NERA
ECONOMIC CONSULTING

Review of the Long Term Revenue Constraint in NBN Co's SAU

A report for Optus

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1. Introduction

This report has been prepared by NERA Economic Consulting (NERA) at the request of Optus. Its subject is the revenue constraint element of the terms proposed by NBN Co for the supply of 'listed carriage services' on the NBN Co Network.

The regulatory and financial arrangements proposed by NBN Co for the supply of both an Access Service and Ancillary Services are set out in a special access undertaking (SAU) [1] lodged with the Australian Competition and Consumer Commission (ACCC) on 28 September 2012.[2]

NBN Co states in its SAU that the proposed Long Term Revenue Constraint Methodology or LTRCM is designed to ensure that:

> "NBN Co will be allowed the opportunity to recover its costs over time (inclusive of an appropriate return on capital), but no more."[3]

and that its proposed approach:

> "is consistent with the 'Building Block' revenue methodologies used by the ACCC and other regulators in a range of industries."[4]

We have been asked to review the particular arrangements proposed under the LTRCM, by reference to both the stated objectives and functioning of the methodology, as well as any relevant principles applied in other regulated industries.

Taking into account our findings above, we have also been asked to describe potential modifications or alternatives to the LTRCM that would assist in ensuring that NBN Co's long term cost recovery arrangements are limited to those costs that would be incurred by a prudent provider of such services.

Our report is structured as follows:

- section 2 assesses the LTRCM by reference to established approaches to the regulation of services provided by infrastructure assets;
- section 3 sets out any recommendations for alternative approaches to regulating NBN Access Services and the Ancillary Services; and
- Appendix A details the assumptions that underpin our analysis of the SAU.

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1 NBN Co, *NBN Co Special Access Undertaking, given to the ACCC in accordance with Part XIC of the Competition and Consumer Act 2010 (Cth)*, 28 September 2012.

2 Unless otherwise indicated, throughout this report we use various defined terms adopted in the NBN Co SAU as if they have the same meaning as those set out in NBN Co SAU.

3 NBN Co, *Supporting Submission NBN Co Special Access Undertaking*, 28 September 2012, page 113

4 *Ibid.*

2. Review of the LTRCM

This section provides a high level description of the proposed LTRCM and sets out our analysis of its operation and associated methodological issues, with a particular focus on:

- the adequacy of the information made available by NBN Co for undertaking a detailed assessment of the implications of the LTRCM on the medium to long term price of NBN Access Services; and
- potential methodological problems with the LTRCM, by reference to both its stated objectives and relevant principles applied by regulators in similar contexts.

2.1. LTRCM and its context

The LTRCM element of the SAU has the essential purpose of formalising a mechanism for recovery of NBN Co's costs, including a regulated return on capital. The LTRCM operates by placing a ceiling on the revenues that NBN Co may recover (and so the prices that it may set) for the supply of all Access and Ancillary Services, over the 27 year term of its proposed SAU.

Although the LTRCM is potentially applicable in each year of the SAU, it does not become a binding constraint until such time as NBN Co has recovered its initial losses, plus the required return on those losses. NBN Co states that it does not expect that to be the case "for at least 10 years".[5]

NBN Co states that the LTRCM:

> "….is consistent with the 'Building Block' revenue methodologies used by the ACCC and other regulators in a range of industries (now including telecommunications) and also incorporates an Initial Cost Recovery Account (ICRA) mechanism, which recognises the timing difference between when costs are incurred to build and operate the NBN and when revenues are received, and is also supported by a number of regulatory precedents."[6]

The SAU sets out a description and an associated mathematical equation for each of the constituent components of the LTRCM. These include:

- the Annual Building Block Revenue Requirement (ABBRR);
- the Regulatory Asset Base (RAB); and
- the Initial Cost Recovery Account (ICRA).

In section 2.2 we identify the information that would be necessary to enable a detailed complete assessment of the implications of the LTRCM for the price of NBN Access Services.

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5 NBN Co, *Supporting Submission NBN Co Special Access Undertaking*, 28 September 2012, page 115

6 NBN Co, *Supporting Submission NBN Co Special Access Undertaking*, 28 September 2012, page 113

Notwithstanding the absence of any working model and associated forecasts capable of illustrating how the LTRCM will operate, we have undertaken a preliminary assessment of the LTRCM using forecast financial data made available elsewhere in NBN Co's SAU, together with number of reasonable assumptions. Our analysis of these data in combination with a number of necessary, supplementing assumptions suggests that:

- the LTRCM will not have a binding effect on NBN Co's prices over the 27 year time horizon of the SAU;
- the ICRA will continue to grow up to and beyond 2039/40;
- at some point subsequent to the SAU, when the ICRA is exhausted, the LTRCM must result in a substantial fall in NBN Co's prices, of at least 45 per cent; and
- the LTRCM provides little if any incentive for NBN Co to minimise the cost (both operating and capital) of providing NBN Access Services and the Ancillary Services, and is inconsistent with all building block-base regulatory regimes.

2.2. Adequacy of information

NBN Co's SAU sets out the regulatory arrangements proposed to apply to the single largest regulatory investment program ever contemplated in Australia. Notwithstanding the significance, size and scope of this investment program, the detailed financial information supporting the SAU is substantially below that which would normally be provided in any similar regulatory context. Although the SAU provides a description and mathematical formula of each of the LTRCM components it does not include:

- any form of financial model illustrating the effect of NBN Co's investment and pricing plans on the RAB, ABBRR and ICRA elements of the LTRCM, and how they are to be calculated over time; and
- any estimates of the effect of critical LTRCM parameters on the anticipated outcomes of the methodology.

The provision of NBN Co's LTRCM model would greatly assist interested parties in understanding the effect of the proposed regulatory arrangements by complementing the information already contained in the SAU. The provision of NBN Co's LTRCM regulatory model would also allow interested parties to confirm that the LTRCM operates in the manner that is claimed, such as that:[7]

> "… revenues would result in a zero expected net present value (NPV) of all relevant cash flows, which is consistent with standard utility regulation."

The absence of such supporting detail and an associated regulatory model is not consistent with the established regulatory practice of the ACCC's associated body, the Australian Energy Regulator (AER). In sharp contrast to the level of detail set out in the SAU, the associated regulatory and financial model for each application of the building blocks

[7] NBN Co, *Supporting Submission NBN Co Special Access Undertaking*, 28 September 2012, page 115

regulatory method in the energy sector is made available as an integral part of the public consultation process adopted by the AER.

An omission of equal significance is the absence of information capable of populating NBN Co's proposed LTRCM model for the entire 27 years of the SAU. The unavailability of these data mean that interested parties are not able to fully analyse the implications of the LTRCM.

In section 2.4 below we have developed an estimate of the LTRCM regulatory model that reflects our understanding of the arrangements proposed by NBN Co, and populated the model using information contained in NBN Co's Corporate Plan 2012-15.[8] Notwithstanding the existence of some information in its Corporate Plan, there is insufficient available data on NBN Co's proposed activities to populate the LTRCM model fully. Missing data, for which we have had to make interpolating or other assumptions, include:

- financial information on NBN Co's activities (ie, capex, opex, revenue and interest costs) for the periods:
  - 2021/22 to 2026/27; and
  - 2028/29 to 2038/39.
- information on how the applicable weighted average cost of capital (ie, the margin of 3.5 per cent above the risk free rate) has been derived;[9]
- information on regulatory depreciation over the 2011 to 2040 period; and
- information on the value of Construction in Progress over the 2011 to 2040 period.

The absence of this information – which, presumably NBN Co has created as part of its own long term planning – means that interested parties do not have the opportunity to examine the full implications of the proposed LTRCM.

A complete understanding of the proposed LTRCM and its articulation by way of a financial model also requires a number of general market assumptions, such as:

- 10 year Commonwealth bond yields;
- changes in the Consumer Price Index (CPI);
- company tax rates; and
- the value of created imputation credits (gamma).

Appendix A to this report set out the assumptions that we have adopted in order to populate the LTRCM model.

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8 NBN Co, *Corporate Plan 2012-15*, 6 August 2012,

9 We note that the NBN Co commissioned Value Advisor Associates to consider the reasonableness of their WACC proposal against their best estimate of the *current* rates of return. However, NBN Co does not provide any evidence of the reasonableness of its proposed rate of return, ie, a margin 3.5 per cent above the risk free rate, over time. Specifically, whether the proposed WACC is a reasonable return to be applied to past NBN investments, or more importantly, is an appropriate rate of return in the future.

2.3. Potential methological issues

The LTRCM contained in the SAU proposes that the ABBRR compensate NBN Co for its actual tax costs rather than its benchmark tax costs given regulatory assumptions as to its financing and other arrangements. This is a significant departure from the approach applied to other regulated entities.

Under the LTRCM, NBN Co's taxable profit would be calculated by deducting the following from actual nominal revenue:[10]

- nominal opex;
- NBN Co's actual interest expense; and
- nominal tax depreciation.

By contrast, the usual regulatory approach to the estimation of taxable profit is to deduct from regulatory nominal revenue:[11]

- nominal opex;
- interest expense as derived from regulatory assumptions as to the gearing ratio, RAB and cost of debt; and
- nominal tax depreciation.

In other words the LTRCM model departs from the usual regulatory practice by using actual revenues and interest expenses, rather than benchmark regulatory values for these parameters. The effect of these differences is difficult to estimate, although we note that:

- the use of actual revenue (rather than the ABBRR) is likely to result in a delay in any positive net tax allowance, since actual revenues are expected to be below the ABBRR until 2022-23;[12] and
- NBN Co's actual interest expenses appear to be substantially below the likely regulatory benchmark cost of debt, (eg, in 2039-40, NBN Co has a positive return on net debt of $1.2 billion[13]), the effect of which would be to substantially increasing the net tax allowance provided to NBN Co, as compared with the usual regulatory approach.

Without more detailed financial data being made available it is not possible to determine precisely the overall effect of this departure from usual regulatory practice. Nevertheless, our preliminary assessment is that this departure would have a substantial positive effect on NBN Co's financial value, as compared with the usual regulatory approach.

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[10] We note that this definition of taxable income is ambiguous as to the treatment of gifted assets, which gives rise to a tax liability.

[11] See the AER's post-tax revenue model.

[12] See section 2.4, of this report.

[13] See, *Exhibit 9-2: Forecast Summary Financials (Nominal Dollars)*, NBN CO, *Corporate Plan 2012-15*, 6 August 2012, page 72.

2.4. Model-based assessment of the LTRCM

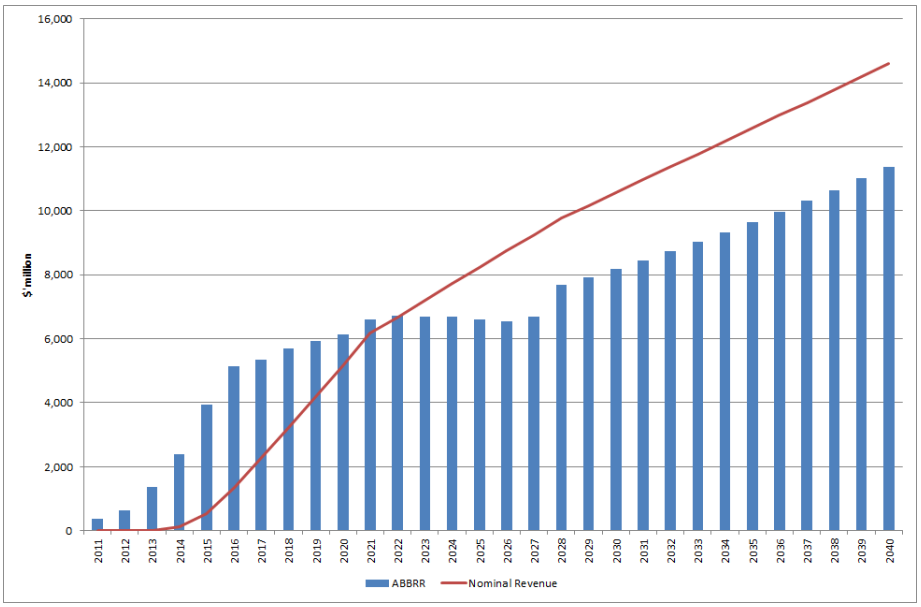
To assess the implications of the LTRCM we populated a model that reflects the arrangements proposed in the SAU with NBN Co's published financial data, in combination with the assumptions that:

- 10 year Commonwealth Government bond yields return smoothly to their long term average;
- consumer price inflation is at the mid-point of the Reserve Bank of Australia's inflation target of between 2 and 3 per cent;
- for the years that NBN Co's financial data is not available, forecast values smoothly change to the next available data point;
- nominal regulatory depreciation is held at a constant 5 per cent of the RAB's opening value; and
- the corporate tax rate and gamma are 30 per cent and 0.25, respectively.

We set out a detailed description of how each of the LTRCM components has been derived in Appendix A to this report.

Figure 2.1 sets out our estimate of the ABBRR and actual revenue for NBN Co. Figure 2.1 illustrates that in the initial years of the roll out, NBN Co's actual revenues are not expected to recover the cost of the services it provides. Only in 2022/23 would NBN Co expect to earn sufficient revenue to recover its then forecast annual costs.

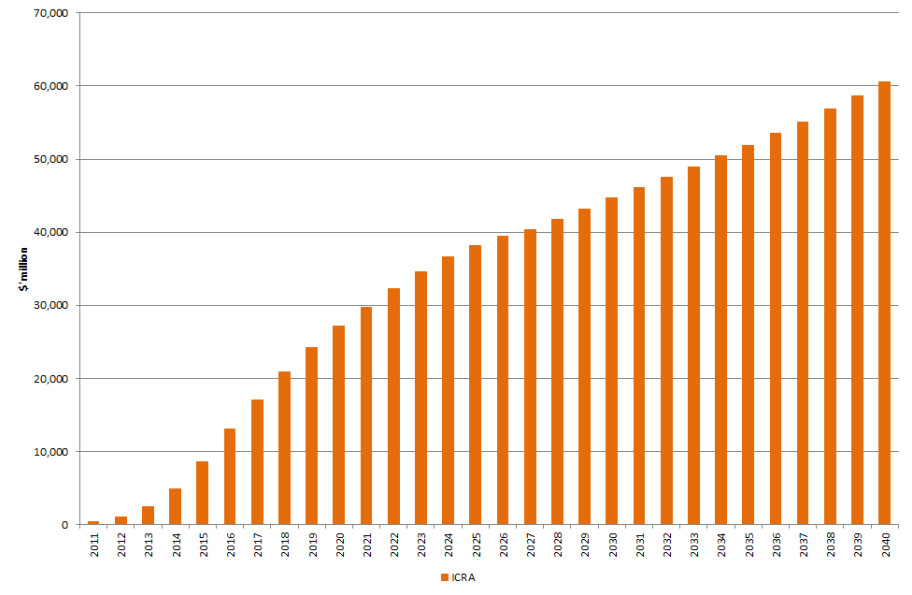
Figure 2.1:
NBN Co - ABBRR and Actual Revenue



The expected deficit in actual revenues in the initial years will result in a positive ICRA. Figure 2.2, sets out our forecast of the ICRA balance at the end of each financial year. Figure

2.2 illustrates that the ICRA account is expected to grow continuously over the period 2011 to 2040, reaching a closing balance at 30 June 2040 of $60.6 billion.

Figure 2.2:
NBN Co - ICRA



On the basis of this analysis, we conclude that:

- the operation of the LTRCM is unlikely to be binding and so has no active role in constraining NBN Co's pricing over the 27 year time horizon of the SAU;
- assuming the terms of the proposed SAU were to continue beyond its 27 year life, at some future point when the ICRA is exhausted, NBN Co will be required to make a substantial reduction in its prices; and
- the LTRCM provides neither any incentive on NBN Co to minimise its costs (either opex and capex) nor any form of regulatory supervision as to the prudence of the costs it does incur.

We explained the basis for each of these conclusions in the following sections.

2.4.1. Is the LTRCM binding?

The LTRCM is designed to ensure that NBN Co will recover all of its costs in the long term. This is achieved through the operation of the ICRA that allows any deficit in revenues in the initial years to be recovered in later years. Our analysis suggests that there will be a deficit in nominal revenue until 2022/23. However, by 2039/40 nominal revenues will exceed the ABBRR by $3.2 billion (ie, 28.3 per cent).

Notwithstanding this increasing 'over recovery' of costs, the ICRA continues to grow over the SAU period, since in each year the outstanding value of ICRA is uplifted by the regulatory WACC. In the final years of the SAU, growth in the ICRA is driven by the return earned on the account.

Figure 2.3 breaks down the annual change in the ICRA on account of unrecovered costs (with negative values representing an over recovery of costs) as distinct from the regulatory return earned on the outstanding account value.

Figure 2.3:
NBN Co – Return on ICRA and Unrecovered Cost

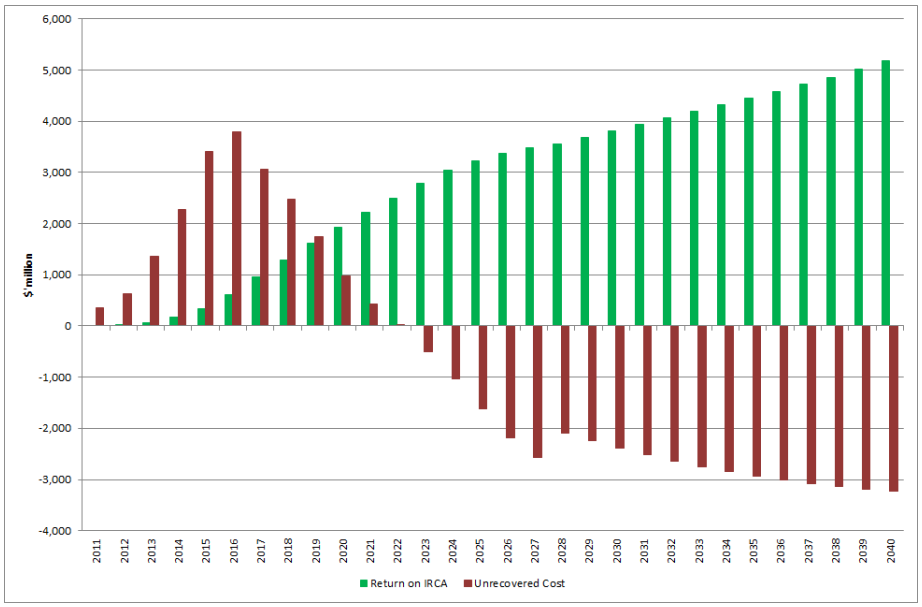


Figure 2.3 illustrates that the return component of the ICRA is the reason why the account continues to grow, even though NBN Co's actual revenues are far in excess of the ABBRR. In 2039/40 NBN Co's actual revenues would need to be at least $16.5 billion (ie, $5.2 billion or 45.5 per cent greater than the ABBRR in that year) to reduce the value of the ICRA.

Although we acknowledge that there is significant uncertainty associated with any forecasts made over such a long period of time, our analysis highlights the likelihood that the LTRCM may never have a binding effect on NBN Co's pricing decisions. Furthermore, the likelihood that the LTRCM is not binding would increase if:

- NBN Co's costs are greater than forecast;
- NBN Co's actual revenues are less than forecast;
- the WACC is greater than forecast; or
- inflation is greater than forecast.

The economic consequences of the LTRCM being non-binding are that for a substantial period of time after it has been built, NBN Co will over-recover its then efficient costs, as represented by its ABBRR at the time. It follows that future prices for NBN Co's Access Service will be much greater than they would otherwise need to be to recover the future efficient cost of providing those services.

2.4.2. Stability of NBN prices

Our understanding of the design intent of the LTRCM is that it will only become binding when the ICRA falls to zero. At that point in time prices would need to fall to ensure that NBN Co does not over-recover its forecast efficient costs, as given by the ABBRR.

The extent of the fall in prices will then depend on the extent that NBN Co is over-recovering its ABBRR. Our analysis suggests that, at the end of the initial SAU period, NBN Co revenues will need to be 45.5 per cent greater than its efficient costs to reduce the ICRA. It is reasonable to surmise that the extent of over-recovery of revenues would need to be substantially greater in order to run down the closing ICRA balance of $60.6 billion. This suggests a substantial fall in NBN prices when the LTRCM does become binding.

Such sharp changes in the prices for NBN Access Services are unlikely to be in the best interests of either NBN Co or its customers. The potentially significant variations in prices highlight the difficulty of locking in a regulatory approach for close to 27 years when there is considerable uncertainty today in relation to:

- the cost of rolling out the NBN Network;
- customer demand for NBN Access Services;
- competition from alternative distribution technologies; and
- potentially unknown future services that could be provided by NBN Co.

In section 3 we set out an alternative regulatory regime that provides for greater flexibility to deal with this uncertainty.

2.4.3. Incentives to minimise costs

The LTRCM established by the SAU is designed to ensure that NBN Co is able to recover all costs that are incurred by it, irrespective of the efficiency or prudence of those costs. The recovery of all incurred costs is enshrined in the LTRCM since:

- all incurred opex costs are included in the ABBRR; and
- all incurred capex is rolled into the RAB.

The consequence of these arrangements is that NBN Co receives no financial reward for reducing the cost of providing NBN Access or Ancillary Services (other than the present value neutral benefit of earlier cost recovery). On the other hand, NBN Co is not penalised for any increase in costs. It follows that the LTRCM provides no incentive for NBN Co to operate efficiently and to minimise its costs. Further, the LTRCM makes no provision for the ACCC or any other independent entity to review the prudence of its expenditure on either an *ex ante* or *ex post* basis.

The need for a regulatory system to contain either incentives for efficient capital expenditure or more information intensive means for monitoring capex (such as through *ex post* review of

the prudence of capital spending) has been recognised by the Australian Energy Markets Commission (AEMC) in the context of its development of the revenue and pricing principles for the electricity transmission sector:[14]

> "The provision of commercial incentives for transmission system operators to achieve cost efficiencies, to make timely, efficient investments and to maintain the longer-term reliability and availability of transmission services is a central element of effective economic regulation. The design and provision of effective incentive regimes can be a cost-effective alternative to more information intensive approaches to regulation. The incentive approach can encourage the delivery of more efficient and reliable service outcomes while avoiding the cost and intrusiveness of more direct forms of regulation."

When compared against all regulatory regimes of which we are aware, the arrangements proposed in the SAU are anomalous because they provide no incentive for NBN Co to minimise its costs over the 27 year period of the SAU. The absence of such incentives – or, alternatively, some form of administrative arrangement for determining the extent to which costs incurred are prudent – within the LTRCM framework significantly increases the risk of inefficient expenditure by NBN Co.

[14] AEMC, *Review of the Electricity Transmission Revenue and Pricing Principles: Initial Consultation Scoping Paper*, July 2005, page 20.

3. Potential Alternative Approaches

This section discusses a potential alternative regulatory approach that incorporates some form of incentive for efficient capital expenditure decisions on the part of NBN Co.

3.1. Priorities for the SAU

Our assessment of the NBN Co Corporate Plan 2012-15 suggests that total capital and operating expenditure on NBN services is forecast to be in the order of $150 billion.[15] To ensure that NBN Co fully recovers these costs, it is proposing to establish a regulatory framework that would bind both itself and the ACCC for the 27 year period of the SAU.

In our opinion, the putting in place of a long term regulatory regime that gives such a high priority to certainty over flexibility is likely to deliver sub-optimal outcomes, and has significant potential to be unsustainable. The desirability of enshrining a degree of regulatory flexibility is essential given:

- the considerable uncertainty that exists now as to the cost and timing of the roll out of NBN services, which we recognise frustrates the potential establishment of *ex ante* cost benchmarks – however, given the 'repeat' nature of many aspects of the NBN Co 10 year roll out, the uncertainty surrounding these costs can be expected to reduce significantly over time;
- the uncertain predictions of future demand for NBN services – ie, take up rates, willingness-to-pay, competing service providers (ie, mobile) – in an industry characterised by disruptive technologies and innovative new services; and
- the potential for unforeseen events to render inflexible regulatory regimes as unsustainable in the long term – for example the onset of the global financial crisis in 2007 gave rise to the 'unravelling' of the highly prescriptive framework for determining the regulatory cost of capital that had earlier been established (in the name of 'certainty') for the electricity transmission sector.

Further, any regulatory regime that guarantees the complete recovery of all incurred costs significantly increases the risk of inefficient expenditure. Further, the very substantial scale of the expenditure on the NBN Network means that even small improvements in efficiency would justify any reasonable level of regulatory costs that such a regime may impose.

In our opinion, a necessary first step in providing greater regulatory flexibility would be to acknowledge that the current SAU encompasses two distinct phases:

- the build phase (up to 2022/23), where the focus should be on providing incentives for efficient investments; and
- the cost recovery phase (post 2022/23) where, once costs are known the focus shifts to recovering those costs in the most efficient manner.

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[15] Based on our assumptions outlined in Appendix A, we estimate that over the 1 July 2010 to 30 June 2040 period, the NBN Co will incur $73 billion in capital expenditure and $80 billion in operating expenditure.

3.2. NBN build phase

The first phase of the current proposed SAU encompasses the roll out of the fibre and wireless/satellite networks, ie, up to 2022/23. An inevitable predicament at the start of this phase is that, without any historical data, it is very difficult for a regulator to develop or approve *ex ante* estimates of NBN Co's costs. The lack of reliable cost data prohibits the immediate development of an efficiency incentive regime.

In the absence of a workable incentive regime, there would be considerable merit in the SAU providing for some form of supervisory or review arrangement to cover expenditure being undertaken over the initial period (say, 3-5 years). Such review arrangements could be in the form of either an *ex ante* or *ex post* review of NBN Co expenditure. The SAU should establish the principles by reference to which such review would be undertaken, including that NBN Co has a reasonable prospect of recovering its prudent and efficient expenditure. In our opinion, the potential for efficiency gains implied by the very substantial scale of expenditure in the initial rollout phase would comfortably outweigh the costs associated with such a review.[16]

However, 3-5 years into the build phase, the regulator is likely to have gained considerably greater visibility of the actual costs of rolling out NBN services. At this point in time, the SAU should provide the ACCC with the flexibility to establish an *ex ante* incentive regime that would apply to capital expenditure being undertaken for the remainder of the roll out period.[17] The regulator would need to develop a bespoke *ex ante* incentive regime for NBN Co that took into account the need for it:

- to continue to be subject to the price cap;
- to continue to encourage the timely roll out of the fibre and wireless/satellite networks; and
- to promote the end customer adoption of NBN services and so not necessarily to recover NBN Co's prudent costs during the build phase.[18]

3.3. The NBN cost recovery phase

Following the completion of the initial roll out of NBN services, the principal task of the regulatory arrangements would then be address the question of how to best recover its efficiently and prudently incurred costs. The efficient recovery of NBN costs is likely to require a regulatory regime that provides a high degree of pricing flexibility. Such flexibility would ensure that costs are recovered through a pricing structure that would largely depend on the demand characteristics of NBN services such as:

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[16] Based on our assumptions outlined in Appendix A, we estimate that over the 1 July 2010 to 30 June 2016 period, NBN Co will incur $18 billion in capital expenditure and $10 billion in operating expenditure.

[17] Based on our assumptions outlined in Appendix A, we estimate that over the 1 July 2016 to 30 June 2023 period, NBN Co will incur $21billion in capital expenditure and $22 billion in operating expenditure.

[18] We note that if NBN Co were to be required to recover its costs during the roll out phase, it would result in extremely volatile prices that were dependent on the take up rate of NBN services. This would also have the potential to penalise early adopters of the NBN and so discourage the take up of NBN services.

- the actual services provided by the fibre and wireless/satellite networks owned by NBN Co;
- the level of competition for NBN Co's services that may also be provided by other technology distribution platforms (such as mobile services); and
- the willingness-to-pay and take up rates of NBN Co's services.

However, the development of an efficient pricing structure for NBN services will require a detailed assessment of market conditions at the commencement of the cost recovery phase, ie, 2023/24. It is impracticable to forecast demand for current services, let alone possible new services, in 10, 20 and 30 years in the future. It follows that the SAU needs to be sufficiently flexible to allow NBN to adjust prices during the cost recovery phase.

Appendix A. Information Sources and Assumptions

This appendix sets out the information sources and reasonable assumptions that underpin our analysis of the LTRCM element of NBN Co's SAU. In particular, we set out below how each the following key parameters of our analysis were estimated, ie:

- the nominal vanilla WACC;
- annual inflation;
- capital expenditure;
- straight line depreciation;
- the regulatory asset base (RAB);
- nominal opex;
- nominal revenue;
- the net tax allowance;
- the annual building block revenue requirement (ABBRR); and
- the initial cost recovery account.

We note that the NBN Co Corporate plan 2012-15 does not provide a breakdown of the annual Construction in Progress (CIP) and so the Annual Construction in Progress Allowance (ACIPA) has been omitted from our analysis. However, the inclusion of the ACIPA is unlikely to have a substantial impact on our analysis, since the only substantive impact of including construction in progress would be a slight adjustment to the depreciation allowance which is NPV neutral.[19]

A.1. Nominal vanilla WACC

Clause 1F.6 of the SAU requires the nominal vanilla WACC is to be equal to a 3.50 per cent margin over the:

> *mean annualised yield on Commonwealth Government Securities with a maturity of 10 years, averaged over the final 20 Business Days of the preceding Financial year and using the indicative mid rates published by the Reserve Bank of Australia*.

We note that the Reserve Bank of Australia (RBA) does not publish a 10 year indicative mid-rate and so it is necessary to calculate this 10 year rate by interpolating the yields of Commonwealth Government Securities (CGS) bonds closest to the 10 year term and which also straddle the 10 year expiry date. This is the same approach as that adopted by the AER to estimate the 10 year CGS yield for regulated energy networks.

[19] Within the LTRC model capital expenditure that is not commissioned within a regulatory year (and so falls into the CIP) earns the same return on capital as commissioned capex. The only difference is that the CIP is not depreciated unlike commissioned capex.

For the years that RBA data is available, ie, 2010/11, 2011/12 and 2012/13 we have calculated this rate using RBA data which results in the following rates of return:

- 8.90% for 2010/11 using a risk free rate of 5.40% which is the mean annualised CGS yield over the 20 business days to 30 June 2010;
- 8.72% for 2011/12 using a risk free rate of 5.22% which is the mean annualised CGS yield over the 20 business days to 30 June 2011; and
- 6.51% for 2012/13 using a risk free rate of 3.01% which is the mean annualised CGS yield over the 20 business days to 29 June 2012.

For future years we have estimate the nominal vanilla WACC on the following basis:

- for 2013/14 we have adopted the mean annualised CGS yield over the 20 business days to 19 December 2012, ie, a risk free rate of 3.22% and a WACC of 6.72%; and
- a straight line transition over 10 years from the current risk free rate of 3.22% to the long run average annualised risk free rate[20] of 5.32%.

Table A.1, below, sets out the risk free rates and subsequent WACCs assumed in our analysis.

Table A.1
Risk Free Rate and WACC Assumptions

Year	2011	2012	2013	2014	2015	2016	2017
Risk free rate	5.40%	5.22%	3.01%	3.22%	3.43%	3.64%	3.85%
WACC	8.90%	8.72%	6.51%	6.72%	6.93%	7.14%	7.35%
Year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024 +**
Risk free rate	4.06%	4.27%	4.48%	4.69%	4.90%	5.11%	5.32%
WACC	7.56%	7.77%	7.98%	8.19%	8.40%	8.61%	8.82%

A.2. Inflation

Clause 1F.8.4(b) of the SAU specified how the Cumulative Inflation Factor (CIF) should be calculated. It requires that:

- the CIF in the first year be equal to 1; and
- in each subsequent year the CIF is to be calculated using the June Consumer Price Index (CPI).

[20] The long run risk free rate has been estimated using the reported 10 year yield published by the RBA in Table F2: Capital Market Yields – Government Bonds – Monthly from December 2002 to November 2012.

For historical dates we have followed clause 1F.8.4(b) to calculate the data CIF. From 2012/13 onwards we have adopted an inflation forecast of 2.5%, which is the mid-point of the RBA inflation target.

Table A.2, below sets out the annual inflation applied in our analysis.

Table A.2
Annual Inflation

Year	2011	2012	2013+
Annual inflation	3.77%	1.31%	2.50%

A.3. Capital expenditure

Clause 1E.2 of the SAU requires Real Capital Expenditure to be grossed up for half a years' return on capital. This is presumably based on the assumptions that:

- capital expenditure is commissioned on average midway through the financial year (ie, 31 December); and
- commissioned capital expenditure does not earn a return on capital in the year that it is commissioned.

The primary source of capital expenditure data is *Exhibit 9-2: Forecast Summary Financials (Nominal Dollars)* of the NBN Co's Corporate Plan (the "Corporate Plan").[21] The exhibit sets out NBN Co's expected annual nominal dollar capital expenditure in the following years:

- 2010/11 to 2020/21;
- 2027/28; and
- 2039/40.

Real Capex each of these years is then calculated by:

- dividing the nominal capital expenditure in each year by the appropriate CIF to derive Real Capital Expenditure; and
- multiplying the Real Capital Expenditure in each year by $(1+WACC_t)^{0.5}$ to derive Real Capex.

However, the Corporate Plan does not provide any information on its expected nominal capital expenditure in the following years:

- 2021/22 to 2026/27; and

[21] NBN CO, *Corporate Plan 2012-15*, 6 August 2012, page 72.

- 2028/29 to 2038/39.

Ideally, NBN Co would have provided this information, however, in the absence of this information I have estimated the capital expenditure in the omitted years by:

- assuming a constant growth in the annual number of houses passed (both fibre and wireless);
- a smoothed incremental capital expenditure per connection (both fibre and wireless);[22]
- calculating the total capital expenditure (both fibre and wireless) by multiplying the smoothed incremental capital expenditure per connection by the assumed number of houses passed; and
- a smoothed growth in other capex.

Table A.3, overleaf, sets out the capital expenditure applied in our analysis.

A.4. Depreciation

NBN Co has provided no information on its expected regulatory depreciation. For the purposes of our analysis I have assumed that real depreciation is equal to 5 per cent of the RAB at the start of each financial year.

A.5. Regulatory asset base

Clause 1E.2 of the SAU sets out how the real and nominal RAB is to be calculated over time. Table A.4, overleaf, sets out the real and nominal RAB over time applied in our analysis.

[22] The calculation of incremental capital expenditure costs relies on information contained in Exhibits 9-2 and 9-7 of the Corporate Plan. See NBN CO, *Corporate Plan 2012-15*, 6 August 2012, pages72 and 75.

Table A.3
Annual Capital Expenditure (Nominal Dollars)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Fibre House Passed (000s)	18	39	341	1,307	2,912	4,625	6,279	7,838	9,283	10,783	12,202	12,383	12,563	12,744	12,925
New Fibre House Passed (000s)	18	21	302	966	1,605	1,713	1,654	1,559	1,445	1,500	1,419	181	181	181	181
Fibre Capex per House ($Nominal)	5,611	20,381	5,493	2,706	2,225	2,225	2,172	2,210	2,198	2,104	2,060	2,321	2,583	2,844	3,106
Fibre Capex ($m)	101	428	1,659	2,614	3,571	3,811	3,593	3,446	3,176	3,156	2,923	420	467	514	561
Wireless House Passed (000s)	165	174	320	374	752	907	921	934	948	961	974	986	997	1,009	1,020
New Wireless House Passed (000s)	165	9	146	54	378	155	14	13	14	13	13	12	12	12	12
Wireless Capex per House ($Nominal)	788	13,667	4,336	13,389	2,087	2,987	6,786	4,231	5,500	1,769	1,692	1,660	1,629	1,597	1,565
Wireless Capex ($m)	130	123	633	723	789	463	95	55	77	23	22	19	19	18	18
Other Capex ($m)	232	337	899	609	656	646	536	485	507	431	410	468	526	584	642
Total Capex ($m)	**463**	**888**	**3,191**	**3,946**	**5,016**	**4,920**	**4,224**	**3,986**	**3,760**	**3,610**	**3,355**	**907**	**1,012**	**1,116**	**1,221**
Real Capex ($m)*	**483**	**914**	**3,171**	**3,830**	**4,754**	**4,554**	**3,818**	**3,519**	**3,241**	**3,039**	**2,758**	**728**	**793**	**855**	**912**

* *Includes the half year return required by Clause 1E.2.1 of the SAU*

Numbers in black have been sourced from NBN Co's Corporate Plan, while numbers in blue have been assumed by NERA.

Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Fibre House Passed (000s)	13,106	13,286	13,467	13,631	13,795	13,959	14,123	14,287	14,451	14,615	14,779	14,943	15,107	15,271	15,435
New Fibre House Passed (000s)	181	181	181	164	164	164	164	164	164	164	164	164	164	164	164
Fibre Capex per House ($Nominal)	3,367	3,629	3,890	4,397	4,904	5,411	5,919	6,426	6,933	7,440	7,947	8,454	8,961	9,468	9,976
Fibre Capex ($m)	609	656	703	721	804	887	971	1,054	1,137	1,220	1,303	1,386	1,470	1,553	1,636
Wireless House Passed (000s)	1,032	1,043	1,055	1,066	1,076	1,087	1,097	1,108	1,118	1,129	1,139	1,150	1,160	1,171	1,181
New Wireless House Passed (000s)	12	12	12	11	11	11	11	11	11	11	11	11	11	11	11
Wireless Capex per House ($Nominal)	1,533	1,501	1,469	1,442	1,415	1,388	1,360	1,333	1,306	1,279	1,252	1,224	1,197	1,170	1,143
Wireless Capex ($m)	18	17	17	15	15	15	14	14	14	13	13	13	13	12	12
Other Capex ($m)	700	758	816	856	895	935	974	1,014	1,054	1,093	1,133	1,172	1,212	1,251	1,291
Total Capex ($m)	**1,326**	**1,431**	**1,536**	**1,592**	**1,714**	**1,837**	**1,959**	**2,082**	**2,204**	**2,327**	**2,449**	**2,572**	**2,694**	**2,817**	**2,939**
Real Capex ($m)*	**966**	**1,017**	**1,065**	**1,077**	**1,132**	**1,183**	**1,231**	**1,276**	**1,318**	**1,358**	**1,394**	**1,428**	**1,460**	**1,489**	**1,516**

* *Includes the half year return required by Clause 1E.2.1 of the SAU*

Numbers in black have been sourced from NBN Co's Corporate Plan, while numbers in blue have been assumed by NERA.

Table A.4
Real and Nominal RAB ($m)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Real start RAB	0	459	1,304	4,252	7,678	11,810	15,546	18,396	20,819	22,857	24,601	25,991	25,383	24,868	24,436
Real Capex	483	914	3,171	3,830	4,754	4,554	3,818	3,519	3,241	3,039	2,758	728	793	855	912
Real Disposals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Real Depreciation	-24	-69	-224	-404	-622	-818	-968	-1,096	-1,203	-1,295	-1,368	-1,336	-1,309	-1,286	-1,267
Real end RAB	459	1,304	4,252	7,678	11,810	15,546	18,396	20,819	22,857	24,601	25,991	25,383	24,868	24,436	24,081
CIF	*1.00*	*1.01*	*1.04*	*1.06*	*1.09*	*1.12*	*1.15*	*1.17*	*1.20*	*1.23*	*1.27*	*1.30*	*1.33*	*1.36*	*1.40*
Nominal start RAB	**0**	**459**	**1,321**	**4,415**	**8,172**	**12,885**	**17,385**	**21,086**	**24,460**	**27,526**	**30,367**	**32,885**	**32,919**	**33,056**	**33,295**
Nominal end RAB	459	1,321	4,415	8,172	12,885	17,385	21,086	24,460	27,526	30,367	32,885	32,919	33,056	33,295	33,631

Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Real start RAB	24,081	23,795	23,572	23,406	23,259	23,171	23,136	23,149	23,204	23,296	23,421	23,575	23,753	23,952	24,169
Real Capex	966	1,017	1,065	1,077	1,132	1,183	1,231	1,276	1,318	1,358	1,394	1,428	1,460	1,489	1,516
Real Disposals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Real Depreciation	-1,252	-1,241	-1,232	-1,224	-1,220	-1,218	-1,218	-1,221	-1,226	-1,233	-1,241	-1,250	-1,261	-1,272	-1,284
Real end RAB	23,795	23,572	23,406	23,259	23,171	23,136	23,149	23,204	23,296	23,421	23,575	23,753	23,952	24,169	24,400
CIF	*1.43*	*1.47*	*1.50*	*1.54*	*1.58*	*1.62*	*1.66*	*1.70*	*1.74*	*1.79*	*1.83*	*1.88*	*1.93*	*1.97*	*2.02*
Nominal start RAB	**33,631**	**34,063**	**34,587**	**35,201**	**35,855**	**36,612**	**37,472**	**38,430**	**39,484**	**40,632**	**41,871**	**43,199**	**44,613**	**46,112**	**47,693**
Nominal end RAB	34,063	34,587	35,201	35,855	36,612	37,472	38,430	39,484	40,632	41,871	43,199	44,613	46,112	47,693	49,354

A.6. Nominal opex

NBN Co's expected future total operating expenditure (opex) is set out in *Exhibit 9-2: Forecast Summary Financials (Nominal Dollars)* of the Corporate Plan.[23] This exhibit sets out NBN Co's expected annual nominal opex in the following years:

- 2010/11 to 2020/21;
- 2027/28; and
- 2039/40.

However, the Corporate Plan does not provide any information on its expected nominal opex in the following years:

- 2021/22 to 2026/27; and
- 2028/29 to 2038/39.

Ideally, NBN Co would have provided this information, however, in the absence of this information we have assumed a smooth growth in nominal opex in the omitted years.

Table A.5, below sets out the nominal opex assumed in our analysis.

Table A.5
Nominal NBN Co Opex ($m)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Nominal Opex	337	521	1,093	1,777	2,904	3,628	3,394	3,350	3,201	3,037
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Nominal Opex	3,151	3,049	2,947	2,845	2,743	2,641	2,539	2,437	2,513	2,589
	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Nominal Opex	2,666	2,742	2,818	2,894	2,970	3,046	3,123	3,199	3,275	3,351

Numbers in black have been sourced from NBN Co's Corporate Plan, while numbers in blue have been assumed by NERA.

A.7. Nominal revenue

Within the NBN Co SAU nominal revenue is a key component in the calculation of:

- the Net Tax Allowance; and
- Unrecovered Cost.

[23] NBN CO, *Corporate Plan 2012-15*, 6 August 2012, page 72.

NBN Co's expected future revenue are set out in *Exhibit 9-2: Forecast Summary Financials (Nominal Dollars)* of the Corporate Plan.[24] This exhibit sets out NBN Co's expected annual nominal revenue in the following years:

- 2010/11 to 2020/21;
- 2027/28; and
- 2039/40.

However, the Corporate Plan does not provide any information on its expected nominal revenues in the following years:

- 2021/22 to 2026/27; and
- 2028/29 to 2038/39.

Ideally, NBN Co would have provided this information. However, in the absence of this information we assume a smooth growth in nominal revenue in the omitted years.

Table A.6 below sets out the nominal revenue over time assumed in our analysis.

Table A.6
Nominal NBN Co Revenue ($m)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Nominal revenue	0	2	18	120	529	1,346	2,281	3,221	4,200	5,167
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Nominal revenue	6,175	6,593	7,040	7,516	8,026	8,569	9,149	9,769	10,101	10,445
	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Nominal revenue	10,801	11,168	11,548	11,941	12,348	12,768	13,203	13,652	14,117	14,597

Numbers in black have been sourced from NBN Co's Corporate Plan, while numbers in blue have been assumed by NERA.

A.8. Compensation for tax

One of the annual building blocks established by NBN Co's SAU is the Net Tax Allowance. Clause 1F.8 of the SAU sets out how the Net Tax Allowance should be calculated, specifically:

$$Net\ Tax\ Allowance_t = [Max\ (0, Taxable\ Profit_t + Tax\ Loss\ Carried\ Forward_{t-1})] * \tau\ (1-\gamma)$$

To estimate NBN Co's Net Tax Allowance we have made the following assumptions.

[24] NBN CO, *Corporate Plan 2012-15*, 6 August 2012, page 72.

- the future corporate tax rate (τ) will remain at 30 per cent;
- the estimated value of gamma (γ) is 0.25;
- Interest Expense is equal to the estimated Net Cash Interest (Funding Costs) reported in *Exhibit 9-2: Forecast Summary Financials (Nominal Dollars)* of the Corporate Plan;[25] and
- tax depreciation is equal to NBN Co's forecast accounting depreciation which has been calculated as the difference between EBITDA and EBIT in *Exhibit 9-2: Forecast Summary Financials (Nominal Dollars)* of the Corporate Plan.[26]

Again we note that the Corporate Plan does not provide any information for the following years:

- 2021/22 to 2026/27; and
- 2028/29 to 2038/39.

We have assumed a smooth growth in NBN Co's interest expense and tax depreciation over the omitted years. Table A.7 on the following page sets out the annual Net Tax Allowance assumed in our analysis.

A.9. Annual building block revenue requirement

Clause 1F.3 of the SAU sets out how NBN Co's ABBRR should be calculated. Table A.8, overleaf, uses the values set out above to derive our estimate of NBN Co's ABBRR over the period 2011 to 2040.

A.10. Initial cost recovery account

Clause 1F.4 of the SAU sets out how NBN Co's ICRA should be calculated over time. Applying the estimates outlined in the above sections Table A.9, overleaf, sets out our estimate of the ICRA over the period 2011 to 2040.

[25] NBN CO, *Corporate Plan 2012-15*, 6 August 2012, page 72.

[26] NBN CO, *Corporate Plan 2012-15*, 6 August 2012, page 72.

Table A.7
Nominal Net Tax Allowance ($m)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Nominal Revenue	0	2	18	120	529	1,346	2,281	3,221	4,200	5,167	6,175	6,688	7,202	7,715	8,229
Nominal Opex	-337	-521	-1,093	-1,777	-2,904	-3,628	-3,394	-3,350	-3,201	-3,037	-3,151	-3,049	-2,947	-2,845	-2,743
Interest Expense	33	60	55	72	83	-1	-176	-344	-615	-786	-961	-924	-886	-888	-889
Nominal Tax Depreciation	19	70	253	413	641	908	1,111	1,280	1,414	1,539	1,669	1,686	1,703	1,720	1,737
Taxable Profit	-323	-529	-1,273	-1,998	-2,933	-3,191	-2,400	-1,753	-1,030	-195	394	1,030	1,666	2,263	2,860
Tax Loss Carried Forward	-323	-852	-2,125	-4,123	-7,056	-10,247	-12,647	-14,400	-15,430	-15,625	-15,231	-14,201	-12,535	-10,272	-7,413
Taxation Rate - 30% ***Tax Gamma - 0.25***															
Net Tax Allowance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Nominal Revenue	8,742	9,256	9,769	10,171	10,574	10,976	11,378	11,781	12,183	12,585	12,988	13,390	13,792	14,195	14,597
Nominal Opex	-2,641	-2,539	-2,437	-2,513	-2,589	-2,666	-2,742	-2,818	-2,894	-2,970	-3,046	-3,123	-3,199	-3,275	-3,351
Interest Expense	-655	-422	-188	-71	46	163	280	397	514	630	747	864	981	1,098	1,215
Nominal Tax Depreciation	1,754	1,771	1,788	1,785	1,781	1,778	1,774	1,771	1,768	1,764	1,761	1,757	1,754	1,750	1,747
Taxable Profit	3,692	4,524	5,356	5,803	6,249	6,696	7,142	7,589	8,035	8,482	8,928	9,375	9,821	10,268	10,714
Tax Loss Carried Forward	-3,721	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxation Rate - 30% ***Tax Gamma - 0.25***															
Net Tax Allowance	**0**	**181**	**1,205**	**1,306**	**1,406**	**1,506**	**1,607**	**1,707**	**1,808**	**1,908**	**2,009**	**2,109**	**2,210**	**2,310**	**2,411**

Table A.8
NBN Co's estimated ABBRR ($m)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Return on Capital	0	40	86	297	566	920	1,278	1,594	1,901	2,197	2,487	2,762	2,834	2,916	2,937
Nominal Regulatory Depreciation	24	64	199	320	474	593	675	760	837	910	972	910	917	926	938
Nominal Opex	337	521	1,093	1,777	2,904	3,628	3,394	3,350	3,201	3,037	3,151	3,049	2,947	2,845	2,743
Net Tax Allowance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxable Profit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ABBRR	**361**	**625**	**1,378**	**2,393**	**3,944**	**5,141**	**5,347**	**5,704**	**5,939**	**6,144**	**6,610**	**6,722**	**6,698**	**6,687**	**6,617**

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Return on Capital	2,966	3,004	3,051	3,105	3,162	3,229	3,305	3,389	3,482	3,584	3,693	3,810	3,935	4,067	4,207
Nominal Regulatory Depreciation	952	969	988	1,007	1,031	1,057	1,086	1,117	1,151	1,188	1,227	1,268	1,312	1,357	1,405
Nominal Opex	2,641	2,539	2,437	2,513	2,589	2,666	2,742	2,818	2,894	2,970	3,046	3,123	3,199	3,275	3,351
Net Tax Allowance	0	181	1,205	1,306	1,406	1,506	1,607	1,707	1,808	1,908	2,009	2,109	2,210	2,310	2,411
Taxable Profit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ABBRR	**6,559**	**6,693**	**7,681**	**7,931**	**8,188**	**8,458**	**8,739**	**9,032**	**9,336**	**9,650**	**9,975**	**10,310**	**10,655**	**11,009**	**11,373**

Table A.9
NBN Co's estimated ICRA ($m)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ABBRR	361	625	1,378	2,393	3,944	5,141	5,347	5,704	5,939	6,144	6,610	6,722	6,698	6,687	6,617
Nominal Revenue	0	2	18	120	529	1,346	2,281	3,221	4,200	5,167	6,175	6,688	7,202	7,715	8,229
Unrecovered Cost	361	623	1,360	2,273	3,415	3,795	3,066	2,483	1,739	977	435	33	-504	-1,029	-1,611
Opening ICRA	0	361	1,015	2,442	4,879	8,632	13,044	17,068	20,842	24,200	27,108	29,763	32,296	34,573	36,594
Nominal Vanilla WACC	8.90%	8.72%	6.51%	6.72%	6.93%	7.14%	7.35%	7.56%	7.77%	7.98%	8.19%	8.40%	8.61%	8.82%	8.82%
Closing ICRA	**361**	**1,015**	**2,442**	**4,879**	**8,632**	**13,044**	**17,068**	**20,842**	**24,200**	**27,108**	**29,763**	**32,296**	**34,573**	**36,594**	**38,210**

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ABBRR	6,559	6,693	7,681	7,931	8,188	8,458	8,739	9,032	9,336	9,650	9,975	10,310	10,655	11,009	11,373
Nominal Revenue	8,742	9,256	9,769	10,171	10,574	10,976	11,378	11,781	12,183	12,585	12,988	13,390	13,792	14,195	14,597
Unrecovered Cost	-2,183	-2,563	-2,088	-2,241	-2,385	-2,518	-2,639	-2,749	-2,847	-2,935	-3,013	-3,080	-3,137	-3,185	-3,224
Opening ICRA	38,210	39,397	40,309	41,776	43,220	44,647	46,067	47,491	48,931	50,400	51,910	53,476	55,112	56,836	58,663
Nominal Vanilla WACC	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%	8.82%
Closing ICRA	**39,397**	**40,309**	**41,776**	**43,220**	**44,647**	**46,067**	**47,491**	**48,931**	**50,400**	**51,910**	**53,476**	**55,112**	**56,836**	**58,663**	**60,614**

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