Review of Appendix A, ACCC Draft Decision on State Water Application

A REPORT PREPARED FOR STATE WATER

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Executive summary

Background

State Water has commissioned Frontier Economics to undertake an independent expert critique of the analysis in Appendix A of the ACCC's Draft Decision on State Water's Application for regulated charges to apply from 1 July 2014 (ACCC 2014a). Appendix A presents an economic analysis of State Water's proposed tariff structure, prepared by Dr Darryl Biggar.

Validity of underlying assumptions

In Frontier's view, the Appendix provides a useful way of framing the issues and our disagreements with Biggar's conclusions relate in large part to the validity of his underlying assumptions.

In particular, Biggar's analysis relies heavily on the following assumptions:

- it is possible to forecast expected long-term water availability
- State Water is not capital-constrained
- irrigators have no access to other risk-management tools in the water market
- water trading occurs only within State Water's region
- the price of water in the market would never go so low as to motivate water users to forgo use of the water rather than pay the delivery charge
- the increase in volatility of irrigators' cashflows from a shift towards a more cost-reflective tariff structure with a higher fixed charge would of itself be a major cause of them not being able to secure finance.

Our report provides clear evidence that these assumptions do not hold true in practice. By Biggar's own admission this would invalidate the policy conclusions with respect to retaining the current 40:60 tariff structure accompanied by his Loss Capitalisation Model (LCM). For example, Biggar explicitly observes that:

- If unforeseeable climate change means it is impossible to forecast expected long-term water availability, the only means of protecting State Water from this risk is to change the tariff structure to be more cost-reflective.
- If risk-management products such as forward contracts were available in the water market this would remove the need to use the tariff structure as a risk management tool.
- If revenue volatility required State Water to finance its operations through debt it would imply higher borrowing costs or lower credit limits which could limit its ability to invest.

Other deficiencies in the analysis

The analysis also contains a number of other major deficiencies including:

- lack of comprehensive and balanced assessment of how volume-related risk should be allocated and lack of critical analysis as to the materiality of perceived problems with irrigators bearing more of this risk or the existence of mechanisms to help them to manage such risk
- insufficient attention is given to the likelihood of extended periods of under- or over-recovery and the impacts of these on the financial sustainability of State Water and its ability to invest, the inherent sustainability of the regulatory regime, and inter-generational equity under the LCM.
- failure to consider practical application of his concepts to the regulatory regime in the real world or to take account of the impact of delivery charges on interstate water trading.
- use of extreme and unrealistic examples.

Frontier's findings

Contrary to Biggar's assessment, our analysis finds:

- State Water's proposed tariff structure would result in small changes in farm business financials as compared to many other risks that they face. We therefore question whether this change would significantly affect farm viability
- risk management products in the water market are in fact becoming available, and therefore their absence should not be used to justify the use of the tariff structure as a risk management tool
- leaving delivery charges high does affect efficiency of water use
  - when interstate trade is taken into account, high delivery charges in excess of the efficient level can distort water market outcomes and lead to water being inefficiently allocated between competing uses within and outside of State Water areas/valleys.
  - it is plausible for the market price of water to fall to extremely low levels (as occurred in late 2011-12) due to high water availability and low water demand. As observed by Biggar, under such circumstances it is possible that high charges for water delivery will deter some productive uses of water at the margin.
  - State Water's proposed tariff structure would therefore contribute to improving the efficiency of water use.
- the LCM is a convoluted mechanism that does not ensure that State Water can recover its efficient costs. It also abstracts away from some key practical

issues in establishing a robust and stable regulatory regime in practice. If a more cost-reflective tariff structure were to be adopted, the LCM would not be required.

It is therefore a major concern that the analysis in this Appendix appears to largely underpin the ACCC's draft decision on the structure of tariffs and the form of price control Based on the analysis presented in this report and the additional information it contains with respect to the validity of the underlying assumptions, the ACCC must reconsider its Draft Decision with respect to these issues.

1 Introduction

The ACCC has released its Draft Decision on State Water's Application for regulated charges to apply from 1 July 2014. Appendix A of the ACCC's Draft Decision presents an economic analysis of State Water's proposed tariff structure, prepared by Dr Darryl Biggar (ACCC 2014a).

Given the Draft Decision on the tariff structure appears to rely heavily on the conclusions of the analysis in Appendix A, State Water has commissioned Frontier Economics to undertake an independent expert critique of the analysis in this Appendix.

The Appendix discusses the effect of State Water's proposed tariff structure on risk sharing/revenue adequacy; the incentives on State Water to reduce costs and to invest; and the efficiency of water use.

The key conclusions in Appendix A include:

- With regard to the impact of the proposed tariff structure on risk sharing:
  - While the proposed tariff structure would reduce the variability in State Water's cash-flows, it is not yet clear that this would have any material economic significance. This is because State Water's commercial viability should not be jeopardised under the current tariff structure as .it should be adequately compensated on average. At this stage the economic harm from exposing State Water to some risk remains unclear.
  - While the impacts of the proposed tariff structure on waters users' cashflows depend on assumptions about the scope for water trading, State Water's proposal would likely increase the risk faced by many of State Water's customers, potentially reducing the amount they can borrow thereby reducing their investment or increasing their risk of insolvency. State Water's proposal would reduce the risk-management role played by State Water's tariff structure, although it would make more sense as water trading is developed and associated risk management tools (e.g. hedge or forward contracts) are developed.
- The impact of the proposed tariff structure on State Water's incentives to reduce costs or to invest is limited to non-existent.
- The proposed tariff structure may have some (perhaps minor) impact on improving the efficiency of water use.

The following discussion provides our assessment of the analysis of these issues in the Appendix. In addition, we raise a number of other issues in our analysis of whether the policy prescriptions suggested by Biggar would be appropriate in practice.

2 Risk sharing/impact on cashflows and financial viability

The Appendix separately addresses the impact on State Water and water users respectively of State Water's proposed tariff structure.

2.1 Impact on State Water

2.1.1 Overall impact and intent of the proposed tariff structure

We agree with Biggar that the proposed tariff structure is not intended to change its average revenue. We also agree that State Water is currently exposed to volatility in its annual cashflow and the proposed tariff structure would reduce this volatility.

2.1.2 Costs associated with financing revenue shortfalls

Biggar queries Frontier Economics' previous conclusion that even though over and under recovery should balance out, State Water incurs a cost associated with financing this variable revenue stream. Biggar suggests that a firm with volatile cashflows does not need any additional revenue, provided that the cost of capital is set correctly.

This would appear to be inconsistent with the ACCC's conclusions with regard to its proposed 'unders and overs' mechanisms which allows State Water to recover extra revenue following a period of under-recovery through a rate of return (WACC value of 7.44%) on the balance in the 'unders and overs' account.

This inconsistency would be removed if what Biggar is saying is that the cost of capital or a firm with volatile revenues should be commensurately higher than a firm with less volatile revenues. This would imply, for example, that, in the absence of any other mechanism, State Water's beta should be set at a higher level if it is constrained to operate within a tariff structure which imposes significant revenue volatility on it compared to one (such as State Water's proposed structure) which provides for greater revenue stability. We note, however, that the ACCC has set State Water's beta at a relatively low level of 0.7.

In any event, "setting the cost of capital correctly" to reflect the potentially extreme volatility in State Water's revenue arising from the major variability in water deliveries in a particular regulatory period may be problematic.

2.1.3 Uncertainty in forecasting long-term water availability

Biggar makes some important points about uncertainty in forecasting long-term water availability. Indeed, his conclusion that State Water should be compensated

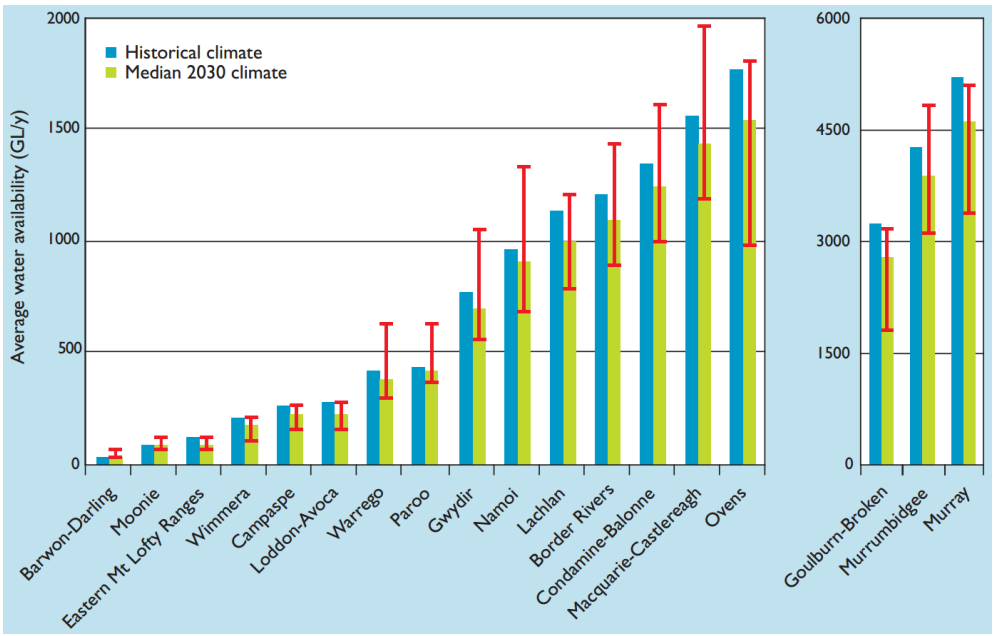
on average under the current tariff structure appears to be based on the condition that it is possible to forecast long-term average water availability. He further states that:

> Why then, might State Water be concerned about volatility in the revenue it receives? One possibility is that uncertainty about climate change introduces uncertainty into the ability to forecast long-term water availability. Under the current arrangements, if there is a permanent shift towards a dryer climate in the Murray-Darling Basin, it may take many years before this shift is revealed in the climate data. Over that period of time State Water would likely substantially under-recover its expenses. State Water may seek to avoid this hard-to-quantify risk.... If State Water's concern is with protecting itself from unforeseeable climate change, the only way to do so is to change the tariff structure. (ACCC 2014a, p. 275)

Frontier agrees that the difficulty in accurately forecasting long-term water availability is a key issue in considering the appropriate tariff structure. In particular we note that there is considerable uncertainty about the impact of climate change on long-term average water availability.

The most recent Intergovernmental Panel on Climate Change (IPCC) report on climate change was released in March 2014 (IPCC 2014). This report considered impacts, adaptation and vulnerability to climate change. It identified that there was "continuing uncertainty about the severity and timing of climate-change impacts". In 2008, CSIRO completed the Murray–Darling Basin Sustainable Yields Project. This project identified the potential impact of climate change on MDB water resources (covering many of State Water's valleys) and highlighted the very large uncertainty inherent in climate projections for 2030 — as represented by the red bars in Figure 1.

Figure 1: Uncertainty of climate change impacts on water availability



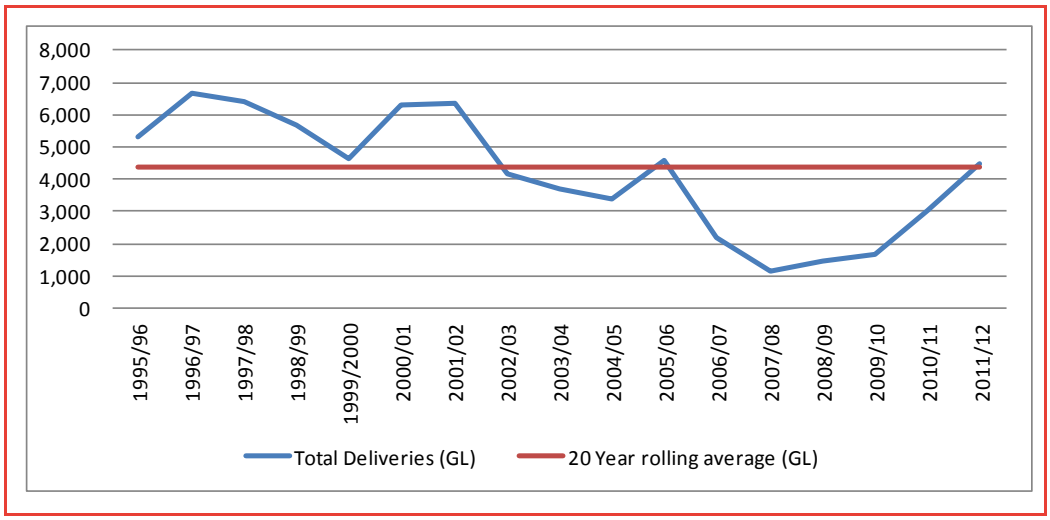
Source: CSIRO 2008

Clearly, the past 20 year average cannot necessarily be taken to be indicative of the future long-term average. We agree with Biggar that the best way to address this risk is to change the tariff structure — so that the revenue State Water needs to recover its efficient costs is less dependent on the accuracy with which demand forecasts turn out to be true but rather reflects its underlying cost structure.

Even if the past 20 year average were to be accepted, there is considerable variation around this average. As evidence in the recent drought, this can involve water deliveries falling to 20% of their average level, and remaining at extremely low levels for extended periods that can extend well beyond a regulatory period. Deliveries can also increase substantially above the long-term 20 year average, resulting in periods where users will be paying substantially in excess of the efficient revenue requirement.

Figure 2 shows State Water's actual water deliveries since 1992-93. This shows it is not uncommon for State Water to experience periods of below average water sales volumes that extend well beyond a single regulatory period.

Figure 2: State Water's annual water deliveries



Source: Data provided by State Water.

Given the relatively high frequency of multi-year 'unders' or 'overs', it is very unlikely that the average water deliveries for a regulatory period will equal the long-term average.

Biggar contends that such variations do not matter as State Water will recover its efficient costs on average over the long run. We think that such variations do matter:

- The Water Charge (Infrastructure) Rules 2010 require (S 29 (2) (b) (i) that the Regulator cannot approve regulated charges unless it is satisfied that "the applicant's total forecast revenue (from all sources) for the regulatory period

is reasonably likely to meet the prudent and efficient costs of providing infrastructure services **in that regulatory period**" [emphasis added]. Curiously, these last four words are not included in the reference to the WCIR in the ACCC's Decision.

- The qualification that the forecast revenue must be reasonably likely to meet the prudent and efficient costs of providing services in that regulatory period in our view implies a clear policy intent that a regulated business should have a reasonable opportunity to recover their efficient costs in each and every regulatory period, rather than potentially have extended periods of under- and over-recovery which might balance out on average in the long run. Given the inherent volatility of deliveries around the long-term average, in our view this imposes a much stronger obligation on the ACCC to ensure that the regulated charges maximise the probability that the forecast revenues (recognising the uncertainty of those forecasts) will allow the regulated business to recover its costs for that period. Adoption of a cost-reflective tariff structure is clearly the most direct approach to ensuring revenue adequacy in the next regulatory period.
- Extended periods of under- or over-recovery would in practice raise a number of issues about inter-generational equity, impact on State Water's financial position and its consequent ability to borrow and invest, and the sustainability of the regulatory regime.

2.1.4 Access to capital markets

Biggar notes that:

> Another possible reason why State Water may be concerned about revenue volatility relates to imperfections in or lack of access to capital markets. Perhaps State Water, as a government-owned firm, does not have normal access to the capital markets. Perhaps it can only finance its operations through debt. In this case an increase in revenue volatility might imply higher borrowing costs, or lower credit limits (which potentially limits investment). However, to my knowledge, State Water has not made these arguments. (ACCC 2014a, p. 275

State Water is in fact capital-constrained in that it cannot borrow unlimited amounts of money. Its borrowings take place via the NSW Treasury Corporation, for which it pays an interest rate including a guarantee fee which takes into account State Water's credit rating. State Water is a commercial entity and its Board have legal obligations for the business to be run as a commercial business including appropriate debt management practices. Imposition of excessive debt on State Water — particularly where such debt is effectively incurred to pay for ongoing operational activities rather than for capital investment — would impact on its credit rating and its cost of borrowing. This would ultimately affect State Water's ability to undertake capital investment.

2.1.5 Availability of other mechanisms to manage risks

Biggar suggests that if revenue volatility for State Water is a concern there are other mechanisms, besides changing the tariff structure, for reducing the risk faced by State Water, such as the Loss Capitalisation Mechanism (LCM). We note that the ACCC has proposed an 'unders and overs' mechanism in conjunction with its proposal to retain the existing tariff structure.

In our view this accompanying mechanism is complex, leads to charging arrangements which are not very transparent, and does not meet the objective inherent in the WCIR to ensure that regulated businesses have a reasonable opportunity to recover their efficient costs in each and every regulatory period, not just over the very long run (see above).

Such complex and non-transparent mechanisms should only be adopted in the absence of better alternative instruments to address the various policy issues of concern. In our view, a cost-reflective tariff structure, supplemented by direct measures (e.g. existing hardship schemes) to address concerns about the cashflows of a small subset of irrigators, is a much superior policy response than distorting the tariff structure for all customers.

2.1.6 Theory versus practice

Biggar concludes (ACCC 2014a, p. 280) that, on the basis of evidence which he has examined, it appears unlikely that State Water's claim that the change in tariff structure it proposes is essential for it to maintain commercial viability.

This analysis does not appear to have taken into account the evidence on what actually occurred during the extended period of below average deliveries during the millennium drought, as presented in section 4 of State Water's application.

As shown in its Application, over the 2006–10 regulatory period and the first two years of the current regulatory period, under-recovery of revenue amounted to around $79.1 million ($2013-14). As State Water illustrates, this under-recovery was driven by the tariff structure mandated by IPART (fixed to variable charge ratio of 40:60) during an extended period when actual water sales significantly below assumed volumes.

During the 2006-10 regulatory period, which included the worst years of the drought, State Water's average return on assets was 2.7 per cent (compared to the allowed rate of 6.5 per cent). State Water observed that during this period it was able to retain an investment grade credit rating largely due to:

- the receipt of operating subsidies from the NSW Government to compensate for variations between 'notional' and 'transitional' regulated revenue allowances for valleys not at full cost recovery

- an agreement between NSW Treasury and State Water on a dividend payout ratio adjustment mechanism to ensure an investment grade credit rating was maintained
- actual debt gearing levels substantially below the 60 per cent efficiency benchmark adopted by IPART and the ACCC.

State Water further observed that had the water availability conditions experienced during the worst years of the drought continued into the 2010–14 regulatory period, State Water's financial viability would have deteriorated below investment grade credit rating and a capital injection would have been requested from shareholders.

The recourse to operating subsidies from the NSW Government provides cogent evidence that the current tariff structure does not provide for State Water to finance its ongoing activities through recovery of its efficient revenue requirement under certain inflow scenarios. Such subsidies are contrary to the principles and objectives of full cost recovery under the NWI and the WCIR.

2.2 Impact on cashflows of water users

The Appendix also seeks to analyse the impact of State Water's proposed tariff structure on the cashflows and related risk of water users.

Biggar observes correctly that under State Water's tariff proposal, customers would pay less in wet years (or, more accurately, years of high water deliveries) and more in dry years, with less overall variability in their annual water bill. He then seeks to explore the impact of this shift in risk, under both a 'no water trade' scenario and under a scenario where water trading is able to occur.

2.2.1 Impact of risk-sharing on State Water's customers – no water trade

Biggar first considers the impact on customers under an assumption of no water trade. He observes that, under this assumption of no water trade, many of State Water's customers (e.g. rice growers who plant larger areas at times of high water availability) are likely to have a cashflow (excluding water charges) which is positively correlated with water availability. As Biggar notes, a water bill which is also correlated with water availability reduces the overall variability of such a user's cashflow. He therefore contends, correctly, that while State Water's proposed tariff structure may reduce the risk on State Water, it may increase the variability in the cashflow of many of State Water's customers.

Biggar then states that to the extent that State Water's customers are risk-averse, exposing customers to risk in this way can be undesirable and reduce overall economic welfare. In our view Biggar has not undertaken sufficient analysis to support his assertion that the allocation of additional volume risk to water users

would necessarily represent an economically inefficient allocation of risk. For example, Biggar has not considered whether State Water may also be risk averse.

More broadly, there is an extensive body of theory which would suggest that optimal risk allocation should consider not just attitudes to risk but also which party is best-placed to manage the relevant risk. As noted above, Biggar has conceded that State Water has no ability to manage volume-related risk. Further discussion of the question of the efficient allocation of volume risk is provided below.

Biggar claims that there can be other real effects arising from a rebalancing of the tariff structure as proposed by State Water. Biggar states:

> In addition, there can be other real effects. Specifically, although many of State Water's customers are large corporations or town councils, many of State Water's customers are owner-farmers. These smaller enterprises often do not have easy access to capital markets – that is, they cannot easily raise equity and often face borrowing constraints. The amount such customers can borrow is typically limited by a worst-case scenario – that is, the cash-flow in a bad year, or in a string of relatively bad years. An increase in cash-flow volatility will likely increase the probability the cash-flow from a bad year or string of bad years will fall below any given threshold. As a consequence, an increase in volatility can reduce the amount the customer can borrow. This may, in turn, limit investment, which can have an impact on farm productivity. In other words, shifting risk on to these customers may have harmful economic consequences. (ACCC 2014a, p. 278)

Frontier has a number of concerns with Biggar's analysis including:

- whether this constitutes a market failure
- the materiality of impact on water users' ability to secure finance
- the distribution of impact between users.

Is there a market failure?

In effect, Biggar appears to be implying that there is some failure in the capital market which is inefficiently preventing these farmers from obtaining finance from banks or other financial institutions and that the proposed tariff change would be sufficient to trigger credit-access problems. No evidence is presented for this proposition. If such enterprises have difficulty in raising finance, this may simply reflect an assessment by the financial institutions of the underlying long-term viability of the business in question, rather than the annual volatility of their cashflows. Biggar is effectively arguing that State Water should assume the role of banker for farm businesses which cannot obtain finance in the market.

Biggar's analysis also contains an implicit assumption that any investment undertaken by such farmers is "good" for the economy and that these farmers should be shielded from the true costs of providing water infrastructure and delivering water on their behalf in order that these farmers can continue to produce or invest in their traditional business models. As recently emphasised by

the Parliamentary Secretary to the Minister for the Environment, well-functioning water markets are now an important tool for farm businesses (Birmingham 2014, p. 5):

> With relatively well established [water] markets across the Murray-Darling Basin irrigators now continue to make water trading decisions based on their water needs, business objectives and financial circumstances, with the water market providing a major new tool for optimising their farm business operations.

The materiality of impact on water users' ability to secure finance

The ACCC do not appear to have undertaken any assessment of the materiality of this issue in practice, for example:

- how many farmers are there who can be characterised in this way?
- what proportion of these farmers' costs is typically accounted for by water costs (i.e. what impact would State Water's proposed tariff structure have on the costs incurred by farmers in dry years?)
- what factors do financiers actually take into consideration in their lending decisions to farmers and how significant is the volatility of annual cashflows?

We have undertaken an analysis based on farm budgets to help put the proposed changes to fixed water charges in perspective/context. This has been undertaken along similar lines to the analysis provided by Frontier (2008) to the ACCC in drafting the *Water charge (termination fees) rules*. In this case, the fixed water charges of interest were related to irrigation infrastructure delivery, rather than bulk water, but this approach is highly relevant. Frontier (2008, p. 29) noted:

> The effect of a [change in water-related fees] on production decisions can be examined by looking at the relative magnitude of fixed water delivery costs as a proportion of other input costs.
>
> Importantly, fixed [water costs] are only one component of total water costs — total water costs also include variable [water costs], property service charges and the costs of the water resource itself. (The (opportunity) cost of water as reflected in the water market can vary dramatically between seasons due to varying water availability.)
>
> In an extremely dry year, it may be that no irrigated production occurs and no water is delivered/used. Fixed [water costs], however, still have to be paid.

Collecting and analysing detailed data on farm profitability is not feasible within the time available to submit to the ACCC in response to the draft decision. Instead, as was conducted in Frontier (2008), insights are based on publicly available data on farm gross margins.

A 'gross margin' is the gross income from an enterprise less the variable costs incurred in achieving it. It enables broad comparison of the relative profitability of similar enterprises. However, it is important to take care when applying gross margins to draw inferences about overall profitability. As overhead costs are

excluded, comparisons of gross margins are only valid between enterprises that use similar resources

In order to put the effect of alternative bulk water charges into context, Table 1 presents NSW DPI farm budgets for 2012-13. These budgets provide the expected gross margin per hectare of an enterprise and provides expected irrigation application rates (ML/ha). Given the relatively average/wet conditions of 2012-13, the published budgets were based on an allocation determination of 100%.

Table 1 also presents the bulk water charges for each activity/valley in 2012-13 and a representative set of bulk water charges if the fixed/variable relationship was 80:20. Based on the neutral rebalancing associated with the alternative bulk water charges, the total cost of bulk water charges per hectare are unchanged at an allocation level of 100%, as compared to the 2012-13 bulk water charges.

However, the higher fixed component of the alternative bulk water charges does increase total bulk water charges per hectare if allocations only reach 50%. The magnitude of this change is equivalent to a 3–6% reduction in gross margin.

Table 1: Gross farm budgets and the effect of alternative bulk water charges

	Irrigated cotton (Gwydir)	Irrigated cotton (Namoi)	Irrigated rice (Murrumbidgee)	Irrigated rice (Murray)
Farm budget @ 100% allocation				
Total income ($/ha)	4637	4637	2600	2340
Total variable costs ($/ha)	3057	3057	1458	1555
Gross margin ($/ha)	1580	1580	1142	785
Irrigation (ML/ha)	7	7	14	13
2012-13 bulk water charges				
Variable usage charge ($/ML)	12.69	19.69	3.72	4.90
GS entitlement charge ($/ML)	4.07	9.01	1.60	2.32
Bulk water charges ($/ha) @100% alloc.	117	201	74	94
Bulk water charges ($/ha) @50% alloc.	146	264	97	124
Alternative bulk water charges (based on 80% fixed and 20% variable)				
Variable usage charge ($/ML)	3.35	5.74	1.06	1.44
GS entitlement charge ($/ML)	13.41	22.96	4.26	5.78
Bulk water charges ($/ha) @100% alloc.	117	201	74	94
Bulk water charges ($/ha) @50% alloc.	211	362	134	169
Effect of alternative bulk water charges				
Difference in bulk water charges ($/ha) @100% alloc.	0	0	0	0
Difference in bulk water charges ($/ha) @50% alloc.	-65	-98	-37	-45
Change in gross margin ($/ha) @100% alloc.	0	0	0	0
Change in gross margin ($/ha) @50% alloc.	-4%	-6%	-3%	-6%

Sources: NSW DPI 2012a, 2012b, 2012c; State Water 2012; Frontier 2008.

To put this into context, a 5% reduction in crop yield or the output price would reduce the estimated gross margin by 11–15% (Table 2).

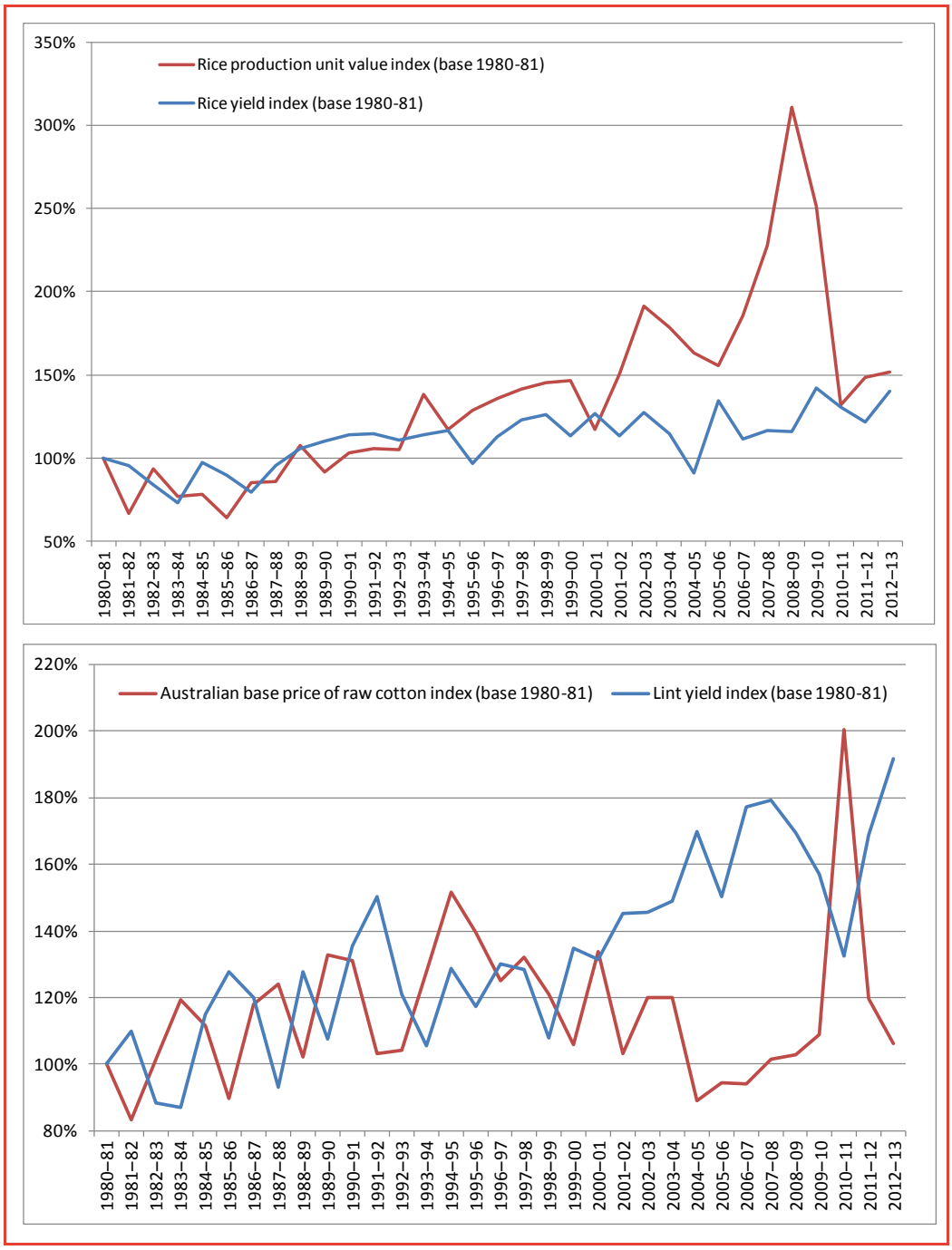
Table 2: Gross farm budgets and the effect of yield and price changes

	Irrigated cotton (Gwydir)	Irrigated cotton (Namoi)	Irrigated rice (Murrumbidgee)	Irrigated rice (Murray)
Farm budget @ 100% allocation				
Total income ($/ha)	4637	4637	2600	2340
Total variable costs ($/ha)	3057	3057	1458	1555
Gross margin ($/ha)	1580	1580	1142	785
Under a 5% reduction to crop yield or output price				
Total income ($/ha)	4405	4405	2470	2223
Total variable costs ($/ha)	3057	3057	1458	1555
Gross margin ($/ha)	1349	1349	1012	668
Change in gross margin ($/ha)	-15%	-15%	-11%	-15%

Source: NSW DPI 2012a, 2012b, 2012c.

Given that a change to 80:20 (fixed: variable) bulk water charges would reduce the variable cost of usage, it would be expected that the change would not reduce incentives for the productive use of water. Rather, because the relative increase in fixed charges in years with low delivery volumes, it could reduce the profitability of the irrigating business under such seasonal conditions. However, we do not consider that the change in bulk water charges would significantly affect a farmer's access to credit or ability to invest given its relatively small influence compared to the risks that are already faced by the agricultural production farm business — the example 5% change in yields or output prices is very modest compared to the yield and price variation actually observed (Figure 3).

Figure 3: Historical variability in rice and cotton yields and prices



Source: Frontier analysis on data from ABARES 2013.

Therefore, we find that the proposed change to lower delivery fees results in small changes in farm business financials as compared to many other risks that they face. We therefore question whether this change would significantly affect farm viability.

The distribution of impact between users

Biggar also claims that under the 'no trade' scenario, although water users pay more in dry years and less in wet years under State Water's proposed tariff structure, each water user pays the same amount on average. This proposition however rests on the assumption that the balancing out occurs over a time period when the customer base is constant. If in fact the balancing out occurs only over very long periods — 50 years is used in Biggar's example (ACCC 2014a, p. 283) — and given the real likelihood of extended periods of water deliveries either significantly above or below the long-term average, it is highly likely that costs are instead shifted from one generation of farmers to another.

2.2.2 Impact of risk-sharing on State Water's customers – active water trade case

Biggar observes that when active water trade is incorporated into the analysis, it is no longer correct to characterise State Water's proposal as a change from fixed to variable tariffs or vice versa. Instead, State Water's proposal is a change to the burden of charges between two groups — from charges on those who use water, to charges on those who hold water entitlements. A water user can always choose to avoid State Water's entitlement charges simply by selling his/her entitlement.

The change in burden would go some way to address the current cross-subsidisation from variable water users to water entitlement holders (noting that many customers are both, but may have varying ratios of water use to water entitlement held).

Biggar notes that the question as to whether State Water's proposed tariff structure increases or reduces the risk faced by its customers becomes less clear-cut. Biggar provides examples where high delivery charges can reduce the volatility of water users returns. We find the numerical examples used in the Appendix to be very extreme. For example:

- The current relationship between fixed: variable charges is 40:60
- State Water proposed a relationship of 80:20
- The underlying cost structures of fixed: variable charges is closer to 95:5
- The numerical examples in the Appendix use negative fixed charges, and the relationship of fixed: variable is about -5:105.

We note that Biggar's cashflow equation (ACCC 2014a, p. 288) ignores the ability of irrigators to supplement their cashfows by selling allocations on the market (see box), but note that it is included in the accompanying chart.

Box 1: Revising Biggar equations

Biggar writes the net-profit of the water user as a function of the underlying price:

$$\pi(\bar{P}|E,D,F) = R\big(Q^*(\bar{P})\big) - \bar{P}Q^*(\bar{P}) - FE + (\bar{P} - D)AE$$

However, when Biggar takes the case of the water user with a constant marginal value up to a fixed capacity, the terms relating to potential trade of water allocations and water charges are ignored:

$$\pi(P) = (m - P)Q^*(P) = \begin{cases} 0, & \text{if } P > m \\ (m - P)K, & \text{if } P \leq m \end{cases}$$

In fact, we consider the correct representation to include the terms relating to potential trade of water allocations and water charges:

$$\pi(P) = (m - P - D)Q^*(P) - FE + P.AE$$

$$= \begin{cases} P.AE - FE, & \text{if } P > m \\ (m - P - D)K + (AE - K)P - FE, & \text{if } P \leq m \end{cases}$$

Biggar finds that: "it is easy to provide reasonable examples where the tariff structure can have a substantial impact in reducing the risk faced by State Water's customers" (ACCC 2014a, p. 280)

We do not, however, consider the examples he provides as being *reasonable*. In order to demonstrate a substantial impact in reducing the risk faced by State Water's customers — i.e. to smooth net cash flow as in the figures on page 286 and 289 — Biggar uses *negative* fixed charges and *extraordinarily high* delivery charges (such as $700/ML).

In fact, as per the analysis in Table 1, we do not consider that the proposed changes to the tariff structure would have a substantial impact on the risk faced by State Water's customers given the relatively small magnitude of these impacts compared to other business risks such as variation in yield and output prices.

2.2.3 Availability of risk management products in the water market

Biggar notes that in theory, there are much better instruments (than using high variable charges in State Water's tariff structure) to reduce the risk to which water users are exposed. These include hedge and forward contracts. Biggar states:

> It appears that in the absence of hedging products in the water market, the current structure of the water charges is playing a risk-management role. Ideally, there would exist risk management products which allow water users to lock in the price they pay for the water they use in advance. In the absence of such products, increasing the delivery fee above zero (and reducing the entitlement fee) seems to allow State Water's customers to mitigate the risks they face.
>
> To my knowledge such hedge contracts are not currently traded in the water market. In the absence of such contracts, State Water's customers are exposed to risk. That

> risk can be partially mitigated by higher delivery charges and lower entitlement charges....
>
> In other words, it appears that the current structure of State Water's charges is playing a risk-mitigation role. This role arises due to the absence of a market in water-price risk-management products. If these other products were available, there would be no need to take into account risk allocation issues when considering the structure of State Water's charges. (ACCC 2014a, p. 281)

A recent report by Frontier Economic for the National Water Commission revealed that there are a number of sophisticated water trading contracts, that are based on transactions of water entitlements or allocations, which are already on offer in the southern MDB. Brokers and large investors are the principal providers of these offerings, which include (NWC 2013c):

- Forward contracts — for buying water allocations for future periods (up to 3 years were reported to be on offer), and for buying guaranteed volumes in the following water year (i.e. the volume is fixed and not subject to allocation announcement risk, with the full volume available from 1 July or another specified date).
- Leases — such as Limited Term Transfers in Victoria, which transfer the benefits of holding a water entitlement (i.e. access to allocations and carryover) to another party for a defined period.
- Contracting arrangements resembling leases — such as a contract providing access to all of the water allocations that accrue to a given parcel of water entitlements. This arrangement was reported to provide the entitlement owner with more control over the asset (for example in the case of non-payment by the other party), and it also retained carryover access with the entitlement owner.
- Carryover products — such as Greeneye Carryover (GEC) which is a contract for allocation water whereby a seller sells GEC (allocation water including carryover capacity) and also agrees to hold the water in his ABA (or equivalent) against his entitlement capability in trust for the buyer such that the water will be carried over in their ABA (or equivalent) into the new water season. Other carryover products included access arrangements for the airspace associated with Victorian Low Reliability Water shares, either through a Limited Term Transfer of the LRWS or otherwise.
- Aggregators — such as the Australian Water Tender (Waterfind) that aggregates multiple parcels of water rights for sale into a larger package.

We also note that Waterfind has recently announced the launch of its Forward Water Market (Waterfind 2014). It notes:

> As Australia's first live forward water market it enables the contracting of temporary or permanent water parcels at a set price to be delivered at a future date. This enables clients to remove market uncertainty and plan for future irrigation requirements.

Clearly, the risk management products to which Biggar refers are in fact becoming available, which would as Biggar suggests remove any need to use the tariff structure as a risk management tool.

It could even be argued that the explicit retention of the current tariff structure to manage risk for some irrigators represents an impediment to the development of such water market products, or at least dampens the demand for them. This would seem to run counter to the whole thrust of the Water Act to promote efficient water markets across the MDB and enable the appropriate mix of water products to develop. In our view this could be seen as a "perverse or unintended outcome" from the regulated tariff structure which should be avoided.

2.3 Determining an efficient allocation of risk

A key conclusion of the Appendix is that State Water's proposed tariff structure should not be adopted because it involves some risks being assumed by water users. Biggar suggests that:

> To the extent to which State Water's customers are risk-averse, exposing customers to risk in this way can be undesirable – it directly reduces overall economic welfare. (ACCC 2014a, p. 278)

Moreover, he appears to favour retention of the current tariff structure primarily because it is playing a risk-management role for irrigators.

In Frontier's view, the analysis in the Appendix is grossly inadequate for reaching a conclusion on the appropriate allocation of risk between State Water and users. It does not provide a comprehensive and robust assessment to support the conclusion it reaches on this issue.

A recent edition (March 2014) of the ACCC's bulletin '*Network*' notes that in considering the optimal allocation of risk, consideration should be given to both the ability of the parties to manage the relevant risk as well as their preferences for risk, jointly termed 'risk tolerance': It states:

> The efficient allocation of risk in a regulatory setting also needs to recognise that the various affected parties are not likely to have incentives to reveal their true preferences. As a result, consideration needs to be given to the ability to mitigate risk and causal responsibility for risk. Optimal risk allocation also needs to take account of the impact on efficient operation and investment, including the incentives to reduce costs. (ACCC 2014b, p. 7)

Unfortunately, the analysis in the Appendix does not apply these principles in considering the appropriate allocation of risk in the tariff structure.

We would have expected to see a comprehensive analysis which clearly identified the risks and how they are manifested, an assessment of who is best placed to manage these risks, and a discussion of risk aversion of the parties.

No assessment is made of the relative risk aversion or ability of State Water and water users to manage the relevant risks (which themselves are not very clearly defined in the Appendix).

The notion that irrigators are likely to be highly risk-averse (or more risk averse than State Water) seems problematic. Irrigated agriculture would seem to be an inherently risky activity, being subject to international commodity prices, water availability, climatic conditions etc.

Moreover, Biggar has made no comment about State Water's likely preferences for risk. We note that State Water is a bulk water infrastructure operator. It does not own the water, it stores and transports it and has responsibilities to meet service standards and other legal obligations imposed upon it.

Biggar also does not appear to have considered the ability of the parties to manage the relevant risks. In our view it would be helpful to more clearly identify the risks and the factors that drive them.

The key risk relevant to the analysis of the tariff structure relates to volume-related risk. Volume-related risk encompasses both supply and demand-side factors. Volumes delivered reflect:

- inflows
- decisions on allocations (made by the NSW Office of Water)
- demand for water by users
- rainfall (e.g. under wet conditions, irrigators will not require as much water to supplement crop water demands)

As Biggar concedes elsewhere in his paper, State Water is not in a position to manage these volume-related risks.

In contrast, irrigators have a range of mechanisms available to help them to manage volume-related risk. For example:

- low volumes delivered because of low water availability — irrigators can sell water on the market (at a time when price will be high), shift to crops that use less water, substitute alternative inputs for water. Alternatively, an irrigator can purchase additional water in the market to maintain deliveries during periods of low water availability.
- low volumes delivered because of plentiful rainfall — irrigators can use the substitute of natural rainfall
- irrigators can also sell some or all of their entitlements so that, under State Water's proposed tariff structure, they are not liable to pay fixed entitlement charges at times of low water allocations when their revenues are also low. It may make sense for growers of opportunistic crops such as rice to free up capital currently tied up in their entitlements as a means of addressing any

lack of access to finance in capital markets to undertake investment as cited by Biggar.

In fact, volume-related risk has a greater proportionate impact on State Water's cashflows than it does on that of its customers. This takes into account the fact that State Water does receive some revenue from the NSW State Government which reduces the costs needed to be funded by users.

The implications of assigning demand risk to State Water need to be clearly articulated, as these risks may ultimately be borne by its customers.

If the regulated tariff structure (and related form of price control) means that under extended periods of below average deliveries, State Water is not able to recover its efficient costs, it may have an incentive to seek to reduce its operating costs to a point which might lead to lower service standards for its customers. Moreover if there is a risk that State Water may never be able to recover its efficient costs, including an appropriate return on capital, this will impose a disincentive for investment by the NSW Government and/or impose a risk on NSW taxpayers to make good the difference. This will also ultimately impose risks on users of State Water's infrastructure and/or NSW taxpayers.

In the case of extended periods of above average deliveries, State Water may accrue a significant over-recovery of its efficient costs.

In Frontier's view it would be appropriate and economically efficient for demand risk to be assigned primarily to water users. At the end of the day, costs incurred in operating State Water's network are largely fixed and incurred regardless of volumes delivered. These costs need to be recovered from the users of the system — if not now then in the future. If they are not, then the users are effectively being subsidised by the NSW Government — i.e. taxpayers. Indeed, the conclusion that State Water should bear the majority of demand risk seems to be based on a presumption that State Water is able to do so simply because it is a government-owned business with 'deep pockets' by virtue of that ownership or recourse to taxpayer funding.

The foregoing analysis brings into serious question the ACCC's retention of a tariff structure which effectively allocates significant volume risk to State Water which Biggar concedes State Water has no ability to manage.

3 Incentives for productive efficiency and investment

Biggar states that State Water's proposed tariff structure does not affect State Water's incentives to reduce expenditure. Frontier agrees with this assessment.

Biggar also suggests that while the current tariff structure (where the delivery charge is in excess of marginal cost) in principle creates an incentive for State Water to maximise water sales, which by implication would be reduced under State Water's proposed tariff structure. However, Biggar suggests that State Water would not in practice be able to act on this incentive because "the total volume of water available is tightly controlled, so State Water has, in fact, no control over the volume of sales" (ACCC 2014a, p. 276).

The acknowledgement by the ACCC that State Water has no control over the volume of sales is significant in another context, however, as it effectively concedes that volume risk is one that State Water has no ability to manage (see discussion above).

Biggar also suggests that if State Water is currently capital-constrained, the reduction in risk from its proposed tariff structure may allow it to invest more. However, Biggar notes that State Water has not claimed that it is currently capital constrained.

As noted above, State Water is in fact capital-constrained in that it cannot borrow unlimited amounts of money. Imposition of excessive debt on State Water — particularly where such debt is effectively incurred to pay for ongoing operational activities rather than for capital investment — would impact on its credit rating and its cost of borrowing. This would ultimately affect State Water's ability to undertake capital investment.

As discussed above, the current structure imposes significant risks that State Water would need to borrow to cover for extended periods of under-recoveries if actual deliveries were consistently below long-term averages. When the effect of this on State Water's ability to continue to borrow to fund under-recoveries is taken into account it is not true, as would appear to be recognised by Biggar, that the current tariff structure has no impact on the incentives for efficient investment.

4 Impact on efficiency of water use

In analysing the impact of State Water's proposed tariff structure on the (economic) efficiency of water use, Biggar first considers a 'no trade' case where users cannot trade any allocations they do not wish to use so are faced with a choice of either using the water (and paying the associated delivery charge) or foregoing use of some of their allocation. As Biggar observes, it is plausible under this scenario that a reduction in the water delivery charge may increase water usage somewhat at the margin, improving economic efficiency. However, Biggar suggests that in practice this effect is likely to be minimal as it would require that at least some customers having a sufficiently large allocation of water in at least some years such that their marginal value of water is less than the delivery charge and they would rather not use that water at all rather than pay the delivery charge.

He then considers the scenario where water trade is possible, which would be expected to equalise the marginal value of water across water users, as reflected in the market price of water allocations. Biggar contends that as the market price is typically at least many time higher than the water delivery charge, increasing the delivery charge merely result in a reduction in the market price of water. He concludes that as long as the market price is greater than zero, there are no efficiency consequences from a change in the delivery fee, so that a shift from delivery charges to charge on entitlement (as proposed by State Water) should have no impact on efficiency of water use.

We find that this result is contingent on a number of flawed assumptions, including:

- that trade does not occur with non-State Water customers (i.e. interstate users)
- that water market prices remain many times higher that the water delivery charge even in years of high water availability
- that delivery charges must be paid on all water volumes that are allocated and not traded (i.e. delivery charges cannot be avoided by a water user choosing not to use available water).

By using realistic assumptions to characterise the problem, we find that leaving delivery charges high does affect efficiency of water use.

High delivery charges would also necessitate the continuation of the policy that recovers 'delivery fees' when water is sold to an interstate purchaser. This is a barrier to interstate water trade and could be characterised as an "unintended or perverse outcome" which State Water's proposed tariff structure would help to ameliorate.

The following discussion addresses two key issues where the high delivery charges under State Water's current tariff structure could affect the economic efficiency of water use, namely:

- efficiency of allocating water between competing uses in the presence of interstate water trade
- efficiency of decisions to use water at times of very low water prices.

4.1 Efficiency of allocating water between competing uses in the presence of interstate water trade

Biggar finds that "as long as the market price is greater than zero there are no efficiency consequences from a change in the delivery fee" (ACCC 2014a, p. 280).

This is not the case once interstate trade is considered. Different delivery fees between States will affect the distribution of water use between States. Efficient delivery fees would promote the efficient distribution of water use between activities/States.

We first consider an example where delivery charges are only payable in the region where water is used. We then consider the outcomes under the current policy whereby State Water requires the payment of variable usage charges for all allocation trades involving a buyer licence not linked to a NSW Works Approval (i.e. interstate trades).

4.1.1 Efficiency outcomes when delivery charges are only payable in the region where water is used

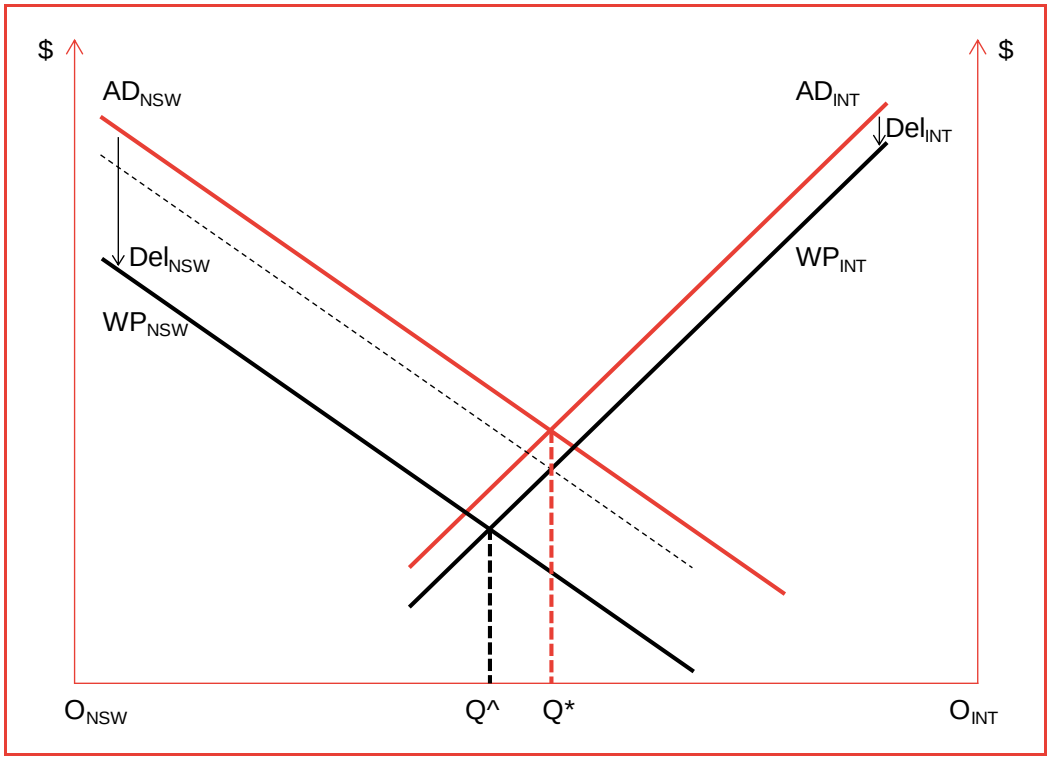
Figure 4 portrays a situation where NSW and interstate (INT) water users can trade water. The aggregate demand for delivered water by NSW water users and interstate water users is given by AD_{NSW} and AD_{INT}, respectively. The variable usage fees that exist in both regions for the delivery of water are Del_{NSW} and Del_{INT} respectively. In this example it is assumed that delivery is only paid for in the region water is used. This means that the willingness to pay for water by a water user (WP) is equal to the price they would be willing to pay for delivered water minus the delivery/usage charge — hence $WP_{NSW} = AD_{NSW} - Del_{NSW}$ and $WP_{INT} = AD_{INT} - Del_{INT}$.

If trade is possible between the regions, then equilibrium would be expected to occur where $WP_{NSW} = WP_{INT}$ at Q^.

If the delivery/usage charge faced by water users is distorted from the efficient level, this will have effects in the water market and distort the allocation of water between users/activities in the two regions NSW and interstate. For example, if the efficient delivery/usage costs where in fact equal in the two regions (such as

equal to Del_{INT} giving a WP_{NSW} of the faint dashed black line), then the equilibrium would occur at Q*.

Figure 4: Delivery fees can distort water use from efficient levels



The above analysis is consistent with the analysis in Productivity Commission (2006, Appendix D) and Dwyer et al (2006), where differentiated taxes on water use are considered.

4.1.2 Efficiency outcomes when delivery charges are payable to State Water on all interstate trades

The above assumption that delivery/usage is only payable in the region of water use is not the current policy implemented by State Water. In fact, State Water requires the payment of variable usage charges for all allocation assignments (allocation trades) involving a buyer licence not linked to a NSW Works Approval (State Water nd) — i.e. on all sales of water to interstate purchasers (see box). This policy seeks to manage the potential financial impacts on State Water of relying heavily of variable revenues and being subject to significant trade out of State Water managed valleys to interstate locations.

Box 2: Payment of variable usage charges and water trade

State Water requires the payment of variable usage charges for all allocation assignments involving a buyer licence not linked to a NSW Works Approval.

This means that:

- For a trade NSW to interstate, the seller must pay the variable usage charge before the trade can occur. The buyer then has to pay the variable bulk water charges and (possibly) infrastructure delivery fees charge in their jurisdiction.
  - In the case of Victoria and South Australia this is zero variable bulk water charges and relevant infrastructure delivery fees for water usage.
  - In the case of Queensland this is the 'Bulk Water Charge – Part B' based on usage and 'Channel Distribution – Part D' for infrastructure usage.
- For a trade from interstate to NSW, the seller would not pay usage fees since non-NSW usage does not occur. The NSW buyer then has to pay State Water's variable usage fee and (possibly) infrastructure delivery fees charge in their valley.
- If water is traded out of NSW and then back to NSW, the variable usage charge would be payable twice — on the trade from NSW to interstate, and then again when water is used from an interstate to NSW trade.
  - State Water does allow water users to make an application to recoup one of the variable usage charge payments if they apply to State Water and they can demonstrate that the *same* volume has been traded back on to the *same* water access licence.

This policy is a mechanism to manage the potential impacts of relying heavily on variable revenues and being subject to trade which may involve significant trade out of State Water managed valley to interstate. For example, at 2012-13 tariffs for Murrumbidgee of $3.73/ML and Murray of $4.90/ML:

- In 2008-09, there was a 390GL export from Murrumbidgee, a 135GL export from NSW Murray and a 28GL export from Lower Darling, the variable usage charge associated with these export volumes is $2 253 400.
- The current 150GL trade out limit in the Murrumbidgee valley acts to limit the variable usage charge on export volumes from this valley to around $0.5 million.
- In 2012-13, New South Wales was a net exporter of water allocations to Queensland and South Australia (302 GL in total). A large volume of interstate allocation transfers were for the delivery of environmental water
  - NWC (2013b, p. 43, Table 3.11) shows that there was a net import of water from Victorian Murray to NSW Murray. There were, however, large exports from both to SA Murray due to environmental deliveries.

Source: Frontier Economics analysis based on tariffs from State Water 2012.

The levying of the variable usage charge on exports is asymmetric and can affect the distribution of water use.

In Figure 5, at Q^B NSW water users are indifferent between buying from other NSW water users or from interstate water users at water price P^B. At Q^A,

interstate water users are indifferent between buying from other interstate water users or from NSW water users at water price P^A — because if they wish to purchase water from NSW the delivery/usage charge is payable.

At volumes between Q^A and Q^B:

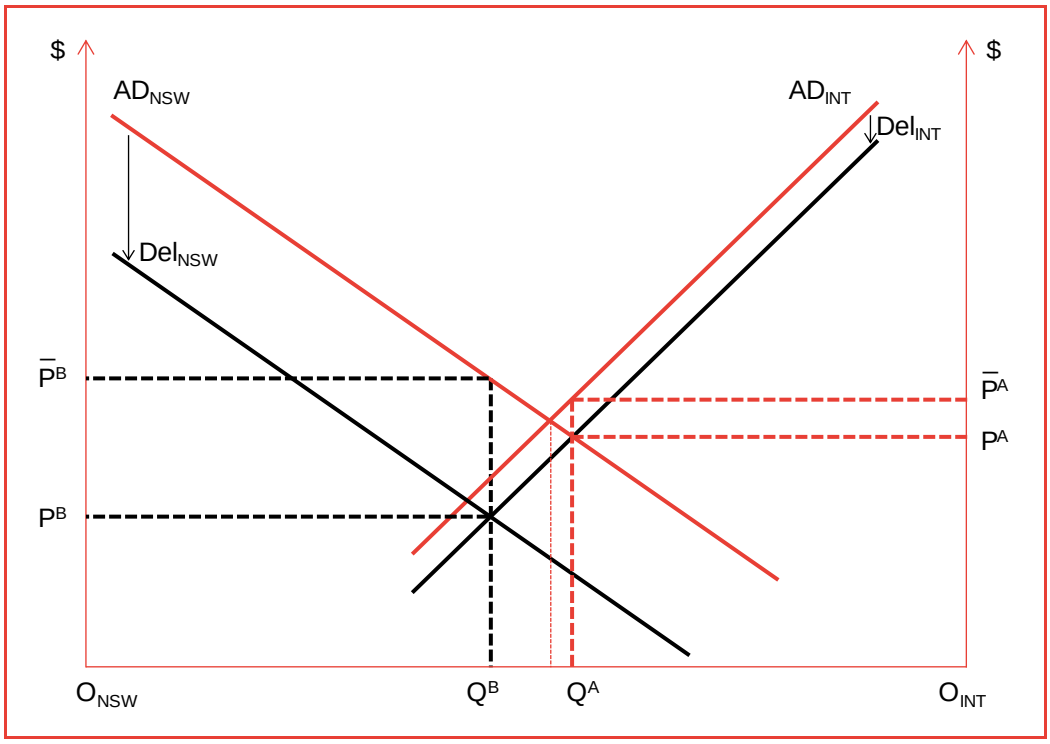
- the NSW willingness to pay for water is below that of interstate and therefore trades to NSW would not occur
- the interstate willingness to pay for water is below the NSW willingness to pay for delivered water (inclusive of the delivery/usage charge that is payable) and therefore trades to interstate from NSW would not occur.

This means that economic theory would expect:

- initial allocations in the segment O_{NSW} to Q^B to reach equilibrium at Q^B.
- initial allocations in the segment O_{INT} to Q^A to reach equilibrium at Q^A.
- initial allocations in the segment Q^A to Q^B to remain stationary and involve no further trade.

Unless the initial allocation is exactly at the efficient distribution of Q* (assuming efficient delivery charges are equal in both regions, this is at the faint red dotted line), then the market would not be expected to reach equilibrium at Q*.

Figure 5: Water trade under asymmetric variable usage charges



We therefore find that when interstate trade is taken into account, high delivery charges in excess of the efficient level can distort water market outcomes and lead to water being inefficiently allocated between competing uses within and

outside of State Water areas/valleys. This result holds under the current State Water policy to levy variable usage change on trades to interstate, as well as in the absence of such as policy. State Water's proposed tariff structure would therefore contribute to improving the efficiency of water use.

4.2 Efficiency of decisions to use water at times of very low water prices

Biggar notes that it is possible that high charges for water delivery will deter some productive uses of water at the margin (i.e. customers will fail to make use of some water that is allocated to them). Under these circumstances, State Water's proposal, by reducing delivery charges towards marginal cost, may increase efficiency of water use.

The reduction of water use due to high delivery charges would occur under periods of high water availability and low demand, such that the marginal value of applying water does not cover the costs of doing so (delivery charges and associated labour/pumping costs).

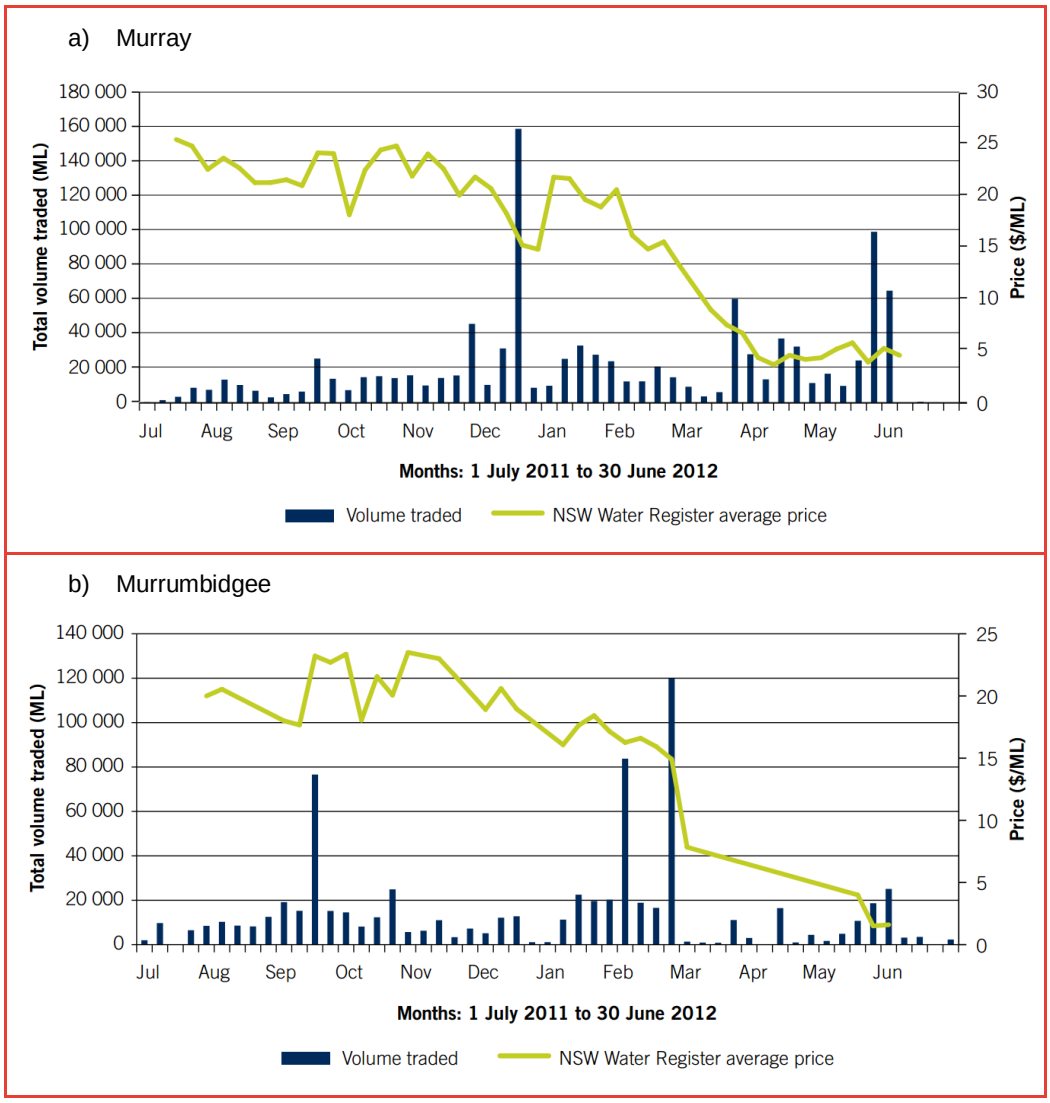
In a water trade context, if water is not sufficiently productive on a given farm, it can be sold to another. It could be expected that 'unproductive water' would be willing to be sold at any positive price that is sufficient to outweigh the costs associated with the trade (i.e. the $50 charge per trade, $0.50 charge per ML, broker/exchange fees and the time involved to undertake the trade). A buyer would require that the water be more productively valuable to them to outweigh the sum of the trade price (covering seller trade costs), any broker/exchange fees and the time involved to undertake the trade, as well as delivery charges associated with using the water.

This may be the case in the latter months of average/wet seasons when extremely low prices are observed. For example, in 2011-12, and average price of approximately $5/ML was observed in the Murray and Murrumbidgee valleys (Figure 6).

Therefore, these seasonal conditions resemble the conditions under which Biggar suggests that high charges for water delivery may deter some productive uses of water at the margin.

We agree with Biggar that it is possible that high charges for water delivery will deter some productive uses of water at the margin. We find that it is plausible for such circumstances to arise during high water availability and low water demand, and that this may have been the case in late 2011-12 when very low water prices were observed.

Figure 6: Water allocation trading volumes and prices, 2011–12



Source: NWC 2013a.

We note Biggar's representation of water trade assumes that water users who receive a water allocation cannot avoid the delivery fee by simply choosing not to take the water they have been allocated. This assumes that "the delivery fee must be paid whether the water is taken or not (unless the water is sold to another user, who must then pay the delivery fee)" (ACCC 2014a, p. 288). This assumption means that water prices may be negative.

This assumption does not hold in reality (water users only pay delivery fees on the volume of water delivered), and this is why we consider that the minimum price water can be traded at is a positive price that is sufficient to outweigh the costs associated with the trade.

In summary, we find that it is plausible for the market price of water to fall to extremely low levels (as occurred in late 2011-12) due to high water availability

and low water demand. As observed by Biggar, under such circumstances it is possible that high charges for water delivery will deter some productive uses of water at the margin.

5 Use of a Loss Capitalisation Model

5.1 Introduction

Biggar states that if revenue volatility for State Water is a concern, there are other mechanisms, besides changing the tariff structure, for reducing the risk faced by State Water, such as the Loss Capitalisation Mechanism (LCM).

The Appendix presents such a Loss Capitalisation Mechanism. Under the model proposed by Biggar, any under- or over-recoveries relative to the allowed revenue are carried forward into a loss capitalisation account. Each period the regulated firm is set a revenue allowance equal to the raw revenue allowance (based on expected revenue) plus a return on the outstanding balance in the capitalisation account.

5.2 Analysis

Biggar presents formulae which he claims proves that the NPV of State Water under the LCM is equal to its expected return. We would note that this relies on some key assumptions:

- that the equality is true only a very long period of time (i.e. as T tends toward infinity). As discussed below, this is not likely to be acceptable in a regulatory context.
- it is possible to know the expected revenue stream and by implication the expected average deliveries. Under climate change, this is not necessarily the case (as discussed in detail in section 2.1.3 above).

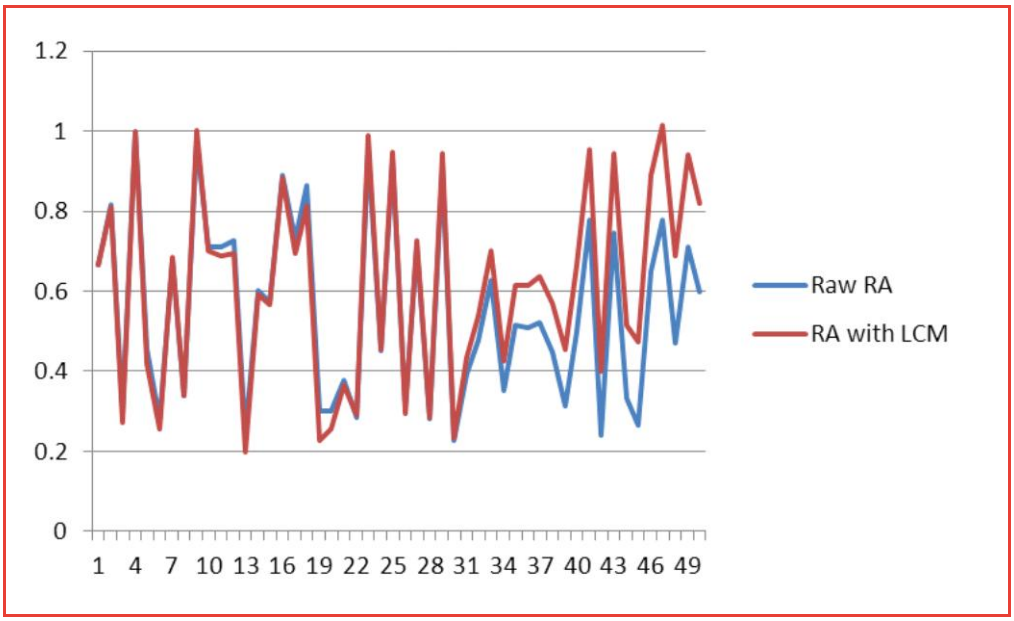
The following discussion identifies a number of issues relevant to the analysis of Biggar's proposed LCM:

- the independent distribution or otherwise of water availability
- the impact of the timing of cashflows on NPV neutrality
- issues associated with practical implementation.

5.2.1 The distribution of water availability

Biggar provides a chart which seeks to illustrate how the revenue allowance for State Water would vary over 50 years under his LCM (Figure 7).

Figure 7: ACCC NPV illustration



Source: ACCC 2014a, p. 283.

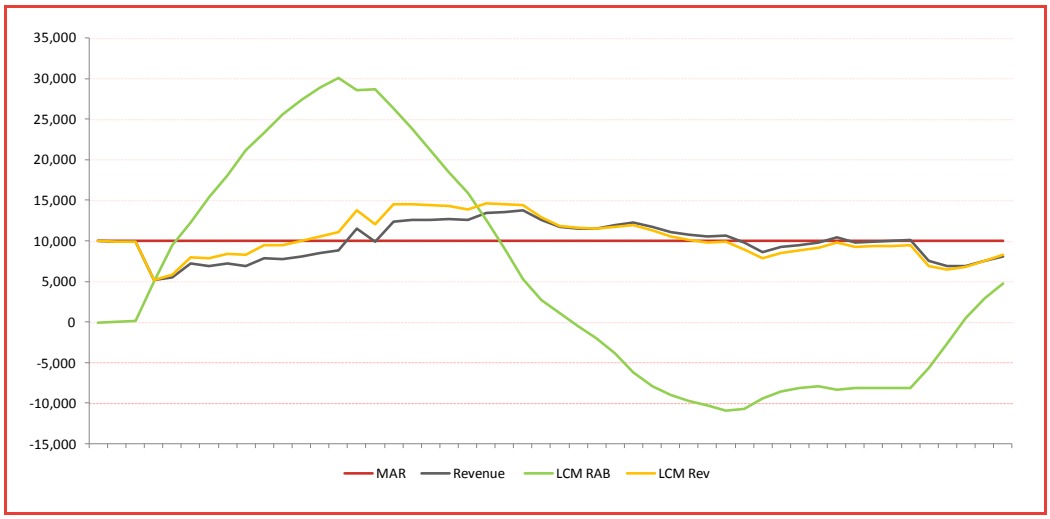
He observes that the difference between the 'raw revenue allowance' and the 'actual revenue allowance' (including the allowance for the LCM) is relatively small. He further asserts that "the impact of this mechanism is that the NPV of State Water is equal to the expected value no matter what the out-turn path of water availability (as opposed to just equal on average)".

We would note the following deficiencies in this analysis:

- First, the terminology used is somewhat confusing, the raw revenue allowance and the actual revenue allowance refer to the revenue that would actually be received by the business depending on the volume of sales in any year, rather than the revenue allowance reflecting the regulator's decision on the revenue requirement or efficient costs.
- Second, it would be more instructive to show how the actual revenue fluctuates around the revenue requirement, the latter of which could be expected to be fairly stable over time. This would provide an indication of how the balance in the capitalisation account might move over time (also providing an indication of how much debt State Water may need to incur to finance this gap).
- Thirdly, the graph does not show the underlying assumption on the volume of water deliveries in each of the 50 years, but by inspection would appear to assume that the pattern of under and over- recoveries is fairly symmetric rather than having extended periods of under- or over-recoveries such as that likely to be experienced during a drought. This assumed symmetry is in fact a key driver of the conclusion that the difference between what Biggar

describes as the actual revenue allowance and the adjusted revenue allowance including the LCM adjustment is minimal. If there was a sustained period of unders or overs the LCM account could be very significant relative to the raw revenue allowance. A stylised example is presented in Figure 8.

Figure 8: Stylised LCM model — extended periods of under and over recovery



Notes: Assumes prices set for 5 year regulatory periods based on 20 year average. 7.5% WACC used to calculated LCM premium. MAR assumed to be fixed at $10,000 per annum.
Source: Frontier Economics analysis

In this example, we have assumed a scenario where in the initial years there is an extended period of low water availability (i.e. a severe drought) which would result in low bills for customers and significant under-recoveries for State Water under the current 40:60 tariff structure. This in turn would result in a significant accumulation in the LCM RAB account. It could be many years before water availability improved to the point where customers were paying annual bills which provided for State Water to recovers it efficient costs in that year, let alone recover the shortfalls from the initial drought years. However, it is entirely feasible that as water availability returns to average of above-average, customers at that time (potentially many years later) could face bills which are 50% higher than they would be if they simply reflected the costs incurred in each year. State Water could then significantly over-recover its costs from customers at the time.

This example serves to highlight that the LCM could lead to substantial shift of costs between generations (in an attempt to smooth prices for current customers) if there are large accumulations in the LCM RAB account (in either direction). Moreover, the price impacts — and State Water's recovery of its debt — depend on unpredictable variations in water availability. Indeed, if there was an unforeseeable step change in inflows arising from climate change, State Water may never recoup its under-recoveries and never be able to pay off its debt.

It does not appear that the ACCC has modelled the likely movement in the capitalisation account under a range of potential water availability scenarios, but

rather have relied on the assumption that water use in each year is independent and identically distributed and does not have prolonged periods of 'unders' or 'overs' (autocorrelation). This is a major deficiency in the analysis.

5.2.2 The impact of the timing of cashflows on NPV neutrality

Biggar does not prove his assertion that the LCM would ensure that the NPV of State Water is equal to the expected value no matter what the out-turn path of water availability. This is also not necessarily true, as the NPV will be affected by the timing of the overs and unders, given the monetary amounts received in later years will be more heavily discounted relative to amounts in the early years. For example, suppose there are systemic under-recoveries because of drought in the first 10 years. In order for later over-recoveries to be worth the same in NPV terms, the actual over-recoveries in those later years would need to be larger than the initial under-recoveries.

This is illustrated in the following simplified example showing the revenues accruing to a regulated business under a cost-reflective tariff and under Biggar's LCM approach. For the purposes of illustration it is assumed that the business has costs which are entirely fixed at $10 000 per annum over a 3 year regulatory period. In order to just recover these costs and no more, its revenue requirement (via a 100% fixed tariff) would need to be $10 000 per annum. Assuming a cost of capital (and, therefore, discount rate) of 7.5%, the NPV of its revenues and costs would be $26 005 over the regulatory period. It would receive the same revenue stream under a tariff structure which had a variable component if and only if actual deliveries were exactly equal to forecast deliveries.

Now suppose an LCM as proposed by Biggar was in place and the following pattern of under- and over-recoveries occurs but which balance out over the course of the full regulatory period:

- In year 1 there is under-recovery of $1000 because actual demand is less than the long-term average, in the second year there is full recovery as actual demand is exactly equal to the long-term average, and in year 3 there is over-recovery of $1000. In this very simple example, the 'unders and overs' account at the end of year 1 would be $1000, and it is assumed that the business would incur a debt of $1000 to fund its operations for that year not recovered through its revenue from users.
- In year 2, because demand is exactly equal to the long-term average demand, the business would recover from users the full revenue requirement for that year, and in addition would receive an extra $75 under the LCM adjustment which would be added to the revenue requirement for that year. This would be offset by the interest that the business would have to pay on its $1000 debt incurred in year 1. The 'unders and overs' account would remain unchanged at $1000, as would the debt carried by the business.

- In year 3, suppose that demand is above the long-term average so that the business over-recovers by $1000. In addition, it would receive an extra $75 (based on the balance on the unders and overs account at the start of the year) which would be added to the revenue requirement for year 3, and again offset the interest it would have to pay on the $1000 debt in that year. At the end of the year the loss capitalisation account would return to a zero balance and the business would be able to apply its $1000 over-recovery for that year to retire its debt.

Table 3: NPV impact of loss capitalisation

	NPV	Year 1	Year 2	Year 3
Revenues				
Expected Revenue/Revenue Requirement	**$26,005**	10,000	10,000	10,000
Actual Revenue/Turn-out	**$26,005**	9,000	10,075	11,075
Adjusted Revenue Requirement		10,000	10,075	10,075
Loss Capitalisation Account				
Annual Loss		1,000	0	-1,000
Balance		1,000	1,000	0
Loss Capitalisation Premium			75	75
Funding the loss				
Debt		1,000	1,000	0
Interest costs			75	75
Net cashflows to business after interest costs	**$25,880**	9,000	10,000	11,000
(net of LCM premium and debt payments)				

Note: Discount rate used in NPV calculations = 7.5%, Interest costs are incurred at the end of the year.

As shown in the table, the loss capitalisation account returns to a zero balance over the regulatory period, so that the under- and over- recoveries cancel out in volume terms. The NPV of the bills paid by customers is the same as the NPV of bills they would have incurred if they had paid $10 000 each year to align with each year's efficient revenue requirement for the business. Presumably, this is what Biggar means when he claims that the LCM results in NPV neutrality.

However, notice that whilst the business is compensated by the LCM for the costs of financing any revenue gap, the revenues that the business is actually left with in order to cover its expected costs are $9 000 in year 1, $10 000 in year 2, and $11 000 in year 3. This means that the NPV of the revenue received by the business net of financing costs, $25 880, is less than the NPV of its expected costs/revenue requirement. This is because while it is compensated for the

interest it has to pay on the debt to finance its shortfall incurred in year 1, it is not compensated for the time value of money from the effective deferral of revenues due in year 1 to year 3.

This simplified example demonstrates that it is not true that is the LCM guarantees NPV neutrality – implying that if actual revenues deviate from the revenues allowed initially, it will not recover its expected efficient costs.

In this stylised example, the under-recovery in year 1 is exactly balanced out by over-recovery in year 3. If, however, losses or gains are persistent (e.g. due to prolonged periods of drought or rainfall), the deviation from NPV neutrality would be even more marked.

5.2.3 Potential issues with practical application of the LCM

Frontier has major concerns with relying on Biggar's theoretical construct which abstracts away from some key practical issues in establishing a robust regulatory regime in practice.

In our view, any system that involves a carry-forward of capitalised under-recovery becomes inherently complicated and much less transparent than one where costs attributable each year are reflected in bills each year (or and under- or over-recoveries are recouped as soon as possible). It is difficult to see how the ACCC's alternative (the current tariff structure accompanied by a loss capitalisation model) can be said to meet the water charging objective in relation to pricing transparency.

Even if were accepted that the LCM were NPV neutral over the very long term (as noted above this is not likely to hold true in practice given the timing and extent of unders and overs), this does not provide sufficient surety that the business will have a reasonable opportunity to recover its efficient costs in the short to medium term. To rely on a model with a 50 year timeframe is clearly inappropriate given the level of uncertainty as to what may happen to the business over such a long timeframe — indeed whether it still exists in its current form if at all. This also highlights the fact that the LCM may result in major inter-generational equity issues as the customers in 50 or even 10 years' time will not be the same customers as today. It is not tenable to abstract from these realities.

The LCM may render the regulatory regime itself inherently unstable or unsustainable, particularly if the loss capitalisation account accrues a large balance in either direction. This will make the 'regulatory contract' very difficult to enforce in practice.

For example, if such a mechanism had applied during the recent drought, the loss capitalisation account would have led to a major addition to the revenue requirement in later years, notwithstanding that only a rate of return applies to the balance. Water users in subsequent years asked to pay higher bills to pay for the shortfalls incurred by earlier generations of users would understandably lobby

the regulator and the NSW Government to have these amounts removed from the revenue requirement. Frontier observes that this precisely what occurred during previous IPART determination where irrigator groups argued for the removal of the revenue volatility allowance on the basis that it was an unjustified tax, notwithstanding that IPART had explicitly included it as a revenue line item to recognise the risk it was imposing on State Water through the current tariff 40:60 fixed to variable tariff structure.

Similarly, if an LCM is put in place now and there is a return to more normal or above-average deliveries over the next one or two regulatory periods, State Water could accrue funds significantly in excess of what is required to fund its ongoing operations. Again, there is likely to be pressure placed on State Water to return these funds to users, rather than it being able to retain them to cover future under-recoveries.

5.3 Conclusion

The foregoing analysis suggests that before imposing such a LCM mechanism, the ACCC should seriously re-consider the need for it in the first place. It is only seen as necessary because of the under- and over- recoveries which might occur under the current tariff structure. If a more cost-reflective tariff structure were to be adopted, the need for such a convoluted mechanism would disappear. The analysis elsewhere in this paper strongly suggests that the arguments for retention of the current tariff structure are spurious.

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