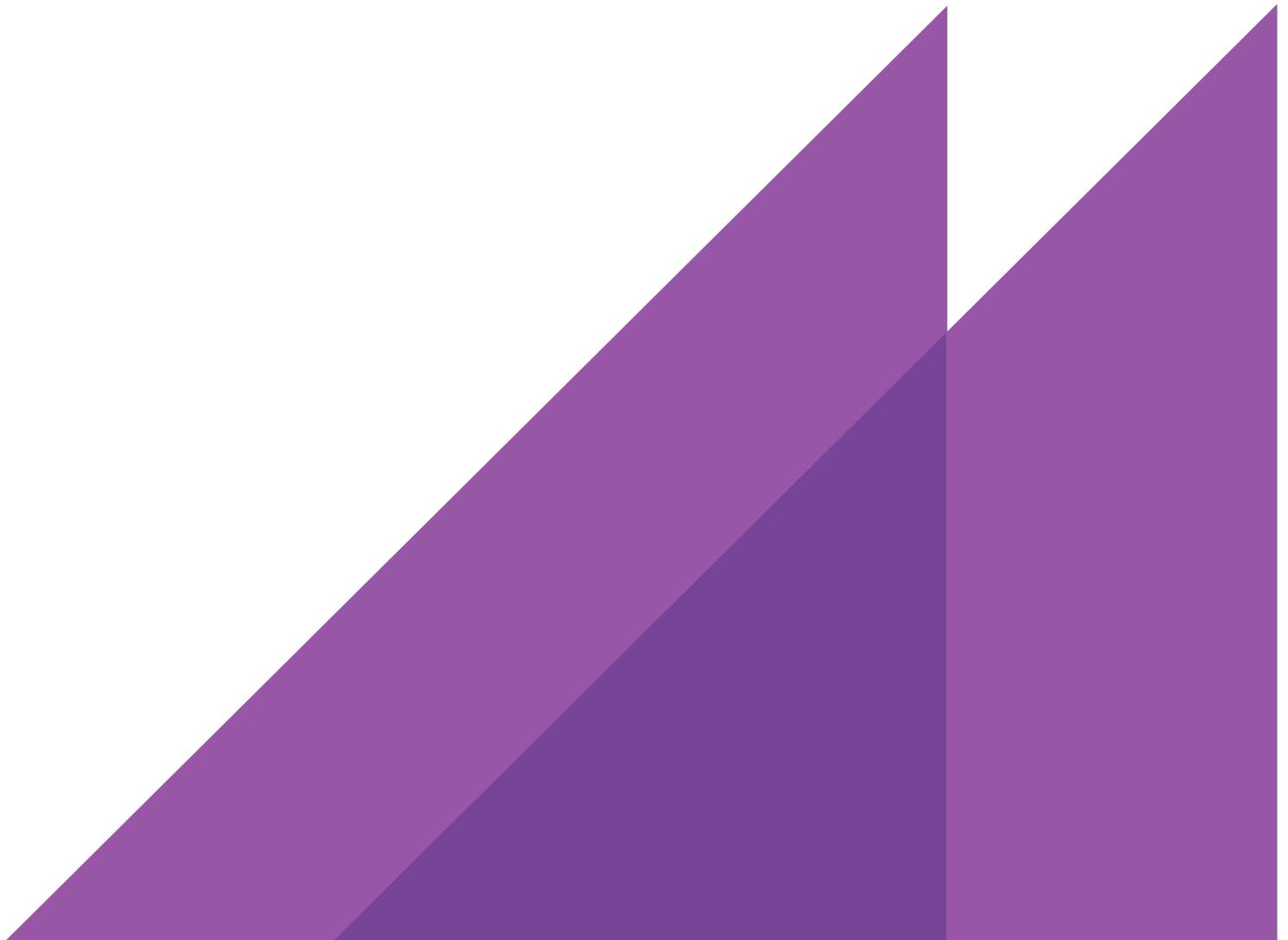


REPORT TO
DEPARTMENT OF PREMIER & CABINET
8 FEBRUARY 2016

REBUILDING NSW



REVIEW OF DAE REPORT – ECONOMIC
IMPACT OF SIS – REBUILDING NSW
(FINAL)





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EXECUTIVE SUMMARY

The Deloitte Access Economics (DAE) report finds that the Rebuilding-NSW plan will increase NSW GSP by about 3.6% (relative to its base-case level) in 2035-36 or by \$300 billion (undiscounted) over the period 2013-14 to 2035-36. However, the increase in *per capita* GSP is much smaller – only about 0.9% in 2035-36.

The increase in GSP that DAE projects is attributable to five factors:

1. An increase in productivity associated with reductions in operating and capital costs that are assumed to follow the partial privatisation of the NSW electricity network service providers.
2. An increase in immigration into NSW stimulated by improved transport infrastructure.
3. A reduction in transport costs associated with improved transport infrastructure.
4. An increase in labour-market participation associated with differences between the participation rates of new migrants and incumbent residents and with reductions in travel times allowed by improved transport infrastructure.
5. An increase in the availability of water to the agriculture and mining sectors associated with improved water infrastructure.

Drivers 2 through 5 are associated with the investment in infrastructure under the Rebuilding NSW plan and account for about 86% of the 2035-36 increase in GSP. The increase in immigration is the dominant driver of the projected increase in GSP. However, the DAE modelling projects only a small increase in per capita GSP. The partial privatisation of the electricity networks accounts for only 14% of the increase in aggregate GSP but accounts for the majority (52%) of the increase in per-capita GSP in 2035-36.

Plausibility of assumptions

Asset leasing

DAE's assumptions about cost savings (capital and operating) that are likely to flow from partial leasing of the NSPs, including the rate at which efficiencies would be realised, are plausible. However, ACIL Allen has reservations about DAE's assumption that potential gains in electricity network efficiency would not be reflected in lower network prices until they are realised following asset leasing. The AER has been under significant pressure to control network costs for some years and has been signalling the likelihood that it would strengthen its approach. An alternative to DAE's assumption would have been to assume that network prices would be reduced to reflect potential efficiency gains whether or not the potential gains are realised.

Infrastructure investment

ACIL Allen considers that the assumptions made by DAE about the construction costs of the proposed Rebuilding NSW investments and the effects of increased water availability on agriculture and mining

are plausible. However, ACIL Allen considers that the assumed increases in population and employment associated with the Rebuilding NSW infrastructure investment are unreasonably high and result in DAE projecting increases in NSW GSP which are also unreasonable. The travel cost savings assumed by DAE are not consistent with their population increase assumptions. The population increase assumptions relied on an estimated relationship between provision of interstate highways in metropolitan statistical areas and population increases in a paper by academic economists, Duranton and Turner. Travel cost savings estimated by Duranton and Turner in the same paper are significantly lower than assumed by DAE.

Consistency of overall modelling approach with contemporary practice

DAE develops key assumptions exogenously from analysis of data on cost differences between publicly and privately owned electricity networks, and estimates by Duranton and Turner of the effects of transport infrastructure on transport costs and population movements. It then uses the DAE-RGEM model to help it summarise the implications of what it assumes to be the key drivers of the economy-wide implications of infrastructure investment. This approach of estimating the effects of shocks outside the model and imposing those external estimates on the model is common practice among CGE modellers.

Consistency of results as published

Apart from some unresolved queries about the timing of electricity networks' realisation of efficiency gains, ACIL Allen has found no evidence of internal inconsistency in the DAE assessment of the effects of the proposed network leasing.

ACIL Allen has reservations about the internal consistency of DAE's results for the effects of the Rebuilding NSW infrastructure investments. These relate mainly to the large increase in population induced by the infrastructure investments, especially in relation to roads in Sydney, and the persistence of the reductions in transport costs (including commuting times) in the face of increased vehicle-kilometres-travelled induced by the same infrastructure investments. This seems inconsistent with the tendency of increasing population and other sources of induced traffic to erode the reductions in congestion initially generated by infrastructure investment. Moreover, DAE's assumed travel cost savings appear to be high relative to the literature, including those estimated by Duranton and Turner.

Consistency of overall conclusions of the Report with the modelling results

DAE reports its results in ways that maximise the extent to which they give the impression that the effects of the Rebuilding NSW package on the NSW economy are favourable. It fails to point out that deviations from base values reported in absolute dollar terms represent only small changes in the rate of growth of the economy. In comparing projected future increases in GSP with the current level, it fails to apply discount factors to convert the future values to present-value units.

DAE concludes that partially leasing the NSW electricity networks would make a positive contribution to NSW GSP. This is consistent with the DAE modelling and follows intuitively from the assumption that the leasing would promote factor productivity in the network businesses.

DAE concludes that the infrastructure investments included in the Rebuilding NSW plan would make a large positive contribution to NSW GSP. Setting aside ACIL Allen's concerns about the plausibility of assumptions used in this modelling, DAE's conclusions are consistent with the DAE modelling and follow principally from the large increase in the labour force that the infrastructure investments are assumed to induce. The DAE Report provides per capita results for overall economic growth in the NSW economy to 2035-36 and provides the data necessary to assess the per capita results in relation to the proposed infrastructure investments. ACIL Allen's analysis of the increase in *per capita* GSP induced by the infrastructure investments shows that it is small and is driven mainly by an increase in labour-market participation. The DAE Report provides no detailed discussion of this feature of the results. In particular, there is no discussion of the extent to which the expansionary effects of the investments can be interpreted as favourable or otherwise from the point of view of NSW's existing residents.

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INTRODUCTION

The scope of work underlying this report requires ACIL Allen Consulting (ACIL Allen) to review the November 2014 report by Deloitte Access Economics (DAE) entitled *Economic Impact of State Infrastructure Strategy – Rebuilding NSW* (the DAE Report). The modelling underlying the DAE Report was conducted using DAE’s DAE-RGEM model – a computable general equilibrium model. An outline of DAE-RGEM is given in Appendix E of the DAE Report.

The scope of work requires ACIL Allen to answer the following questions:

- *Taking as given the terms of reference provided to Deloitte Access Economics, are the assumptions that are made in the Report plausible?*
- *Is the overall modelling approach consistent with approaches used in contemporary economics and policy analysis?*
- *Are the results of the assessment internally consistent as published?*
- *Are the overall conclusions of the Report consistent with the modelling results as published?*

ACIL Allen understands that the terms of reference for the DAE Report were to:

- *Assess the economic impact of the long-term lease of a 49 per cent share of NSW electricity transmission and distribution assets under the Rebuilding NSW Plan.*
- *Assess the economic impact of the \$20 billion investment in infrastructure assets contained in the Rebuilding NSW Plan.*
- *Model the economic impact of any additional strategies and infrastructure investments identified as part of the revised State Infrastructure Strategy. It is understood that the second SIS will have a longer time frame than Rebuilding NSW and so may involve a series of additional infrastructure investments.*
- *Develop baseline economic forecasts for the NSW economy to 2035. This baseline will take into account both:*
 - *updated population forecasts from the Department of Planning; and*
 - *the impact of the infrastructure investments which have been committed to by the government in response to the first State Infrastructure Strategy.*

The baseline analysis will also update the discussion of the key themes or ‘driving forces’ impacting infrastructure demand in NSW over the period to 2035.

In ACIL Allen’s view, the first two points in the DAE terms of reference are the key points to be explored in answering the four questions posed in the scope of work. These points appear to require DAE to evaluate separately the impact of leasing the NSW electricity network businesses and the impact of the \$20 billion infrastructure-investment program contained in the Rebuilding NSW Plan. ACIL Allen notes that there appears to be no particular emphasis in the DAE terms of reference on the connection between the leasing proposal and the infrastructure-investment proposal. Hence, this report evaluates these two exercises separately (in Sections 2 and 3, respectively). The issue of whether or not it is appropriate to consider only one possible way in which to finance the investment

program is dealt with in Section 5, in the context of answering the last of the four questions posed in the terms of reference.

ACIL Allen's conclusions about how DAE assessed "*the economic impact of the \$20 billion investment in infrastructure assets contained in the Rebuilding NSW Plan*" are broadly applicable to how DAE models "*the economic impact of any additional strategies and infrastructure investments identified as part of the revised State Infrastructure Strategy*". The DAE Report includes a short section summarising the results of DAE's modelling of the effects of the 2012 SIS investments but offers no additional insights about its methodology. Hence, ACIL Allen does not elaborate further on this part of the DAE Report.

In Section 4, issues relating to DAE's baseline assumptions are discussed.

As foreshadowed above, Section 5 concludes the report with a discussion of the extent to which "*the overall conclusions of the Report (are) consistent with the modelling results as published*". The DAE Report provided the following conclusions:

- *Rebuilding NSW will increase NSW's Gross State Product (GSP) by \$30.9 billion by 2035-36 (measured in 2013 prices); this is a real increase of 3.6% over the level of GSP that would occur without the Rebuilding NSW plan. The total increase in GSP over the period to 2035-36 is estimated to be almost \$300 billion (measured in 2013 prices), roughly equivalent to 60% of current GSP.*
- *The increase in GSP comes partially from a more efficient electricity network but largely from the reinvestment of funds from the partial lease of electricity network assets into productive infrastructure.*
- *Reinvestment in infrastructure will allow NSW to better manage the increase in population and economic activity that will occur over the coming decades. Better infrastructure will also help attract more people and business to NSW by creating easier access to jobs and markets – boosting economic growth.*

In addition to examining the consistency of each of these conclusions with the DAE modelling, Section 5 also discusses the welfare significance of the activity oriented (i.e., GSP) results on which the DAE Report focusses.

In undertaking the review, ACIL Allen was informed by the DAE Report itself, by documents cited therein as sources of data for the DAE modelling and by answers that were received from DAE to questions that ACIL Allen prepared following an initial reading of the DAE Report. These answers were provided in part in writing and in part orally in a meeting held with representatives of DAE on 11 August 2015. DAE also provided some model inputs and some outputs in an excel workbook that was received by ACIL Allen on 5 August 2015. ACIL Allen provided a supplementary set of questions on 23 September 2015. The supplementary questions were designed to check with DAE that ACIL Allen had interpreted the DAE modelling correctly. DAE's answers to these supplementary questions were provided to ACIL Allen on 27 November 2015 and were discussed in a meeting held on 2 December 2015.



This section of the report assesses the DAE modelling of the partial lease of the network assets relative to the information available to DAE at the time at which the modelling was performed. It also assesses the robustness of the modelling relative to subsequent developments in the information base. In particular, the second part of the assessment focusses on two key factors:

- the structure of the proposed transaction
- the approach of the Australian Energy Regulator (AER) in determining the charges that the network businesses are permitted to levy on energy retailers and other large customers.

2.1 What did DAE know/assume?

When DAE conducted its modelling, full details of the leasing of the network businesses had not been announced. DAE was aware that overall 49% of the network businesses would be leased and that *Essential Energy* would be retained 100% in public ownership. ACIL Allen understands that DAE was instructed to assume that for all businesses subject to partial leasing, majority managerial control would be assigned to the private lessees. Hence, DAE made no explicit allowance for the possibility that the efficiency gains attainable under partial privatisation would be less than those attainable under full privatisation.

The DAE modelling includes an explicit representation of the way in which efficiency gains in the network businesses would be passed through into lower network charges for consumers. For this part of the modelling, DAE assumed that the AER would make network-price determinations according to procedures similar to those that it had applied prior to its most recent decisions.

2.2 Calibration of efficiency gains?

Appendix A of the DAE Report sets out in some detail how DAE calibrated the efficiency gains likely to follow from partial leasing of the network businesses.

2.2.1 DNSPs

DAE examined five studies of the efficiency of publicly owned DNSPs in Australia relative to privatised DNSPs:

- a 2014 report by Ernst and Young for the NSW Treasury
- a 2014 submission by AGL to the AER
- a 2013 report by the Productivity Commission
- the final report of the 2013 Queensland Independent Review Panel (IRP) on Network Costs
- a 2012 report by the Grattan Institute.

DAE concludes that the results of all five of these reports are broadly consistent with each other. ACIL Allen agrees that this is reasonable.

In its efficiency benchmarking for *Endeavour Energy* and *Ausgrid*, DAE relies on data from the Queensland IRP, which it finds the most tractable for statistical work conducted at a business-specific basis. ACIL Allen also agrees that this is reasonable.

DAE proceeds by regressing operating costs per customer and capital expenditure per customer on customer density from a data sample that includes private and public DNSPs (refer Charts A.1 and A.2 on p. 45 of the DAE Report). It then assumes that *partial* privatisation will allow *Ausgrid* and *Endeavour Energy* to attain the fitted cost levels for their densities. The results suggest that the reductions in operating costs available to *Endeavour Energy* are greater than those available to *Ausgrid* but that the reductions in capital expenditure available to *Endeavour Energy* are smaller than those available to *Ausgrid* (see dot points on p. 44 of the DAE Report). Recognising the broad-brush nature of the statistical analysis, DAE assumed an average 25% saving in operating costs and capital expenditure for both DNSPs. ACIL Allen agrees with DAE that this is a reasonably representative assumption and that the use of finer granularity is not warranted by the available statistical evidence for the purposes of such a high-level report.

DAE notes that its assumption that partial leasing of the DNSPs would result in their attaining the fitted cost levels for their densities in the DAE regressions is conservative – they argue that a more aggressive approach would be to exclude public DNSPs from the sample. DAE also notes that other factors such as topography could imply a bias the other way. However, the DAE Report does not elaborate on these other factors.

2.2.2 TNSP

To benchmark *TransGrid*, DAE relied on seven years' (2006-13) data submitted to the AER by the five TNSPs participating in the NEM. With these data, DAE regressed operating and capital costs as a function of line length and ownership. DAE then compares *TransGrid's* actual costs to fitted costs for the appropriate line length under private ownership.

One problem is the time volatility of capital expenditure, as evident in the first column of costs in Table A.2 of the DAE Report. DAE avoided this problem by assuming that leasing *TransGrid* would result in annual capital cost reductions equivalent to the seven-year average of the differences between *TransGrid's* actual costs and "fitted" costs for a partial lease of *TransGrid* from the seven-year regression study. A similar approach was adopted for operating costs, although they do not exhibit such time volatility. Given the relative scarcity of data and the high-level at which DAE was asked to conduct its study, ACIL Allen regards these averaging procedures as reasonable.

2.3 Imposition of efficiency gains in the modelling?

According to the workbook supplied by DAE on 5 August 2015, DAE applied the efficiency gains that it assumed would follow from partial leasing of the network businesses by shocking end-user electricity prices. The shocks distinguish between Residential, Commercial and Industrial customers, and between twelve regions. All regions benefit from efficiency gains assumed to apply to the transmission network supply provider (*TransGrid*) but only regions served by *Endeavour Energy* and *Ausgrid* benefit from efficiency gains assumed to apply to distribution network supply providers (see Figure 3.1 on p. 14 of the DAE Report).

The shocks to end-user electricity prices have two components. The first represents the effect on prices of the cost savings being fully passed on to consumers at the rate at which they are realised by the network businesses. DAE assumed that the realisation would take place "progressively over 10 years". The impact of this on total costs is straightforward for operating costs but for capital costs it depends on the way in which annual reductions in capital expenditure (relative to the base case) accumulate into changes in the aggregate value of the network businesses' capital stocks. DAE recognises this in the discussion in the third paragraph of p. 48 of its report. The workbook supplied on 5 August 2015 shows the consumer price reductions corresponding to the cost savings building up over the 10-year period to 2024-25 and then stabilising – consistent with the discussion in the DAE Report.

To accommodate these price shocks, it is apparent that DAE must have endogenised input-saving technology variables in the electricity-supply specification in their model. The DAE Report does not include detail of how the electricity sector is modelled in DAE-RGEM, apart from stating that it "...is

based on the ‘technology bundle’ approach ... developed by ABARE” (DEA Report, Appendix E, p. 81). ACIL Allen has not been able to verify how electricity supply is modelled in the DAE-RGEM model and which variables were endogenised.

The 5 August 2015 workbook also includes a block of shocks labelled “Reduction in (non-performing) electricity Capex spending (\$m)”. This shows reductions in capital expenditure for *TransGrid*, *Ausgrid* and *Endeavour Energy* starting in 2019-20. These shocks are required to ensure that the model accounts for the economy-wide implications of the electricity sector’s reduction in the demand for capital resources.

2.4 Modelling of pass through of efficiency gains to customers?

Figure A.1 on p. 49 of the DEA Report illustrates DAE’s approach to modelling the pass through of NSP cost reductions into network charges. It assumes that the NSPs will not be required to pass on any cost savings realised in the current five-year regulatory period and that in the next regulatory period they will be able to retain a small proportion (not all) of the cost savings that they have realised by then. In subsequent periods (i.e., after 15 years) full pass through is assumed. DAE assumes that the opportunity that the AER’s behaviour allows the NSPs to retain realised cost savings will be reflected in the price paid to the government by the lessees. Hence, in the DAE modelling the retained cost savings are treated as government tax revenue. The 5 August 2015 workbook suggests that the modelling treats the government as receiving this revenue in the years in which the cost savings are retained by the NSPs, not up-front when the leases are sold.

While the DAE’s modelling of the regulatory pass through of cost savings seems to be a reasonable representation of the AER’s historical approach to network regulation, ACIL Allen does not think it constitutes an appropriate representation of the future regulatory approach or of potential lessees’ assumptions about the future regulatory approach. ACIL Allen accepts that DAE did not know that the AER would move to the specific benchmarking approach that it adopted for its most recent decisions. It also notes that the AER’s new benchmarking approach is currently subject to legal challenge. However, given the controversy about network charges over the last few years and the role of the AER in setting them¹, ACIL Allen has reservations as to whether it is appropriate to assume that there would be no changes in the regulatory regime or that any changes to the regime would not constrain network charges more heavily in the future than has been the case historically. ACIL Allen notes that the AER’s Better Regulation reform program, which set out significant changes to the historical approach, including greater use of benchmarking, was published in late 2012.

In ACIL Allen’s view, it is particularly implausible to assume that in determining their bid prices for the leases, sophisticated investors would not discount heavily the revenue stream that would be earned under a no-change assumption about the regulatory regime. However, DAE assumes that the lease price would reflect the value of realised cost savings that the historical regulatory regime would allow lessees to retain – see the last paragraph of p. 49 of the DAE Report. This suggests that DAE has assumed that potential lessees would not discount this revenue stream.

ACIL Allen accepts that in competitive auctions, the winning bid is usually from the bidder that has the most optimistic view of future revenues². For this reason, it might be argued that it is appropriate to assume that the winning bidder’s optimistic view of future revenues might be sufficient to counteract the effect of discounting less optimistic views. However, DAE does not discuss this issue in its Report and does not provide a detailed justification for the approach it has adopted.

ACIL Allen’s view is that this issue is likely to be material for the effect of network privatisation on consumer prices. The AER’s new benchmarking approach (which, as noted above, is currently subject to legal challenge) implies that the majority of cost savings that would be available from converting NSPs from public to private ownership would be built in to network charges whether or not the NSPs are actually privatised. This would limit the effect that leasing the NSPs would have on network charges and presumably constrain the lease price.

¹ For example, the primary purpose of the 2012 Grattan report cited by DAE was to highlight that AER network regulation was setting prices well above actual costs.

² Government transactions of this type usually are usually first price sealed bid auctions.

2.5 Summary: answers to key questions – Asset leasing

2.5.1 Plausibility of DAE assumptions

In ACIL Allen's view, the assumptions made by DAE about the cost savings likely to flow from partial leasing of the NSPs are plausible. DAE uses limited data on the efficiency of government-owned network businesses relative to privately owned businesses and extracts from the data broad orders of magnitude for the likely cost savings. Given that DAE was instructed to assume that leasing would pass full managerial control to the private sector, their processes for deriving efficiency assumptions are conservative. By adopting a broad-brush approach, DAE avoids giving its results a level of precision that cannot be supported by the data. The DAE approach seems consistent with a level of detail that its terms of reference seem to require.

DAE's assumptions about the rate at which efficiencies would be realised post leasing are somewhat arbitrary but overall plausible. They also appear to make realistic assumptions about the way in which reductions in capital expenditure would be incorporated into allowable costs as conventionally measured.

On the other hand, ACIL Allen has reservations about DAE's assumptions about the role of the AER in determining network charges relative to network costs. In essence, DAE assumes that the AER's historical approach to setting network charges will persist post privatisation. Moreover, it assumes that cost savings that potential lessees would not have to pass through to consumers under the AER's historical approach will be built into the lease price. Given the recent widespread disquiet about the AER's performance in facilitating sharp rises in network charges, these do not seem plausible assumptions, even in the absence of detailed knowledge about the recent evolution of the AER's approach. Recent developments at the AER have confirmed the implausibility of this view. ACIL Allen regards it as especially implausible to assume that potential lessees would not discount heavily any benefits that they could derive from a persistence of the AER's historical approach.

2.5.2 Consistency of overall modelling approach with contemporary approaches

The essence of the DAE's approach for this part of the analysis is that they estimate outside their CGE model the effects of partial leasing of the NSPs and on end-user prices of electricity and then use the model to infer a profile of efficiency gains that support the price effects. Approaches of this sort are commonly employed in contemporary policy analysis using CGE models. They exploit the closure flexibility inherent in the models, whereby naturally exogenous variables (e.g., the NSPs input requirements) can be treated as endogenous to allow the imposition of assumptions (or external estimates) of movements in naturally endogenous variables (e.g., end-user electricity prices). DAE could have given more confidence that it had applied this approach appropriately had it reported the inferred patterns of efficiency gains and related them to external data on network technologies.

Similarly DAE's approach of accounting for efficiency gains not passed on to the consumers as transfers to government represents acceptable contemporary practice. However, the existence of these efficiency gains is based on the assumption that the lease price will reflect these gains; an assumption which ACIL Allen considers to be questionable in the context of the benchmarking approach that the AER flagged as part of the Better Regulation reform program published in 2012.

2.5.3 Internal consistency of results

ACIL Allen found no evidence of internal inconsistency in the DAE assessment of the effects of the proposed network leasing.

2.5.4 Consistency of overall conclusions

DAE's main conclusion from this part of their analysis is that partially leasing the networks would make a positive contribution to NSW GSP. This is consistent with the DAE modelling and follows intuitively from the assumption that the leasing would promote factor productivity in the network businesses.

A minor concern is that the section of the DAE Report entitled "About this report" states:

"... productivity gains in electricity combine with improved infrastructure to create greater benefits overall than could be achieved with both individually."

ACIL Allen found no evidence to support the claim that this reflected in the DAE modelling. All decompositions included in the DAE Report (e.g., p. iv.) suggest that the effects of network leasing and those of infrastructure investment are simply additive in the modelling.



IMPACT OF NEW INFRASTRUCTURE INVESTMENTS PLANNED FOR REBUILDING NSW

3

DAE finds that the investment of \$20 billion in infrastructure assets contained in the Rebuilding NSW Plan would increase the size of the NSW economy substantially – by the end of the projection period (i.e., in 2035-36) real GSP would be \$26.6 billion (2013 prices) larger than under base-case assumptions³. This is much bigger than the effect of the partial leasing of the NSPs (\$4.3 billion in 2035-36) and also twice as big as the effect of infrastructure investment included in the 2012 SIS (\$13.3 billion in 2035-36) which was separate to the investment planned under Rebuilding NSW. The DAE Report also alludes briefly to the effects of the investments on aggregate employment, aggregate household consumption and aggregate household income.

Five drivers account for the expansionary effects of the Rebuilding NSW investments. They are:

- increased activity associated with the construction phase of the infrastructure investments
- increased immigration to NSW induced by improvements in the State's transport infrastructure
- reductions in transport costs
- increased labour supply facilitated by reductions in business and commuting travel times
- increases in agricultural and mining production induced by improvements in the States water infrastructure.

The DAE report does not provide a detailed decomposition of the overall results into the contributions of the individual drivers but it is clear that the immigration effect is dominant, with DAE projecting the Rebuilding NSW Plan investment to lead to a 2.7 per cent increase in population and 3.3 per cent increase in employment. The effects on per capita GSP, income or consumption are small. In fact, comparison of Tables 4.2, 4.3 and 2.4 of the DAE Report suggests that by 2035-36 the infrastructure investments will have *reduced* GSP per full time equivalent (FTE) worker (i.e., labour productivity) by about 0.2 percentage points relative to the base case and *increased* GSP per resident by about 0.2 percentage points. The discrepancy between the results for labour productivity and per capita GSP partly follows from DAE's assumption that some of the savings in travel time promoted by the improvement in transport infrastructure would be reflected in longer working hours, i.e., it would increase the participation rate as shown by a comparison of Tables 2.4 and 2.5 of the DAE Report).

DAE's approach to the infrastructure modelling draws heavily on the work of Duranton and Turner (2012, 2011 and 2009) especially with respect to the immigration effect and the travel time savings. Understanding how the work of Duranton and Turner has been applied by DAE is central to any assessment of the plausibility of the DAE infrastructure modelling. Consideration of the application of the Duranton and Turner findings to the DAE modelling is a core part of the analysis that follows.

The remainder of this section of the report is structured as follows:

³ DAE Report, p. iv.

- Section 3.1 discusses the modelling of each of the key drivers in turn, to the extent allowed by the information provided in the DAE Report or from DAE's responses to ACIL Allen's clarifying questions.
- Section 3.2 considers the discussion of infrastructure investment modelling in the context of the four questions posed by the ACIL Allen scope of work.

3.1 Modelling of key drivers of expansion

3.1.1 Construction phase

The 5 August 2015 workbook gives a breakdown of the construction-phase shocks by year and by region. Unsurprisingly, more than 80 per cent of the new expenditure occurs in *Metro Sydney*. The new expenditure begins in 2015-16, builds up to peak in 2019-20, and ends in 2024-25.

There is a low case and a high case. As explained in subsection 4.3.1.2 of the DAE Report, the cases differ according to the share of new investment in urban roads that is routed through tunnels – 45% in the high case and 60% in the low case. ACIL Allen infers that the total expenditure on roads does not differ between the cases. Hence, since tunnels are relatively expensive, there is a larger increase in the road stock (measured in lane kilometres) in the high case than in the low case. The 5 August 2015 workbook reveals that the difference between the low and high cases has no effects on the timing or regional location of the construction-phase shocks.

As noted above, the DAE provides no results for the construction-phase effects. However, ACIL Allen would not expect the construction-phase shocks to have much effect on GSP, income or employment – in a model with an orthodox neoclassical specification of factor markets, new capital expenditure would, to a large extent, crowd out other forms of expenditure. There remains the question, however, of how DAE assumes the new capital expenditure is financed. If it is financed by domestic residents, then it should crowd out domestic consumption in the short term, although the returns on the investment will enhance consumption possibilities in the longer term. If it is financed by foreign borrowing, then the need to provide a return to the foreign lenders should restrict the extent to which it enhances domestic consumption in the future. It is not clear from the DAE report and the 5 August 2015 workbook as to how DAE accounted for the financing of the investments. This issue is discussed further in the context of aggregating economic welfare over time in section 5.3.3 below.

3.1.2 Immigration effect

The dominant driver of the DAE results is an increase in employment (and population) that DAE assumes will be induced by the increase in transport infrastructure that is envisaged under the Rebuilding NSW plan. The DAE Report (p. 20.) explained its approach to estimation of effects from investing in road and rail infrastructure as follows.

*"In the absence of detailed information on the economic impact of particular infrastructure projects, the effect on population from road and rail infrastructure has been estimated based on findings from the academic literature. Intuitively, investments in transport infrastructure should lead to increases in population as better transport infrastructure makes it easier to access high quality jobs and makes a city an easier, more enjoyable place to live and work. This intuitive relationship has been confirmed and measured in economic literature. The increase in population will result in growth in the economy via the 3 Ps pathways described above"*⁴

DAE calibrates the employment/population effect by applying elasticities drawn from a study of US cities by Duranton and Turner (2012) to its own estimate of the extent to which the Rebuilding NSW investments will increase the stock of road and rail infrastructure in NSW. Road infrastructure is measured in lane-kilometres (see, for example, Table 4.1 in the DAE Report). It is not clear whether or not the measurement of rail infrastructure allows for multiple tracks on each route (see, for example, sub-section 4.3.1.4 of the DAE Report).

DAE was required to assume that \$8 billion would be spent on urban roads. It estimated that this would add 100 and 115 lane-kilometres of road in the low and high cases respectively. DAE was also required to assume that \$3 billion would be spent on regional roads, and stated that this would provide

⁴ The "three Ps" are productivity, population and participation.

an additional 380 lane-kilometres.⁵ DAE used the Sydney Rapid Transit (SRT) project as an indicator of investment in Sydney rail. It observed that the SRT project would add about 30 kilometres to the city's rail stock.⁶ According to a SRT Fact Sheet (June 2014), SRT's North West and South West Rail components were estimated to cost \$10.4 billion.

To estimate the *proportional* increases in infrastructure implied by these *kilometre* increases, DAE required estimates of the current (pre-investment) stocks of the relevant classes of infrastructure. For urban roads, it used the current stock of "major orbital style roads in metropolitan Sydney" -- estimated to be around 400 lane-kilometres (covering a combined distance of 159 kilometres). For regional roads, it used the estimated 20,600 lane-kilometres of highway in rural NSW. DAE estimated that the current stock of rail in Sydney to be 2,101 kilometres.

A key issue is to ensure consistency between the proportional increases in infrastructure and the elasticities that are used to estimate the effects of the infrastructure investments on NSW employment and population. DAE used elasticities drawn from a study by Duranton and Turner (2012), relating to the effects of provision of transport infrastructure on congestion and growth of cities in the United States. The population elasticities were around 0.2 for road provision and 0.08 for rail provision over 20 years. The employment elasticity for road provision was about 0.15 over 20 years, suggesting that a 10 per cent increase in lane-kilometres causes a 1.5 per cent increase in employment over the next 20 years.⁷ The Duranton and Turner elasticities represent the employment and population effects of increasing the stock of US interstate highways within US Metropolitan Statistical Areas (MSAs). According to their analysis, in urbanised parts of the MSAs, interstate highways represent about 1.5 per cent of all road kilometres and 24 per cent of vehicle kilometres travelled (VKT), while other major urban roads account for 27 per cent of road kilometres and 62 per cent of VKTs (Duranton, Turner, 2011, p. 2622; 2012, p. 1433).

DAE provides no supporting rationale as to why it was considered appropriate to apply elasticities estimated in respect of United States interstate highways in MSAs (not just the urbanised part) to an assumed increase in lane-kilometres expressed as a proportion of a relatively small part of the arterial road network in metropolitan Sydney: a selection of "major orbital style roads". In subsequent interaction with ACIL Allen, DAE acknowledged that there is no direct comparator in Australia to United States interstate highways in MSAs, but considered its selection of "major orbital style roads" to be the closest available substitute. DAE did not justify this view.

Nor does DAE provide supporting rationale as to why it applied estimated elasticities for expansion of US interstate highways within US MSAs to an assumed increase in rural/regional lane-kilometres expressed as a proportion of lane-kilometres of *all* rural/regional highways in NSW. This involved two substantial inconsistencies. First, the elasticities for metropolitan roads would be higher than for rural/regional roads. Second, DAE used a large base to calculate the proportional expansion, rather than the small base used for major urban roads.

Similarly, DAE did not explain why the rail expansion was measured relative to the large base of all metropolitan Sydney's rail stock, not just a small part of the stock as was done for metropolitan roads.

Another key issue is that DAE stated during interaction with ACIL Allen that its adoption of population-road provision elasticities estimated by Duranton and Turner (2012) for US MSAs was supported by extensive analysis of the literature undertaken for a previous report by DAE (2012) for Infrastructure NSW. Papers identified by this literature review were summarised in Appendix C of that report. In ACIL Allen's view, those papers are not relevant to issues under focus in the analysis undertaken by Duranton and Turner (2012), and do not provide any estimates of relevant elasticities. In its own review of the literature, ACIL Allen was unable to find any analyses that corroborated the work of Duranton and Turner (2012) on population-road provision elasticities. This work appears to be unique work. However, ACIL Allen notes that it is related to a large body of literature (discussed below) on induced traffic that includes estimation of VKT-road provision elasticities.

⁵ DAE stated that the estimate of 380 lane-kilometres of road was based on an estimated average cost of \$8.1 million per lane-kilometre. However, dividing \$3 billion by \$8.1 million provides an estimate of 370.4 lane-kilometres.

⁶ DAE did not distinguish between rail route length and track-kilometres. The latter takes account of multiple tracking on routes.

⁷ Duranton and Turner (2012) estimated an employment-road provision elasticity of 0.15 over 20 years and a population-rail provision elasticity of 0.3 over 80 years. Duranton and Turner (2011) estimated a population-road provision elasticity of 0.2 (p. 2642) or 0.21 (p. 2644) over 20 years.

A third issue is that Duranton and Turner (2012) did not estimate employment/population-road provision elasticities for roads other than interstate highways, and did not estimate separate elasticities for urbanised and other parts of MSAs.

With regard to the second and third issues, Duranton and Turner (2011, 2009) estimated VKT-road provision elasticities for interstate highways in urbanised and non-urbanised parts of MSAs and for other major roads in urbanised parts of MSAs. These estimates excluded public transport VKT. They provide an indication of employment/population elasticities in areas of interest, because inducement of population and employment by road provision is one intermediate element of inducement of VKT.

Duranton and Turner (2011, 2009) estimated that VKT-road provision elasticities for interstate highways were significantly higher in urbanised than in other parts of MSAs. Their estimates for other major roads in urbanised parts of MSAs were significantly lower than for interstate highways in urbanised parts of MSAs and were also lower than for interstate highways in non-urbanised parts of MSAs. Because induced population is a significant contributor to induced VKT, the geographical differences between VKT-road provision elasticities suggest that the employment/population-road provision elasticities drawn from Duranton and Turner (2012) are too high for metropolitan arterial roads and rural/regional roads.

Moreover, VKT-road provision elasticities estimated by Duranton and Turner (2009, 2011) are at the top of the range of US-focussed estimates by econometricians. For example, their estimate of the long-term VKT-road provision elasticity for interstate highways in entire MSAs (urban plus non-urban parts) is 1.03. Other US estimates based on econometric techniques range from 0.16 on a state-wide basis (Hymel, Small, Van Dender, 2010), through 0.39 for freeway expansion projects in California (Cervero, 2003), to 0.7 and 0.9 for Californian state highways in counties and metropolitan areas, respectively (Hanson, Huang, 1997). Most estimates fall in the range 0.6 to 0.9.⁸ Again, as induced population is a significant contributor to induced VKT, employment/population-road provision elasticities estimated by Duranton and Turner (2012) may be regarded as imprudently high.

A prominent urban transport economist, Robin Lindsey (2012, p. 58), concluded a review of the magnitude of induced traffic effects as follows:

To sum up: the strength of induced demand is highly context specific. It depends on the geographical scale over which capacity investment is undertaken, on the time period considered, on the types of roads that are built or expanded (e.g., limited-access highways versus city streets), on the quality of public transit in the affected region, and so on.

It is ACIL Allen's view that the combination of DAE's overestimating the proportional increase in urban road infrastructure, mismatching elasticities with the estimated proportional increases, and adopting high-end elasticity estimates resulted in DAE significantly overestimating the extent to which new urban arterial roads would induce increases in employment and population.

In ACIL Allen's view it would have been more reasonable and prudent to apply different lower elasticities to metropolitan and rural/regional road expansions than those that were applied by DAE. In addition, in the case of metropolitan roads, it would have been much more acceptable to apply the lower elasticity to a much smaller proportional increase in road capacity calculated by using a base comprising all major arterial roads in metropolitan Sydney, including major orbital, by-pass and radial roads. This could be complemented by sensitivity analysis showing how the population effects vary with different assumptions regarding elasticities and proportional increases in the road and rail stock.

The DAE Report does not describe precisely how DAE implemented its procedure for incorporating these immigration and employment effects. But, as shown by Chart 2.4b from the DAE Report and by the 5 August 2015 workbook, the annual rate of increase of the number of new immigrants slackens from 2030 onwards relative to the rate experienced from 2021 to 2030. It is not clear whether this is driven by a slackening in the rate of augmentation of the transport infrastructure or by a break in the population/infrastructure elasticity.

The 5 August 2015 workbook also reveals that the DAE procedure leads to increases in population growth rates from 2021 out to 2040, with the increases being stronger out to 2030 than subsequently. For example, the increase in the population growth rate for MetroSydney is 0.25% out to 2030 in the

⁸ For surveys, see Litman (2015) and Handy and Boarnet (2014).

low case, reducing to 0.14% from 2030 to 2040. In the high case, the increases are 0.29% reducing to 0.16%. Table 2.4 of the DAE Report shows that the NSW population will be 2.9% larger than its base-case level by 2035-36 in the high case and 2.5% larger in the low case. As noted in the previous subsection, there is a greater increase in the State's transport infrastructure in the high case than in the low case. Hence, the DAE procedure generates more immigration in the high case than in the low case.

ACIL Allen considers that the percentage increases in population reported in Table 2.4 of the DAE Report are unreasonably high because:

- the initial urban roads asset base for metropolitan Sydney that is used to calculate the proportional increase in capacity is implausibly small (refer Table 3.1 below), and
- the employment (and population) lane-kilometre elasticities estimated by Duranton and Turner (2012) are high, being based on the same body of research, data and analytical approach as VKT-lane-kilometre elasticities estimated by Duranton and Turner (2011) that are at the high end of the range of econometric estimates for the United States.

TABLE 3.1 – TRANSPORT INFRASTRUCTURE DATA FROM DAE REPORT

Item	Stock	Change	Percentage change
Urban roads (lane-kms)	(p.21) 400	(p.23) 100 (low case) 115 (high case)	25% (low) 29% (high)
Regional roads (lane-kms)	(p.22) 20,600	(p.24) 380	1.8%
Urban rail (kms)	(p.22) 2101	(p. 24) 30	1.4%

SOURCE:

ACIL Allen is aware that the DAE-RGEM model includes a specification of interstate (and possibly international) migration. However, the 5 August 2015 workbook suggests that this is not what determines the immigration effect in the DAE simulations. Instead, the population changes estimated using the Duranton/Turner elasticity appear to have been imposed exogenously. DAE did not provide any explanation of where the additional population comes from.

3.1.3 Transport cost effect

DAE used travel time savings estimated by Duranton and Turner (2009, 2012). DAE observed that business savings effectively translated into an increase in labour productivity, but appear to have treated part of the time saved as an increase in labour supply in its modelling. In the case of savings in travel time to and from work, DAE assumed in its high case that 40 per cent of this saving would be allocated to extra work. DAE also stated that its high case also included benefits of investments to deal with "pinch-points" with high benefit/cost ratios. It referred to a UK Department of Transport report that indicated that "early pinch-point interventions" could on average yield benefit/cost ratios in excess of 4.

Duranton and Turner (2012, p. 1431) noted:

"To summarise, marginal extensions to the interstate highway system (in cities) fail to provide welfare gains primarily because they result in such small decreases in the price of travel. As argued above, the elasticity of the cost of driving with respect to roads is -0.057. Thus, a 1 per cent increase in the stock of roads results in a 0.057 per cent decrease in the time cost of travel."

Elsewhere, Duranton and Turner (2009, 2011) explained that travel costs (including time) fell only slightly following provision of new arterial road space in cities plagued with traffic congestion because of the phenomenon of induced traffic. This appears to have been accepted by DAE (2014, p. 25), which stated:

"This finding indicates that increases in road provision only slightly reduce travel times because increased road provision encourages more driving activity."

DAE (2014, p. 18) stated that its assumed expansion of the road network in Sydney would lead to “a reduction in the cost of transporting goods and people of around 1.9 per cent in Sydney”. This was higher than indicated by the elasticity of the cost of driving with respect to roads estimated by Duranton and Turner (2012, 2009). The latter estimate would suggest a cost saving of 1.4 per cent, assuming a 25 per cent expansion of lane-kilometres of major Sydney roads. The effect of DAE’s estimate was compounded in its high case by an assumption that 40 per cent of savings in travel time to and from work would be allocated to extra work.

The induced traffic phenomenon and the complementary concept of triple convergence were first highlighted by Anthony Downs (1962, 1992). Road improvements make driving more attractive, encouraging travellers to shift to the improved facility from other *times*, *transport modes* and *travel routes* (triple convergence), and induce extra driving on the road network (genuine induced demand). The additional driving undermines the anticipated congestion-alleviating benefits of road improvements and the associated shift away from public transport also reduces public transport’s viability, requiring higher government subsidies or service cuts. These in turn can encourage further shifts to driving and additional dissipation of anticipated benefits of road improvements.⁹

DAE’s use of estimates of driving cost savings made by Duranton and Turner (2012, 2009), implicitly recognised the importance of allowing for induced traffic when analysing benefits of new road space. Also, like Duranton and Turner (2012), DAE recognised in its high case that benefits of provision of roads could be enhanced by targeting investments to deal with “pinch-points” or “bottlenecks” that have high benefit/cost ratios. However, DAE did not explain how such benefits were estimated and included in its high case. ACIL Allen notes that addressing “pinch-points” does not detract from the importance of allowing for dissipation of benefits through induced traffic effects.

These principles also apply to urban rail investments. While benefit-cost analysis of public transport projects typically include the opportunity cost of required resources, too many have failed to take into account the applicability of the induced traffic and triple convergence phenomena to public transport investments that is now widely recognised in the urban transport literature. As Downs (2004), Small and Verhoef (2007) and Duranton and Turner (2011, 2009), and ACIL Allen (2012) have explained, rail and other public transport improvements attract commuters from roads. This frees-up road space so that driving in peak times and locations becomes more attractive and consequently additional traffic is induced.

ACIL Allen infers from the 5 August 2015 workbook that the percentage changes in transport costs imposed by DAE were uniform over 2021 to 2050. Consistent with subsection 4.3.3 of the DAE Report, for MetroSydney, they were minus 1.91% in the low case and minus 3.42% in the high case. Duranton and Turner (2009 and 2011) pointed out that the increase in population and other sources of traffic induced by an improvement in transport infrastructure would erode any reduction in congestion that the infrastructure investment allows initially. Hence, ACIL Allen would expect that any induced reductions in transport costs would fall over time as population and other effects increase. As estimates of population-road provision elasticities by Duranton and Turner (2012) were derived from the same body of research, data and analytical approach as the estimates of VKT-road provision elasticities by Duranton and Turner (2009, 2011), the former as well as the latter should take into account induced traffic effects. The DAE (2014) Report provides insufficient detail for ACIL Allen to be able to reconcile the estimated elasticities with DAE’s estimates of travel cost savings. However, ACIL Allen is not confident that DAE has accounted for induced traffic correctly. If not, it is likely that DAE has overestimated the significance of the transport-cost driver on GSP.

3.1.4 Agriculture and mining effect

DAE assumes that output is proportional to water availability in the agricultural and mining sectors, and that investments in water infrastructure included in the Rebuilding NSW plan will reduce water loss and allow more water to be made available to these sectors, as well as increasing environmental flows. The share of increased water availability going to mining is greater in DAE’s high case than in its low case. DAE calibrates the assumed relationship between water availability and water infrastructure on the basis of recent Victorian experience. It uses data from the ABS and the NSW Minerals Council to calibrate the relationship between agricultural and mining output and water

⁹ See ACIL Allen (2012), Small and Verhoef (2007), and Downs (2004) for further discussion of these issues.

availability. DAE acknowledges that its approach is broad-brush but speculates (in our view reasonably) that more sophisticated approaches would lead to similar results, at least qualitatively.

The 5 August 2015 workbook indicates that in implementing its approach DAE assumes constant (in value terms) increases in agricultural and mining output, starting in 2022 and persisting until 2050. This implies that water availability will continue to be a constraint on output in these two sectors. While this may be reasonable in the case of agriculture, it seems likely that weakness on the demand side will be increasingly important for mining. This possibility is a more important caveat for the results of DAE's high case, in which increases in mining output play a bigger role than in the low case.

The DAE report does not reveal the relative importance of the agriculture and mining effect in DAE's overall estimate of the benefits of the Rebuilding NSW infrastructure investments. Pages 18 and 26 of the DAE Report suggest that about \$1 billion of the aggregate \$20 billion investment (i.e., 5%) is to be spent on water infrastructure, increasing the value of agricultural and mining output by between \$1 billion and \$2 billion each year from 2022 onwards. According to Table 4.2 of the DAE Report, the aggregate increase in GSP generated by the infrastructure investments is \$26.6 billion. Hence, for the water investments to have the same social rate of return as the rest of the investment program, it should be generating value added in the agricultural and mining industries worth about \$1.3 billion¹⁰.

3.1.5 Participation rate effect

It is clear from comparison of Tables 2.4 and 2.5 of the DAE Report that the DAE modelling includes an increase in the participation rate relative to the base case – i.e., the percentage increase in employment exceeds the percentage increase in population. Two factors might underlie this: new migrants having higher participation rates than incumbents, or other parts of the modelling scenario implying an across-the-board increase in labour market participation rates.

The text at the top of page 12 of the DAE Report suggests that the variation in the participation rate is due to the “demographic of the residents arriving in the state”. The DAE Report provides no further detail on this. On the other hand, in discussing the welfare significance of the results, representatives of DAE advised ACIL Allen to assume that the economic characteristics of the new arrivals are identical to those of the incumbents. Also, subsection 4.3.4 of the DAE Report explains that the DAE modelling includes an assumption that investments in transport infrastructure reduce travel time, with some of the time saved being reflected in an increase in working time per employee. This is equivalent to an increase in the average participation rate in the sense that it increases amount of FTE employment relative to the population.

3.2 Summary: answers to key questions

3.2.1 Plausibility of DAE assumptions

In ACIL Allen's view, the assumptions made by DAE about construction costs and the effects of increased water availability on agriculture and mining seem plausible. Consistent with its approach to assessing the effects of network leasing, DAE takes a broad-brush approach that avoids giving their modelling a spurious level of detail. However, ACIL Allen had difficulty in assessing the materiality of these assumptions because of the lack of a detailed decomposition of the DAE results into the contributions of the individual drivers of the results.

In formulating assumptions about the effects of investments in transport infrastructure on savings in freight costs and travel times and consequently on NSW population and employment, DAE relied very heavily on the work of Duranton and Turner. This relates to US cities and is formulated in terms of a model in which improved urban infrastructure causes migration from a pool of non-urban population into a city. In this way, Duranton and Turner are able to look at cities in isolation rather than as entities competing with each other. ACIL Allen notes that the Duranton and Turner estimates of the elasticities of employment and population with respect to transport infrastructure are likely at the high end of econometric estimates in the literature based on the range of estimates of induced traffic effects for road building.

In applying the Duranton and Turner elasticities for the case of urban road infrastructure, DAE uses an implausibly small estimate for the urban road base. Hence, ACIL Allen considers that DAE's estimates

¹⁰ Where DAE refers to Agriculture and Mining output, it is not clear to ACIL Allen whether they refer to gross output or value added.

of the *proportional* increase in urban road infrastructure (25 per cent and 29 per cent for the low and high cases respectively) are much too high. ACIL Allen considers that the combination of DAE's selection of high-end population and employment elasticities and overestimating the proportional increase in urban road infrastructure makes the urban roads assumptions used in the DAE modelling unreasonable.

The DAE Report provides no explanation of the geographic origin of the people who account for the increase in NSW population that is assumed to occur in the DAE modelling. This restricts ACIL Allen's ability to assess the extent to which the Duranton/Turner results are applicable to the Rebuilding NSW case. In addition, the flat timing evident in DAE's population, transport-cost and travel-time shocks seems to be in tension with DAE's stated position to have dealt adequately with the well-known problem of induced traffic from population and other sources eroding the reduction in congestion that infrastructure investment is designed to produce.

3.2.2 Consistency of overall modelling approach with contemporary approaches

DAE does not use its model to explain the effects of infrastructure investment. Instead, it adopts the key explanations from other sources – principally, the work of Duranton and Turner – and uses the DAE-RGEM model to help it summarise the implications of what it assumes to be the key drivers the economy wide implications of infrastructure investment. This is common practice among CGE modellers.

But as well as estimating summary measures of the aggregate effect, a CGE model is also capable of providing decompositions of the summary measures to show the relative importance of the key drivers. In assessing the Rebuilding NSW plan, DAE separates the effects of network privatisation from the effects of infrastructure investment but it fails to report any decomposition of the relative importance of the key drivers of the effects of infrastructure investment.

3.2.3 Internal consistency of results

The reservations that ACIL Allen has about the internal consistency of DAE's results for the effects of the Rebuilding NSW infrastructure investments relate mainly to the persistence of the reductions in transport costs and commuting times in the face of the large induced increase in traffic. In the text of its Report, DAE claims to have accounted appropriately for the tendency of increasing population and other sources of induced traffic to erode the reductions in congestion initially generated by infrastructure investment but the input data provided to ACIL Allen by DAE are not consistent with that claim.

3.2.4 Consistency of overall conclusions

DAE's main conclusion from this part of their analysis is that the infrastructure investments included in the Rebuilding NSW plan would make a large positive contribution to NSW GSP. This is consistent with the DAE modelling and notwithstanding ACIL Allen's view of the unreasonableness of the population and therefore FTE employment increases assumed to be induced by the infrastructure investments, follows principally from those assumed large increase in the FTE employment. The DAE Report provides per capita results for overall economic growth in the NSW economy to 2035-36 and provides the data necessary to assess the per capita results in relation to the proposed infrastructure investments. ACIL Allen's analysis of the increase in *per capita* GSP induced by the infrastructure investments shows that it is small and is driven mainly by an increase in labour-market participation. The DAE Report provides no detailed discussion of this feature of the results. In particular, there is no discussion of the extent to which the expansionary effects of the investments can be interpreted as favourable or otherwise from the point of view of NSW's existing residents.



To undertake economic impact analysis of a project or policy, it is necessary to develop a counterfactual scenario in which the project or policy did not happen. In respect of the economic baseline for its analysis of the impact of the State Infrastructure Strategy, DAE was required to develop baseline economic forecasts for the NSW economy to 2035. This baseline was required to take into account both:

- updated population forecasts from the Department of Planning; and
- the impact of the infrastructure investments which have been committed to by the government in response to the first State Infrastructure Strategy.

The baseline analysis was also to update the discussion of the key themes or ‘driving forces’ impacting infrastructure demand in NSW over the period to 2035.

This section provides an overview of the DAE baseline, of how DAE met the terms of reference and of the importance of the baseline to the projected impacts.

4.1 Overview of the baseline

A description of the main assumptions and projections in the baseline are provided in Chapter 5 and Appendices B, C, D and E of the DAE Report.

Table 4.1 provides a summary of the baseline projection for a few macroeconomic variables. Based on ACIL Allen’s own macroeconomic projections of the NSW economy over the forecast period, the DAE baseline projections are considered to be reasonable.

TABLE 4.1 – DAE BASELINE – NSW ECONOMIC SNAPSHOT

	2013-14	2031-32	2035-36	CAGR
GSP (\$bn)	493.3	786.1	867.7	2.6%
Population (million)	7.5	9.3	9.7	1.2%
GSP per capita	65,785	84,371	89,452	1.4%
Employment (number)	3,659,379	4,435,405	4,594,648	1.0%

SOURCE: DELOITTE ACCESS ECONOMICS – TABLE 5.1, P.32

4.1.1 Population growth

According to the information available (Table 5.1, page 32, Appendix B (pages 55-56) and Appendix D (pages 69-70)), the updated population forecasts from the Department of Planning and Environment (DP&E 2014) were incorporated into DAE’s baseline. These projections provide forecasts for NSW as a whole to 2041, while data for Regional NSW, Sydney, Illawarra, Lower Hunter & Central Coast, and all Local Government Areas (LGA) are available to the year 2031. The information provided in the

DAE Report matches that available from DP&E (2014) and therefore satisfies this element of the terms of reference.

4.1.2 Impact of investments associated with 2012 State Infrastructure Strategy

Section 4.6 of the DAE Report provides a separate analysis of the specific investments associated with the 2012 State Infrastructure Strategy and therefore satisfies this element of the terms of reference.

4.1.3 Driving forces of infrastructure demand

Appendix D of the DAE Report provides a discussion of the megatrends that are deemed likely to influence the NSW economy over the period to 2035-36. The discussion covers a variety of topics including population growth and demographics, congestion, housing, structural changes driven by emerging international economies, anticipated environmental changes and the ongoing role of developments in information communications and technology. ACIL Allen considers that the report therefore satisfies this element of the terms of reference.

4.1.4 Importance of the baseline

The importance of the baseline assumptions depends on the nature of the policy scenarios and whether the policy shocks are dependent on the baseline. In the case of DAE's analysis, the key headline variables that are reported include real GSP, population and employment. The projected changes in population and employment are stimulated by the investment in the transport infrastructure and due to the method used, it is unlikely that the baseline assumptions will affect the projected percentage change in population and employment. Further, as the terms of reference specifically requested the use of the DP&E (2014) population forecasts, any reported impacts on the number of people will be insensitive to the DAE baseline with other discretionary modelling assumptions likely to have a small effect on any reported impacts on the number of jobs.

Of the component factors that underpin the projected increase in real GSP, the impact of:

- the productivity increases that are assumed to follow the partial privatisation of the NSW electricity network service providers is sensitive to the baseline demand and NSW supply of electricity
- the increase in water availability to the agriculture and mining sectors is sensitive to the baseline gross value added per unit of output from these sectors
- the reductions in transport costs associated with improved transport infrastructure is sensitive to the baseline projected increase in real GSP per worker
- the increase in immigration into NSW stimulated by improved transport infrastructure is sensitive to the baseline projected increase in real GSP per worker.

As discussed in Section 3.1.2 above, most of the projected percentage change in real GSP is related to the increase in immigration into NSW stimulated by improved transport infrastructure. The nature of the policy simulations means that any projected *percentage* change in real GSP will be largely insensitive to the baseline but the *absolute* change in real GSP will be sensitive to the real GSP per worker projected in the baseline. From the information in Table 4.1, the average annual growth in real GSP per worker in the baseline is approximately 1.5 per cent a year. A ± 0.5 percentage point change in the baseline growth rate will have an impact of approximately 11 per cent on the projected change in the level of real GSP by 2035-36. Consequently, the \$26,600 million increase in GSP in 2035-36 due to the Rebuilding NSW reinvestment policy would change by approximately $\pm \$3,000$ as a result of a change in the baseline productivity growth (but, as noted earlier, would not alter the reported percentage change in GSP).

Overall, ACIL Allen are not concerned by the level of sensitivity of the projected policy impacts due to the baseline assumptions.

4.2 Summary: answers to key questions

4.2.1 Plausibility of DAE assumptions

In ACIL Allen's view, the assumptions made by DAE about the baseline are plausible.

4.2.2 Does the baseline in the Report meet the terms of reference?

In ACIL Allen's view, the assumptions made by DAE about the baseline and the documentation provided in the report meet the terms of reference.



5.1 The main conclusions

Rebuilding NSW will increase NSW's Gross State Product (GSP) by \$30.9 billion by 2035-36 (measured in 2013 prices); this is a real increase of 3.6% over the level of GSP that would occur without the Rebuilding NSW plan. The total increase in GSP over the period to 2035-36 is estimated to be almost \$300 billion (measured in 2013 prices), roughly equivalent to 60% of current GSP.

The key assumption underlying the DAE modelling is that infrastructure investment will generate a substantial increase in immigration into NSW. Given this assumption, DAE's projection that the Rebuilding NSW plan will increase NSW's GSP by about \$30.9 billion (or 3.6% of base-case GSP) by 2035-36 seems reasonable, at least as a broad order of magnitude. But to accumulate the GSP increase over the period 2013-14 to 2035-36 without discounting future values and then to express the accumulated deviation as a percentage of 2013-14 GSP does not seem sensible.

The increase in GSP comes partially from a more efficient electricity network but largely from the reinvestment of funds from the partial lease of electricity network assets into productive infrastructure.

The DAE Report includes results that demonstrate that the leasing of the network assets accounts for only 14% (\$4.3 billion out of \$30.9 billion) of the increase in GSP generated by the Rebuilding NSW plan in 2035-36. But it accounts for about 52% of the induced increase in per capita GSP. The explanation is that, while the leasing of the network assets is assumed to increase the productivity of the economy's existing resources, the infrastructure-investment component of the plan stimulates GSP mainly by increasing immigration into NSW and by increasing the labour-force participation rate. According to the DAE modelling, by 2035-36 the infrastructure-investment component will have reduced marginally the output per FTE worker.

Reinvestment in infrastructure will allow NSW to better manage the increase in population and economic activity that will occur over the coming decades. Better infrastructure will also help attract more people and business to NSW by creating easier access to jobs and markets – boosting economic growth.

DAE's results imply that the Rebuilding NSW infrastructure investments could reduce congestion costs associated with the increase in population and economic activity assumed to occur in the DAE base case. But if the better infrastructure does attract more people (as assumed in the DAE modelling) this will at least partially offset the reductions in congestion costs that the investments would otherwise produce. This well-known phenomenon is noted by Duranton and Turner (2009 and 2012) upon whom DAE relies heavily. ACIL Allen doubts that the DAE modelling accounts adequately for the phenomenon.

5.2 Reporting of results

As explained by Adams and Parmenter (2013, pages 609-611), the results from a CGE model can be presented in a variety of ways, some of which suggest superficially that a shock has a larger effect than others. It is common for users of the model to select a mode of reporting that superficially seems to best support the conclusions that the user wishes to draw.

DAE reports results for NSW GSP, aggregate employment, aggregate household consumption and aggregate household income. It reports the results in two main ways:

- as deviations from base-case levels in 2020-21, 2025-26, 2030-31 and 2035-36
- as deviations from accumulated quantities over the period 2013-14 to 2035-36.

To explain the implications of these modes of reporting and to confirm the consistency between them, this section focuses on the GSP effects of the combination of leasing the NSPs and investing \$20 billion in the Rebuilding-NSW initiatives. These results are given in Section 2.2 of the DAE Report.

DAE finds that in the “average” of their “Low” and “High” cases the combined package of measures would increase real GSP (2013 prices) by \$30.9 billion or 3.6% in 2035-36 relative to the base-case level. (The base case excludes NSP leasing, the Rebuilding-NSW investments and the other investments not already approved but included in the 2012 SIS.) From this, ACIL Allen infers that the base-case level of GSP in 2035-36 must be about \$860 billion ($=30.9/0.036$). This is confirmed by Table 5.1 of the DAE Report.

According to DAE, the accumulated increase in GSP (over the period 2013-14 to 2035-36) is “almost \$300 billion” or “roughly equivalent” to 60% of base-period GSP. From this, ACIL Allen infers that *base-period* (2013-14) level of GSP must be about \$500 billion ($=300/0.6$). Again, this is confirmed by Table 5.1 of the DAE Report.

It is easy to understand the consistency between the 2035-36 deviation (\$30.9 billion) and the accumulated deviation (\$300 billion). If the deviation were to grow linearly from zero in 2013-14 to 30.9 in 2035-36, the accumulated deviation would be \$340 billion ($= 22 \times 30.9/2$). But, as shown by Chart 2.1.b in the DAE Report, the deviations build up slowly in early years so that the accumulation schedule is concave from above and the area below it is smaller than the area below the linear schedule. Hence, the reported accumulated deviation is only \$300 billion. This still seems like a large effect, especially when expressed as a percentage (about 60%) of the base *period* (i.e., 2013-14) level. Note that in calculating the accumulated deviation, DAE applies no discount factors to future GSP. Hence, the accumulated deviation is not reported in present value terms and therefore is not really in the same units as the base level.

As noted in Table 5.1 of the DAE Report, the base-case annual growth rate of GSP to 2035-36 is about 2.6% ($\approx (860/500)^{1/22} - 1$). In the case including the package of NSP leasing and Rebuilding-NSW investments, the growth rate is about 2.66% ($= (860+30.9)/500)^{1/22} - 1$). That is, another way of reporting the effects of the package is that it would increase the annual growth rate of NSW GSP by 0.06 percentage points. This seems like a rather modest effect.

5.3 Measures of economic welfare

It is widely accepted that that measures of economic *activity* (such as GSP) should not be interpreted as measures of economic *welfare*. A community’s economic welfare depends on the income accruing to the community’s citizens, not on the income generated by the economic activity occurring within the community’s borders – for example, income accruing to foreigners who have invested within the region should not be counted as a positive contribution to the community’s economic welfare. In our view, DAE does not pay sufficient regard to this. For example, page 8 of the DAE Report states:

“Other measures of welfare, beside GSP, are consumption and household income.” (Emphasis added)

The DAE Report gives results for household income and consumption but includes very little discussion of them.

5.3.1 Returns to scale in NSW economy

For assessing the welfare implications of the Rebuilding NSW package of NSP leasing and infrastructure investment, the per capita effects are of more interest than the aggregate effects – an increase in aggregate income generated simply by increases in the population and workforce might leave no individual better off. Table 5.1 summarises the DAE results for GSP, household income and consumption per capita and per FTE worker. GSP per FTE worker is a measure of labour productivity.

TABLE 5.1 – RESULTS PER HEAD AND PER FTE WORKER

Variable	Percentage change relative to base case			
	2020-21	2025-26	2030-31	2035-36
GSP per capita	0.7	0.9	0.8	0.9
GSP per employee	0.7	0.6	0.3	0.3
Household income per capita	0.7	0.9	0.8	0.8
Household income per employee	0.7	0.6	0.3	0.2
Consumption per capita	0.6	0.8	0.7	0.7
Consumption per employee	0.6	0.5	0.2	0.1

SOURCE: DAE REPORT

Results included in the DAE Report also decompose the effects of the package on GSP per FTE worker and on per capita GSP into the contributions of NSP leasing and the infrastructure investments. Table 5.2 summarises these results.

TABLE 5.2 – DECOMPOSITION OF GSP RESULTS

Variable	Percentage change relative to base case			
	2020-21	2025-26	2030-31	2035-36
GSP per FTE worker				
Lease effect	0.2	0.4	0.4	0.5
Infrastructure effect	0.5	0.3	-0.1	-0.2
Total effect	0.7	0.6	0.3	0.3
Per capita GSP				
Lease effect	0.2	0.4	0.4	0.5
Infrastructure effect	0.5	0.6	0.4	0.4
Total effect	0.7	0.9	0.8	0.9

SOURCE: DAE REPORT

Table 5.1 shows that the effects of the Rebuilding-NSW package on per capita GSP, income and consumption are stronger than the effects on GSP, income and consumption per FTE worker. This reflects the DAE's conclusion that the infrastructure-investment component of the package will increase the labour-force participation rate.

Table 5.2 sheds further light on this. It shows that leasing the electricity networks would increase GSP per FTE worker by the same percentage as it would increase GSP per capita. Leasing is assumed to increase labour productivity but not to affect participation rates. But the infrastructure investments have a *stronger* effect on GSP per capita than on GSP per FTE worker – in the long run they *reduce* GSP per worker. This could be the case if the NSW economy faces decreasing returns to scale – due

to congestion costs, for example¹¹. Then the population increase stimulated by the infrastructure investments could reduce labour productivity.

The body of the DAE Report does not address this issue – rather, it includes shocks to transport costs that would suggest that the infrastructure investments should increase productivity. Moreover, the discussion in the first paragraph of subsection 2.3 in the DAE Report suggests that NSW faces *increasing* returns to scale. There is some tension between this and the discussion of congestion in Appendix D of the DAE Report.

5.3.2 Labour-leisure choice

As measures of economic welfare, DAE proposes household income and aggregate consumption. In DAE-REGEM, household utility is assumed to be a Cobb-Douglas function of private consumption, government consumption and saving. Hence, the value shares of private consumption, government consumption and saving in aggregate income are constant. DAE-REGEM does not include leisure in the utility function. Hence, *any* increase in the participation rate is deemed to be welfare-enhancing.

5.3.3 Aggregating over time

When calculating the effects of an investment on a community's economic welfare, it is important to take an intertemporal view that recognises that any consumption foregone by the community's citizens in order to free the resources necessary to make the investment should be offset against the increased future consumption facilitated by the investment. Deviations of consumption from base-case values in future years (e.g., 2035-36) can thus be misleading indicators of the welfare effects of the investments.

It is also conventional to apply a discount factor to future consumption. The DAE Report does not include numerical results for consumption or income aggregated over time. However, it includes such results for GSP, with future values undiscounted, as noted above. ACIL Allen is of the view that GSP should not, in any case be relied on as a measure of economic welfare.

Chart 2.2 in the DAE Report does not seem to show any sacrifice of domestic consumption (relative to base-case levels) in early years when the investment activity is taking place. Hence, ACIL Allen infers that the investments are (implicitly) funded by foreign borrowing. If so, it is important that measures of aggregate income do not include the return on investments financed from foreign borrowing. There is no discussion of this issue in the DAE Report.

5.3.4 Who should be included in the welfare measure?

The discussion in subsections 3.2 and 5.3.1 above suggests that a distinction should be made between the effects of the Rebuilding NSW package on the economic welfare of the incumbent citizens of NSW and the income earned by the new immigrants that are assumed to arrive as a consequence of improvements in transport infrastructure. In deciding whether or not to support the policy, the voters of NSW would presumably be more concerned with its effects on the incumbents than with the fact that it would induce additional migrants to share their living standards.

The DAE report does not make such a distinction, although it is clear that the increase in activity and income generated by the investment component of the package is due largely to an induced increase in immigration. At the meeting between ACIL Allen and DAE on 11 August 2015, representatives of DAE stated that their modelling should be interpreted as indicating that incumbent residents of NSW, as well as new immigrants, would be made better off by the Rebuilding-NSW package. In asserting this, DAE relied on an assumption that the economic characteristics of the new immigrants would be identical to (or at least in material dimensions substantially similar to) those of the incumbents. However, the first paragraph on page 12 of the DAE Report acknowledges that the “demographic mix of the residents arriving in the state” is a material determinant of aspects of the DAE results. The body of the Report provides no further details, although Appendix D includes discussion of the demographics of the base-case population.

ACIL Allen accepts that it is reasonable to conclude that incumbents would be made better off by shocks included in the DAE modelling that reflect assumed cost reductions. This includes all the

¹¹ Increases in population increases congestion and hence costs associated with living and working in the city in which the population increase occurs. However, increases in population and population density may increase worker productivity through agglomeration benefits. Neither of these issues were raised or discussed in any significance in the DAE report.

shocks imposed to reflect the effects of leasing the NSPs and those reflecting the assumption that infrastructure investments would reduce transport costs and travel times and increase water availability for agriculture and mining. All these shocks impose productivity improvements on the domestic economy. It is not so clear, however, that shocks reflecting an induced increase in NSW population lead to increases in incumbents' economic welfare. If the NSW economy faces decreasing returns to scale (due to congestion costs, for example), then the population increase could well reduce incumbents' economic welfare. As noted in subsection 5.3.1 above, there is some evidence in the DAE results that suggests this may be the case in the DAE modelling.

5.4 The relationship between infrastructure investment and asset leasing

ACIL Allen understands that the terms of reference provided to DAE required it to evaluate separately the effects of leasing the NSW NSPs and the effects of investing in transport and water infrastructure in NSW. DAE concluded that both the leasing and the investments would have favourable effects on the NSW economy.

As noted above, ACIL Allen has some reservations about these conclusions but even if they are accepted, there is an underlying issue about whether or not they can legitimately be interpreted as indicating that the economic impact of the Rebuilding NSW Plan is favourable. This depends on whether sufficient attention has been paid to the connection between the asset-leasing and infrastructure-investment components of the plan.

As noted above, DAE's approach (consistent with its terms of reference) is to model how much better off the NSW economy would be if the infrastructure investments proceeded than it would be if the investments were not made at all. Another possibility would be to view the Rebuilding NSW Plan as a plan for financing infrastructure investments that could be financed in other ways if the network businesses were not leased. From this perspective, it would be more appropriate to model how much better off the NSW economy would be if the infrastructure investments were financed by the proceeds of asset leasing than it would be if the investments were financed by borrowing (say), with the dividends earned from the government-owned network businesses contributing to the servicing of the required borrowing. In this context, the price received for the proposed leases would be crucial. To the limited extent that DAE addresses this issue, it takes a very optimistic view. In particular, it assumes that potential lessees would assume that the current regulatory regime would persist into the future and that uncertainty about this would not induce them to discount the revenue stream estimated on the basis of the revenue-as-usual assumption.

5.5 Overall summary: answers to key questions

Taking as given the terms of reference provided to Deloitte Access Economics, are the assumptions that are made in the Report plausible?

Asset leasing

In ACIL Allen's view, the assumptions made by DAE about the cost savings likely to flow from partial leasing of the NSPs are plausible. Given that DAE was instructed to assume that leasing would pass full managerial control to the private sector, its processes for deriving efficiency assumptions from limited data on the efficiency of government-owned network businesses relative to privately owned businesses are conservative. DAE avoids giving its results a level of precision that cannot be supported by the data.

DAE's assumptions about the rate at which efficiencies would be realised post leasing are somewhat arbitrary but overall plausible. DAE appears to make realistic assumptions about the way in which reductions in capital expenditure would be incorporated into allowable costs as conventionally measured.

However, ACIL Allen has reservations about the plausibility of DAE's assumptions that the AER's historical approach to setting network charges would persist post privatisation and that potential lessees would adopt this assumption in determining the price they will offer for the leases.

Infrastructure investment

In ACIL Allen's view, the assumptions made by DAE about the construction costs of the proposed Rebuilding NSW investments and the effects of increased water availability on agriculture and mining seem plausible. Consistent with its approach to assessing the effects of network leasing, DAE avoids giving their modelling a spurious level of detail. However, it was difficult to assess the materiality of these assumptions because of the lack of a detailed decomposition of the DAE results into the contributions of the individual drivers of the results.

In formulating assumptions about the effects of investments in transport infrastructure on freight costs and travel times and consequently on NSW population and employment, DAE relied very heavily on the work of Duranton and Turner, which relates to US cities drawing migrants from a pool of non-urban population. ACIL Allen considers that this part of the DAE Report is not plausible because DAE overestimated the proportional change in urban road infrastructure and because the Duranton and Turner elasticities used are at the high end of econometric estimates for the United States in the literature based on the range of estimates of induced traffic effects for road building. These factors combine to lead to unreasonably large induced population effects. At a minimum, ACIL Allen would have expected DAE to undertake sensitivity analysis on these parameters across the likely range of estimates as reported in the literature.

Two other factors make ACIL Allen sceptical about the plausibility of this part of the DAE Report. The first is that the Report provides no explanation of the geographic origin of the people who account for the increase in NSW population assumed in the DAE modelling. Secondly, the flat timing evident in DAE's population, transport-cost and travel-time shocks seems to be in tension with DAE's stated position to have dealt adequately with the well-known problem of population movements eroding the reduction in congestion that infrastructure investment is designed to produce.

Is the overall modelling approach consistent with approaches used in contemporary economics and policy analysis?

DAE does not use its model to *explain* the effects of asset leasing or infrastructure investment. Instead, it adopts the key explanations from other sources – principally, data on cost differences between publicly and privately owned NSPs, and estimates by Duranton and Turner of the effects of transport infrastructure on transport costs and population movements. It then uses the DAE-RGEM model to help it summarise the implications of what it assumes to be the key drivers the economy wide implications of infrastructure investment. This approach of estimating the effects of shocks outside the model and imposing those external estimates on the model is common practice among CGE modellers.

When used in this way, the model produces patterns of structural change that are necessary to make the model's theory and data consistent with the externally imposed estimates of the effects of the shocks of interest. Underlying the results in the DAE Report must be patterns of change in NSP input requirements and in interstate and international migration that allow DAE-RGEM to accommodate DAE's assumptions about the effects of the Rebuilding NSW package on electricity prices and the NSW population. DAE could have given more confidence that it had applied its modelling approach appropriately had it reported the inferred patterns and related them to external data on network technologies and population distribution.

As well as estimating summary measures of the aggregate effect of shocks, a CGE model is also capable of providing decompositions of the summary measures to show the relative importance of the key drivers. In assessing the Rebuilding NSW plan, DAE separates the effects of network privatisation from the effects of infrastructure investment but it fails to report any decomposition of the relative importance of the key drivers of the effects of infrastructure investment.

Are the results of the assessment internally consistent as published?

Apart from some unresolved queries about the timing of NSPs' realisation of efficiency gains, ACIL Allen has found no evidence of internal inconsistency in the DAE assessment of the effects of the proposed network leasing.

ACIL Allen has reservations about the internal consistency of DAE's results for the effects of the Rebuilding NSW infrastructure investments. These relate mainly to the persistence of the reductions in transport costs and commuting times in the face of the large induced increase in population. This latter

aspect is hard to reconcile with DAE's stated position to have accounted appropriately for the tendency of increasing population to erode the reductions in congestion initially generated by infrastructure investment.

Are the overall conclusions of the Report consistent with the modelling results as published?

Asset leasing

DAE concludes that partially leasing the NSW NSPs would make a positive contribution to NSW GSP. This is consistent with the DAE modelling and follows intuitively from the assumption that the leasing would promote factor productivity in the network businesses.

Infrastructure investment

DAE concludes that the infrastructure investments included in the Rebuilding NSW plan would make a large positive contribution to NSW GSP. This is consistent with the DAE modelling and follows principally from the large increase in the labour force that the investments are assumed to induce. But the increase in per capita GSP induced by the investments is small and driven mainly by an increase in labour-market participation. The DAE Report provides no detailed discussion of this feature of the results. In particular, there is no discussion of the extent to which the expansionary effects of the investments can be interpreted as favourable or otherwise from the point of view of NSW's existing residents.

Additivity

The section of the DAE Report entitled "About this report" states:

"... productivity gains in electricity combine with improved infrastructure to create greater benefits overall than could be achieved with both individually."

ACIL Allen finds no evidence to support the claim that this reflected in the DAE modelling. All decompositions included in the DAE Report (e.g., p. iv) suggest that the effects of network leasing and those of infrastructure investment are simply additive in the modelling.

Reporting

DAE reports its results in ways that maximise the extent to which its results can give the impression that the effects of the Rebuilding NSW package on the NSW economy are favourable. It fails to point out that deviations from base values reported in absolute dollar terms represent only small changes in the rate of growth of the economy. In comparing projected future increases in GSP with the current level, it fails to apply discount factors to convert the future values to present-value units.

Welfare implications

The DAE Report focusses mainly on the effects of the Rebuilding NSW package on the level of activity in the NSW economy. It notes that measures of domestic income or domestic consumption are alternative measures of the welfare effects of shocks but does not provide any extensive discussion of their appropriateness relative to the activity measures.

According to the DAE modelling, the effects of the Rebuilding NSW package on per capita GSP, income or consumption are small. This reflects the fact that the main driver of the expansionary effects of the package is an increase in NSW population, driven by the assumption that increased transport infrastructure will attract additional migrants from interstate or overseas and will increase the labour-force participation rate.

The brief discussion in the DAE Report about the time pattern of the effect of the Rebuilding NSW package on NSW consumption does not resolve the question of whether the resources required for the Rebuilding NSW investments are provided in the modelling by sacrifice of domestic consumption or by foreign capital inflow.

The DAE Report does not address the issue of whether or not the expansionary effects of the Rebuilding NSW package would be associated with an increase in the economic welfare of the incumbent population of NSW, as opposed to allowing new migrants to enjoy a standards of living similar to that enjoyed by the incumbents following adoption of the package. While it is reasonable to

assume that those aspects of the package that increase labour productivity in NSW would benefit incumbent residents, there is some evidence in the DAE results to suggest that the NSW economy faces decreasing returns to scale. This would be an offset to whatever benefit the productivity enhancements would have for incumbent residents.



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