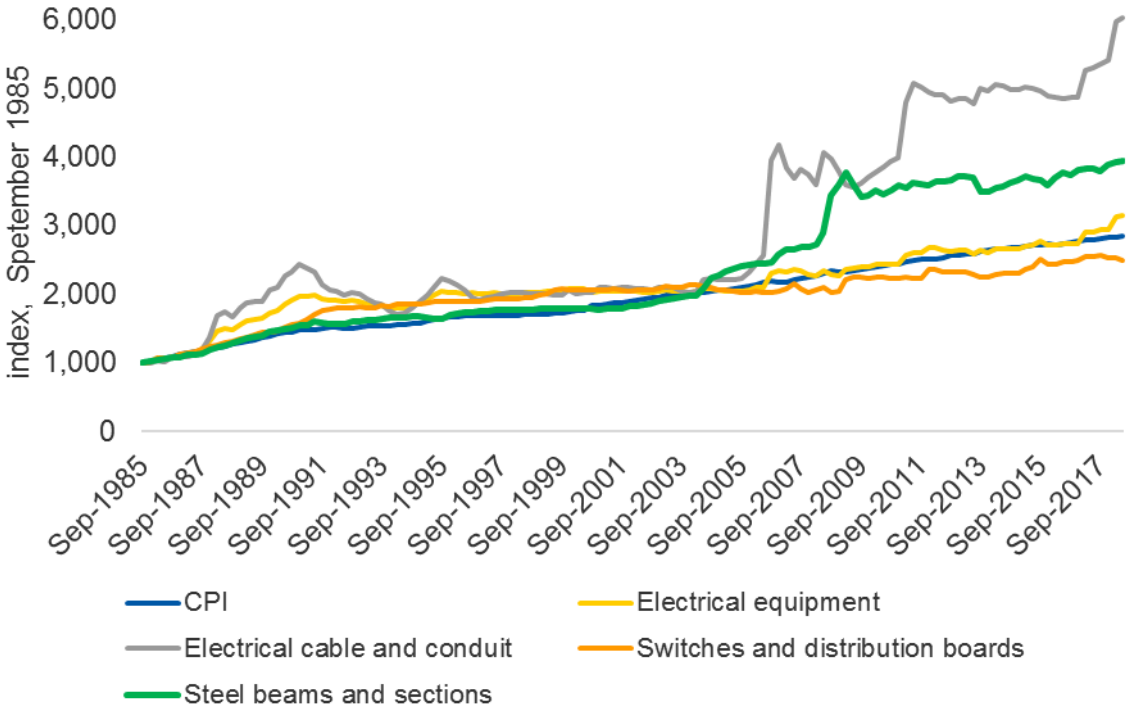
[37] ACCC, *2018 REPI Final Report*, p.165.

as a "real price effect" (RPE). In its Analysis of excessive RAB growth, Grattan (2018) assumes away the potential for RPEs:[38]

> *Cost escalation above CPI: higher labour and materials costs may have inflated capital costs at certain times. CPI is the best available indicator though because long-term cost growth above the buying power of customers is unsustainable.*

73. While we have not attempted to conduct a full RPE analysis for Australian NSPs, we note there is some evidence to suggest that there may have been a long term, real increase in the cost of network capex, which would increase the RAB as assets are replaced. For example, Figure 4.7 below shows various potentially relevant indicators from the Australian Bureau of Statistics (ABS) House Construction and Manufacturing Indices that may be relevant to the cost of constructing electricity networks. Figure 4.8 below shows the "wage price index" for construction against CPI, which the ABS only tracks as far back as 1997.

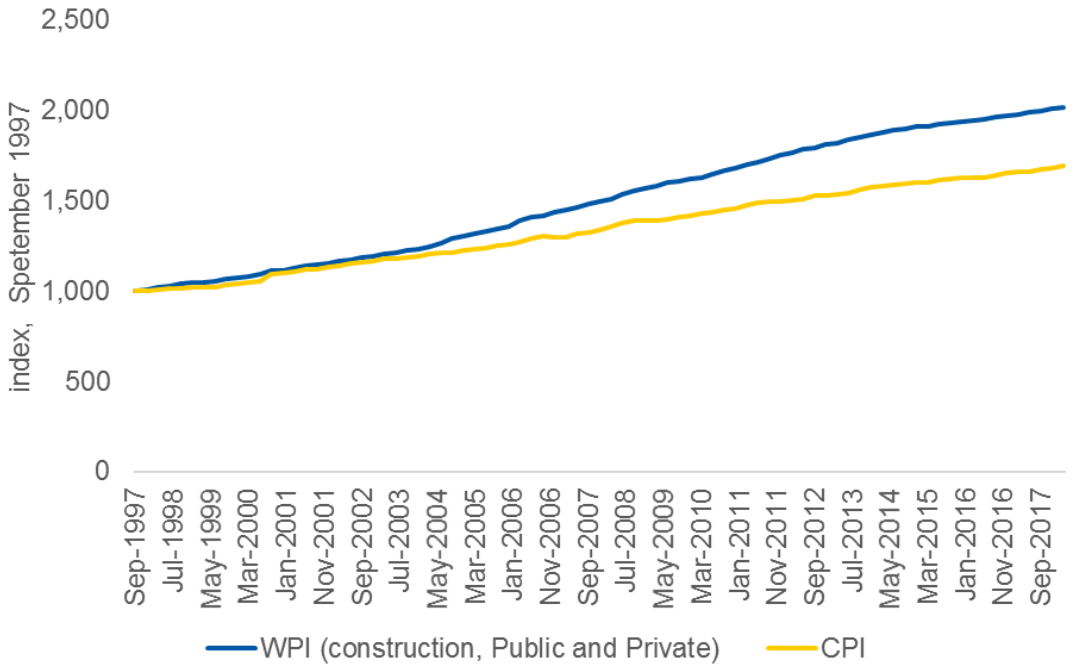
Figure 4.7: Some price indices that are potentially relevant to network capex have increased faster than inflation



Source: Australian Bureau of Statistics CPI, Input to the House construction industry and Input to the Manufacturing Industry data. The relevant series IDs are A2390816C, A2389781T, A2389805X, A2389511T

[38] Grattan, *Down to the wire.*, p. 22.

Figure 4.8: Wage growth in the construction industry has outstripped economy wide inflation over the last 20 years



Source: Australian Bureau of Statistics CPI and WPI series. Note: the WPI series used is "Total hourly rates of pay excluding bonuses; Australia ; Private and Public ; Construction ;"

74. Over the last 30 years, the cost of steel beams and electrical cable have increased at a significantly greater rate than CPI. Similarly, over the 20 years with which the ABS publishes the WPI series, the WPI for construction has risen by 16% more than CPI. This implies a real increase of 0.8% per year. While this is an incomplete view of what, if any, real cost inflation may have occurred for NSP capex, it suggests that the issue should be further investigated before concluding "over investment" has occurred – the RAB could be increasing simply because it has become more expensive over time to construct an electricity network.

75. In Great Britain, where the regulatory price control similarly indexes revenues using a variant of CPI, Ofgem includes a real price effect to account for cost increases in excess of inflation, noting at a conceptual level:[39]

> *DNOs' allowed revenues are indexed by the Retail Prices Index (RPI) as part of the price control framework. We expect some of the costs faced by DNOs during RIIO-ED1 to change over the period at a different rate than the RPI measure of economy-wide inflation. These differences in cost changes are RPEs*

76. Table 4.1 demonstrates that in Great Britain, Ofgem has assessed that the long-term growth rate in the price of materials and specialist labour used for capex by NSPs has increased by 0.3-1.7% in real terms. Interestingly, the Ofgem data shows that the aggregate real cost index actually fell from a peak in 2009-2009, as demonstrated by Figure 4.9 below. This Ofgem RPE index suggests any assets installed by UK NSPs in 2008-2009 that are replaced now will actually result in a reduction in the

[39] Ofgem, *Reasons for our decision on the treatment of real price effects for RIIO-ED1 slow-track electricity distribution network operators*, 28 November 2014.

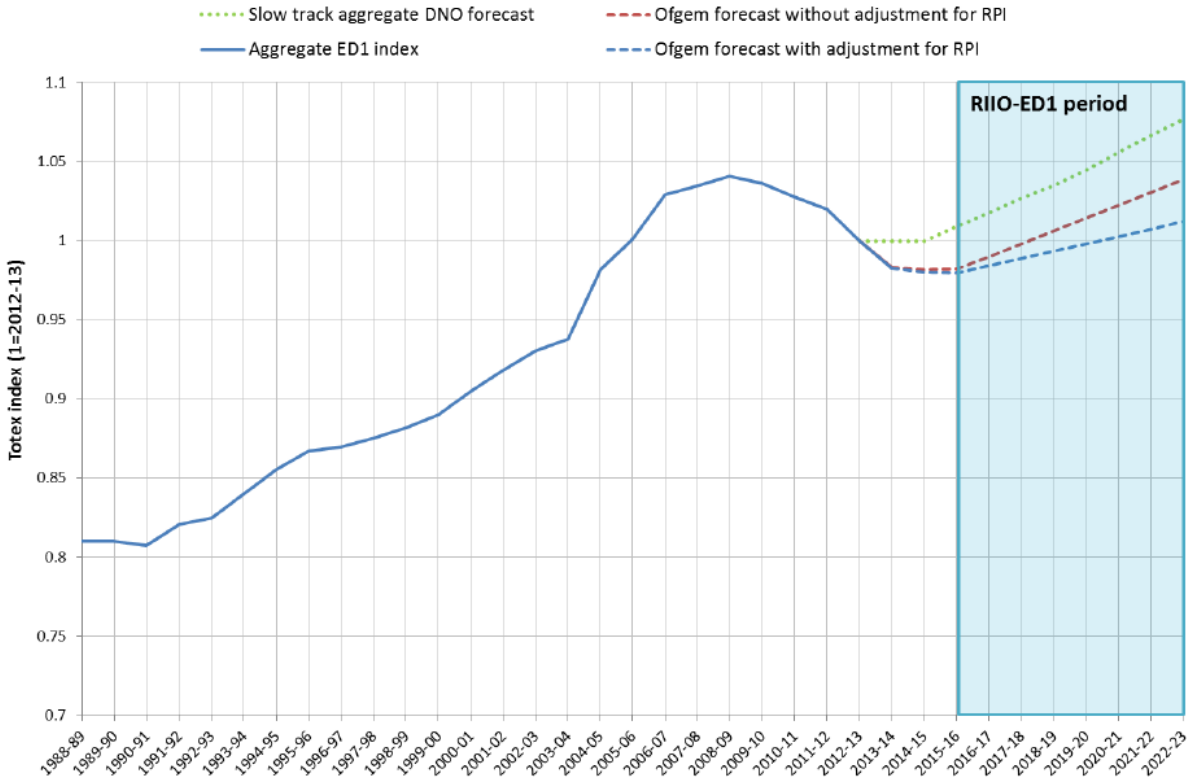
RAB, whereas any assets installed prior to ~ 2004 will result in an increase in the RAB when they are replaced, all other things being equal.

Table 4.1: RPE factors used by Ofgem in RIIO-ED1

Source	Index	Historical series	Historical average real growth rate (applied 2014-15 to 2022-23)	Real growth rate in 2013-14
General labour				
ONS	LNKY AEI private sector including bonus	1990-2000	Average real growth rate of combined index = 0.7 per cent per year	N/A
ONS	K54V AWE private sector including bonus	2000-2014		-1.1 per cent
Specialist labour				
BEAMA	Electrical labour	1987-2014	1.6 per cent per year	-0.6 per cent
BCIS	70/1 Labour and supervision in civil engineering	1987-2014	1.1 per cent per year	-1.1 per cent
Materials capex				
BCIS	3/58 Copper pipes and accessories	1991-2014	1.7 per cent per year	-5.4 per cent
BCIS	3/59 Aluminium pipes and accessories	1991-2014	0.3 per cent per year	-2.8 per cent
BCIS	3/S3 Structural steelwork materials: civil engineering work	1991-2014	1.5 per cent per year	-3.8 per cent
Materials opex				
BCIS	FOCOS RCI infrastructure: materials	1990-2014	1.6 per cent per year	-2.6 per cent
Plant and equipment				
ONS	K389 Machinery and equipment output PPI	1996-2014	-1.2 per cent per year	-0.4 per cent
ONS	K5W6 Machinery and equipment input PPI	1996-2013	Average real growth rate of combined index = -1.4 per cent per year	Growth rate of combined index = -2.6 per cent
ONS	MB4U Machinery and equipment	2013-2014		
BCIS	70/2 Plant and road vehicles: providing and maintaining	1987-2014	-0.2 per cent per year	-1.5 per cent

Source: Ofgem, RIIO-ED1: Draft determinations for the slow-track electricity distribution companies: Business plan expenditure assessment, pp 113-114

Figure 4.9: Ofgem's aggregate Real Price Effect (RPE) index



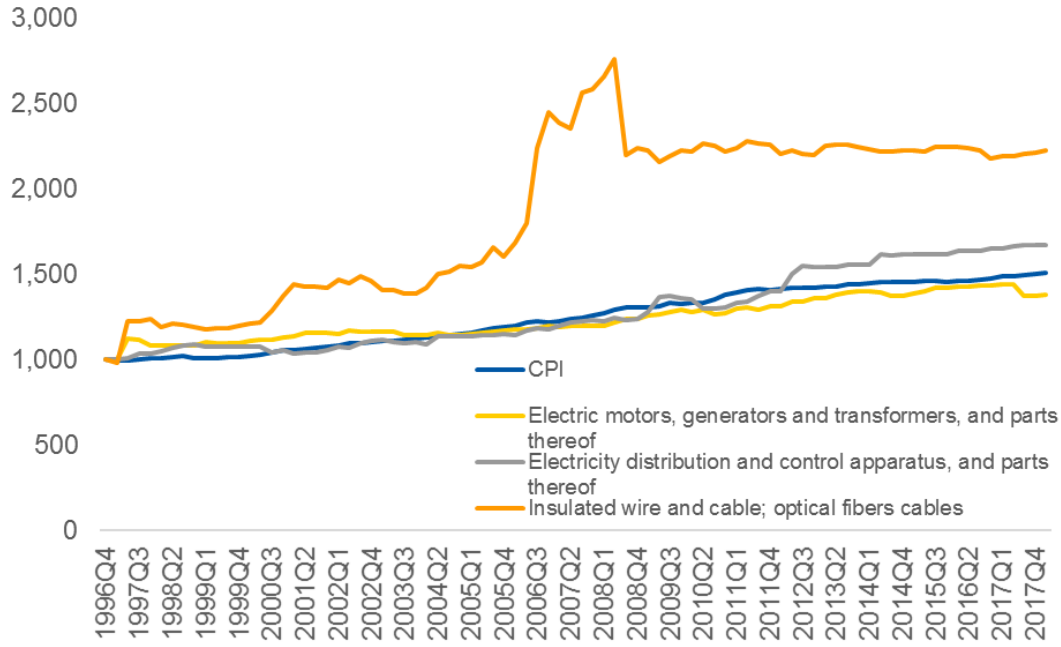
Source: Ofgem, RIIO-ED1: Draft determinations for the slow-track electricity distribution companies: Business plan expenditure assessment, page 118.

77. Another data point is the capital good price index (CGPI) that Statistics New Zealand publishes for New Zealand. This series and its components measure the change in price of fixed assets. Three components that form part of the CGPI and are relevant to distribution services are show against NZ CPI in Figure 4.10 below.

78. The spike in insulated wire prices and subsequent decline and flattening post 2008, and the similar decline in Ofgem's RPE index demonstrates the sensitivity of RPE analysis to the starting point of the analysis. Or more importantly, whether real price effects occur depends crucially on when the asset was installed. The replacement cost of an asset installed at a historical peak may have actually *fallen* in real terms.

79. In principle, in assessing the net impact of Real Price Effects for capex by DNSPs in Australia, we would need to also consider potential changes in productivity levels beyond those captured in the CPI.

Figure 4.10: New Zealand CPI vs potentially relevant RPE factors



Source: NERA analysis, Statistics New Zealand.

4.3. Impact of enhanced reliability and safety standards and the form of those standards

80. Mandated improvements in network reliability and safety might have contributed to the increased RAB value over time by increasing capex requirements. Over the period considered, different States have introduced new measures and standards. We discuss incentive mechanisms in relating to reliability in Section 4.6.

81. Regarding safety measures, many States have introduced programs to improve bushfire safety intervention. The Victorian Government announced a Powerline Bushfire Safety plan in 2011, consisting of a $250 million government contribution to research and development and replacement of dangerous assets. The plan estimated an overall $500 million investment by Victorian DNSPs on new generation electrical asset protection and control equipment.[40]

82. South Australia also introduced new safety standard legislation. The Electricity (Principles of Vegetation Clearance) Regulations of 2010 aim to minimise the risk of bushfires, damage to powerlines and electrical shocks without imposing excessive vegetation clearance. The Electricity (General) Regulations of 2012 define legal safety requirements concerning electrical installations and infrastructure.[41]

83. New South Wales and Queensland provide a significant example of how reliability and safety standards resulted in peaks in Capex – and potentially RAB increase. The ACCC[42] and Grattan

[40] Victoria State Government: Environment, Land, Water and Planning. https://www.energy.vic.gov.au/safety-and-emergencies/powerline-bushfire-safety-program

[41] South Australia Government: Electricity acts, regulations and standards. https://www.sa.gov.au/topics/energy-and-environment/electrical-gas-and-plumbing-safety-and-technical-regulation/acts,-regulations-and-standards/acts-regulations-and-standards

[42] ACCC, *2018 REPI Final Report*, Ch.7, Box 7.1.

Institute[43] explain how the governments of the two Sates implemented demanding reliability standards in 2005, following large-scale power outages in 2004.

84. The new standards were highly prescriptive and focused on inputs rather than outcomes. In New South Wales, DNSPs were previously responsible for setting the desired reliability level. The new standards required the networks to avoid supply interruptions if two elements of the system failed ("N-2 standard"). Queensland networks faced incremental increases in the Minimum Service Standard set in the legislation. In both States, networks increased investment to meet the new standards; capital expenditure increased substantially compared to other areas.

85. The Grattan Institute report argues that the reliability requirements set in Queensland and New South Wales did not consider the value for money of the standards and resulted in higher costs for customers with little improvement in the quality of supply.[44]

86. The rules were reviewed in 2011, then repealed in 2014-15. The ACCC interprets the subsequent repeal of the standards as follows:[45]

> *They were also subsequently changed, indicating that they are now not valued by both government and customers. As such, the investment can be more clearly seen in retrospect as excessive.*

87. In the present context where we are primarily concerned with RAB growth since the *2013 Guidelines*, the past investment in reliability has already occurred and capex has reduced markedly. In our discussions with the AER we have been informed that that their databases do not identify capex specifically related to improving reliability. However, as already noted, augmentation capex has declined materially since 2013, which suggests that, at least in a relative sense, meeting reliability and safety standards have not been a material driver of RAB growth since 2013.

4.4. Impacts of mandatory obligations to serve or connect

88. Obligations to connect, where connection fees do not cover the full cost of new connections will tend to inflate the RAB over time, as this the net capex enters the RAB and is therefore recovered from all customers.

89. Under the National Electricity Rules (NER) DNSPs must provide a connection to customers submitting a connection application, once they have verified that the application meets adequate standards of safety and feasibility.[46] While NSPs can charge new customers a connection fee, known as a capital contribution, if the capital contributions are less than the costs incurred connecting customers, then this will increase the RAB over time.

90. The AER's connection charge guidelines sets out that in general, new houses and small businesses will not be charged an upfront fee.[47]

91. Figure 4.11 shows capex for connections and capital contributions by state since 2011. This demonstrates that capital contributions generally have not covered the costs of new connections,

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[43] Grattan Institute, *Op. cit.*

[44] For example, the Grattan report argues (page 31) by reference to SAIDI and SAIFI measures that:
The main improvements were in the two distribution networks in Queensland (Ergon and Energex) and the regional network in NSW (Essential, see Figure 4.4 on the next page). But it is still not clear that these improvements were worth the cost (Figure 4.5 on the following page). In other distribution networks, consumers are paying more today for no noticeable improvement at all.

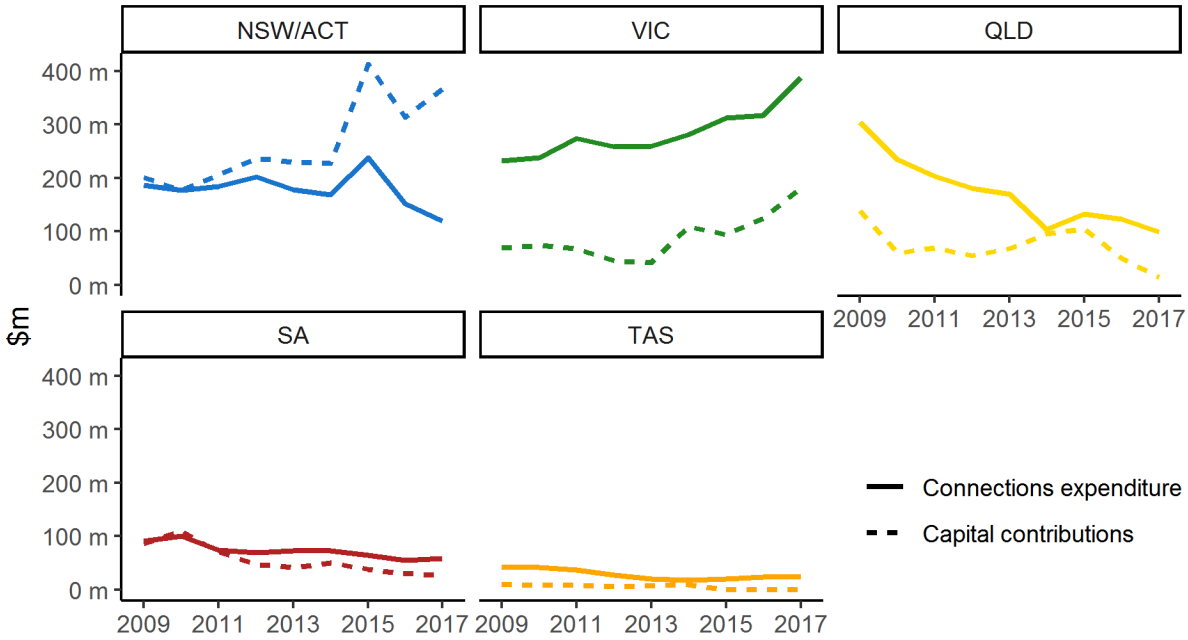
[45] ACCC, *2018 REPI Final Report*, p.166.

[46] For example, 5A.B.1 of the NER sets out that DNSPs must have a model standing offer to connect retail customers.

[47] AER, *Connection charge guidelines: under chapter 5A of the National Electricity Rules For retail customers accessing the electricity distribution network: Final Decision*, 20 June 2012, p.6.

except in New South Wales. This is presumably because capital contributions are also contributing to upstream augmentation. Firm level analysis, presented in Appendix C, presents a similar picture.

Figure 4.11: Connections capex vs capital contributions



Source: AER CA RIN.

4.5. Proposed depreciation allowances, AER decisions on depreciation, any impacts of current PTRM and RAB roll-forward approaches in deferring investment cost recovery

4.5.1. Indexation of the RAB in the PTRM and RFM defers capital recovery and depreciation

92. The NER and NGR require the use of a nominal rate of return and an indexed asset base. This means that inflation is compensated for in both the rate of return and through revaluing the asset base. To achieve NPV=0, this requires that the indexation of the asset base is treated as income and deducted from annual revenue requirement. The AER does this by subtracting the inflation indexation component from the depreciation building block to give what it refers to as "regulatory depreciation".

93. The AER describes its approach as follows:[48]

> *The NER and NGR require use of a nominal rate of return (that is, a nominal weighted average cost of capital or WACC) in setting total annual revenues. The NER also requires the RAB to be indexed and maintained in real terms. The NGR requires the capital base to be depreciated in a manner that ensures that an asset is depreciated only once and that asset values are adjusted for inflation. Inflation is thus accounted for in both returns on and of capital. To avoid double compensation for inflation we adjust by removing the indexation of asset base amount from total revenue. We subtract this amount from the depreciation building*

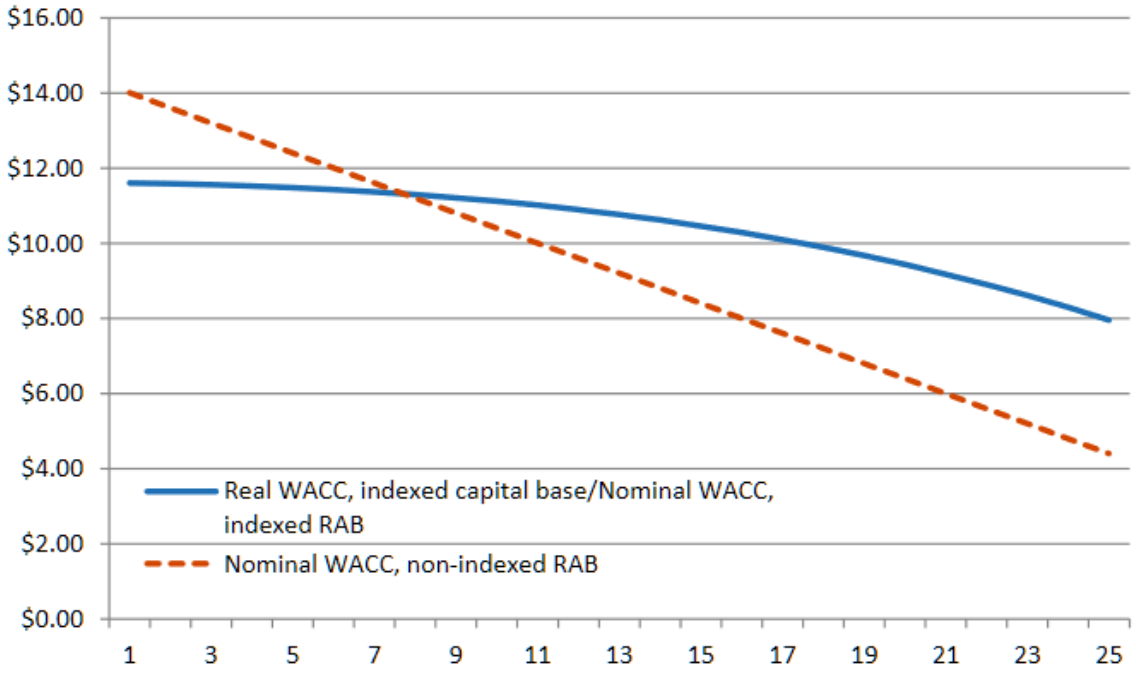
[48] AER, *Regulatory treatment of inflation: Final position paper*, December 2017.

block. the same total annual revenue and asset base as if a real rate of return is used in combination with an indexed asset base.

94. The alternative approach, would be to use a nominal rate of return and not index the asset base. Relative to the approach used by the AER, this would result in front loading of recovery and a RAB that falls more quickly. The AER recognized this point during AusNet services recent determination process:

> *Under an alternative approach where a nominal rate of return was used in combination with an un-indexed (historical cost) RAB, no adjustment to the depreciation calculation of total revenue would be required. This alternative approach produces a different time path of total revenue compared to our standard approach. In particular, overall revenues would be higher early in the asset's life (as a result of more depreciation being returned to the TNSP) and lower in the future—producing a steeper downward sloping profile of total revenue. Under both approaches, the total revenues being recovered are in present value neutral terms—that is, returning the initial cost of the RAB.*

Figure 4.12:AER Revenue path example – indexed vs un-indexed RAB ($ nominal)

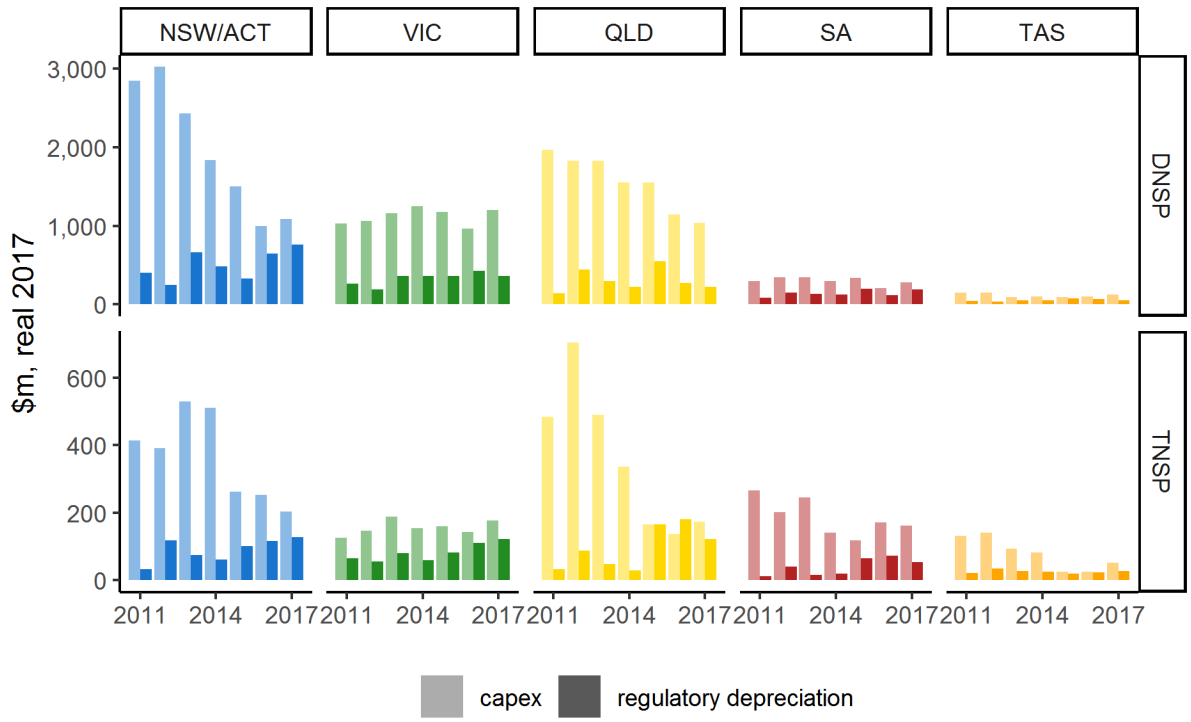


Source: AER, AusNet Services transmission determination 2017–18 to 2021–22: Draft Decision, ttachment 5 – Regulatory depreciation, July 2016.

95. As the AER recognizes, the choice between indexation and non-indexation is NPV neutral. It does however result a different time profile of cash flows and, importantly in the present discussion, the RAB. Indexation results in depreciation effectively being smoothed over the life the asset such that *real* depreciation is relatively constant.

96. This matters for the present context because a deferral of depreciation during times of large capex will result in the RAB rising by more than it would under a non-index approach. This is illustrated by Figure 4.13 which shows the large capex programs prior to 2013 only resulted in a material rise in regulatory depreciation with a lag.

Figure 4.13: Actual capex vs regulatory depreciation: during periods of high capex depreciation catches up with a lag



Source: NERA analysis of AER RFM models

4.5.2. The use of forecast depreciation will slow RAB growth when NSPs are underspending their allowances

97. All else equal, extending asset lives and deferring depreciation will tend to result in the RAB growing more quickly over time, particularly where regulatory asset lives exceed economically useful lifetimes. Conversely, approaches that accelerate depreciation will moderate RAB growth (but result in higher prices in the near term, all other things being equal).

98. Data on the replacement programs of DNSPs and whether assets' technical and regulatory lives were equal was not available at the time of writing this report. However, the AER has recently made two changes to the regulatory regime which may have the effect of front loading depreciation. In current conditions, both of these changes would tend to reduce RAB growth at the expense of increasing charges in the short term.

99. Firstly, in 2013, it changed to an approach of forecast depreciation instead of actual depreciation[49] to align the deprecation approach with the capital expenditure sharing scheme (CESS). As the AER noted in the context of the capital expenditure incentive guideline, if NSPs underspend their

[49] For example, the AER noted in the 2011-2015 determination for the Victorian DNSPs (which was a move from forecast depreciation to actual depreciation) that:

"the use of actual depreciation is also consistent with the economic regulation of transmission network service providers under Chapter 6A of the NER and the AER's distribution determinations in New South Wales Australian Capital Territory, Queensland and South Australia"
AER, *Victorian electricity distribution network service providers Distribution determination 2011–2015: Final decision*, p.462

allowances, using forecast depreciation results in a higher depreciation charge than if actual depreciation was used:[50]

> *If there is a capex underspend, actual depreciation will be lower than forecast depreciation. This means that the RAB will increase more at the next regulatory control period than it would if forecast depreciation were used. Hence, the NSP will earn more into the future (i.e. it will retain more of the benefit of an underspend into the future) than if forecast depreciation had been used to roll forward the RAB.*

100. As we discuss elsewhere in this report, DNSPs have persistently underspent their capex allowances since at least 2011.

101. Secondly, in recent resets the AER has allowed NSPs to apply annual adjustments to depreciation charges including on capex that is spent within the regulatory period and for disaggregated asset classes. The AER argues that the year-by-year tracking will magnify the "distortion" caused by using forecast depreciation and result in excess depreciation, particularly for assets with short asset lives. For example, as the AER argued in its discussion of Victorian DNSPs 2016-20 determination:[51]

> *We have determined that forecast depreciation, rather than actual depreciation, will be used to roll forward the RAB over the 2016–20 regulatory control period. The adoption of a forecast depreciation approach in the RAB roll forward will create some distortion in the depreciation of disaggregated asset sub- classes, which can reduce the benefit of year-by-year tracking (particularly for short lived assets). For example, a particular year's forecast capex may prove to be much greater than actual capex. In this case, the asset sub-class (for example, 2016 IT) will have its value depreciated by more than the asset sub-class' forecast depreciation would have suggested had actual capex been known at the time. The depreciation amount of the asset sub-class in future years will then be relatively lower to offset this over-depreciation early in the asset's life.*
>
> *Forecast depreciation, coupled with the greater disaggregation of capital expenditures under year-by-year tracking, will also increase the prospect of negative asset sub- classes at the end of the regulatory control period. This would occur where actual capex was much lower than forecast for a particular year—so that actual capex was less than the forecast depreciation allowance. When negative asset classes emerge at the end of the regulatory control period, we consider these amounts should be returned to customers over the next regulatory control period.*

4.6. Impacts of the AER's Capital Expenditure Efficiency Sharing Scheme and other relevant incentive schemes

102. DNSPs across Australia face or have faced a broad range of incentives which aim to provide incentives for cost efficiency and improved quality of service. Table 4.2 summarises recent incentive schemes in place across the NEM.

103. The impact of the incentive schemes cited on RAB growth will depend on the design of the scheme itself. For example:

[50] AER (2013), *Better Regulation: Capital Expenditure Incentive Guideline for Electricity Network Service Providers*, Section 3.0, p.11

[51] AER, *PRELIMINARY DECISION: Jemena distribution determination 2016 to 2020, Attachment 5 – Regulatory depreciation*, October 2015.

- The STPIS, f and s factor and DMIS provide incentives for quality of service or supporting particular projects. To the extent that additional capex may improve performance under these incentives, they may encourage DNSPs to invest in the RAB to ensure scheme targets are met; [52]
- The CESS and EBSS provide incentives to reduce capex and opex respectively, and, theoretically at least, to equalize incentives for cost reduction across the two schemes. All else equal, the CESS will tend to put downward pressure on capex and the RAB and the EBSS will tend to put upward pressure on the RAB insofar as DNSPs face trade-offs between opex and capex.

104. The extent to which these incentives materially contribute to the potential inflation of the RAB depends on the gearing of these incentives and the payments available for them.

Table 4.2: Summary of DNSP incentive mechanisms

Scheme name	Description	Introduced
Service Target Performance Incentive Scheme (STPIS)	Sets parameters/standards for quality and reliability of supply, customer service and Guaranteed Service Levels	2008
Efficiency Benefit Sharing Scheme (EBSS)	The NSP keeps the benefit (or incurs the cost) of delivering actual opex lower (higher) than forecast opex in each year of a regulatory control period.	2008
Capital Expenditure Incentive (CESS)	The NSP keeps the benefit (or incurs the cost) of delivering actual capex lower (higher) than forecast capex in each year of a regulatory control period.	2013
Demand management incentive scheme	Incentive scheme attributed to specific demand management projects under submission of a compliance report. Incentive revenue relative to a project in year *t* enters the DNSP revenue for year *t+2.* The allowance is given ex ante to fund projects.	2018
Victoria f-factor	DNSPs rewarded/penalised for exceeding/not meeting a set fire reduction standard	2012
Victoria s-factor	Reliability standard incentive	2010

Source: AER Publications Library – Guidelines, Schemes, Models and Reviews

105. Figure 4.14 presents the NEM-wide revenue (penalty) from incentives since 2006. As can be seen from the Figure, the revenues earned in total under incentive schemes is typically positive and has grown tenfold since 2008. STPIS and EBSS schemes make the largest contribution to overall revenues. Both schemes arguably encourage investment in the network.

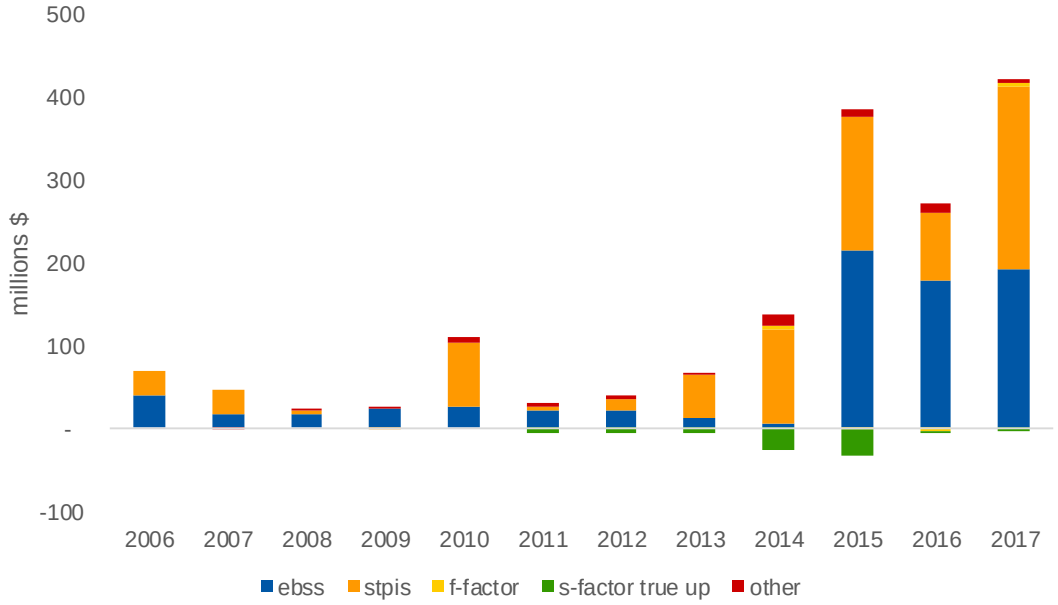
[52] The AER has noted the potential for targets within STPIS to promote capex in the past. For example, in its issues paper for the 2017 amendment to the STPIS, the AER notes that "*We consider that, in general: Capex investments such as auto-reclosers and network automation would result in SAIFI improvements as well as the associated SAIDI improvements. Opex investments mainly result in SAIDI improvements through faster response time. It appears that distributors may have been incentivised to invest more in capex to improve SAIFI rather than opex to improve SAIDI under the current incentive framework".*

AER (January 2017), *Issues paper: Reviewing the Service Target Performance Incentive Scheme and Establishing a new Distribution Reliability Measures Guidelines.*

106. Figure 4.15 presents impact incentives have on the return on assets of each NSP on average since 2013, calculated as the difference between the ROA including incentives and the RAO excluding incentives, using the AER's ROA calculations. This shows that the materiality of incentives varies across NSPs, but overall doesn't have a particularly large impact on returns.

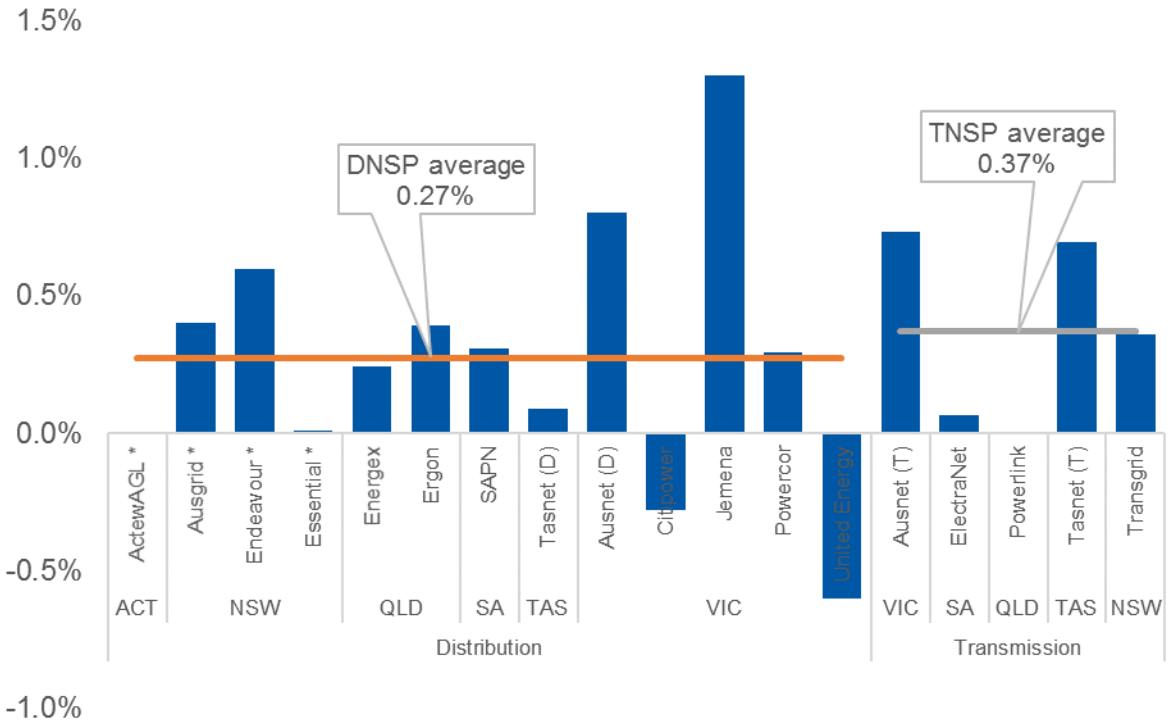
107. In addition to providing evidence on the incentive for DNSPs to incur capex and thereby the rate of RAB growth, the extra returns from incentives are relevant for considering whether evidence of RAB multiples greater than 1 means the allowed rate of return is too high. This would however require a persisitent pattern of outperformance across firms over and over time, and a belief that these trends would continue into the future. We return to this issue in section 5.5 below.

Figure 4.14: Total revenue/penalty by incentive scheme (NEM Wide, Transmission and distribution)



Source: AER data from EB RIN

Figure 4.15: Incentive revenue/penalty average contribution to return on assets (ROA including incentive payments – ROA excluding incentive payments): 2014-2017



Source: NERA analysis of AER, Return on Assets – Summary data – September 2018

5. Empirical evidence/verifiable indicators of whether allowed ROR has lead to higher/lower than efficient RAB growth

108. The TOR asks us to assess indicators that the AER's rate of return approach since 2013 may have led to higher or lower than efficient network Regulatory Asset Bases. As described in Section 1 and Section 6, we approach this question by looking for evidence that the *allowed* rate of return is either above or below the return required by investors.

109. In this section, we consider 5 indicators for whether the allowed rate of return may have led to higher than efficient RAB growth since the 2013 guidelines:

- Variances between approved capital expenditure allowances and actual capital expenditure since 2013 for network businesses;
- Observed historical returns for firms with similar betas;
- RAB multiples;
- Realized returns for the NSPs; and
- Equity analyst research and observed capital raising behavior;

5.1. Variances between approved capital expenditure allowances and actual capital expenditure since 2013 for network businesses

110. If the allowed rate of return is less than true cost of capital, we might expect NSPs to defer/reduce capex and sweat existing assets. For example, the ENA has argued:[53]

> *Evidence suggests that current returns, which were significantly lowered in the 2013 Guidelines, are starting to impact investment levels. This is evidenced by lower actual expenditure levels relative to approved allowances.*

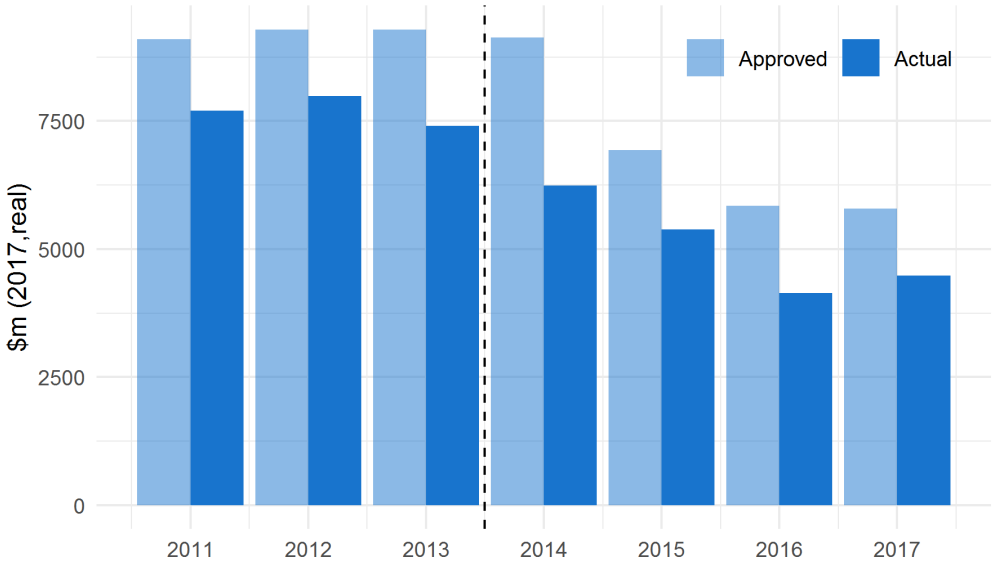
111. To assess whether this is the case, we have examined actual and approved capital expenditure for TNSPs and DNSPs since 2011, both on a dollar and % of allowance spent basis, using data captured by the AER from the roll forward model (RFM) and CA RINs where RFM data is not available. This is contained in Figure 5.1, Figure 5.2, Figure 5.3 and Figure 5.4 below. This analysis shows that since 2013, NSPs have indeed been underspending their capex allowances. However, they were also underspending their allowances prior to the 2013 Guidelines. This suggests that one/all of the following are true:

- The allowed rate of return was already too low;
- NSPs expect future rates of return, on average over the life of their new assets, to be too low
- NSPs have been underspending due to regulatory uncertainty concerning RAB write downs
- NSPs have been underspending due to uncertainty regarding future demand and the role of networks;

[53] AER, *2018 Draft Guidelines explanatory statement*, p.25.

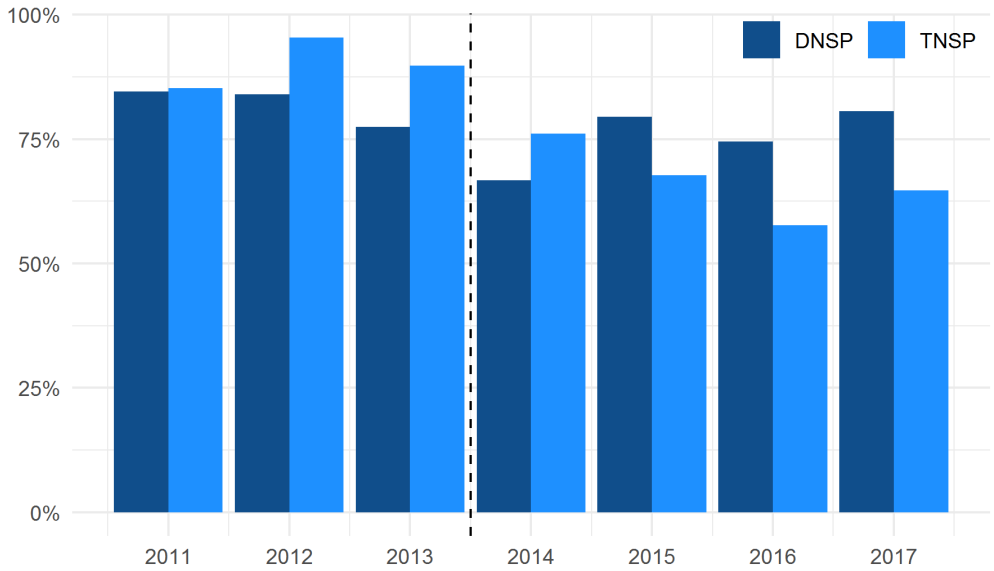
- NSPs have achieved greater capital efficiencies or non-capex based alternatives than anticipated at the time of the relevant network determinations; and/or
- Many or all NSPs have been able to persistently convince the AER to set capex allowances at levels above what they actually expect to spend.[54]

Figure 5.1: Approved allowances have decreased materially since 2014, but NSPs were already underspending their allowances



Source: AER RFM and CA RINs.

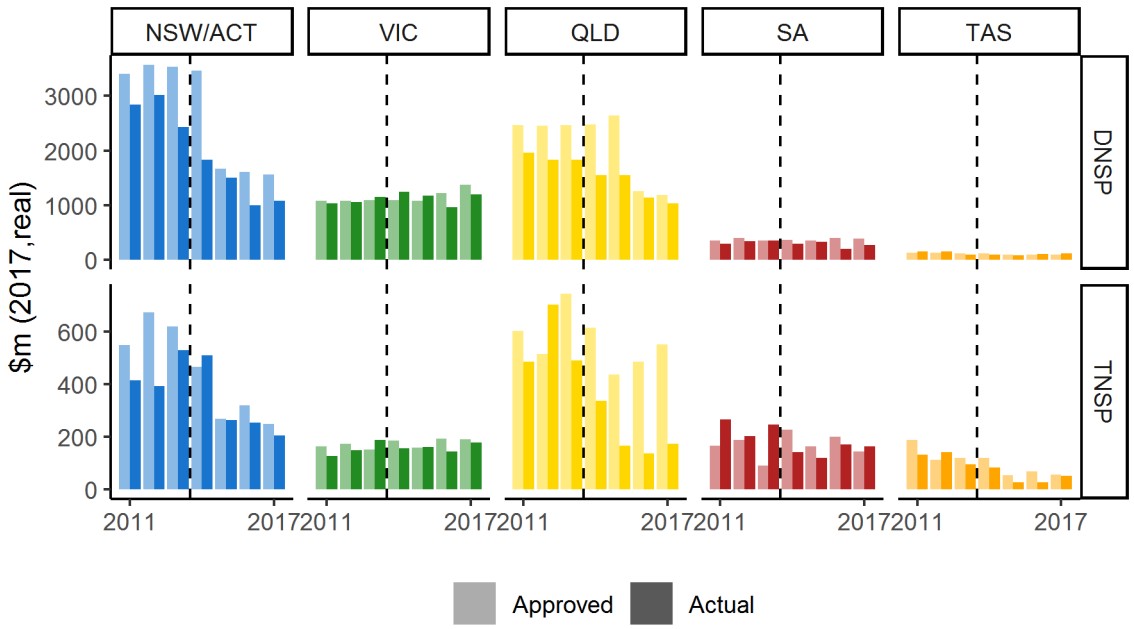
Figure 5.2: % of allowance spent on aggregate basis for DNSPs and TNSPs



Source: AER RFM and CA RINs.

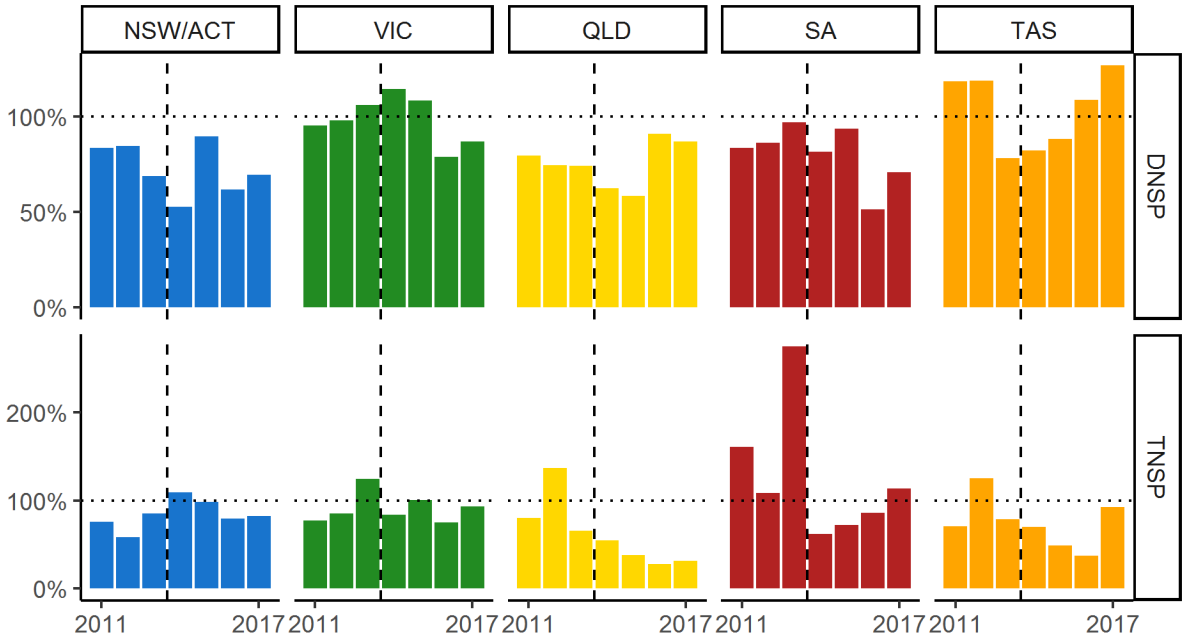
[54] This is because the AER cannot challenge past expenditure where the forecast is not exceeded. See, e.g., 2015 *Senate interim report on performance and management of electricity network companies notes,* p.10.

Figure 5.3 Capex, approved vs actuals by state: NSW and QLD NSPs have had their allowances slashed, elsewhere allowances pre and post 2013 exhibit less difference



Source: AER RFM and CA RINs.

Figure 5.4: Capex, % of allowance spent by state: There is no *consistent* pattern demonstrating that DNSPs have spent less of their allowance in % terms since the 2013 guideline. The picture for TNSPs is complicated by overspends prior to 2013

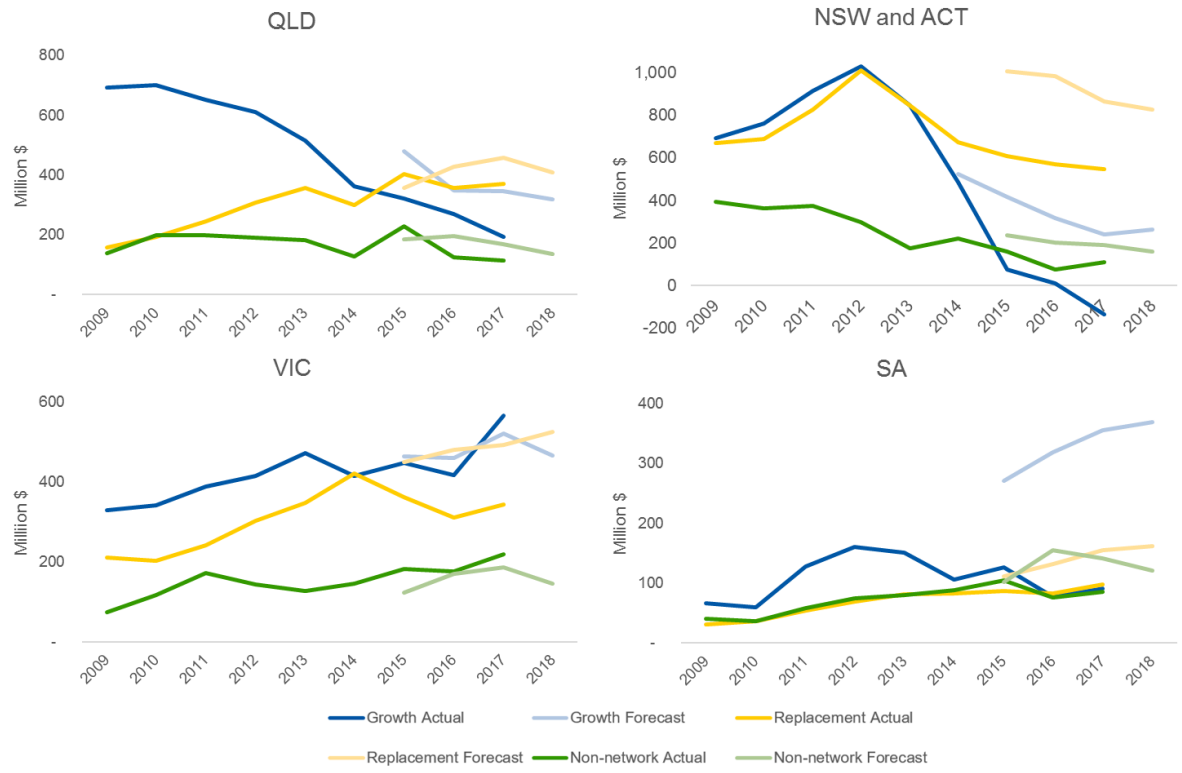


Source: AER RFM and CA RINs.

112. Figure 5.1, Figure 5.2, Figure 5.3 and Figure 5.4 show that NSPs (both distribution and transmission networks) have been systematically underspending their capex allowance. The general trend is consistent across NSPs, there are some notable outliers. Appendix B presents versions of the preceding charts by individual NSP.

113. To understand where the underspending is occurring, we have compared forecast and actual expenditure by broad category for each state. This is shown in Figure 5.5 below.

Figure 5.5: Actual v. Forecast Capex by Driver for DNSPs by State ($m, nominal)



Source: CA RIN (Actual), Reset RIN (Forecast)

114. This analysis shows that outside Victoria, DNSPs have been underspending relative to forecasts, and therefore allowances, across the board. In Victoria however, growth capex (augmentation + connections net of capital contributions) was actually above forecast. This appears to stem from capital contributions being much lower than forecast, and in some cases even negative.

5.2. Comparing the historical returns of Australian firms operating in the competitive market, and with a similar degree of risk (i.e. beta), with the allowed returns provided by the AER's current methodology over comparable periods

5.2.1. Overview

115. The AER uses the Sharpe-Lintner CAPM as its foundation model to estimate the risk adjusted return for NSPs. In this model, only systematic or non-diversifiable risk is compensated for, and this is measured by a parameter known as beta (β). In the 2013 Guidelines and subsequent determinations, the AER determined a range for the equity beta of 0.4-0.7 and used 0.7 as the point estimate when setting the cost of equity. [55]

116. To ascertain whether the allowed rate of return set by the AER is "too high" or "too low", one method is to compare the allowed cost of equity set by the AER with the observed historical share market returns of companies with a similar beta to that set by the AER for NSPs.

117. At a high level, our methodology is as follows:

- Estimate equity betas for a broad selection of companies using the same methodology and time periods (i.e. Henry's three different beta estimation windows) that fed into the 2013 guidelines (i.e. "estimate betas the AER/Henry would have estimated in 2013")
- Filter these companies for those with an equity beta in the range 0.4 - 0.7 to get a comparator sample;
- Compare the observed historical returns for comparator sample against the allowed cost of equity set by the AER, over two time periods:
  - 1992-2018: Essentially the period for which Datastream has ASX200/300 index data. or put another way, the AER's estimation window for beta at the time of the 2013 Guidelines plus the all periods since.
  - 2013-2018: Observed returns since the AER's 2013 guideline.[56]
- If the allowed cost of equity is statistically significantly different from the observed returns for the comparator sample this might, with appropriate caveats, be evidence that the allowed rate of return is "too high" or "too low".

5.2.2. Methodology

118. Regarding the broad sample for which we estimate equity betas, our starting point is the current ASX200. We then add any firms fitting the following criteria that are not currently in the ASX200:

- Firms that were in the ASX200 in December 2013;

[55] AER (2013), *Explanatory Statement – Rate of Return Guideline*, p.11

[56] This time period would typically be considered too short to make inferences about expected returns. It is however a direct comparison to allowed return resulting from the 2013 guidelines and the returns other firms have achieved since the guidelines was finalized.

- Firms classified as Utilities by Bloomberg as per the AER staff industry equity beta analysis[57]; and
- The AER's 9 comparator firms.[58]

119. To estimate equity betas, we replicate the methodology used by Professor Henry to find equity betas in various studies for the AER.[59]

120. This allows us to establish the set of companies that the AER would have considered to have similar risk to the firms that they regulated at the time of setting the new guidelines for the WACC in 2013, based on their own estimation methodology.

121. In line with his study, equity betas are derived for each company using an OLS regression model. We use weekly returns data on ASX200 companies for the longest period available until the 28th June 2013 – the date at which the new guidelines for setting the WACC are issued. The ASX 300 total market returns index is used as our market portfolio. We extend Henry's (2014) analysis to include the latest available returns data for the comparable companies, until the 30th July 2018.

122. In line with Henry's methodology we estimate betas over three different windows:

- the longest possible period of data available for the benchmark sample (29th May 1992 to 28th June 2013);
- the period of data for the benchmark sample after the tech boom (1st Jan 2002 to 28th June 2013) and excluding the global financial crisis (1 September 2008 to 30 October 2009);
- the most recent five years of data (28th June 2008 to 28th June 2013).

123. Our conclusions do not appear to be particularly sensitive to the estimation window used. Therefore, for our main results, we filter the broad sample and report as the equity beta for the comparator sample the average equity beta over the three scenarios. We also report results for each beta timeframe separately in the appendix.

124. We further report results for the full selection of ASX 200 companies, as well as for a sub-sample of only the utilities companies. We also report results for a sub-sample of 9 Australian gas and electricity firms specified by the AER as a group of comparable companies.

5.2.3. Results

125. Table 5.1 below summarises the different sample selection methodologies. It reports the average equity betas for the companies in this selection, as well as their average annual stock market returns. We report returns for both 2013-2018, the last 5 years of available data, as well as the long-term returns from 1992-2018, all years of available data. For each of these we report the arithmetic and geometric averages.

[57] AER (April 2018), *AER Staff Industry Equity Beta Analysis*, Appendix 2, p.36.

[58] AER, 2009, Electricity transmission and distribution network service providers (NSP) on a review of the weighted average cost of capital (WACC) parameters, Final Decision, May 2009, page 255.

[59] Henry, O.T. (2014), "Estimating Beta: An Update".

Table 5.1: Equity beta and stock market returns results by sample selection method

					Observed returns			
					2013-2018		1992-2018	
Sample Selection	**Beta estimation window**	**Firms**	**Beta range**	**Average Beta**	**Arithmetic average**	**Geometric average**	**Arithmetic average**	**Geometric average**
Comparator group - Average Beta of 3 timeframes		54	0.4-0.7	0.54	12.8%	10.7%	18.0%	10.9%
Comparator group - Last 5 years	28/06/2008 - 28/06/2013	54	0.4-0.7	0.55	13.2%	10.6%	16.0%	10.0%
Comparator group - Last 10 years ex. GFC	01/01/2002 - 28/06/2013, ex 01/09/2008 - 30/10/2009	58	0.4-0.7	0.55	11.7%	9.8%	16.2%	10.3%
Comparator group - All available years	29/05/1992 - 28/06/2013	54	0.4-0.7	0.56	12.5%	10.3%	16.5%	10.8%
Bloomberg Utilities only	29/05/1992 – 28/06/2013	21	-	0.68	1.9%	-8.2%	0.3%	-11.2%
Full sample - Average Beta of 3 timeframes	29/05/1992 – 28/06/2013	239	-	0.88	10.3%	5.8%	16.5%	8.0%
AER 9 – longest sample period as per Henry.	29/05/1992 – 28/06/2013	9	-	0.46	16.5%	14.2%	15.9%	14.2%

Source: NERA Calculations, DataStream, AER.

126. Results are presented in the charts below for the average equity beta over these three different estimation windows. We restrict the sample to companies with a Beta within the range of 0.4-0.7, on the basis that this represents comparability under the *2013 guidelines.*

127. For companies that would have the same beta as NSPs under the AER and Henry's estimation methodology, observed stock market returns are higher on average than the allowed cost of equity (post-tax nominal) in the AER's determinations since the 2013 guideline.[60] For each estimation method presented, the allowed cost of equity for both VIC/QLD/SA (the 2015 DNSP reset) or NSW/ACT (the 2014 DNSP reset) are below the average and median returns of comparable companies.

128. We report observed returns over two different windows

- "all available data", i.e. 1992-2018; and
- "last 5 years", i.e. 2013-2018.

129. Regardless of the period over which observed returns are calculated and whether the geometric or arithmetic mean is used, the AER's allowed cost of equity appears to be below the average observed return for the comparator sample we have identified. In a statistical sense this is also true, as the allowed cost of equity is below the 95% confidence interval (CI) in each panel of Figure 5.6, except for the case when geometric returns are used over the last 5 years, where it is below the mean/median but within the 95% CI. This general pattern (below or within the 95% CI) is also true for the different beta estimation windows implemented by Henry. Results using the three different beta estimation windows implemented by Henry, as opposed to the average beta across the windows, are reported in Appendix E.

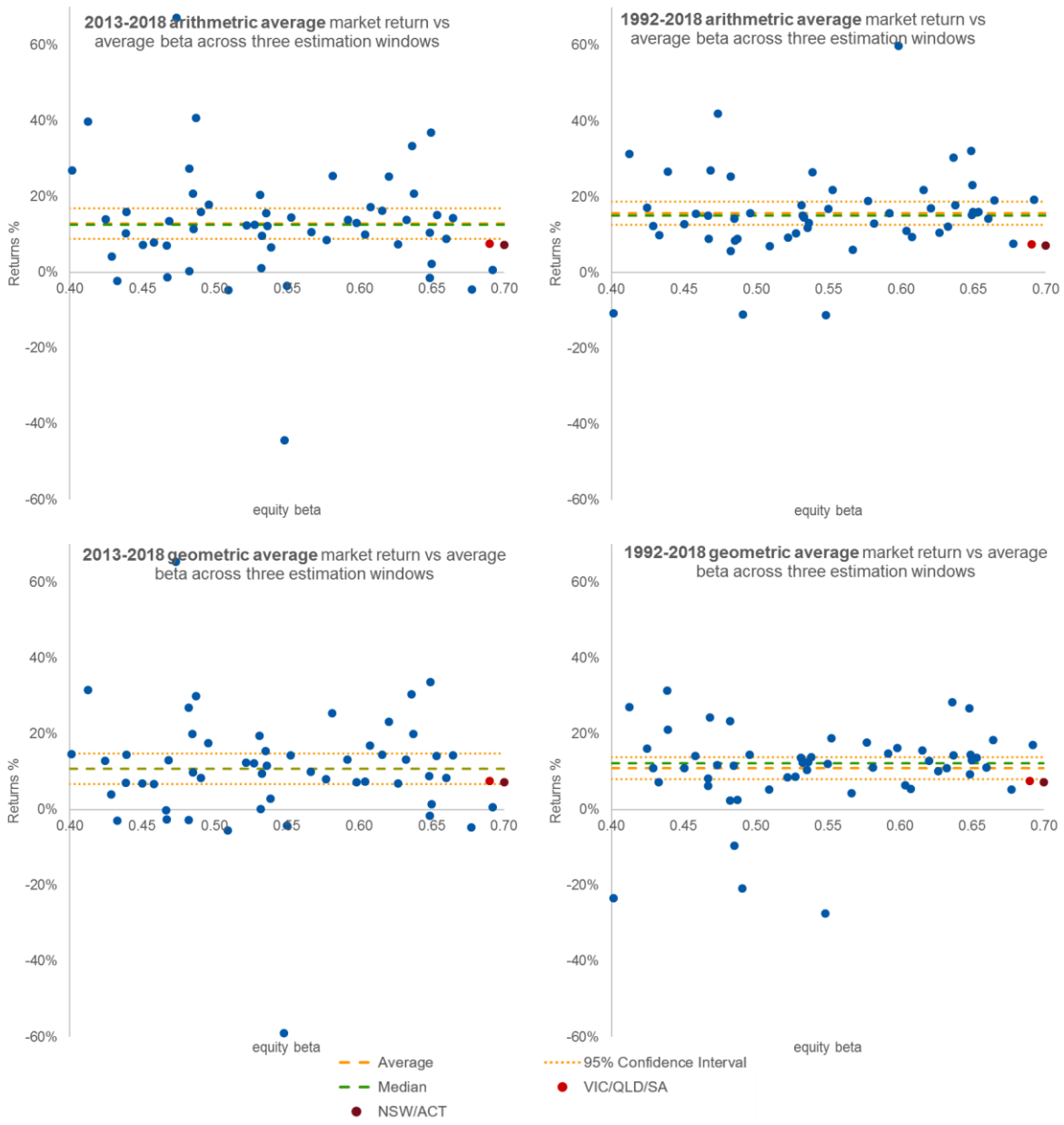
[60] AER (2013), *Explanatory Statement – Rate of Return Guideline*, p.9

130. This analysis suggests that the AER's allowed cost of equity was, if anything, too low, as the allowed cost of equity for DNSPs is outside the confidence interval for the historic average of our comparator sample.

131. We note that the use of observed equity returns over a period that differs from that used to estimate beta implicitly assumes that leverage for the comparator sample is constant over the period which we analyse observed returns. For example, if a firm has higher leverage post 2013 but we estimate beta prior to 2013, this firms equity beta, and hence expected returns would be higher post 2013.

132. Using equity betas and also means that firms that wouldn't otherwise be considered to comparable risk on a whole of firm basis, are considered comparators because of their financing structure.

Figure 5.6: Equity beta vs observed stock market returns for companies with a similar beta to the range in the 2013 Guidelines (n=54)

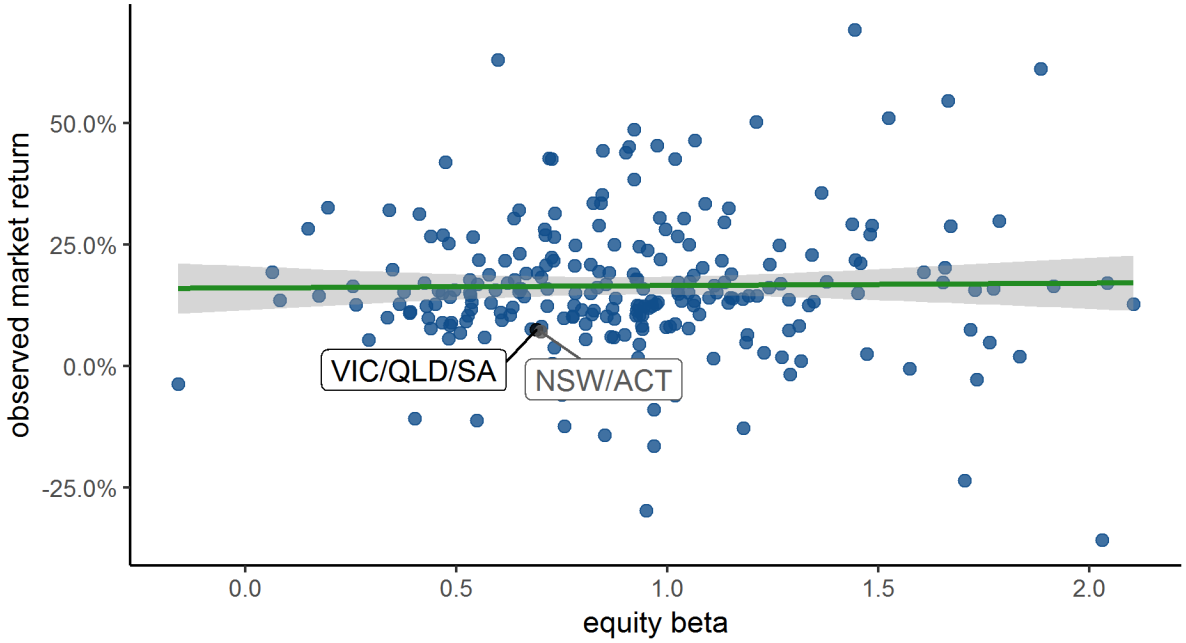


Source: NERA analysis, DataStream, AER AR RIN. Note: y axis has been cropped for expositional purposes. This only affects the top right panel which has one observation with an average return of 140%. If this observation is excluded, the AER COE figures still lie outside the 95% CI.

133. In Appendix E we present the same analysis, restricting the sample to companies with either 10 years of returns or 20 years. The 10 year restriction only drops 5 observations, taking our sample from 54 firms to 49. The results are largely the same as Figure 5.6. The 20 year restriction slightly more than halves the sample down to 23 firms. Once this restriction is made, the AER's allowed cost of equity generally falls inside the confidence intervals, though the confidence intervals are wider with a lower number of observations.

134. We have also considered observed returns for our whole sample. Given the entire sample include beta values outside the 0.4-0.7 range in the *2013 Guideline*, rather than calculate the average for all the firms, we compare the estimated cost of equity to the trend line. Figure 5.7 below charts the results for returns data from 1992-2013. The allowed cost of equity from the recent determinations for both VIC/QLD/SA and NSW/ACT DNSPs falls well below the confidence interval for the trend line – again indicating that the allowed cost of equity is unlikely to be too high, and in fact may be too low. Results using average annual returns calculated between 2013-2018 are reported in the appendix, as well the same results using geometric averages.

Figure 5.7: Relationship between beta and arithmetic average of observed returns (1992 – 2013) for all companies, beta = average of three estimation windows (n=239)



Source: NERA analysis, DataStream, AER. Note: shaded grey area is a 95% confidence interval around the regression line. The estimated trend line is y=0.160479 + 0.004898x. With a p-value of 0.831, the trend line is not statistically significantly different from zero.

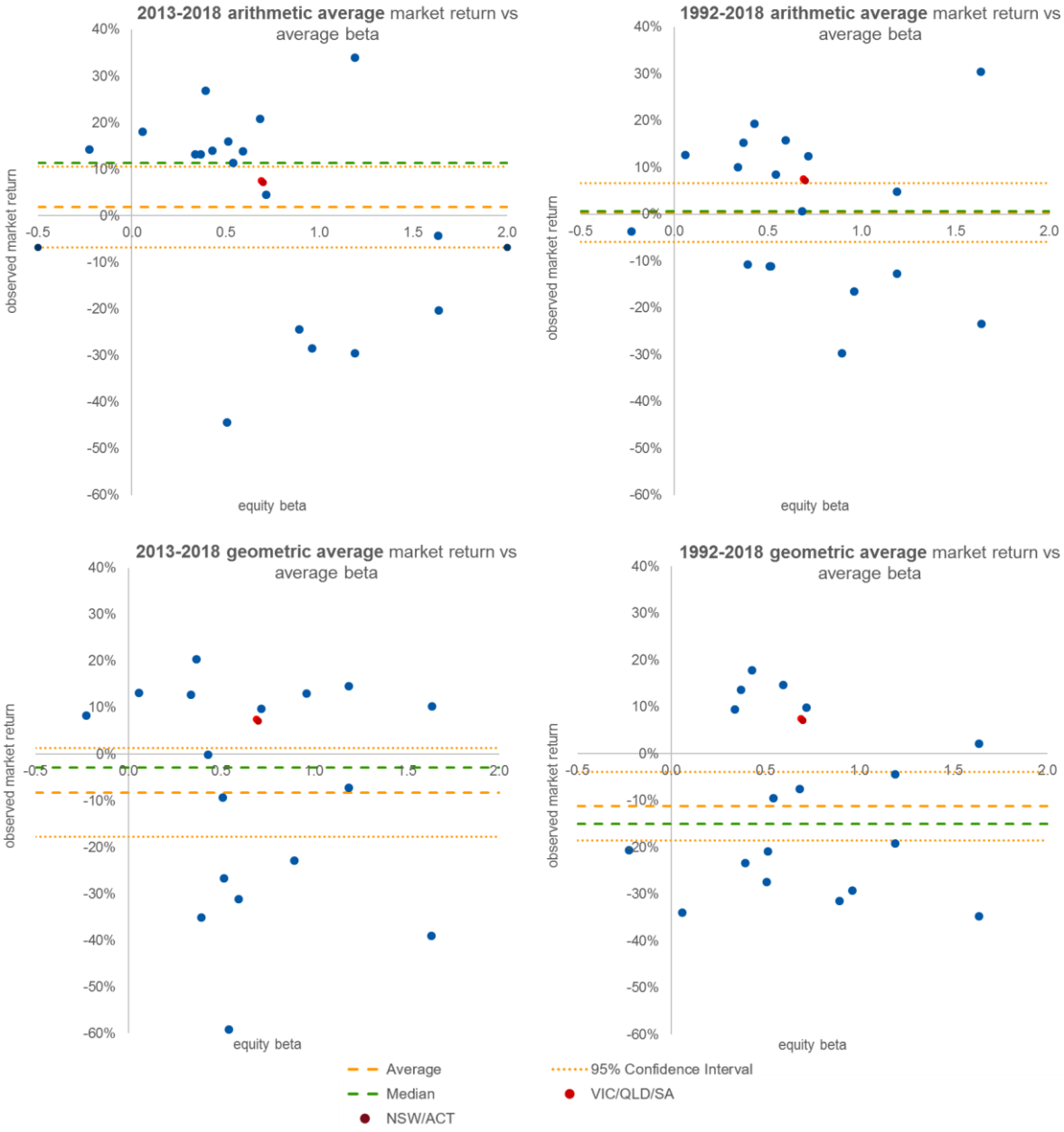
135. We then limit our comparison to the subset of firms classified as utilities by Bloomberg. This gives a sample of 21 companies with more limited data on returns as some firms were not listed on the ASX during the full estimation window.

136. Compared to these firms the allowed cost of equity is no longer materially lower than the average level. For this sample, the average equity beta is 0.68, with a range from -0.23 to 1.64. Only 7 of the 21 companies in this group have an equity beta in the *2013 Guidelines* range of 0.4-0.7. Thus, the companies in question appear to display different levels of risk to the AER's 2013 view of NSP risk.

This is consistent with the recent, more detailed analysis undertaken by the AER as part of the *2018 Guidelines* process.[61]

137. The results for this sample are presented in Figure 5.8 below. For both time periods considered, the allowed cost of equity of VIC/QLD/SA and NSW/ACT are above the average and median level of returns. The scale of the difference depends on whether the arithmetic or geometric average is considered. The geometric average is significantly lower than the arithmetic as it accounts for the compounding nature of the returns. The difference is driven primarily by a group of firms with strongly negative returns, especially during the years 2013-2018.

Figure 5.8: Equity beta vs. observed stock market returns for companies in the Bloomberg utilities classification



Source: NERA analysis, DataStream, AER AR RIN.

[61] AER, *Staff study on industry equity beta*, April 2018.

138. The final sub-sample we consider is the AER's comparator group of 9 companies.[62] Their equity betas and average annual returns are reported below. The group has an average equity beta of 0.46, ranging from a minimum of 0.29 to 0.74. The average annual returns of the group were 15.9 per cent from 1992-2018. The difference between the AER's allowed cost of equity at the most recent resets and the group's average returns from 1992-2018 was 8.4 per cent for VIC/QLD/SA and 8.8 per cent for NSW/ACT.

Table 5.2: Allowed cost of equity vs. market returns for comparable companies as selected by the AER

Company	Bloomberg Ticker	Starting Year of Returns Data	Years of Data	Equity Beta[63] (1992-2013)	Average (arithmetic) observed return (1992 – 2018)
Alinta Limited	AAN	2001	7	0.57	32.6%
Australian Gas Light Group	AGL	1991	23	0.38	17.8%
APA Group	APA	2001	13	0.54	16.5%
DUET Group	DUE	2005	9	0.48	10.1%
Envestra Limited	ENV	1998	16	0.43	12.2%
Gasnet Australia Group	GAS	2002	6	0.35	13.4%
Hasting Diversified Utilities Fund	HDF	2005	9	0.74	16.2%
Spark Infrastructure Group	SKI	2006	8	0.38	16.6%
Ausnet Services	AST	2006	8	0.29	8.0%
Average		-		0.46	15.9%
Average (excl AAN)				0.45	13.8%
VIC/QLD/SA		-		0.7	7.5%**
NSW/ACT		-		0.7	7.1%**

Source: NERA Analysis, AER, DataStream
**Equity betas are taken from Henry (2014)*
***AER estimated post-tax nominal cost of equity*

[62] Being AAN, AGL, APA, DUE, ENV,GAS,HDF,SKI and AST

[63] Henry O.T. (2014), "Estimating Beta: An Update", table 9, p. 28

5.3. Profitability measures

139. The next factor we consider is the level of profitability that the regulated NSPs have attained since the implementation of the *2013 guidelines* on the allowed rate of return. The AER has recently been consulting on the appropriate profitability measures for monitoring the performance of NSPs[64] and has released return on asset (ROA) calculations for the last four years. The AER has not yet published other measures of profitability, such as the return on regulated equity (RoRE), but intends to do so in the future.[65]

140. Profitability measures such as RoRE and ROA tell us whether allowed rates are being achieved or exceeded, but do not directly tell us whether the allowed rates are too high or too low. However, knowing whether the realised rate of return exceeds the allowed rate of return is important context when looking at market evidence such as RAB multiples, equity analyst commentary and observed capital raising behavior by firms.

141. This is because market evidence concerning the value of NSPs will be driven by the return investors expect to realise, which will incorporate all sources of value in the regime (such as incentive payments). That is to say, to interpret, for example, whether RAB multiples indicate that the allowed rate of return is excessive, one must first have a view on whether investors expect to achieve a return greater than or equal to the allowed rate of return.

142. For example, the realized return on assets can differ the allowed cost of equity for a number of reasons, including:

- Incentive mechanism payments/penalties;
- Under/over spending opex and capex allowances;
- Mis-forecasting of demand resulting in revenue being higher/lower than expected;[66] and
- Revenue smoothing across years.

143. The list of reasons for why the realized return on equity can exceed the allowed level is the same as for ROA, with the addition of:

- Higher gearing than the benchmark level assumed by the AER;
- Raising debt more cheaply than assumed by the AER; and
- Paying less tax than the regulatory tax allowance.

144. As the AER sets out in the explanatory note to the ROA calculations,[67] in any given year the ROA may differ from the WACC due to revenue smoothing between years and the unders-and-overs mechanism means that revenues greater or lower than expected will result in compensating adjustments to revenue in future years. That revenue allowances due for activity in one year may in fact be paid in another means that making inferences from annual ROA figures over a short period of time can be misleading.

[64] For a summary of the indicators being considered, see AER (April 2018), *Profitability measures for electricity and gas network businesses*, draft position paper, p.3, table 1.1.

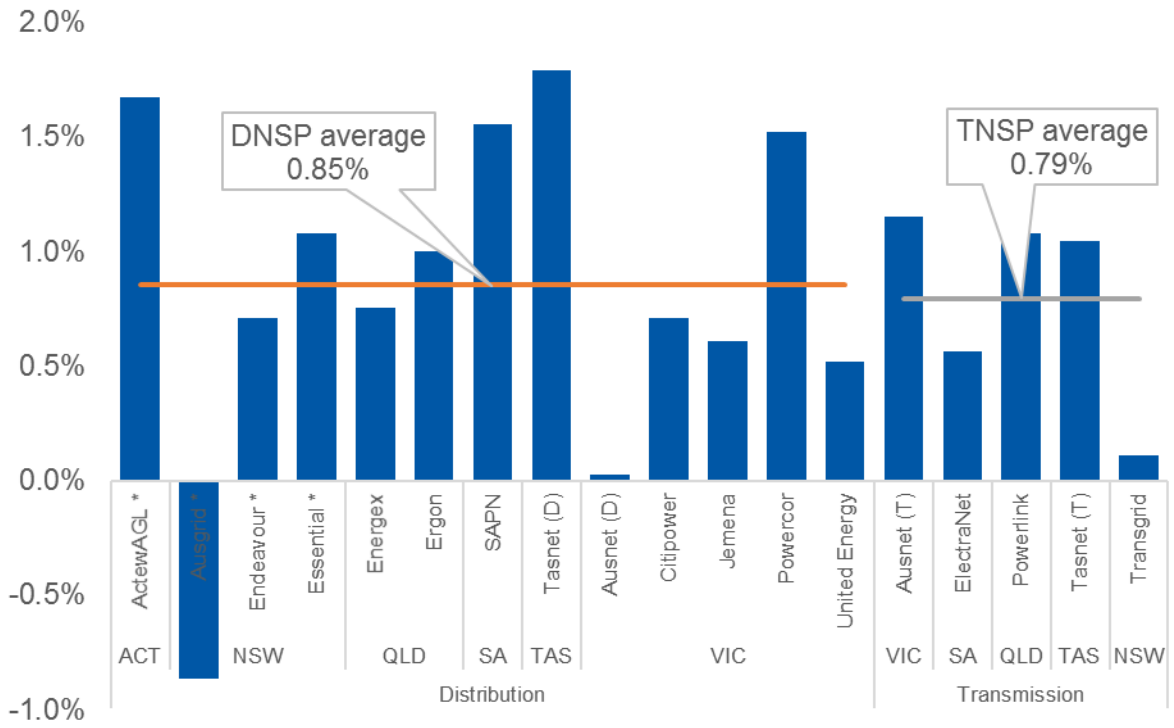
[65] The AER's profitably consultation documents are available at: https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/profitability-measures-for-electricity-and-gas-network-businesses

[66] Though deviations between actual and expected demand are adjusted in future periods through the overs-and-unders mechanism.

[67] AER, *Return on Assets for electricity network businesses: Explanatory note*, 10 September 2018.

145. Figure 5.9 shows the average difference between ROA (excluding incentive payments) and WACC for the last 4 years. The average outperformance relative to WACC is 0.85% for DNSPs and 0.79% for TNSPs. Including incentive payments, DNSP outperformance increased by 0.27% to 1.13% and TNSP outperformance increased by 0.37% to 1.16%.

Figure 5.9: Actual RoA excluding incentives relative to allowed Rate of Return: average 2014-2017



Source: NERA analysis of AER, Return on Assets – Summary data – September 2018.

146. This shows that while the increment over WACC is generally positive, there is a large variation across NSPs. Figure 5.13 below, which plots the ratio of the realised ROA to the allowed rate of return, demonstrates that outperformance has also varied materially over time for the 4 years of data published by the AER.

147. Whether any returns in excess of the allowed ROR are a persistent/structural feature of the regime or "luck" drives whether these returns, should they exist, are a problem. We do not think strong inferences can be drawn based solely on 4 years of data, some of which relate to different regulatory periods. We also concur with the caveats on interpreting the data set out by the AER.

148. We interpret the inclusion of the allowed rate of return objective in the National Electricity Rules (NER), in addition to the NEO, as suggesting that the allowed rate of return should be assessed on a stand-alone basis. This appears to broadly be the approach the AER has taken, through its approach of setting a benchmark return based on market parameters and placing the risk of over/under performing that benchmark on the NSPs:[68]

> *We apply a benchmark approach and an incentive regulatory framework. We estimate a benchmark rate of return which is then applied to a specific service provider, rather than*

[68] AER, *2018 Draft rate of return guidelines – explanatory statement*, p.74.

> *determining the returns of a specific service provider based on all of its specific circumstances.*
>
> *The service providers' actual returns could differ from those of the benchmark regulatory allowance depending on how efficiently it operates its business. This is consistent with incentive regulation. That is, our rate of return approach drives efficient outcomes by creating the correct incentive by allowing (requiring) service providers to retain (fund) any additional income (costs) from outperforming (underperforming) the efficient benchmark.*

149. Therefore, disentangling expectations of realized returns from the allowed return only arises in practice if the AER the incentive mechanisms and cost allowances, intentionally or unintentionally, allow all NSPs to systematically outperform their allowances.[69]

150. Whether our interpretation of the interrelationship of the NEO/NGO and the allowed rate of return objective is correct, is ultimately a legal question. However, good regulatory design would suggest that if excess returns are being realized through the regime, then those parts of the regime should be amended/recalibrated rather than implementing what could be an arbitrary adjustment elsewhere in the regime. The converse of this is that if realised returns were persistently below the allowed rate of return, the answer is not to increase the allowed rate of return, but to ask what aspect of the regime is resulting in low returns.

5.4. Data and evidence from capital raisings and equity investor advisory notes

5.4.1. Capital raisings

151. Regarding evidence from capital raisings, the AER has recently noted in the context of the 2018 Guidelines process:[70]

> *There is no evidence to suggest that the energy networks we regulate have not been able to raise capital on reasonable terms to undertake extensive investment programs.*
>
> *See, for example, DUET, Successful completion of DUET's $200 million placement offer, 1 April 2016; DUET, DUET completes $1.67 billion placement and entitlement offer, 13 August 2015; DUET, DUET completes $396.7 million entitlement offer, December 2014; SP AusNet, SP AusNet completes A$434 million Entitlement Offer, 15 June 2012. ASX & SGX-ST release, AusNet Services successfully prices HKD 1.2bn offer, 9 December 2016; ASX & SGX-ST release, AusNet Services successfully prices NOK 1bn offer, 10 January 2017; ASX & SGX-ST release, AusNet Services successfully prices USD 80m offer, 19 January 2017.*

152. We have collated a database of announcements to the ASX by DUE, SKI and SPA/AST since 2008 regarding capital raisings. After removing announcements that specifically relate to a capital raising that is carried out by a subsidiary that is not an Australian NSP[71] and also announcements that double up, we were left with 132 observations.

153. Figure 5.10 suggests that NSPs have not struggled to raise capital since the 2013 guideline – it is not obvious that any sources of funding dried up for these three companies post 2013. Some interesting patterns are however observable, such as SPA/AST appearing to no longer use bank debt, instead

[69] That is to say, individual NSPs may systematically outperform because they have superior management, and this isn't necessarily indicative of a flaw in the regime.

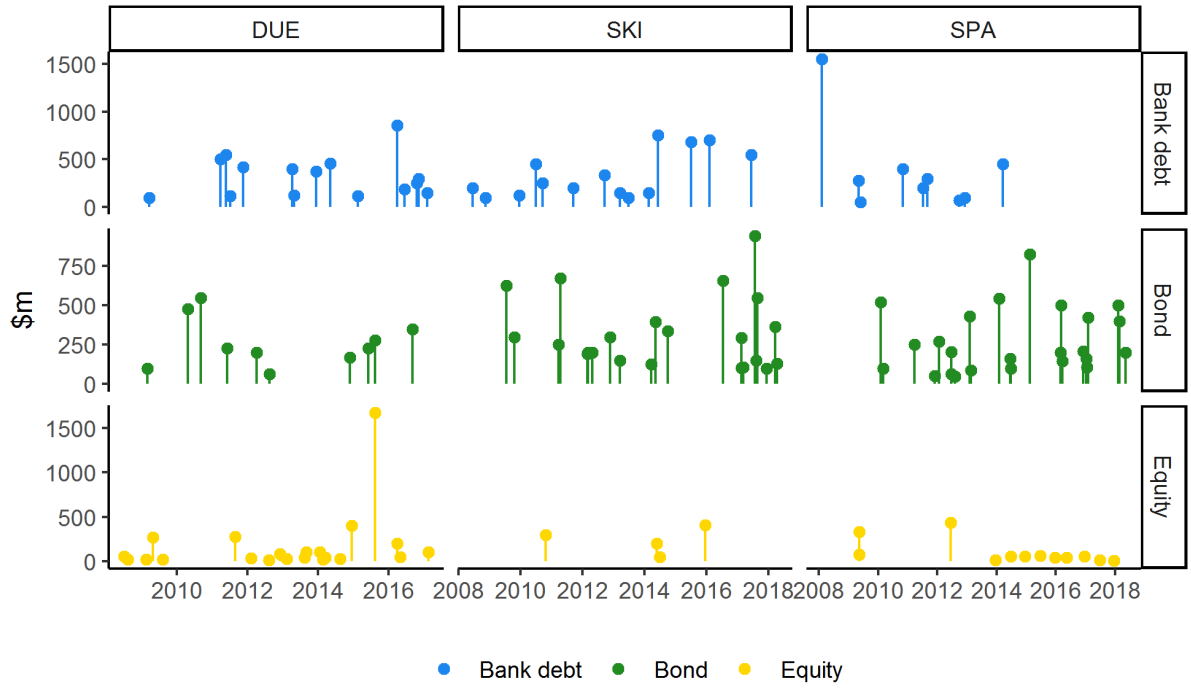
[70] AER (2018), *Does the rate of return achieve the national gas and electricity objectives?*, available at: https://www.aer.gov.au/system/files/AER%20presentation%20on%20achieving%20the%20NEO%20.pdf

[71] For example, DUET announcements relating to capital raising undertaken by the Dalrymple Bay Coal Terminal (DBCT), Duquesne Light Company (DLC) and Duquesne Light Holdings (DLH) were excluded.

having a preference for small equity raises and bonds. Similarly, SKI/its investees appear to have increased their use of bonds in recent years.

154. A simple examination of whether capital raising have been successful does not provide the whole picture. It is of course possible that the terms under which NSPs have been able to raise finance have materially improved or declined since the 2013 guideline. Capital raisings may not have failed largely because NSPs accurately anticipated and met investors' changed expectations. Accordingly, the absence of evidence that NSPs have struggled to raise finance needs to be interpreted carefully.

Figure 5.10: AUD raised over time for SKI, DUE and SPA based on stock exchange announcements



Source: FactSet database of ASX announcements
Note: Includes refinancing. Hybrid offers are counted in bonds. Includes announcements related to subsidiaries. Excludes capital raisings by subsidiaries that are not NSPs regulated by the AER. Raisings directly by the company are included regardless of stated purpose.

5.4.2. Analyst reports

155. We analysed equity analyst reports from investment banks from 2013 to 2018 to establish the prevailing market view on the allowed WACC and rate of RAB growth. Our review encompassed analyst reports on network utilities more generally and specific reports on DUET, Spark Infrastructure and SP Ausnet that mentioned regulation or AER price determinations. We reviewed 42 reports, the full list of which is contained in Appendix F.

156. Whilst it was impossible to establish consensus on the matter, the market generally considered that the regulatory regime was tightening and forecast reductions in the WACC, capex and opex from 2013 onwards. However, this had largely been anticipated and was not met by a shift to a negative view on assets regulated by the AER. In this period sampled regulatory announcements rarely produced surprises and led to only minor revaluations (noting this comment excludes the announcement of the 2018 draft guideline). Prior to 2013, the return on equity for NSW and Queensland electricity networks were considered strong to exceptional

"Return on equity for the government-owned networks is strong to exceptional. Two of the New South Wales networks (Ausgrid and Endeavour Energy) stand out for the strong returns on equity that they generate, with Ausgrid delivering an ROE of 18.5% in FY12 and Endeavour 20.8% ."[72]

157. Analysts consider regulatory risk to be low in relation to this market and frequently mentioned the attractiveness of the regime due to its stability and predictability. This report from April 2014 demonstrates this view:

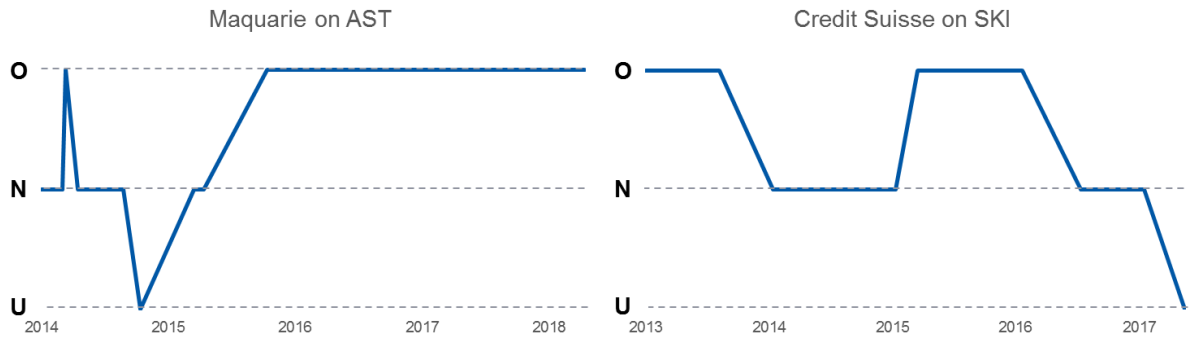
"The regulator is applying framework consistently and rigidly: our previously stated view is the regulator is applying the framework in a very deterministic manner, which results in a narrow distribution of potential outcomes and low stock-specific risk."[73]

158. Analysts mentioned the leniency of the AER's regime as an attraction for investor, as in this 2015 analyst report concerning the sale of Transgrid:

"[Transgrid] is a great asset… governed by a generous regulatory regime which still by design errs on the side of over-incentivising."[74]

159. Our review of the buy sell ratings of analysists suggest that analysts appear to have generally viewed these companies, or at least SKI and AST, favourably since the release of the 2013 guidelines.

Figure 5.11: Analyst ratings of SKI and AST



Source: NERA analysis of broker reports, see Appendix F.1.

160. Analyst reports show that the market is sensitive to the AER's determination and incentivisation of efficiency for NSPs. The potential for financial rewards encourages investment banks to pay close attention to the issue, as they anticipate changes to the allowed WACC for regulated entities. This is exemplified in the following passage from a 2015 analyst report in relation to an AER determination for SA Power Networks:

"In contrast to the prevailing perception that the 'party is over' and that the regulator would wield political and community will to reduce network costs by sharply reducing opex and capex allowances; today's regulatory determinations showed that the regulator is being much more selective and still rewarding those networks that are deemed to be 'efficient' operators."[75]

[72] Credit Suisse (2013), "Regulated Utilities Update - QLD & NSW Electricity Networks", Analyst Report

[73] Credit Suisse (2017), "AusNet Services: Final ET decision confirms low regulatory risk", Analyst Report

[74] Credit Suisse (2015), "Spark Infrastructure Group - Transgrid Acquisition: Vex or Validate?", Analyst Report

[75] Credit Suisse (2015), "Australian regulated equities - positive determination outcomes", Analyst Report

161. Analysts from investment banks often point to capex growth as key factor in investment decisions as it seen as crucial for determining the ability to grow earnings and dividends over time. The analyst reports suggest that RAB growth is perceived as a generally desirable outcome in investors' consideration of regulated businesses, regardless of whether the regulated return is more or less than the actual cost of capital. For example, the following quote from a 2014 report by Credit Suisse:[76]

> *The proposal put forward by SAPN calls for a 50% increase in capex allowance versus the previous regulatory period made up of increases in replacement capex (repex), augmentation capex (augex) and growth in connections. Capex is important as it determines the ability to grow earnings and dividends over time.*

162. Analysis by CEPA for the AEMC made a similar finding, suggesting that while this is likely to be changing, some NSPs may naturally have a capex bias, as they may operate within a corporate culture that is focused on growing the RAB, which drives growth in earnings and provides investors with long-term, stable revenue streams.[77]

163. Our review of analyst reports is also consistent with the AER's finding that[78]

> *Broker reports suggest that our recent determinations have not removed the ability or listed networks to maintain payment of dividends*

164. Analyst reports should however be interpreted with caution, as academics and commentators have observed 'optimism' bias in equity analyst ratings, which may be driven in part by relationships with corporate clients.[79]

5.5. RAB multiples

165. The RAB multiple, sometimes referred to as the market-to-asset ratio (MAR), is the ratio of the market value of the firm to the RAB. Where a network company is floated, the RAB multiple is directly observable at all points in time by comparing the market capitalisation on the stock market and the RAB recorded in the regulatory accounts. In cases where a network company is not floated, the RAB multiple is only observable when the business changes hands at a publicly-known price.

166. In circumstances where the regulated network's costs and revenues are exactly as the regulator foresees them, and the entity in question has no unregulated businesses, the market value of the company will be equal to the RAB. As a result, over the medium term, the RAB multiple for a network company that has no unregulated revenue, cannot outperform the regulatory assumptions, including its cost of capital, and does not receive income from incentive mechanisms, will be equal to one. In practice, RAB multiples are commonly more than 1 in many jurisdictions internationally because investors anticipate receiving back more than the costs recorded in the regulatory accounts. This is because either:

- outperformance of regulatory targets, and resulting incentive payments; or
- investors require lower returns than the regulator assumes in the Allowed Rate of Return (AROR).

[76] Credit Suisse (2014), "Spark Infrastructure Group - Investor Day".

[77] Cambridge Economic Policy Associates (April 2018), "Incentives faced by network service providers", Draft Report

[78] AER (2018), *Does the rate of return achieve the national gas and electricity objectives?*, available at: https://www.aer.gov.au/system/files/AER%20presentation%20on%20achieving%20the%20NEO%20.pdf

[79] See for example, commentary in: Green, C., Jame, R., Markov, S., and M. Subasi, 2014, "Access to management and the informativeness of analyst research", *Journal of Financial Economics*. 114, 239-255. And also: Arand, D. and A. Kerl, 2015. "Sell-side analyst research and reported conflicts of interest", *European Financial Management*, 21, 20-51

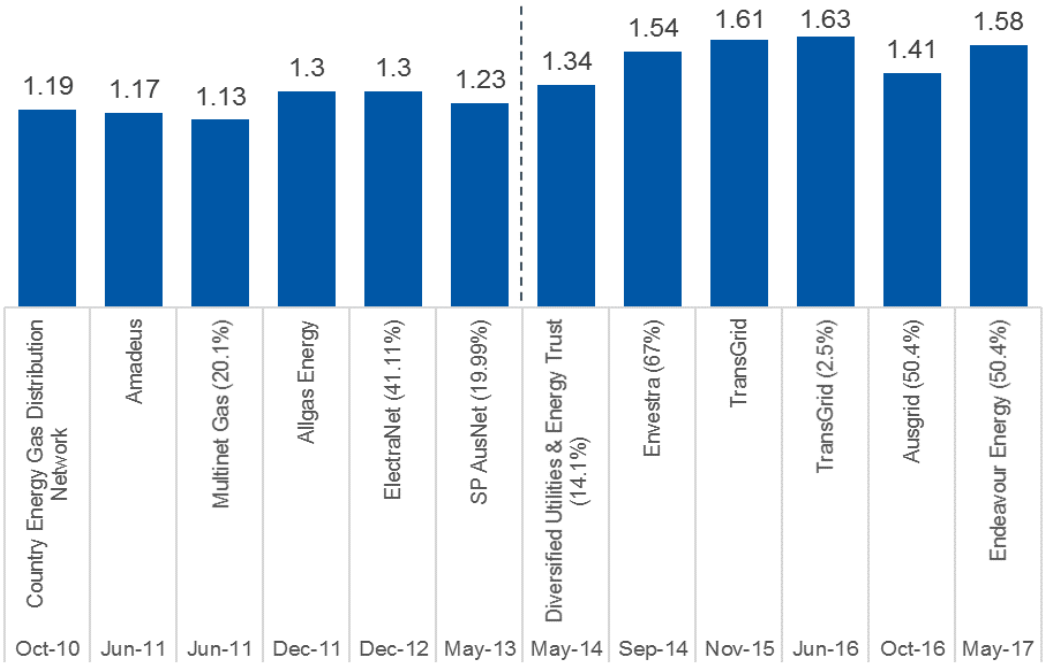
167. If the market expects a network company in steady-state without unregulated revenue to earn no incentive payments on average, the RAB multiple can be written as being equal to the ratio of the allowed rate of return in the current and all future price controls to the investors' expected weighted average cost of capital (WACC):[80]

$$RAB\ multiple = \frac{AROR}{WACC}$$

168. In this sense, it is potentially a direct measure of whether the allowed rate of return is greater than WACC. However, NSPs in Australia receive income/penalties from incentive mechanisms, can outperform the regulatory assumptions, and have grown the RAB in real terms (i.e. are not in steady state). As a result, a RAB multiple greater than one need not be evidence that the AROR is too high in the price control and neither may the RAB multiple precisely measure the ratio of the AROR to the WACC.

169. The data on RAB multiples for firms regulated by the AER is summarized graphically in Figure 5.12 below.

Figure 5.12: Australian Historical Network Trade Sale Multiples - for acquisitions under the AER's regulatory regime



Source: AER, Morgan Stanley, Best Endeavours – Australia Regulated Utilities, 11 May 2017, p 2.

170. As can be seen from the Figure, RAB multiples based on trade sales have increased since the 2013 Guideline. This could be interpreted as evidence that the allowed rate of return under the 2013 guidelines is overly generous. However, we note that no single network in the sample changed hands before and after the 2013 Guideline. As a result, control premia and the differences in expected cost conditions for the specific networks traded after May 2014 may account for the differences in RAB multiples.

[80] For a simplified derivation, see NERA., "Implications of Observed Market-to-Asset Ratios for Cost of Equity at RIIO-T2", 1 December 2017, available at: http://www.nera.com/content/dam/nera/publications/2017/171201_MAR_report_final.pdf.

171. As Biggar (2018) notes, in practice the RAB multiple is not a *direct* measure of the relativity between the allowed rate of return and the cost of capital:

> *In my view it would be slightly more correct to say that RAB multiples provide the most direct information available on the relativity of expected cash-flows and market discount rates to the cash-flows needed to just compensate investors. RAB multiples themselves say nothing about the relativity of allowed and expected returns on capital or equity. As we have seen above, the regulatory-allowed cost of capital could perfectly reflect the firm's true cost of capital and the RAB [multiple] could still be above one*

172. Biggar's focus on cashflow is important, as this is what investors value and therefore what will drive RAB multiples. AROR is one source of cash-flow for network companies. But Biggar's analysis is that all sources of cash-flow, including outperformance, may lead to RAB multiples greater than one, even if the AROR were exactly equal to the WACC.

173. That investors' expectation of the payments for outperformance on cost and quality incentives may have increased over time is therefore a rival explanation of RAB multiples increasing over time. Moreover, investors' valuation of those payments may have also increased: if discount rates have fallen since 2013, as is the case under AER's rate of return methodology, $1 of expected future outperformance is worth more now than it was in 2013.

174. There has been much discussion of RAB multiples in the 2018 Guidelines process. The AER describes the contrasting views of the NSPs and consumers as follows: [81]

> *…the network businesses have not been in favour of the use of RAB multiples to inform the rate of return – primarily due to the difficulty in disaggregating the RAB multiples into its different sources of value. However, (…) consumer groups have been in favour, mainly highlighting that the rate of return is a large component of the building block revenue, and the large multiples observed, particularly in recent transactions, are suggestive that the rate of return has been too generous*

175. Similarly, there has been some discussion about what might constitute a "normal" RAB multiple, with Biggar (2018) noting:

> *…due to each firm's ability to earn rewards for taking desirable actions, an EV/RAB ratio of slightly above one should be considered normal. This is consistent with the theoretical observation that the regulated firm must be left some "information rents" in an optimal regulatory contract. I therefore suggest that, as a starting point, an EV/RAB in the vicinity of 1.1 should be considered unobjectionable. In addition, due to uncertainties and complexities in the regulatory process, and in the process of estimating the EV and the RAB, I suggest an error margin of plus or minus twenty per cent on this figure could be considered a "normal range". I therefore suggest that an EV/RAB outside the range of 0.9-1.3 might give cause for further exploration and investigation.*[82]

176. It is *conceptually* possible to disaggregate RAB multiples in order to ascertain what fraction, if any, the premium the market places on the RAB is due the allowed rate of return being too high.

177. Some of the factors one would need to control for are set out by the AER:[83]

- Outperformance in regulatory benchmarks, including expenditure allowances (operating expenditure and capital expenditure) and tax allowances.

[81] AER, "Draft – Rate of Return Guidelines – Explanatory Statement," July 2018, p. 133,

[82] *Ibid.* p. 11.

[83] AER, "Draft – Rate of Return Guidelines – Explanatory Statement," July 2018, p. 142.

- Unregulated revenue – potential growth and cost efficiencies that can be achieved.
- Control premium – if the acquisition results in a majority share ownership;
- Economic circumstances at the time of the transactions – differences between the rate of return set at the time of the business' determination versus market conditions when the transactions took place.
- Possibility of over-optimism in assumptions.

178. That is to say, the RAB multiple is influenced by factors specific to the firm involved, when the transaction occurred, and the optimism of the investor involved. Therefore, caution is warranted when making extrapolations based on unadjusted RAB multiples.

179. Even for an individual firm/transaction, like any valuation exercise the adjustments are subject to uncertainty/judgment by the analyst. For example, NERA has done work on adjusting the RAB multiples for National Grid and the two listed water companies in the UK using external analyst (i.e. non-NERA) estimates of the valuation of the various factors described above.[84] The adjustments are shown in Table 5.3 below.

Table 5.3: NERA adjustments to National Grid and listed UK water utilities RAB multiples

Firm/Scenario	Raw RAB multiple	Adjusted RAB multiple	
		Upper bound	lower bound
National Grid (pre-GDN sale)	2.21	1.46	0.72
National Grid (post-GDN sale)	2.31	0.92	0.35
Severn Trent Water	1.26	1.05	0.89
United Utilities	1.27	1.09	0.96

Source: NERA, "Implications of Observed Market-to-Asset Ratios for Cost of Equity at RIIO-T2", 1 December 2017

180. In percentage terms, these downward adjustments from the raw RAB multiple to the adjusted RAB multiple equate to ranges of -75% to -196% for National Grid[85] and -18% to -37% for the listed water utilities.

181. As set out in Section 5.3, NSPs have also on average outperformed the allowed weighted average cost of capital by ~1% over the last 4 years, which could also be driving RAB multiples if investors expected this level of outperformance to persist. Purely for illustrative purposes, we can impute a RAB multiple associated with this outperformance. I.e. we are asking the hypothetical question "if investors expected current levels of outperformance to continue in the future, and we assume the AER's allowed rate of return[86] is equal to the expected returns required by investors, what RAB multiple would this imply?".

182. That is, we calculate "ROA (including incentives) divided by AROR". Where AROR is measured as the real, pre-tax WACC. The results of this calculation for the individual years the AER has published ROA data for is shown in Figure 5.13 below. This RAB multiple makes fairly stringent assumptions:

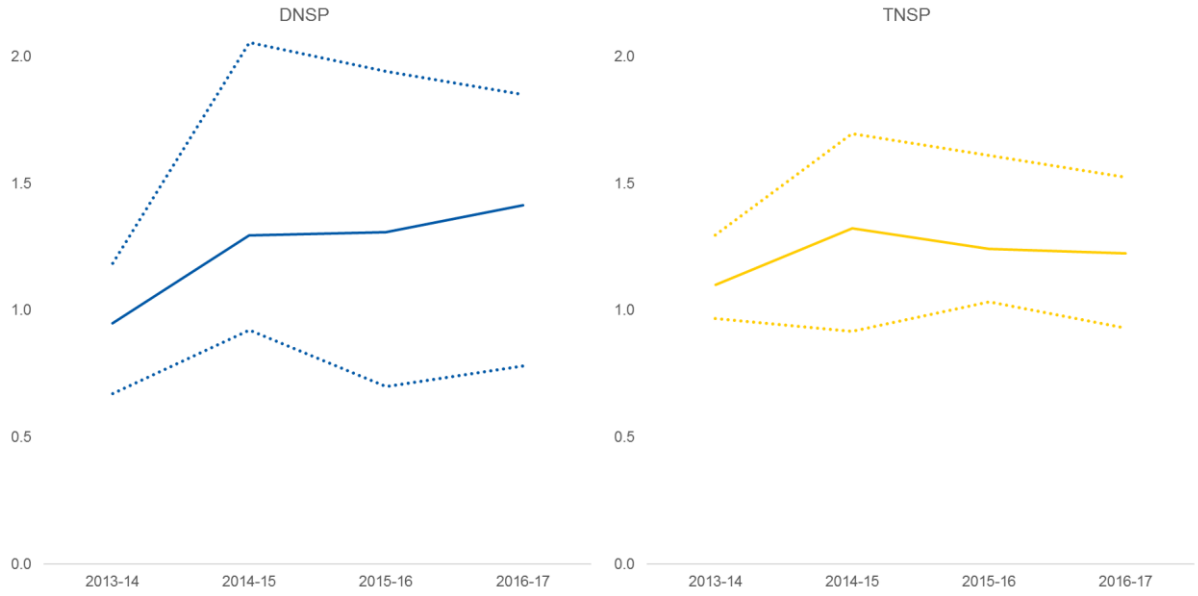
[84] See, NERA., "Implications of Observed Market-to-Asset Ratios for Cost of Equity at RIIO-T2", 1 December 2017

[85] National Grid has significant activities in the US which are not subject to regulation by Ofgem.

[86] Measured as the pre-tax real WACC.

investors would need to assume that NSPs will always be able to outperform by a constant percentage, even as the AER tightens standards in response.

Figure 5.13: Ratio of AER realised ROA (including incentives) vs allowed Rate of Return



Source: NERA analysis of AER, Return on Assets – Summary data – September 2018.

183. This chart, while only illustrative in relation to RAB multiples, suggests a few things:

- Outperformance has on average risen for DNSPs since 2013-14, which could partly explain the increase in RAB multiples shown in Figure 5.12, if investors expect these trends to persist;
- Outperformance can be material, and thus could explain the magnitude of observed RAB multiples if investors expected these levels to persist in the future.
- Not all firms outperform the allowed rate of return;
- Outperformance varies materially across firms and across time, suggesting that attempts to predict outperformance, either by investors or the AER, are subject to considerable uncertainty.

184. The previous paragraph should not be interpreted as definitive evidence about investor expectations of outperformance. Instead, this illustrates the risks of attributing RAB multiples entirely to the allowed rate of return being greater than the required return, when NSPs have the opportunity to outperform.

185. That is to say, RAB multiples would provide more compelling evidence that the allowed rate of return is too high in a circumstance where realised returns are close to the allowed rate of return, yet a large RAB multiple persists.

6. Does the Evidence present a consistent and robust pattern?

186. We have considered 6 empirical indicators to get at the question of whether the AER's allowed rates of return are too high or too low. A summary of the outcome of these are presented in table 5.1.

187. The National Electricity Objective and National Gas Objective are set out in the National Electricity Law (NEL) and National Gas Law (NGL) and have similar objectives:

> ***National gas objective (NGO)***[87]
>
> *The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas;*
>
> ***National electricity objective (NEO)***[88]
>
> *The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to—*
>
> *(a) price, quality, safety, reliability and security of supply of electricity; and*
>
> *(b) the reliability, safety and security of the national electricity system*

188. The *allowed rate of return objective is* in the National Electricity Rules and National Gas Rules (NGR). Clause 6.5.2 (c) describes allowed rate of return objective at high level:

> *The allowed rate of return objective is that the rate of return for a Distribution Network Service Provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the Distribution Network Service Provider in respect of the provision of standard control services (the allowed rate of return objective).*

189. Clause 6.5.2 (e) then sets out some factors that the AER must have regard too:

> *In determining the allowed rate of return, regard must be had to:*
>
> *(1) relevant estimation methods, financial models, market data and other evidence;*
>
> *(2) the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt; and*
>
> *(3) any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.*

190. As mentioned earlier in this report, we interpret allowed rate of return objective as requiring the AER to set the allowed rate of return on a stand alone basis. That is, if other parts of the regime over or under compensate NSPs, the allowed rate of return shouldn't be used to make up or claw back those deficits/surpluses.

[87] NGL, s. 23.

[88] NEL, s. 16(1)(a);

191. Thus our consideration of whether the allowed rate of return is too high or too low has focused on whether the indicators can allow inferences to be drawn about the relativity between the allowed rate of return and the expected return required by investors.

192. Regarding the consideration of evidence/indicators which can be used to assess whether the rate of return set by the 2013 guidelines is "too high" or "too low", the table below sets out the indicators we considered, what they suggest and our view on whether they can be relied on. In summary, the evidence doesn't present a particular clear picture one way or the other. There is evidence that could be interpreted to suggest returns are either too high, too low or at the correct level – and none of the evidence is particularly robust. This stems from the difficulty disentangling *realised* returns in excess of the *allowed* rate of return from whether the *allowed* rate of return is greater than the return required by investors to finance the activities of an NSP.

Table 6.1: Summary of indicators considered on whether the WACC is too low or too high

Indicator	Result	Discussion of strengths and weaknesses	Suggests allowed return is too high / too low?
Variances between approved capital expenditure allowances and actual capital expenditure since 2013 for network businesses	▪ DNSPs were underspending their allowances prior to 2013 and have continued to underspend, though some have overspent ▪ TNSPs overspent allowances prior to 2013 and have underspent since. ▪ The $ allowances, and $ of capex spent, have generally declined since 2013 ▪ On a % basis there is no clear evidence that "under spending" has increased for DNSPs, while the picture for TNSPs is clouded by spikes in expenditure prior to 2013.	▪ NSPs might defer or scale back capex if the allowed RoR < expected WACC. ▪ However, there are other reasons why NSPs might be under spending their allowance. ▪ For example, the uncertain regulatory environment and concerns about assets being stranded could mean there is option value in deferring investment. ▪ NSPs may also have an incentive to submit upwardly biased expenditure forecasts, in which case the allowance is not the level NSPs were planning on spending. However allowances are approved by the AER, and the AER can substitute its own forecast if it believes the NSP's proposal isn't efficient.[89] ▪ Allowances also reflect forecasts, and therefore deviation from allowances may simply reflect forecasting error.	Ambiguous
Observed historical returns for firms with similar betas	▪ We define similarity as firms that the AER would have estimated an equity in the same range it set for NSPs (0.4 – 0.7) as at the time of the 2013 guideline. ▪ The allowed cost of equity set by the AER appears to be lower than outturn returns for firms with a similar beta.	▪ Large variability in observed returns and the established limitations of the *ex post* empirical performance of the CAPM means inferences should be drawn with caution. ▪ Using equity returns allows for direct market evidence to be used across a very broad cross section of companies. ▪ However, *ex ante* expected returns can diverge from *ex post* realised returns over a persistent period of time. ▪ To the extent that the data used to estimate beta and calculate observed returns is the same, one might expect the observed RoE for comparable firms to be the same as the AER's estimated cost of equity. ▪ Equity betas and observed equity returns are also influenced by other factors such as leverage, incentive schemes etc. So our similarity criterion identifies firms whose equity holders face similar systematic risks, rather than identifying comparator firms based on the risks (systematic or otherwise) faced by the firm as a whole. ▪ If leverage differs between the sample used to estimate beta and the period over which observed returns are measured, leverage could drive trends in observed returns.	Too low

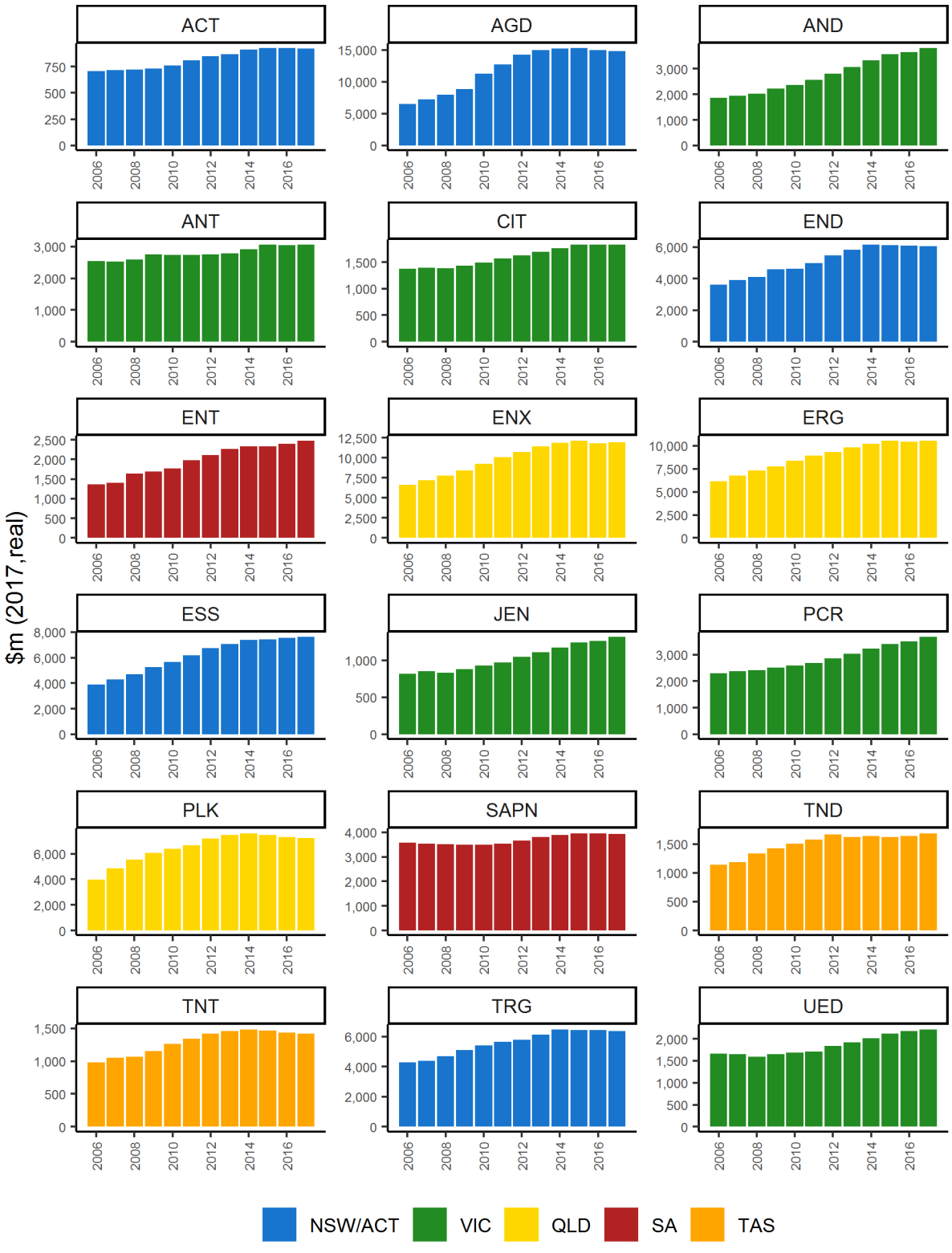
[89] Technically, the AER assesses whether an NSPs proposal reasonably reflects the "expenditure criteria" under the National Electricity Rules (NER). See, e.g. AER, *Expenditure Forecast Assessment Guideline for Electricity Distribution*, November 2013.

Indicator	Result	Discussion of strengths and weaknesses	Suggests allowed return is too high / too low?
Realised returns for the NSPs	▪ The AER's return on asset (ROA) figures show that most NSPs have realised returns greater than the allowed rate of return between 2014 and 2017. ▪ This outperformance has on average been less than 1% excluding incentive payments and slightly above 1% on average including incentive payments.	▪ The purpose of incentive based regimes is that firms may earn higher returns from reducing costs (including financing and tax) or providing higher quality service. ▪ If investors expect the realised return to persistently exceed the allowed return, this could explain RAB multiples greater than 1. ▪ Persistent outperformance should trigger a review of the incentive regime or other elements of the building block framework, rather than seeking to "claw back" these gains through a lower allowed forward-looking return. ▪ Setting a lower allowed return on the assumption there will be outperformance would risk deterring efficient investment for projects where outperformance is likely to be lower than average and would also assume that out performance can be predicted, which is questionable. ▪ Robust conclusions cannot be made on the basis of the limited income data (four years) the AER has collected to date, some of which relates to price control periods where the 2009 rate of return guideline applied.	N/A, informs other measures
RAB multiples	▪ RAB multiples for trade sales of firms regulated by the AER have been materially in excess of 1, and this figure has increased since 2013.	▪ Under a set of extremely tight assumptions, that are unlikely to hold in practice, the RAB multiple is a *direct* measure of the ratio of the *allowed* return to the *expected* return *required* by investors. ▪ Observed, unadjusted, RAB multiples provide information on whether the expected return (which is based on expected net cash flows) is greater than the true cost of capital. ▪ The various factors affecting market value besides the allowed RoR, such as expected potential outperformance, can *in theory* be controlled for, but in practice this may be quite difficult and transaction or firm-specific. ▪ Adjustments to RAB multiples to account for non-RoR factors result in wide ranges. ▪ This raises questions about the robustness of drawing inferences from RAB multiples in relation to the allowed RoR.	Ambiguous
Equity analyst research and observed capital-raising behaviour	▪ Analysts appear to have generally remained positive on NSPs since the 2013 guideline. ▪ Some even cited the permissiveness of the regime. ▪ Spark Infrastructure (SKI), AusNet Services (AST) and DUET (DUE) and the network businesses they invest in appear to have been able to raise capital.	▪ Positive analyst coverage and a continued ability to raise capital suggests at the very least that *realised* returns are sufficient. ▪ We have not however assessed whether the cost of raising these funds has changed. ▪ It is hard to separate whether the allowed RoR is too high from the ability of firms under incentive-based regulation to earn realised returns above the allowed level. ▪ Academics and commentators have observed 'optimism' bias in equity analyst ratings.	Not too low/ambiguous

Source: NERA analysis

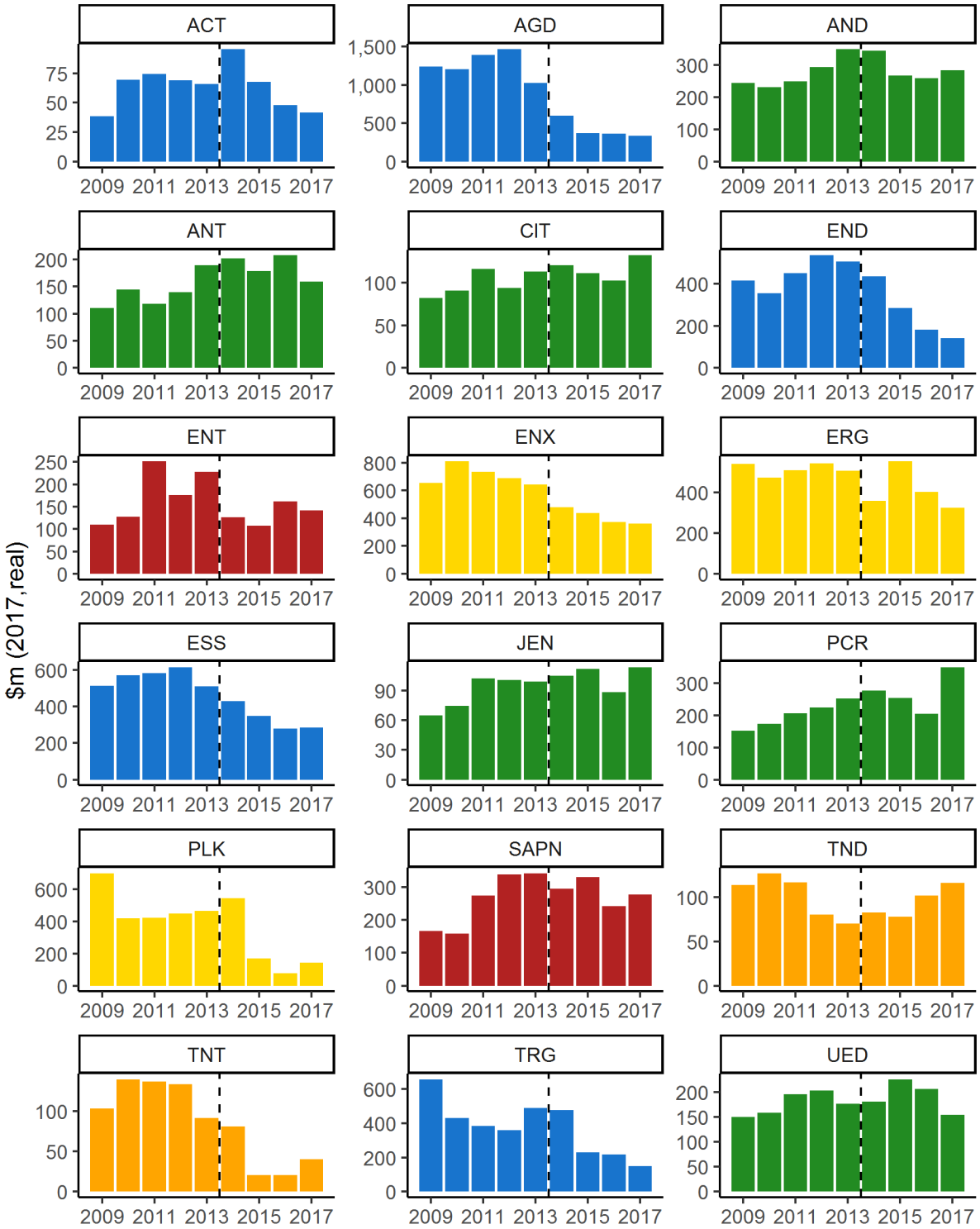
Appendix A. Firm level RAB and capex analysis

Figure A.1: Regulatory asset base (RAB) by NSP



Source: AER RFM

Figure A.2: Total capex by NSP

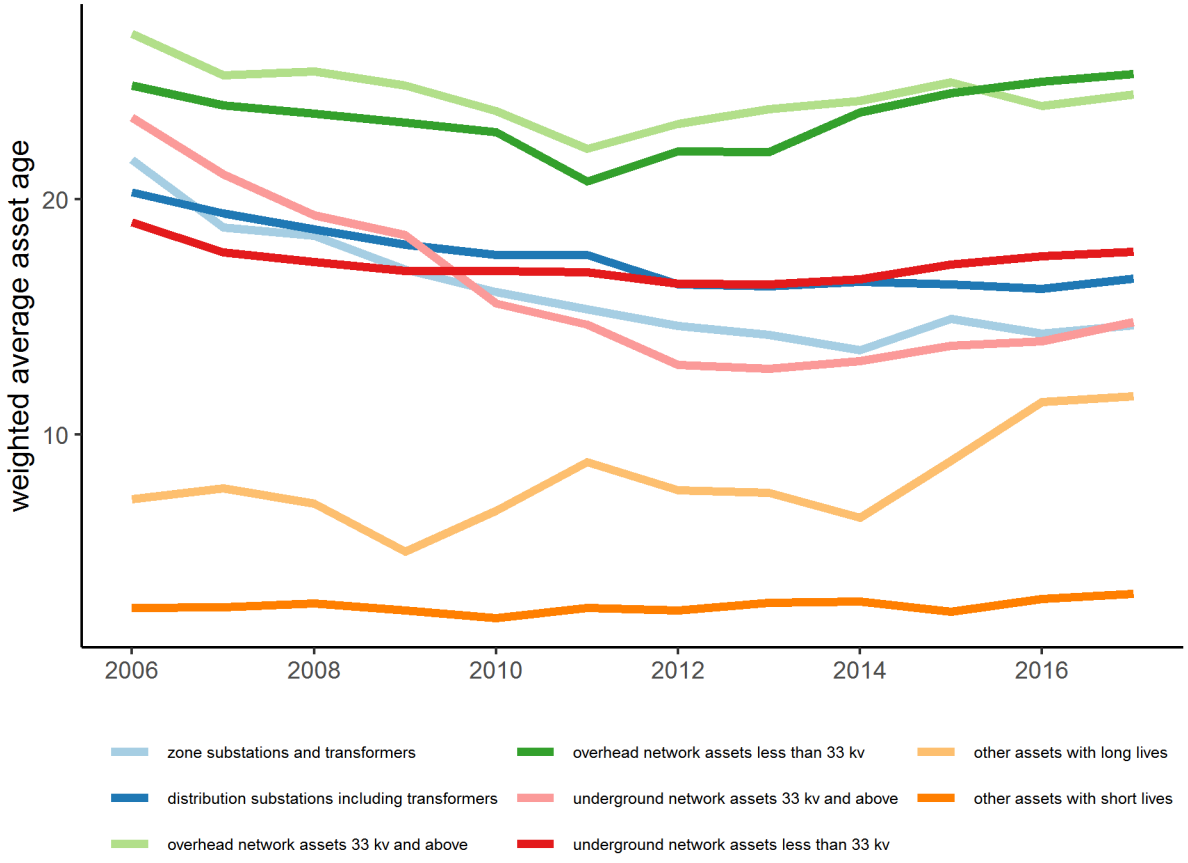


Source: AER CA RIN

Appendix B. Further analysis of asset age and replacement expenditure

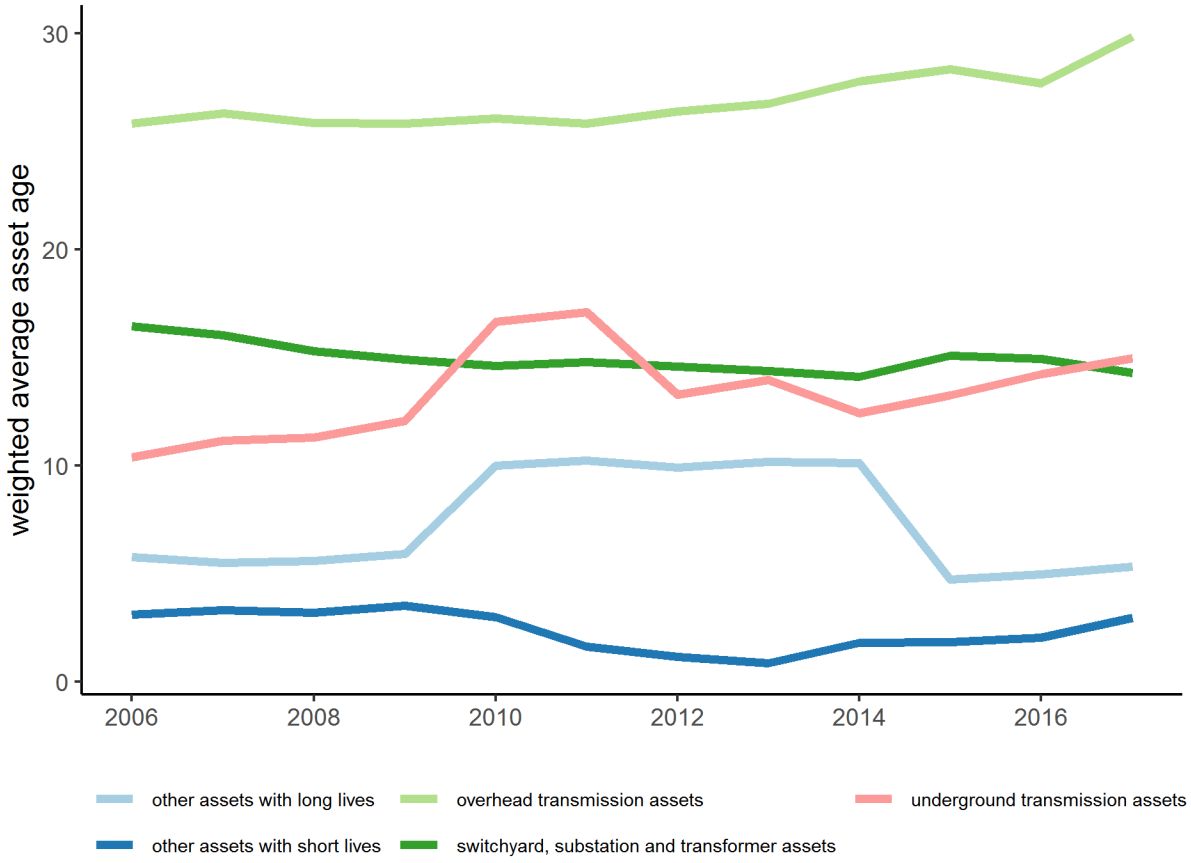
B.1. Asset age by asset class

Figure B.1: NEM wide average asset age for distribution assets: low voltage assets and substations/transformers have gotten younger, high voltage assets have gotten older



Source: AER EB RIN. Excludes meters.

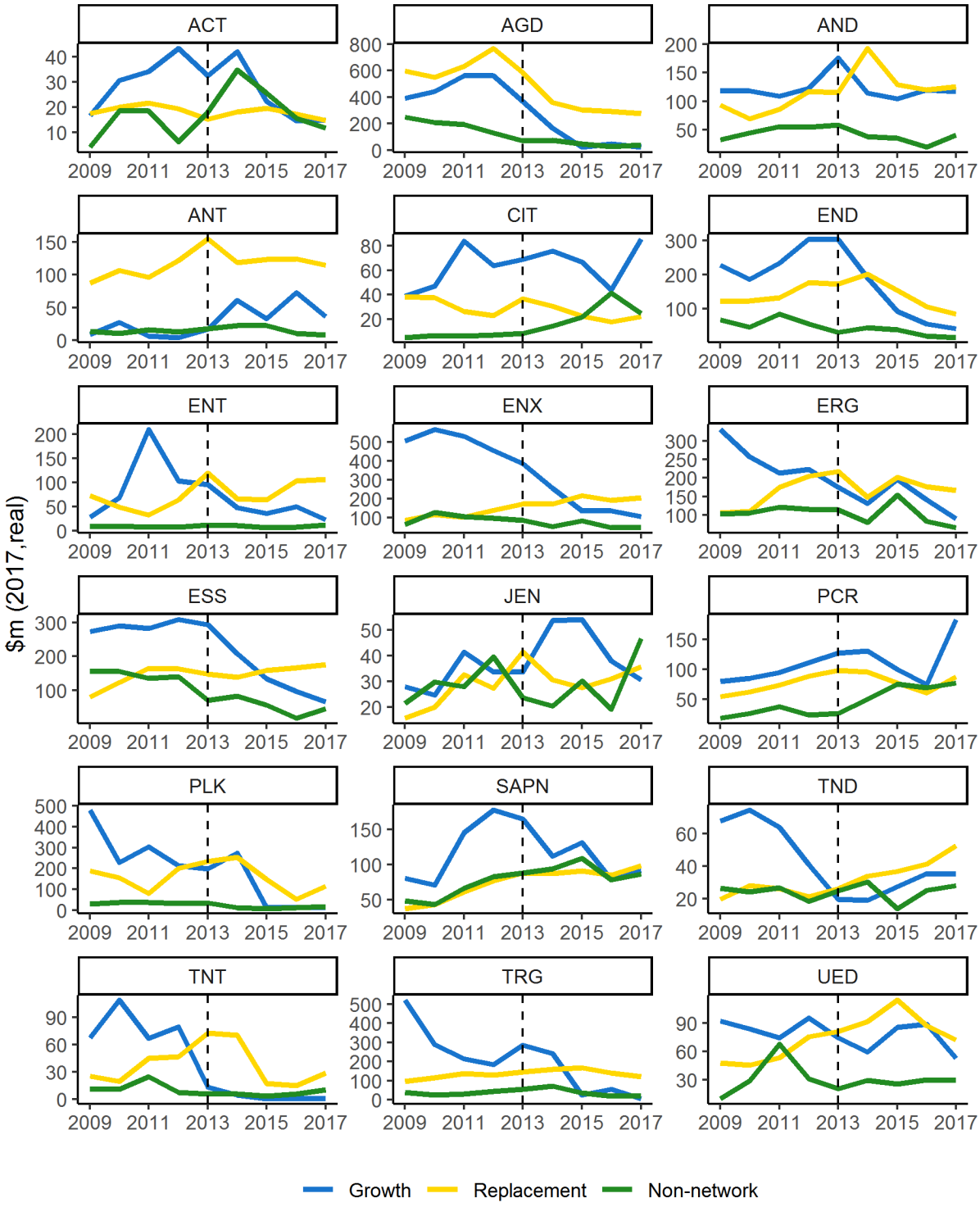
Figure B.2: NEM wide average asset age for transmission assets: Overhead assets have gotten older, substation and transformer assets have gotten younger



Source: AER EB RIN. Excludes meters.

B.2. Firm level capex by driver analysis

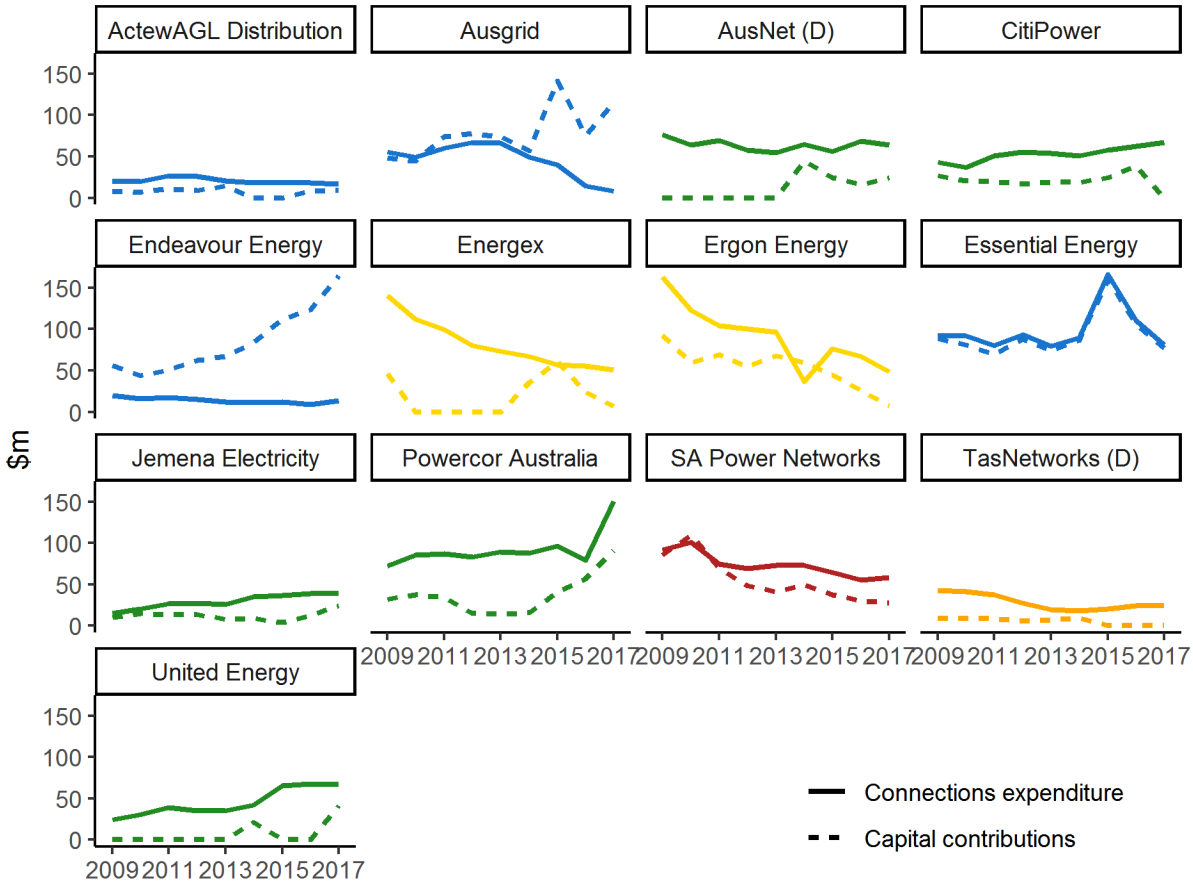
Figure B.3: Capex by driver: firm level analysis



Source: AER CA RINs.

Appendix C. Firm level of analysis of connections expenditure vs capital contributions

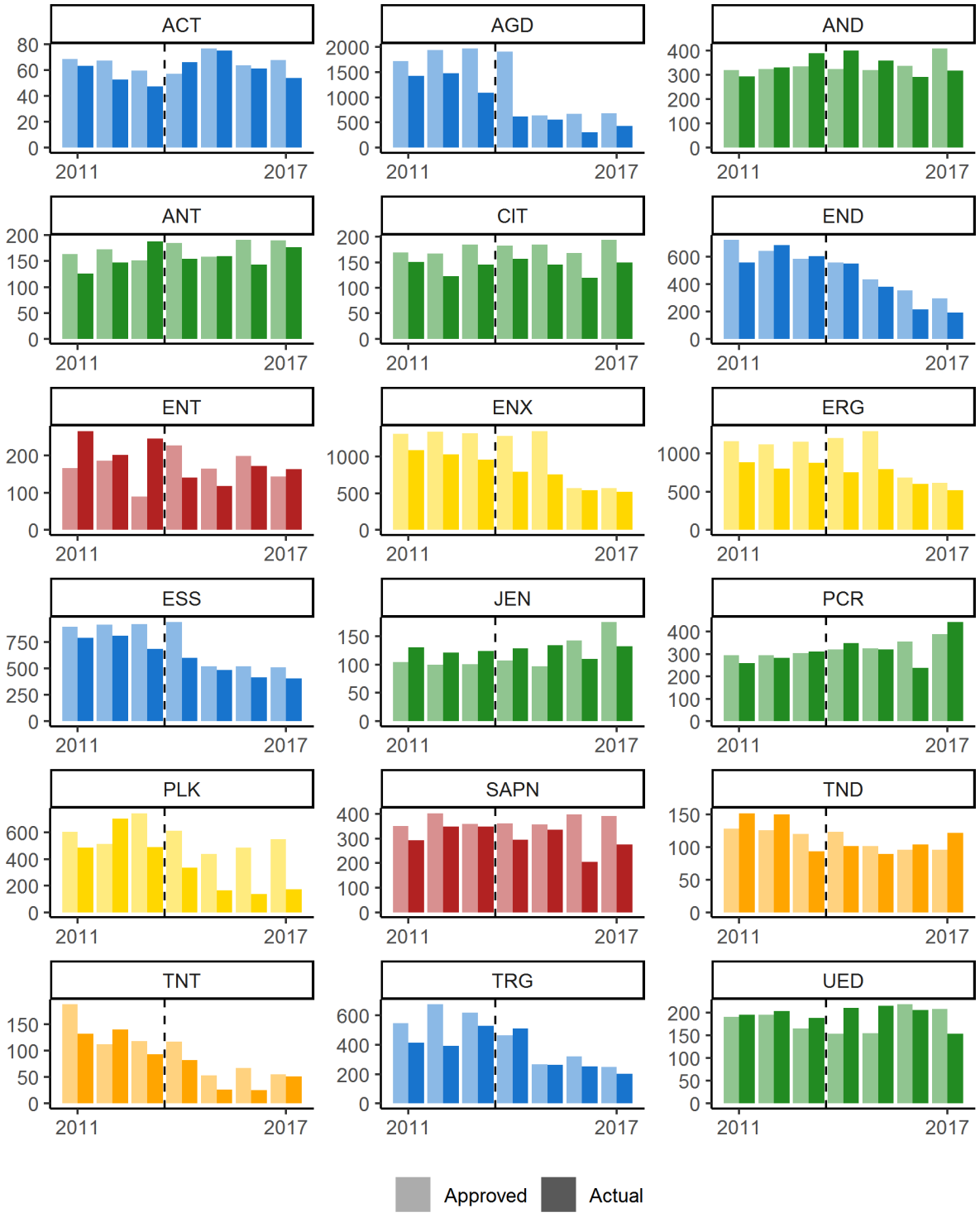
Figure C.1: Connections expenditure vs capital contributions by NSP



Source: AER CA RINs. ARR RIN used for 2017 Powercor figure as not contained in CA RIN.

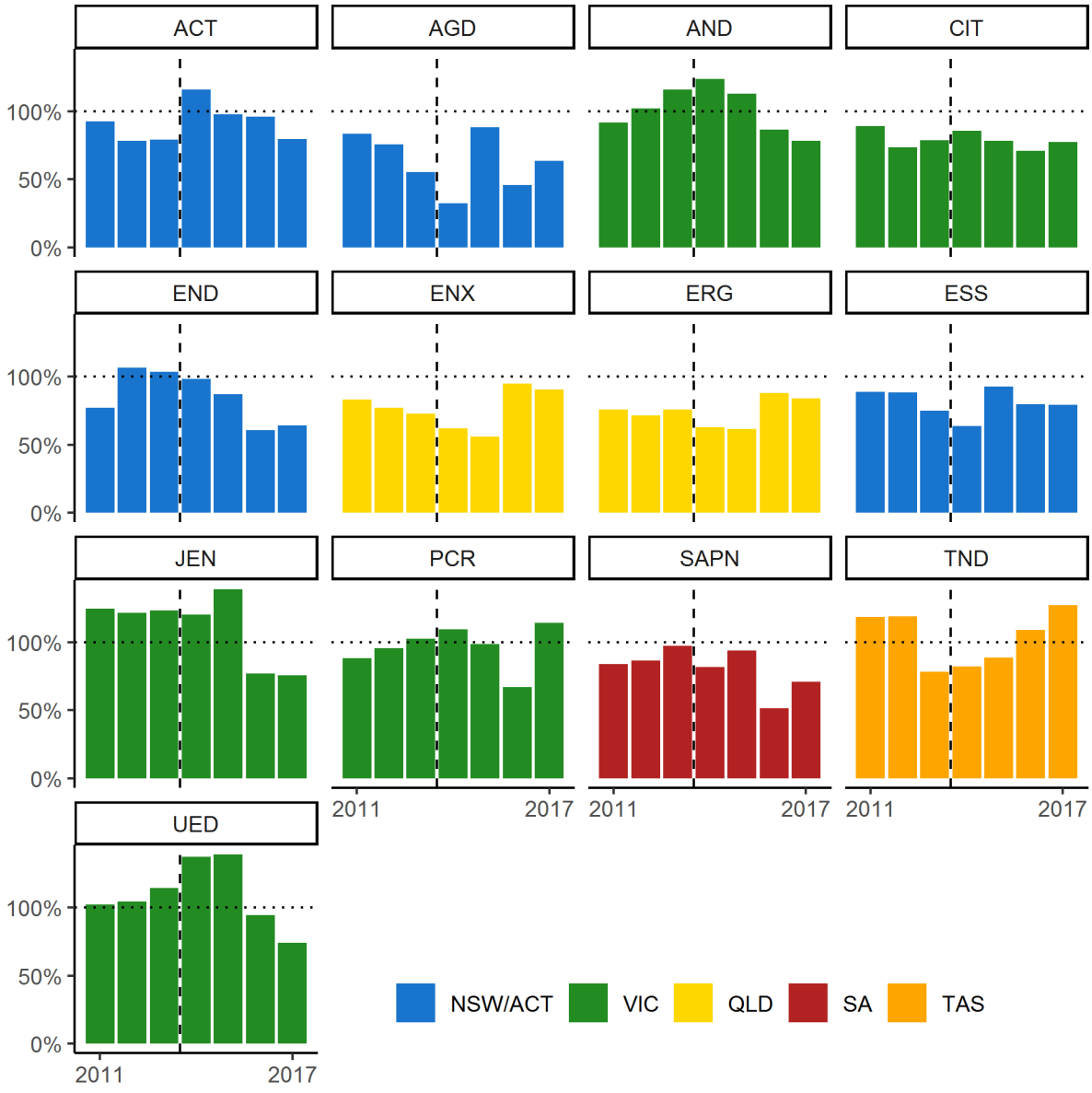
Appendix D. Analysis of actual vs allowed capex by NSP

Figure D.1: Capex: actual vs allowed by NSP



Source: AER RFM and CA RINs.

Figure D.2: % of capex allowance spent, by DNSP



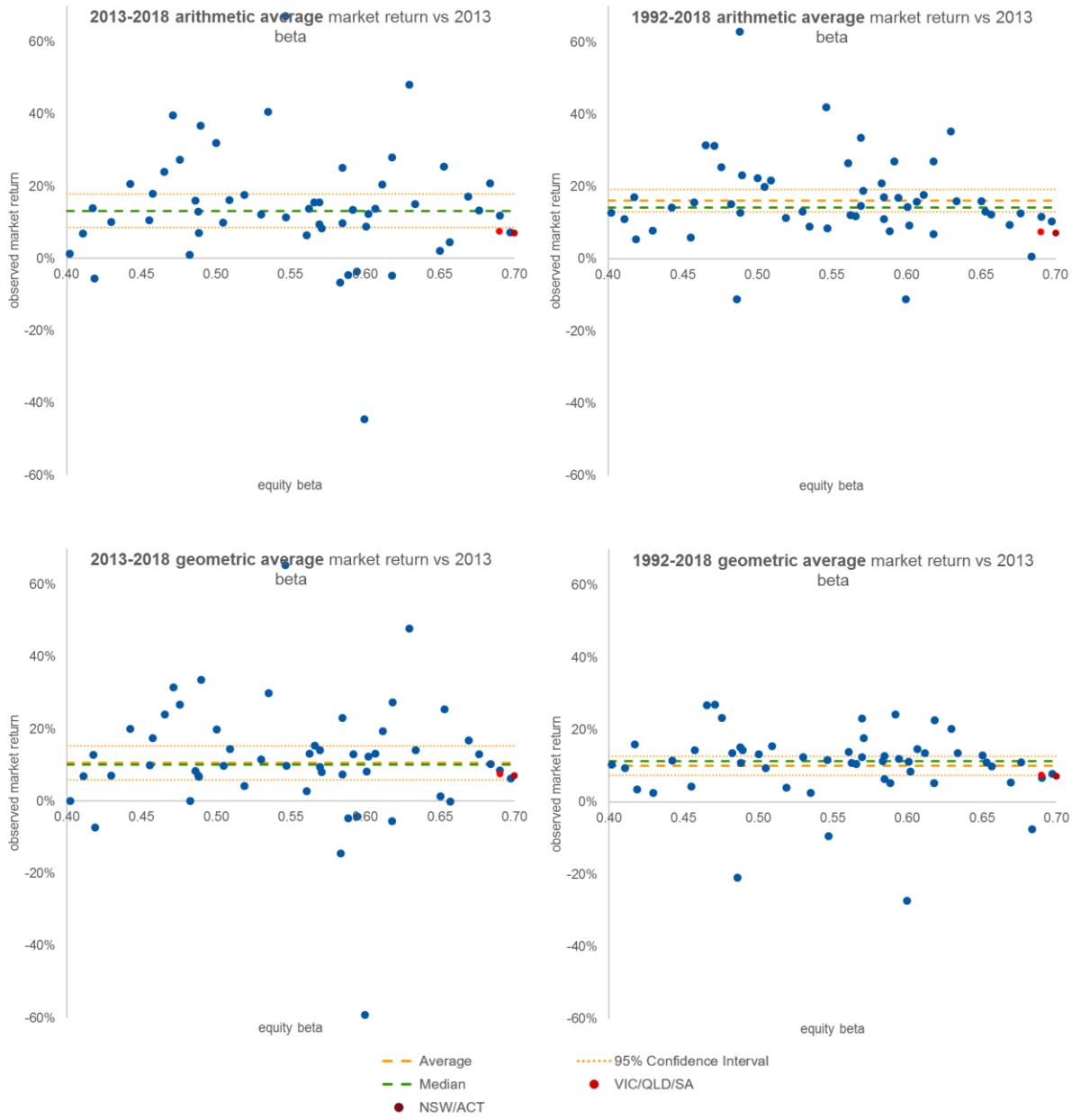
Source: AER RFM and CA RINs.

Appendix E. Beta vs observed returns – further calculations

E.1. Companies with a similar beta to the range in the 2013 guidelines: Unrestricted sample & different estimation windows

E.1.1. Beta estimation window = "last 5 years"

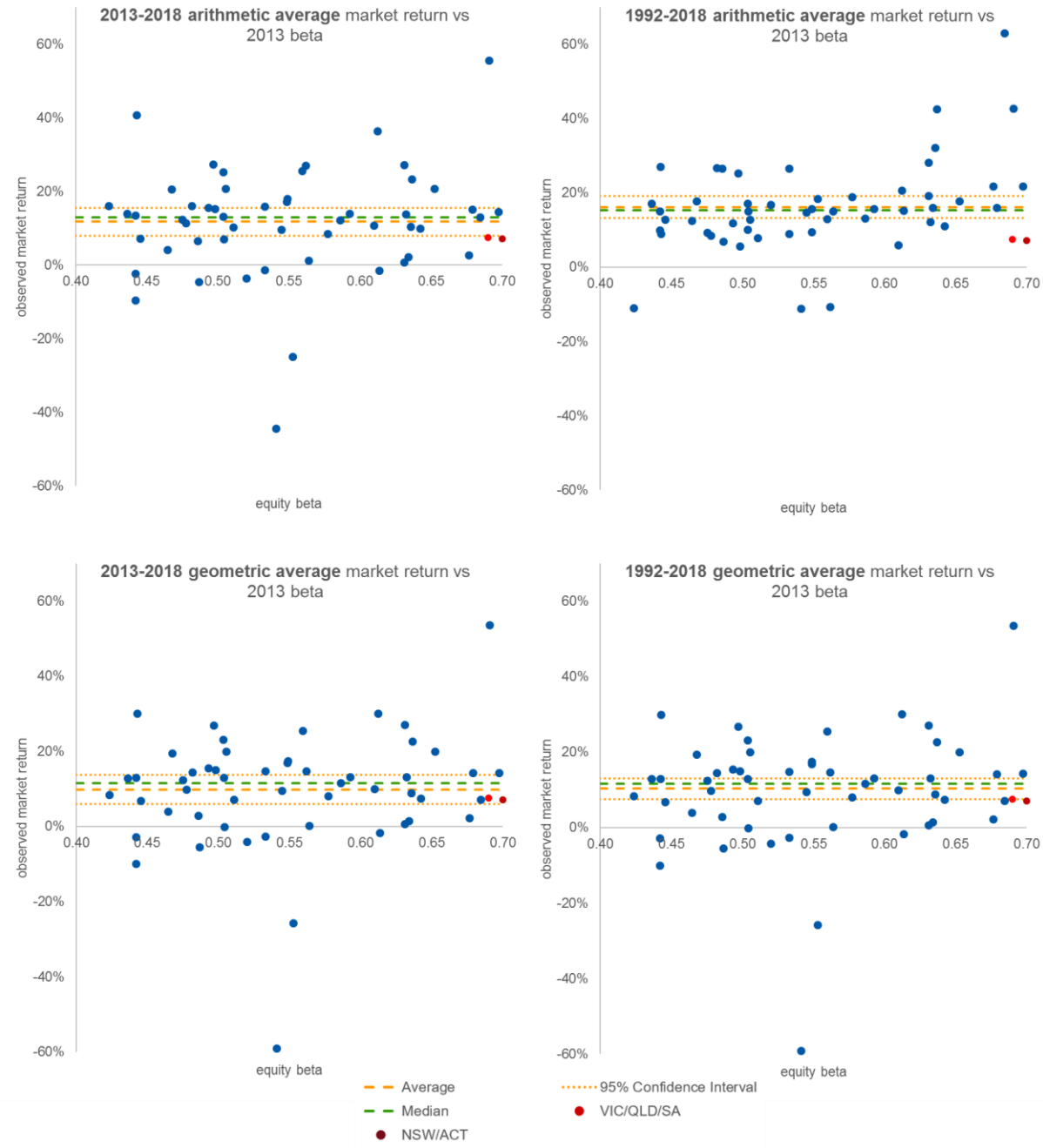
Figure E.1: Equity beta vs. observed stock market returns, beta calculated from 2008-2013 ("last 5 years")



Source: NERA analysis, DataStream, AER. Note: Betas are calculated from 28/06/2008 to 28/06/2013

E.1.2. Beta estimation window = "post tech boom, excl GFC"

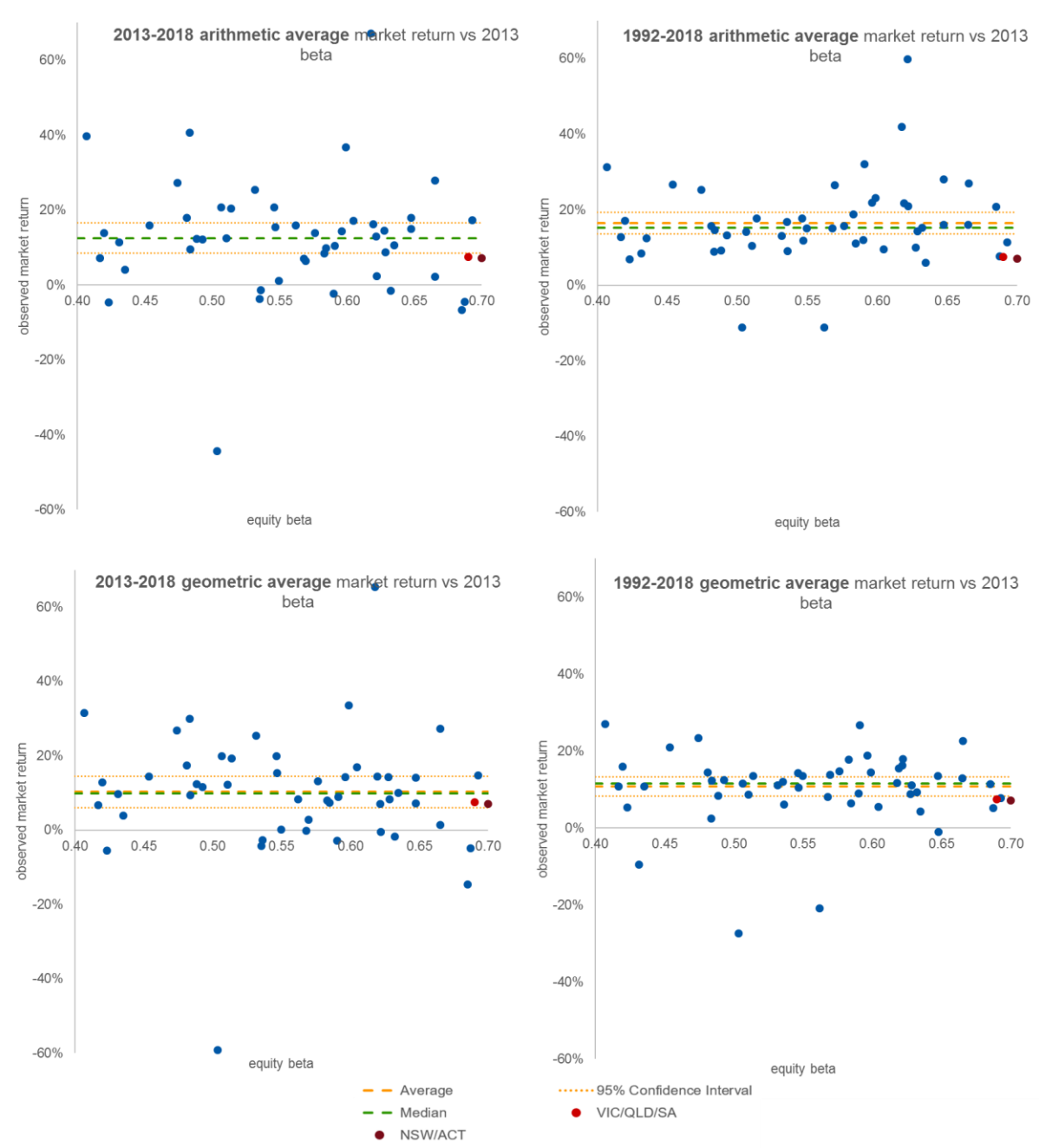
Figure E.2: Equity beta vs. observed stock market returns, beta calculated from 2002-2013 excluding the GFC



Source: NERA analysis, DataStream, AER. Note: Betas are calculated from 01/01/2002 to 28/06/2013, excluding the global financial crisis period, defined here as 01/09/2008 to 30/10/2009.

E.1.3. Beta estimation window = "all available data"

Figure E.3: Equity beta vs. observed stock market returns, beta calculated from 1992-2013 ("all available data")

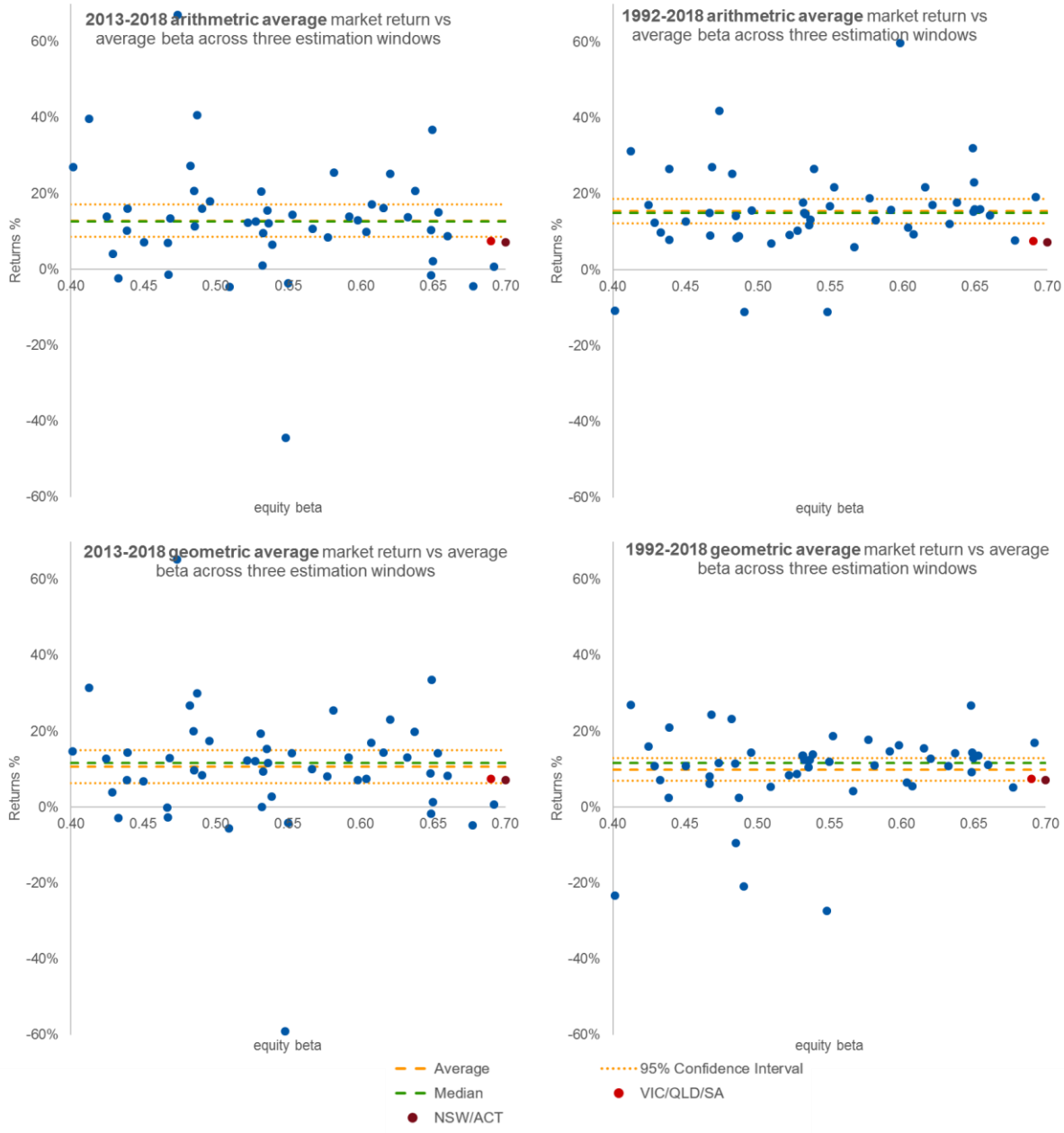


Source: NERA analysis, DataStream, AER. Note: Betas are calculated from 29/05/1992 to 28/06/2013

E.2. Companies with a similar beta to the range in the 2013 guidelines: 10 year and 20 years sample restrictions, average of three beta estimation windows

E.2.1. 10 year sample restriction on observed returns

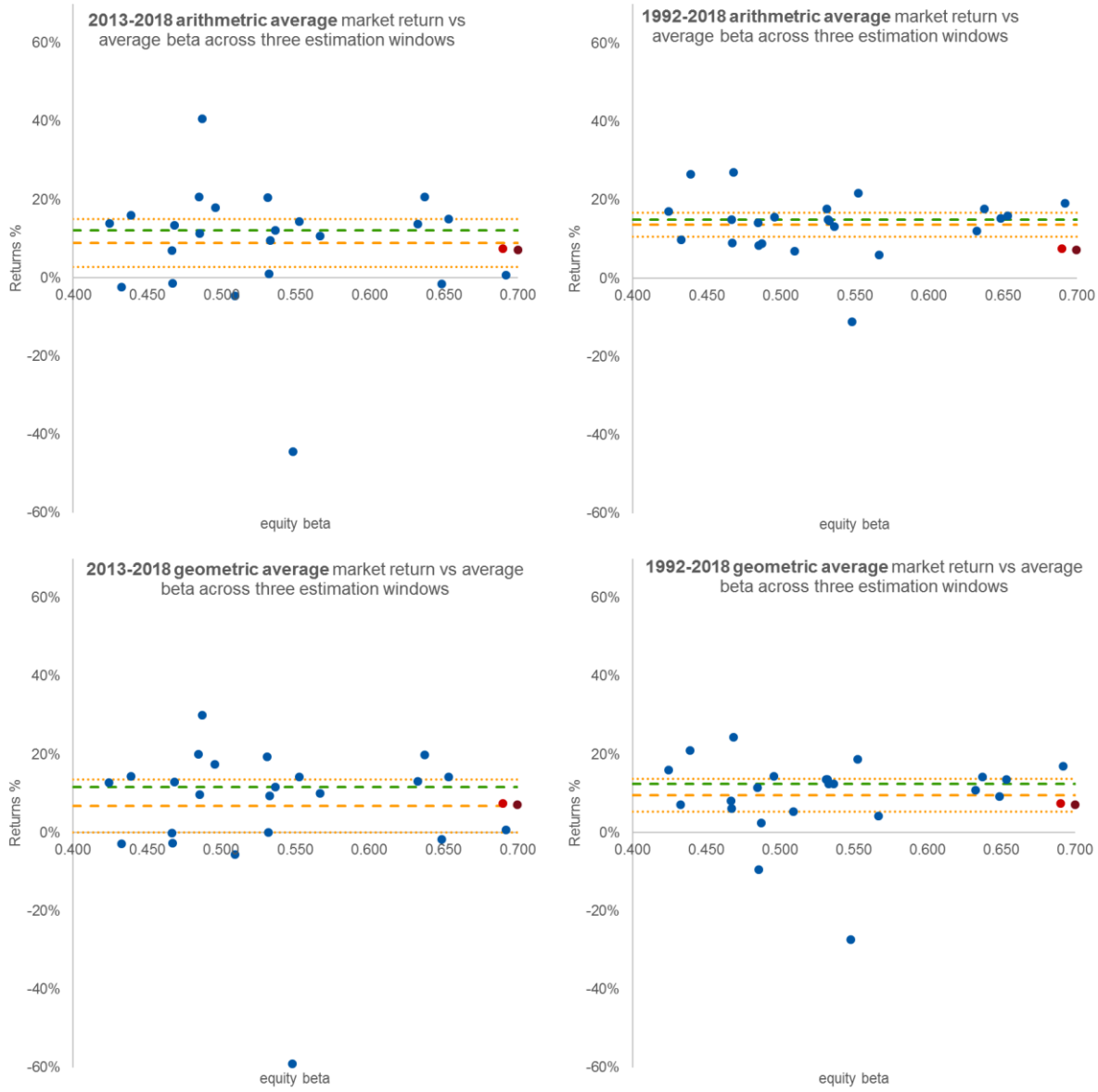
Figure E.4: Equity beta vs. observed stock market returns, beta average of three estimation windows, firms with less than 10 years of observed returns excluded (n=49)



Source: NERA analysis, DataStream, AER

E.2.2. 20 year sample restriction on observed returns

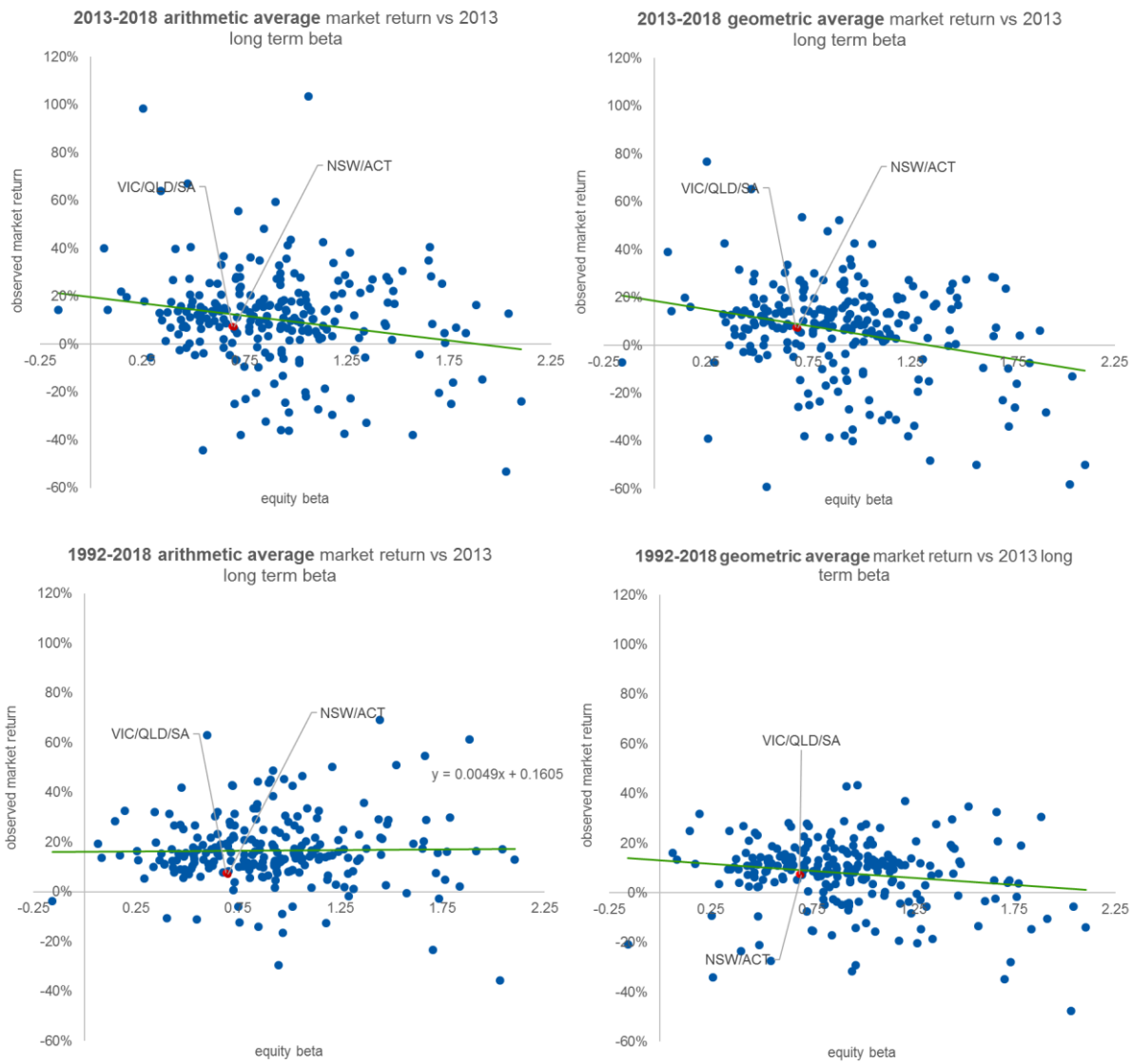
Figure E.5: Equity beta vs. observed stock market returns, beta average of three estimation windows, firms with less than 20 years of observed returns excluded (n=23)



Source: NERA analysis, DataStream, AER

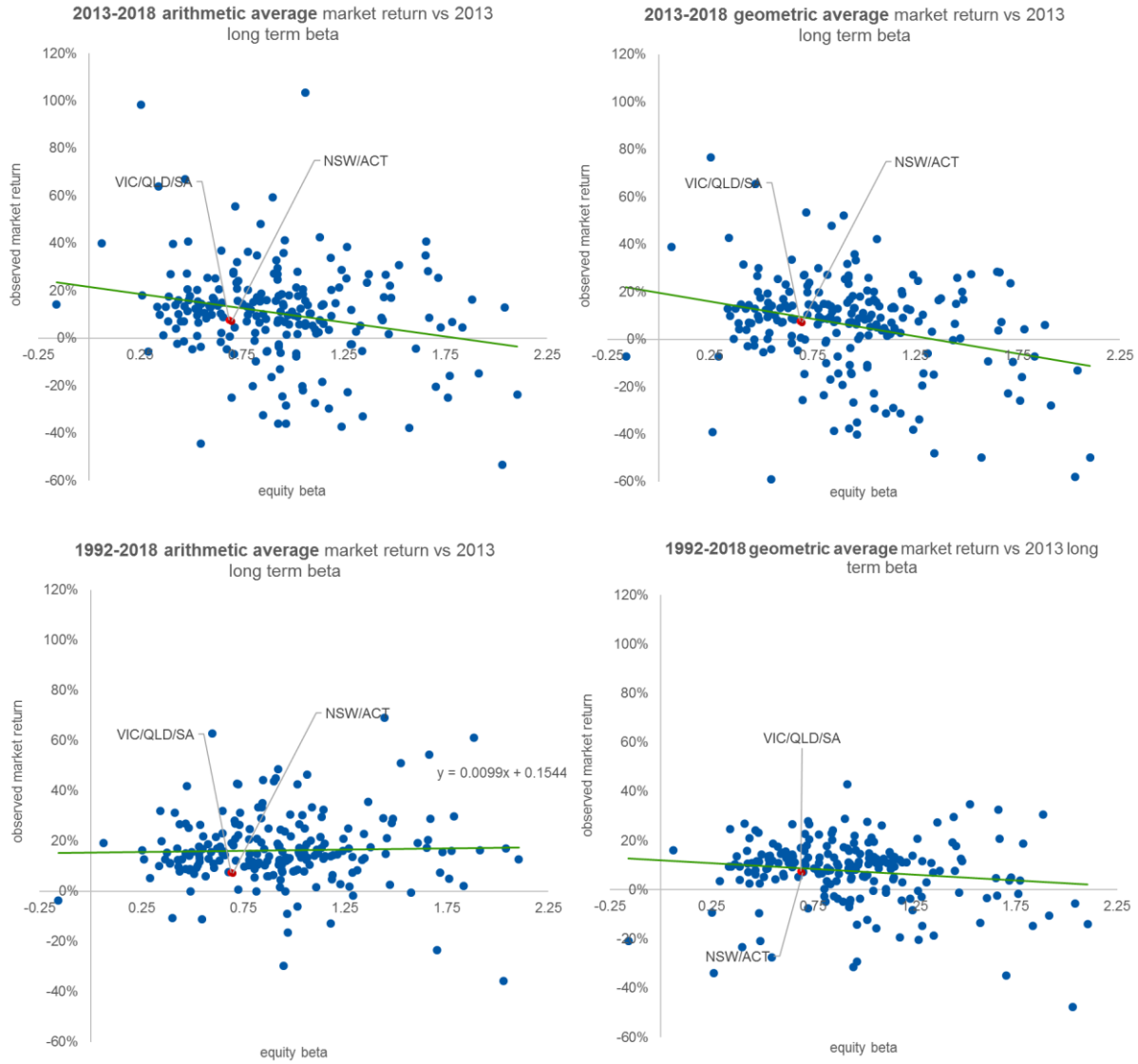
E.3. Equity beta vs. observed stock market returns – trend line for all companies using average of three beta estimation windows

Figure E.6: Equity beta vs observed stock market returns for all ASX companies in dataset (all data, n=237)



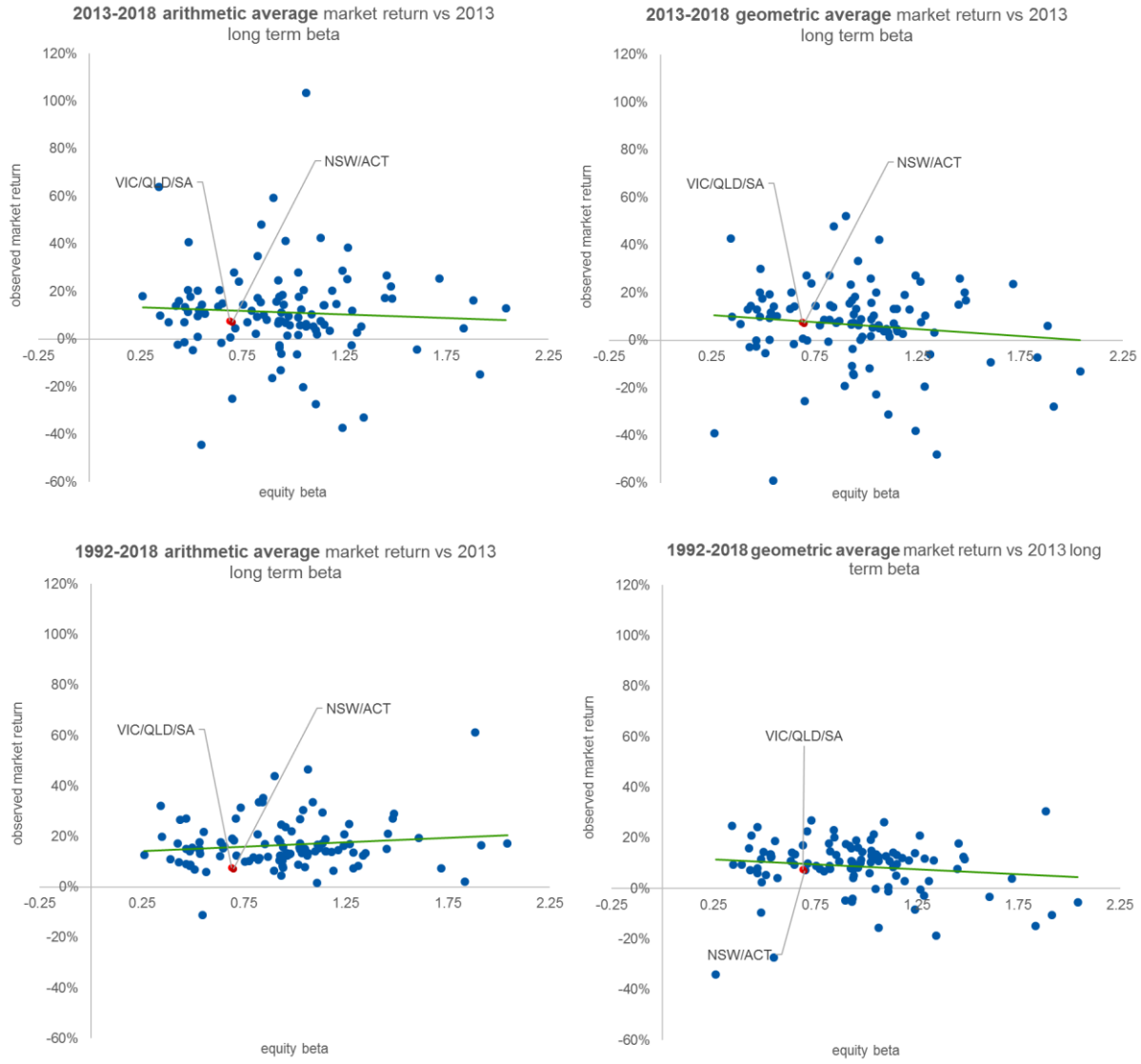
Source: NERA analysis, DataStream, AER

Figure E.7: Equity beta vs observed stock market returns for all ASX companies in dataset (firms with 10+ years of returns, n=212)



Source: NERA analysis, DataStream, AER

Figure E.8: Equity beta vs observed stock market returns for all ASX companies in dataset (firms with 20+ years of returns, n=107)



Source: NERA analysis, DataStream, AER

Appendix F. Analyst Reports

F.1. List of Equity Analyst Reports

Table F.1: List of equity analyst reports reviewed for research into market opinion

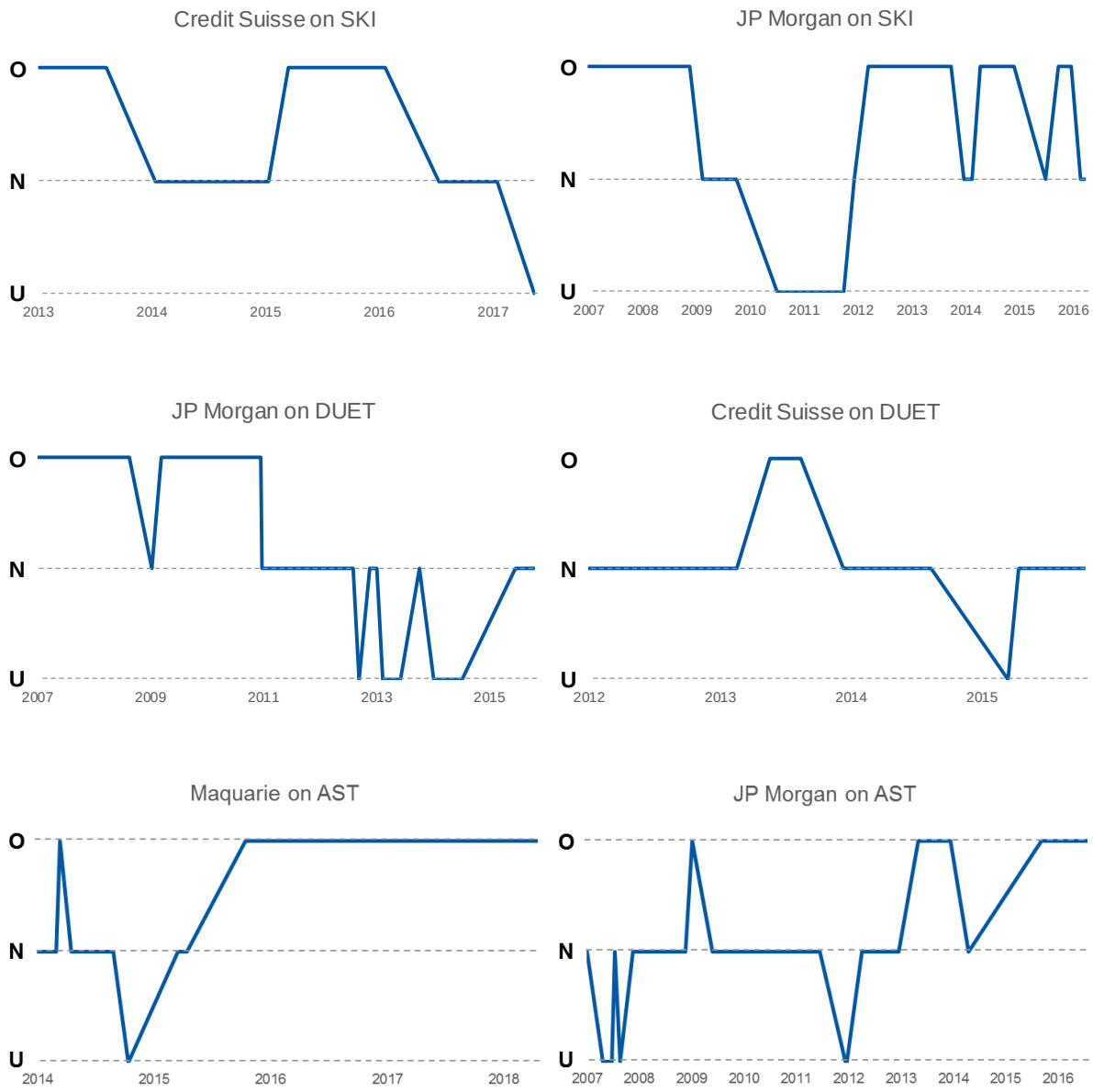
Number	Date	Author	Title
1	2013-03-11	(JPMORGAN)	Network Utilities VIC GAAR Preview Anticipating a 7.2% WACC
2	2013-07-22	(CREDIT SUISSE)	Regulated Utilities Update - Qld and NSW electricity networks
3	2013-08-16	(MACQUARIE RESEARCH)	DUET Group (Neutral) - Barely inflationary RAB growth
4	2013-08-30	(CREDIT SUISSE)	SPN AX SP AusNet - Reg decision in VIC gives higher capex
5	2013-08-30	(DEUTSCHE B)	SP AusNet Alert - Electricity transmission draft slightly weaker than expectations
6	2013-08-30	(MORGAN STANLEY)	SP AusNet - Transmission draft decision in line with expectations
7	2013-12-17	(DEUTSCHE BANK)	Regulated Utilities - AER releases new rate of return guidelines
8	2013-12-17	(JPMORGAN)	Aus NZ Utilities - APA ENV Merger Update
9	2013-12-17	(MACQUARIE RESEARCH)	AER WACC review - Better debt outcome than expected
10	2014-01-31	(DEUTSCHE BANK)	SP AusNet Alert - Electricity transmission final determination in line
11	2014-01-31	(JPMORGAN)	SP AusNet - Regulatory Outcome Surpasses Expectations
12	2014-01-31	(MACQUARIE RESEARCH)	SP AusNet (Neutral) - Incentives balance final decision
13	2014-01-31	(RBC CAPITAL MARKETS (CANADA)	SP Ausnet - Out with the old, in with the new
14	2014-03-11	(MORGAN STANLEY)	DUET Group - A Yield of Dreams
15	2014-11-12	(UBS RESEARCH)	AusNet Services - All eyes on the AER (Neutral) Leitch
16	2014-11-26	(RBC CAPITAL M)	ASX regulated utilities - AER releases NSW draft regulatory reset decision
17	2014-12-08	(JPMORGAN)	Network Utilities - SKI Site Tour - NSW QLD Privatisation Front of Mind
18	2014-12-09	(CREDIT SUISSE)	SKI AX Spark Infrastructure Group - Investor day - best in show
19	2015-04-30	(CREDIT SUI)	SKI AX Spark Infrastructure Group - Regulatory decisions confirm preference for SKI
20	2015-04-30	(JPMORGAN)	Spark Infrastructure Group - AER Come

21	2015-06-12	(JPMORGAN)	DUET Group - Distribution Growth on Hold
22	2015-10-26	(CREDIT SUIS)	Australian Regulated Utilities - Preview October regulatory determinations
23	2015-11-09	(CREDIT SUISSE)	Australian Regulated Utilities - Positive determination outcomes
24	2015-11-25	(CREDIT SUI)	SKI AX Spark Infrastructure Group - TransGrid acquisition; Vex or validate?
25	2016-01-12	(MORGAN STANLEY)	Spark Infrastructure - Five Years
26	2016-05-12	(MACQUARIE RESEARCH)	AusNet Services (Outperform) - Softer, but regulatory upside remains
27	2016-05-25	(RBC CAPITA)	ASX Network Utilties - AER final reset decisions broadly neutral with upside
28	2016-05-26	(MACQUARIE RESEARCH)	AusNet Services (Outperform) - Reg outcome above expectation
29	2016-07-20	(CREDIT SUI)	AST AX AusNet Services - Small positive from draft decision on transmission
30	2016-07-20	(MACQUARIE RESEARCH)	AusNet Services (Outperform) - Draft transmission decision
31	2016-11-18	(MORNINGSTA)	Morningstar - Ausnet's Earnings Fall
32	2016-12-05	(JPMORGAN)	DUET Group - Not enough risk/reward; maintain Neutral rating
33	2017-03-08	(MORNINGSTAR INC.)	Morningstar - AusNet Looks Fairly Valued
34	2017-04-28	(JPMORGAN)	AusNet Services - Transmission revenue
35	2017-04-28	(MORGAN STA)	AusNet Services - Correction – 1st Take: Narrowing Draft-Final Dispersion, Narrowing Avenues of Appeal
36	2017-04-30	(CREDIT SUISSE)	AST AX AusNet Services - Final ET decision confirms low regulatory risk
37	2017-05-24	(RBC CAPITAL MARKETS)	ASX Network Utilities Quantifying downside from higher gamma value
38	2017-09-21	(MORNINGSTA)	Morningstar - Regulatory Cap on AusNet Returns Precludes a Moat; Shares Fairly Valued
39	2017-09-28	(CREDIT SUI)	SKI AX Spark Infrastructure Group - Updating for draft TransGrid determination
40	2018-07-09	(MORGAN STA)	Australia Regulated Utilities - The Draft 2018 Rate of Return Guideline; Keep UW AST, SKI
41	2018-07-10	(MACQUARIE R)	Macquarie - AER releases WACC draft guidelines - Impacting AST, SKI and APA
42	2018-07-12	(MACQUARIE RESE)	Macquarie - AusNet Services (Outperform) - Regulatory impact; ACCC & AER

Source: ThompsonOne

F.2. Analyst Ratings of SKI, AST, DUET

Figure F.1: Analyst ratings of listed NSP/network investors



Source: Analyst reports

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