The Independent Competition and Regulatory Commission (the Commission) was established by the Independent Competition and Regulatory Commission Act 1997 to determine prices for regulated industries, advise government about industry matters, advise on access to infrastructure and determine access disputes. The Commission also has responsibilities under the Act for determining competitive neutrality complaints and providing advice about other government-regulated activities. Under the Utilities Act 2000, the Commission also has responsibility for licensing utility services and ensuring compliance with licence conditions.

The Commission has one part-time Senior Commissioner, Paul Baxter.

Correspondence or other enquiries may be directed to the Commission at the addresses below:

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The secretariat may be contacted at the above addresses, by telephone on (02) 6205 0799, or by fax on (02) 6207 5887. The Commission’s website is at www.icrc.act.gov.au and its email address is icrc@act.gov.au.

For further information on this investigation or any other matters of concern to the Commission, please contact the Commission on (02) 6205 0799.
Foreword

The Attorney General, pursuant to sections 15(1) and 16 of the Independent Competition and Regulatory Commission Act 1997, has referred to the Independent Competition and Regulatory Commission (the Commission) the task of undertaking an investigation of the projected costs and other matters provided by ACTEW Corporation (ACTEW) of the enlarged Cotter Dam (ECD) project to provide enhanced water security for the ACT. The Attorney-General’s reference, dated 12 November 2009, is made under the Independent Competition and Regulatory Commission Act 1997, section 15 (Nature of industry references) and section 16 (Terms of industry references).

The terms of reference for the investigation require the Commission to report on:

- whether the projected costs of the ECD water security project are prudent and efficient in terms of meeting the water security standards required of ACTEW
- the approach taken to put in place an alliance arrangement with contractors to secure delivery of the ECD water security project to provide water security for the ACT and region
- the process undertaken to develop and test the costings of the ECD water security project at all stages from 2005 to November 2009
- the potential for any new cost variations to be incurred by ACTEW under the contractual arrangements put in place for the ECD water security project delivery
- the scope for cost savings to be passed on to ACTEW to the benefit of ACT and regional water users
- other matters the Commission considers relevant to the inquiry.

As always, the Commission believes that community involvement is a crucial part of the investigation process. In November 2009, the Commission sought submissions on the terms of reference for the investigation. This draft report sets out the Commission’s draft findings against each of the terms of reference. The Commission welcomes submissions on this draft report. Submissions should be provided to the Commission by 28 May 2010. Details of how to provide submissions are set out in section 1.4 of the report. The Commission also intends to hold a public hearing on 24 May 2010.

The Commission must provide its final report to the Attorney General by 30 June 2010.

Paul Baxter
Senior Commissioner
April 2010
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Summary

In response to climate change, drought and bushfires, ACTEW Corporation (ACTEW) examined a range of water security options and made a number of recommendations to the ACT Government. In October 2007, the Chief Minister announced an agreed suite of measures with the purpose of creating a secure and sustainable water supply for Canberra (Stanhope 2007). Those measures included:

- enlargement of the Cotter Dam
- transfer of water from the Murrumbidgee River to the Googong Dam
- implementation of a smart metering program
- design of a demonstration water purification plant.

Two other measures were also announced:

- possible water purchases from the Tantangara Dam
- construction of a demonstration water purification plant.

The government’s decision on the water security program coincided with the Commission’s review of regulated water and sewerage services provided by ACTEW and preparation of a price direction for the five-year period from July 2008. Therefore, the Commission considered the capital expenditure implications of the program in making its price determination, and those costs were reflected in the pricing outcomes (ICRC 2008: 72–76). The estimated cost of the Cotter Dam enlargement project provided by ACTEW at that time was $145 million. This was accepted by the Commission with the proviso that final costs could be up to 30% higher. In the latest estimate provided by ACTEW, those costs had risen to $363 million.

On 12 November 2009, the ACT Attorney-General, Simon Corbell MLA, issued terms of reference to the Commission under sections 15 and 16 of the Independent Competition and Regulatory Commission Act 1997, requiring the Commission to undertake an investigation of the projected costs of the enlarged Cotter Dam (ECD) and other matters relating to the undertaking of the ECD project as part of the enhanced water security program for the ACT, and to report on its investigation by the end of June 2010.

The Commission has undertaken a detailed review of the decision to undertake the ECD water security project against the terms of reference, and has reached the following preliminary conclusions. The Commission is seeking to test these findings through the release of this draft report and the public consultation process.

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1 Key milestones in this examination are detailed in chapter 3 and appendix 3 of this report.
Key draft findings

Assessment process

<table>
<thead>
<tr>
<th>Findings on first term of reference: whether the projected costs of the ECD water security project are prudent and efficient in terms of meeting the water security standards required of ACTEW</th>
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<tbody>
<tr>
<td>1.1 ACTEW has used a net economic benefit (NEB) approach to assessing alternative water security supply options and this is supported as being an appropriate approach for such an evaluation.</td>
</tr>
<tr>
<td>1.2 The ACTEW NEB analysis supports the adoption of the ECD at the higher cost of $363 million.</td>
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<tr>
<td>1.3 The government’s stated water security standard is 1 year in 20 in temporary restrictions.</td>
</tr>
<tr>
<td>1.4 Notwithstanding a positive NEB under ACTEW’s analysis, the ECD alone may not meet the 1 year in 20 temporary restrictions objective.</td>
</tr>
<tr>
<td>1.5 However, the water security program, which includes ECD, Murrumbidgee to Googong transfer and Tantangara storage, is likely to meet this level of service objective under ACTEW’s assumptions.</td>
</tr>
<tr>
<td>1.6 The ECD provides one option for meeting part of the water security standard identified by the government, but alternative options should have been given further consideration as standalone options in the NEB evaluation as the true costs of the ECD became apparent.</td>
</tr>
<tr>
<td>1.7 There are some concerns about the calculation and presentation of the NEB for the ECD and other options, and this may have influenced a decision on the ordering and timing of investment in these options.</td>
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The Commission notes the complexity of planning for the optimal timing of investment within the water industry is largely driven by factors outside the control of the water business. Finding the optimal investment strategy is a function of the following factors:

- **Current storage capacity and the inflows to catchments.** The Commission notes that there has been considerable variability in the ACT’s dam levels over the past 10 years. The Commission notes that each of the major water security program options identified by ACTEW is likely to reduce the pressure on all three existing catchments.

- **Demand factors including population growth and the impact of demand management programs.** The Commission is satisfied that ACTEW has appropriately modelled the impact of population growth and demand reductions in considering the need for the ECD project, notwithstanding that there is potentially a need to make some revision for the impact that these matters are likely to have on the cost of restrictions estimates.

- **Operating standards and available options.** The Commission has concerns about the lack of clarity around the definition of the water security standard in the ACT. The lack of definition surrounding the operating requirements, including the security of supply standard set by the ACT Government in terms of what is meant by time in restrictions, and under what climate change scenario, provides very little guidance to ACTEW as to what it should be aiming to achieve in terms of its operating deliverables.

- **Assumptions about the impact of climate change and the probability of time in restrictions.** ACTEW based its climate change modelling on the most severe 2030 estimate provided by CSIRO; other more severe and less severe climate change scenarios were outcomes of the
2070 CSIRO climate change models. ACTEW understandably decided to take a precautionary approach to its forward planning. Given the uncertainty associated with the modelling of climate change impacts, the Commission would have expected greater testing of the time in restrictions and the NEB calculations under various climate change scenarios presented by CSIRO. At a minimum, a worst-case (extreme) scenario, medium (average) scenario, and low-impact (no change) scenario should have been presented by ACTEW to illustrate this uncertainty. The usefulness of the NEB as a transparent decision-making tool would have been enhanced by sensitivity testing of the NEB within the range of climate change estimates provided by CSIRO, not just against the 2030 worst-case scenario.

- The cost assigned to the various restriction levels. The benefits included in the NEB are primarily derived using the cost of restrictions estimates supplied by the Centre for International Economics (CIE). The Commission is concerned that the CIE estimates lack sufficient detail to substantiate the assumptions that underpin the various cost estimates used in the calculation of the cost of restrictions. The Commission also has concerns about other aspects of the cost of restrictions work completed, including the:
  - use of the upper estimate of the original willingness-to-pay work completed by Hensher et al (2005, 2006) for households, and the use by ACTEW of the upper bound of the CIE survey data in determining the cost of restrictions
  - escalation of these estimates over time
  - use of the 3.5 risk aversion adjustment factor to ‘revise’ upward the cost of Stage 4 restrictions in the 2007 Future Water Options paper
  - inclusion of the cost of restrictions estimates for costs which represent a transfer between consumers, and ACTEW and the ACT Government, and thus should not have been treated as an additional cost to the ACT economy.

The Commission notes that while the NEB approach used by ACTEW is consistent with standard cost–benefit assessment methodologies, it is concerned that the decision on the various inputs used in the ACTEW/CIE calculation of the NEB considerably diminishes the effectiveness of the approach as a decision-making tool.

The Commission endorses the use of the NEB approach by ACTEW, as it has considered these and other factors that act upon its decision on future water security investments. The NEB approach provides a methodology on which a decision on the prudence and efficiency of ACTEW’s decision to invest in the ECD can be assessed.

Under the assumption that the 2030 worst-case climate change scenario presented by CSIRO is the actual climate scenario that ACTEW is now facing, not investing in any additional augmentation works would have been an imprudent course of action for ACTEW. This is largely driven by the expectation that the ACT would have been in some form of water restrictions two years in every five years under a 2030 worst-case climate change scenario. The Commission is satisfied that if this climate change scenario is the most likely outcome, the ‘do nothing’ option was not available.

ACTEW based its decision on the need to increase the water storages as assessed within the framework of the NEB methodology; that is, ACTEW was targeting only economically justifiable projects to improve the water security of the ACT in absolute terms. The lack of an official statement from government of the required water security objective until March 2009 results in a clear definition of this standard being absent at the time the 2007 Future Water Options Review was being undertaken and the decision to proceed with the ECD was taken.
The Commission considers that this lack of a clearly defined water security standard was unhelpful in the consideration of the various water supply options over the period. Greater official guidance should have been available to ACTEW, and indeed the community, on what was an acceptable water security standard, and under what climate change scenario, before funds were committed to proceed with any new investment projects. Notwithstanding the absence of any specific guidance on the water security objective, the NEB approach is a reasonable approach to assessing water security options, assuming that inputs into the NEB are appropriately considered and calculated.

The Commission notes that the water security program which is built around the ECD will, on the basis of ACTEW’s own analysis, result in the ACT facing water restrictions 1 year in every 40 years, under the 2030 worst-case climate change scenario presented in the 2007 Future Water Options paper. This is twice the water security objective subsequently set by the ACT Government of 1 year in every 20 in temporary restrictions. Should the climate change scenario be more severe than the 2030 worst-case climate change scenario, the time in restrictions would be higher than the 1 year in 40 (that is, more often than 1 year in every 40 years). Likewise, climate change scenarios which are less severe than the 2030 worst-case would be significantly above the requirement of 1 year in every 20 set by the ACT Government.

The Commission notes that the application of the NEB, while potentially overstated, was an attempt by ACTEW to quantify the benefits associated with avoiding the costs of restrictions against the cost of individual augmentation options. The Commission suspects that of itself the NEB, with amendments to reflect the Commission’s concerns about some of the ‘benefit’ estimates used, may not have been sufficient grounds for undertaking the ECD investment. However, the requirement to meet the government’s water security objective implies that a positive NEB is not necessarily the only driver of prudence. In such circumstances, the NEB approach would be used to assess the ability of various options to meet the policy objective set by the government at the least cost to the community; that is, to identify the most efficient option for delivering that particular level service.

The Commission has a number of concerns about ACTEW’s application of the NEB framework in determining whether or not the ECD was the most efficient option. The Commission is concerned that the NEB does not necessarily indicate that the ECD project would have been the most efficient of a number of options that were available in the search to provide greater water security. The Commission notes that, at least in the information provided by ACTEW, two other water security projects (the Murrumbidgee to Googong and the Tantangara releases), which have also been approved, were not assessed as standalone options once the full cost of the ECD was known in 2009. In the 2007 Future Water Options paper the Murrumbidgee to Googong option was only ever presented as an incremental option to the ECD. Therefore, the Commission is unsure about how close these two projects would have been to meeting the water security objective without the ECD project. Further, the Commission notes that the next best option presented in the 2007 Future Water Options paper was approximately $21 million lower in NEB terms than the ECD. The additional costs to build the ECD project which have now been revealed suggests that had the 2007 Future Water Options analysis been completed with this additional cost information, or at the very least retested, the ECD may not have been considered at that time the ‘best individual option’.

While the Commission initially accepted both the prudence and efficiency of the ECD project in its 2008 Price Determination (ICRC 2008), it did so based on the considerably lower capital cost estimate of $145 million given when the ECD was presented as the best individual option under consideration. However, since that time, the cost of the ECD has grown significantly, and the
Commission would expect ACTEW to have undertaken further evaluation of the ECD option on a standalone basis against the list of alternatives included in the 2007 Future Water Options paper.

It is unclear to the Commission whether a revised cost–benefit assessment that considered these alternatives as standalone options was completed by ACTEW or assessed by the ACT Government. Further, the Commission is unsure about the degree to which these options would have met the water security objective at a more efficient NEB outcome without including the ECD project as a possible additional guarantee that the security standard would be achieved. Given the Commission’s concerns about the calculation of the NEB, it questions whether any NEB assessment that did not consider the alternative options once the higher ECD costs were known could have provided appropriate guidance on the least-cost option and the willingness of consumers to pay the much higher price of the ECD project.

The need to make at least some augmentation to the existing water supply capabilities is clear under the assumption that the 2030 worst-case climate change outcome has occurred. The decision to proceed with the ECD once the final costs of the project were known is less clear. The Commission notes that the projected economic return/NEB on the ECD project at a cost of $363 million is likely to have been negative if ACTEW had calculated the NEB using the median results instead of the upper bound estimates in the 2008 CIE study. Furthermore, the Commission considers that the project was considerably more marginal in NEB terms than the original 2007 presentation of the NEB suggested due to the inclusion of certain data that the Commission questions, primarily the 3.5 risk aversion factor and the ACTEW and ACT Government ‘costs’, and the exclusion of margins and owner costs which were not included in the original cost estimate of the project. Coupled with the significant cost increases between the 2007 cost estimate and the 2009 TOC, the Commission would have expected a more comprehensive review of the decision in 2009, including a reassessment of the two standalone options.

Alliance arrangement

2.1 The adoption of the Bulk Water Alliance approach to project procurement and delivery is considered to be appropriate and is an increasingly used delivery methodology for water-related infrastructure projects.

2.2 The tendering process for selecting the Alliance contractors used by ACTEW was systematic and rigorous, and consistent with the practice of similar agencies throughout Australia.

Procurement process

Once the decision to proceed with the ECD was made, ACTEW undertook a review of the various procurement options available to it. The Commission has found that ACTEW engaged in a detailed and robust assessment of the various procurement options available. Following this assessment an alliance contract was deemed to be the most satisfactory procurement method. This decision appears to have been taken in the context of the normal commercial considerations associated with the procurement of major projects.
Having decided on the alliance procurement methodology, ACTEW undertook a competitive process to appoint Alliance contractors. While a competitive tender was undertaken for both the design and construction elements of the Alliance, only two parties responded to the design tender. The Commission accepts that this was largely due to the considerable capacity constraints in the market for designers, due to the growth in the Australian economy at the time. While more tenderers would have yielded a more competitive outcome, the Commission is satisfied that the process did not limit the number of tenders received. The Commission notes that four responses were considered for the construction element of the Alliance. The Commission is satisfied that ACTEW conducted an open and transparent tender to select the Alliance contractors.

**Development of the TOC**

The Commission is confident that the TOC has been significantly improved since the initial $145 million estimate. It was developed using competitive tender responses from subcontractors and includes allowances for the various direct costs, excluding ACTEW’s costs, likely to be incurred while building the ECD. The Commission is satisfied that the TOC was developed in a competitive environment and represents a robust cost estimate for the ECD project.

**Allocation of risks**

The Commission has found that ACTEW and the Alliance contractors have gone through a detailed review and allocation of risks consistent with good commercial discipline. Further the Commission notes that the Alliance contractors have agreed to a considerably lower risk amount than the Commission’s consultant, Halcrow, has seen in similar contracts.

**Incentive mechanism within the contract**

The Commission notes that, on balance, the final renegotiated gain-share/pain-share arrangement transfers the risks associated with the project back onto ACTEW to control costs over the agreed TOC, as the incentive mechanism does not reduce the project fee generated by the Alliance contractors until the project costs have increased by 5.3%. Despite this, ACTEW’s customers are better off under the revised TOC and incentive mechanism than they would have been under the initial TOC estimate, because the TOC was negotiated down to $299 million in the TOC determination process.

The Commission notes that there is potentially an increased incentive, particularly as the project nears completion, for the TOC to be revised upwards. However, the Commission is confident that a revision upwards is unlikely for the following reasons: first, ACTEW has given public assurances that the scope for the project will remain unchanged; second, the definitions and operation of both a ‘change’ and a ‘scope change’ clauses set out in the Program Alliance Agreement establish strict guidelines for the possible activation of these provisions.² The fact that the TOC of the ECD project was eventually set at a level considerably higher than the original 2007 cost estimates also serves to place further pressure on ACTEW to ensure that any potential changes to the TOC are not approved except where the changes are certain to provide an increase in the value for money for ACT consumers.

The Commission is of the view that any price increases above the current TOC, whether in the form of changes to the initial TOC, the current scope of works, or a higher AOC, must represent value for money for the ACT consumer. ACTEW will need to provide strong evidence of this

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² The activation of the change and scope change provisions must be approved by the Alliance Leadership Group; ACTEW and ActewAGL have a joint majority membership of the group.
value-for-money outcome as part of any potential change in the cost of the project that is presented to the Commission in its final regulatory price submission as part of the next price determination to be made by the Commission prior to 2013–14.

**Conclusion on the Alliance**

The Commission is satisfied that ACTEW undertook a detailed study of available procurement models and that it conducted a competitive and transparent tender process. The Commission would expect that ACTEW’s cost control processes throughout the implementation of the Alliance contract and the project construction stages would be extremely robust so as to assure the community, the Commission and the ACT Government that any concerns about aspects of the Alliance costing and risk-sharing arrangements are unfounded and that the final cost of the dam represents value for money and an appropriate sharing of the risks and rewards from the undertaking of a project of this magnitude.

**Costings process**

<table>
<thead>
<tr>
<th>Findings on third term of reference: the process undertaken to develop and test the costings of the ECD water security project at all stages from 2005 to November 2009</th>
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<tbody>
<tr>
<td>3.1 The 2005 and 2007 cost estimates were deficient in that they excluded owner costs and potential margins and management costs from external contractors.</td>
</tr>
<tr>
<td>3.2 The 2009 cost estimate of $363 million includes these omitted costs.</td>
</tr>
<tr>
<td>3.3 The 2009 estimate is based on a robust process to estimate the efficient costs of the ECD.</td>
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</tbody>
</table>

The Commission notes that there were four costs estimates between 2005 and 2009. The first two cost estimates were inadequate to be used as the basis for final approval of the ECD project. Significantly, these estimates explicitly excluded costs which would have been reasonably expected to be included at the time the decision to proceed with the ECD was being taken. These costs were:

- owner costs—subsequently revealed to be $64 million or a little over 50% of the direct construction costs which were being considered at the time the decision was taken to proceed with the ECD
- contractor margins and fees—subsequently revealed to be a significant percentage of the direct construction costs.

It is clear to the Commission that the $145 million estimate was deficient for the purposes of approving the ECD project due to the preliminary nature of the estimates as well as an absence of market testing of the costs assumed in 2007. Additional feasibility studies were required to ensure that the costs were tested and the design of the dam refined. The Commission is concerned that the $145 million estimate was used in the decision to proceed with the dam, given that the most up-to-date estimate of the cost of the ECD project was considerably higher than the 2007 estimate. As a consequence, ACTEW at that time made decisions which favoured the ECD, and the favouring of this one option influenced the process for considering other options: that is, in the NEB assessment process it considered the other options as add-ons to the ECD rather than as possible standalone options.
Despite these deficiencies, the 2007 estimates were used to make the decision to proceed with the ECD. Once that decision had been made, and as the more realistic cost estimates became available following the establishment of the Alliance arrangement and the associated detailed costing of the project, the process that was adopted was one of seeking to justify the additional costs on the basis of revised NEB estimates as discussed above.

The TOC presented in 2009 and now accepted by ACTEW is a considerably improved estimate of the actual cost of procuring the ECD project. Based on a detailed review of the ECD design, it includes market-tested subcontractor cost estimates and contractor margins. The $363 million cost estimate also includes ACTEW’s owner costs.

**Contractual arrangements for cost variations**

4.1 The 2009 estimate of $363 million includes an allowance for risk and escalation costs which is consistent with allowances included in similar infrastructure projects and alliance models.

4.2 The agreed TOC and associated contractual arrangements provide ACTEW with significant project control, which suggests that new cost variations are unlikely to occur.

4.3 Under the final negotiated gain-share/pain-share arrangements, there is an increased requirement on ACTEW to monitor and control any cost variations.

Two elements have the potential to increase the costs of the ECD project:

- the design work which is yet to be completed
- the gain-share/pain-share mechanism between the Alliance contractors and ACTEW.

The Commission is concerned that a large portion of the dam design remained unspecified at the time the final TOC was developed in 2009, but accepts Halcrow’s comments that the remaining design work will not have a material impact on the AOC. The Commission takes comfort from the fact that the level of design in place as at March 2010 is robust enough for the current TOC estimate to still be realistic, and will result in a TOC which is closely aligned with the AOC.

The pain-share mechanism has the potential to allow an increase in the direct construction cost of the project by approximately 5% without the Alliance contractors experiencing any pain. Insulating the Alliance contractors from cost increases results in shifting the risk from them to ACTEW, and could be considered a material risk. The amended risk-sharing mechanism, however, is a result of the across-the-board cost estimate reduction that brought the final TOC estimate below $300 million.

This outcome was generated only after ACTEW had extracted a $1.5 million reduction in the project fees and a $5.2 million reduction in the TOC, a $6.7 million saving on the initial TOC estimate. While at no stage is the ACT consumer worse off under the revised TOC and incentive mechanism compared with the initial TOC estimate, there are different incentives on the parties as a result of the changed mechanism. On balance, the revised gain-share/pain-share arrangement transfers the risks associated with the project back onto ACTEW to control costs over the agreed TOC as the incentive mechanism does not reduce the project fee generated by the Alliance contractors until the project costs have increased by 5.3%. However, when compared to the initial
TOC, the Commission notes that ACTEW’s customers are better off under the revised TOC and incentive mechanism arrangements.

Cost savings

Findings on fifth term of reference: the scope for cost savings to be passed on to ACTEW to the benefit of ACT and regional water users

5.1 Negotiation and final agreement on the TOC achieved immediate cost saving benefits for ACTEW as part of a trade off in terms of the operation of the gain-share/pain-share arrangements.

5.2 The final gain-share/pain-share arrangements incentivise the Alliance contractors to achieve additional cost savings to those negotiated to ACTEW’s benefit as part of the TOC setting process.

5.3 ACTEW will benefit from any additional cost savings should they exceed $10.4 million.

The incentive mechanism entered into between ACTEW and the Alliance contractors is slanted in favour of the Alliance contractors in terms of cost savings which are potentially generated by these parties. This outcome was generated only after ACTEW had extracted the initial savings discussed earlier. At the same time the Alliance contractors have a considerable incentive to deliver the project for less than the revised TOC of $299 million. This is highlighted by the gain-share element between the Alliance contractors and ACTEW, which allows for a considerable percentage of any initial cost savings to be retained by the Alliance contractors. That is, the actual outturn cost would need to be approximately 5% lower than the TOC before ACTEW and ACT consumers shared in any additional savings on the contract.

Other relevant matters

Findings on sixth term of reference: other matters the Commission considers relevant to the inquiry

6.1 The original decision in 2007 to adopt the ECD over other water security supply options should have been tested against these other options on a standalone basis once it became clear that the true cost of the ECD was significantly higher than the 2007 estimate.

6.2 While the NEB evaluation methodology adopted by ACTEW is supported, there is concern about the use of the upper end of the cost of restriction estimates in the NEB calculations supporting ACTEW’s decision.

6.3 The opportunity to further develop the principles and practice surrounding the derivation and use of data in future NEB calculations should be considered.

Having reviewed in detail the use of the NEB assessment methodology, the Commission confirms its support for the use of this approach in major investment evaluations of the type undertaken by ACTEW in addressing the ACT’s water security requirements. It is readily apparent that there are some issues surrounding the veracity of the data used in this form of analysis and the need for complete transparency in any assessments of this type. The ‘rules’ that should be applied to the use of the NEB analysis are not dissimilar to those that apply to the use of cost-benefit analysis (CBA). There are numerous publications available on this issue, and for use in the assessments of
infrastructure and public utility decision making. For example, the Australian Government Department of Finance and Deregulation through its Office of Best Practice Regulation has produced a number of informative reports and guides on this subject which, while not directly applicable to a NEB analysis on water security options, address a number of the data issues and forms of comparative assessment that apply equally to assessments using a NEB methodology and cost–benefit analysis assessments.

The approach undertaken by ACTEW in seeking to apply the NEB methodology has been informative and, in a number of instances, pioneering. It is clear, though, that further development of some of the data estimation and application techniques is needed. Nevertheless, the Commission believes that the experience of the use of this methodology in the context of the water supply security evaluations in the ACT provides a useful starting point for undertaking further work to guide public utilities such as ACTEW in any future work requiring detailed NEB assessments.
1 Introduction

Over much of the past decade, the ACT Government has pursued a range of infrastructure and supply measures to ensure the future water security of the ACT and region. An important part of this effort has been the Water Security—Major Projects program developed and delivered by ACTEW Corporation (ACTEW) which includes enlargement of the Cotter Dam. The enlarged Cotter Dam (ECD) water security project is the subject of the Attorney-General’s terms of reference for the Commission’s investigation.

1.1 Background

ACTEW is a territory-owned corporation\(^3\) responsible for the control, ownership and operation of water supply and sewerage systems within the ACT. As well, the company has assets and investments in electricity, gas and telecommunications. ACTEW jointly owns ActewAGL, a joint venture comprising two partnerships. Fifty per cent of the distribution partnership is owned by ACTEW and 50% is owned by Jemena. Fifty per cent of the retail partnership is owned by ACTEW and 50% is owned by AGL Energy Ltd. ActewAGL Distribution operates and maintains the ACT’s water and sewerage networks through an agreement with ACTEW.\(^4\)

In response to climate change, drought and bushfires, ACTEW examined a range of water security options and made a number of recommendations to the ACT Government.\(^5\) In October 2007, the Chief Minister announced an agreed suite of measures with the purpose of creating a secure and sustainable water supply for Canberra (Stanhope 2007). These measures included:

- enlargement of the Cotter Dam
- transfer of water from the Murrumbidgee River to the Googong Dam
- implementation of a smart metering program
- design of a demonstration water purification plant.

Two other measures were also announced:

- possible water purchases from the Tantangara Dam
- construction of a demonstration water purification plant

The government’s decision on the water security program coincided with the Commission’s review of regulated water and sewerage services provided by ACTEW and preparation of a price direction for the five-year period from 1 July 2008. The Commission, therefore, considered the capital expenditure implications of the program in the making of its price determination, and these costs are reflected in the pricing outcomes (ICRC 2008: 72–76). The estimated cost of the Cotter Dam enlargement project provided by ACTEW at that time was $145 million. This was accepted by the Commission with the proviso that final costs could be up to 30% higher. In the latest estimate, these costs have risen to $363 million.

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\(^3\) ACTEW Corporation Ltd is a territory-owned corporation under the *Territory owned Corporations Act 1990* (ACT). The Act sets out the obligations of the company, its directors and its voting shareholders (the Treasurer and the Chief Minister).

\(^4\) Information on ACTEW’s corporate structure and governance is available on its website at http://www.actew.com.au and in documents such as ACTEW’s *Annual report 2008-09*.

\(^5\) Key milestones in this examination are detailed in chapter 3 and appendix 3 of this report.
There has been some comment on the Commission’s decision to include the estimated cost of the ECD in the forward price path. The Commission’s decision at that time was based on the costs as then presented by ACTEW and as reviewed and declared as efficient by its engineering consultants. The consultants also undertook a process audit of the evaluation that had been undertaken by ACTEW and advised that this was rigorous and prudent. On the basis of this advice, the Commission accepted the prudence and efficiency of the water security program, including the ECD, for purposes of setting the price of water.

The decision of the Commission at that time was based on the information provided by ACTEW and in relation to the cost and benefit offered by the other options under consideration at that time. The material increase in costs of the ECD outside the tolerance originally presented to the Commission draws into question the continuing preference of this water security option over others. The terms of reference of this inquiry direct the Commission to examine this among other issues.

1.2 Terms of reference

The Attorney General’s reference6 (reproduced in appendix A) to the Commission was issued under Division 3.1 (Industry references) of the Independent Competition and Regulatory Commission Act 1997 (ICRC Act). The reference required the Commission to undertake an investigation of the projected costs and other matters provided by ACTEW of the ECD project to provide enhanced water security for the ACT. The terms require the Commission to report on:

- whether the projected costs of the ECD water security project are prudent and efficient in terms of meeting the water security standards required of ACTEW
- the approach taken to put in place an alliance arrangement with contractors to secure delivery of the ECD water security project to provide water security for the ACT and region
- the process undertaken to develop and test the costings of the ECD water security project at all stages from 2005 to November 2009
- the potential for any new cost variations to be incurred by ACTEW under the contractual arrangements put in place for the ECD water security project delivery
- the scope for cost savings to be passed on to ACTEW to the benefit of ACT and regional water users
- other matters the Commission considers relevant to the inquiry.

The Commission is required to report to the Attorney General by the end of June 2010.

1.3 Timeline

The Commission’s timeline for the current investigation is set out below.

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6 Independent Competition and Regulatory Commission (Investigation into Projected Costs of the enlarged Cotter Dam water security project) Terms of Reference Determination 2009, Disallowable instrument DI2009-227.
1.4 Making a submission on the draft report

Submissions may be mailed to the Commission at:

Independent Competition and Regulatory Commission
GPO Box 296
CANBERRA CITY ACT 2601

Alternatively, submissions may be emailed to the Commission at icrc@act.gov.au.

Submissions should be provided by 28 May 2010.

The secretariat may be contacted at the above addresses, by telephone on (02) 6205 0799, or by fax on (02) 6207 5887. The Commission’s website is at www.icrc.act.gov.au.

All submissions will be treated as public documents and will be published on the Commission’s website unless the author of a submission indicates clearly that all or part of the submission is confidential and not to be made publicly available. Where confidential material is provided, the Commission prefers that this be under separate cover and clearly marked ‘In Confidence’.

1.5 Structure

The remainder of this report is structured as follows:

- Chapter 2 outlines the Commission’s approach to the conduct of the investigation.
- Chapter 3 outlines the ACT’s water security strategy and development of the ECD project.
- Chapter 4 outlines the Commission’s understanding of ‘prudence’ and applies this to the decision to proceed with the ECD project.
- Chapter 5 examines the alliance contractual arrangements entered into for delivery of the ECD project, including the procurement process, the approach to risk sharing, the incentives to manage costs, the extent of potential cost variances, and the scope for cost savings.
- Chapter 6 analyses the process to develop and test the costings of the ECD water security project.
- Chapter 7 sets out the Commission’s key draft findings against the terms of reference.
- Appendix 1 reproduces the terms of reference.
- Appendix 2 lists submissions received in the first stage of consultation on the terms of reference.
- Appendix 3 summarises the development from 2004 of the ACT’s water security program.

Finally, there is a list of abbreviations and acronyms and a reference list.


2 Approach to investigation

2.1 General approach

This investigation was referred to the Commission as an ‘industry reference’ under Part 3 (Investigations) Division 3.1 (Industry references) of the ICRC Act. The Commission is therefore bound by the procedures for conducting an investigation under the Act. Section 17 provides that the Commission must conduct an investigation as authorised by the terms of the reference. The Commission may request submissions from the public or any specified person or body, or conduct hearings. Unless the Commission orders otherwise, the hearings must be open to the public. Before transmitting a final report to the Attorney-General, the Commission must prepare a draft report and make it publicly available. The Commission must invite interested people to make written submissions on the draft report, and must take these submissions into consideration in preparing its final report.

As a first step in conducting the investigation, the Commission invited written submissions on the matters subject to the terms of reference. The closing date for submissions was 15 January 2010. In response to the invitation, the Commission received three submissions, listed in appendix 2. As detailed in chapter 1, submissions on this draft report have been invited and will be made publicly available through the Commission’s website. A public hearing is scheduled for 24 May 2010.

In the conduct of this investigation, the Commission has undertaken a detailed analysis and review of the process through which the decision to enlarge the Cotter Dam was reached. The terms of reference have been addressed through systematic review of various issues associated with the decision to proceed with the ECD project. This has included a robust analysis of the supporting documentation and sensitivity testing to analyse and confirm the work completed by ACTEW in support of its recommendation to proceed.

2.2 Treatment of confidential information

Part 7 (Information) of the ICRC Act establishes the Commission’s power to require the provision of information or documents to assist the Commission in the exercise of its functions. The Act sets up a framework within which the Commission may either disclose or prohibit or restrict the disclosure of documents, information or evidence provided to it. The Act also makes special provisions for ‘confidential information’. This is information given to the Commission that was, at the time it was given, stated to be confidential or commercially sensitive, or contained in an exempt document within the meaning of the Freedom of Information Act 1989. Protected confidential information is subject to strict non-disclosure provisions under the ICRC Act. The Commission must give notice to any affected party of a proposed disclosure of this type of information, and disclosure must be consistent with the Commission’s disclosure guidelines.7

The ICRC Act sets out the processes for including protected confidential information in its reports. Section 23 provides:

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23 Confidential material in reports

(1) If a final report or a special report includes protected confidential information, the commission must divide the report into 2 documents, as follows:

(a) a document (the **sealed section**) containing the confidential information, or part of that information;

(b) a document (the **unsealed section**) containing the rest of the report.

(2) If the commission divides a report, the commission must include in the unsealed section—

(a) a statement to the effect that there is a sealed section of the report including protected confidential information; and

(b) a general description of the contents of the sealed section.

### 2.3 Information provided by ACTEW

An important element of the Commission’s ability to adequately address the terms of reference has been the cooperation of ACTEW in providing the necessary access to the supporting documents associated with the ECD project. In December 2009, the Commission sought access to information from ACTEW under the provisions of the ICRC Act on the following matters:

- feasibility study and hydrological studies related to the ECD and its catchment area, and alternative options for ACT water security
- technical specification for the final design of the ECD
- peer reviews of the design options and of the final design of the ECD
- scope of work for the final design of the ECD and full cost estimation
- business cases for the ECD
- development and testing of the costings of the ECD project at all stages from 2005 to November 2009
- risk and risk-mitigation strategies related to implementation of the ECD project
- risk of cost variations that could be incurred under the contractual arrangements and how these risks would be mitigated
- alternative alliance models considered by ACTEW, expressions of interest, tenders and documentation related to the development of an alliance arrangement for enlargement of the Cotter Dam and selection criteria for an alliance arrangement
- board records, including board submissions explaining cost variances, board minutes showing acceptance of revised costs, board and management documentation related to formation and finalisation of the alliance agreement
- the Deloitte report (August 2009) on the reasoning for the revisions to the enlarged dam costs.

ACTEW has provided the Commission with all requested documentation and has cooperated with the Commission throughout the investigation. ACTEW identified certain information in three key documents and requested that this be considered ‘confidential information’ for the purposes of the ICRC Act. These documents are the Program Alliance Agreement (ACTEW 2008a), the Deloitte report (Deloitte 2009), and the ECD Target Outturn Cost (TOC) report (Bulk Water Alliance 2009).
In preparing this draft report, the Commission consulted with ACTEW on the disclosure of confidential information, and ACTEW has agreed to the disclosure of all information contained in it. Therefore, the draft report does not include a sealed section.

2.4 Halcrow Pacific review

In 2008, as part of its review of water and wastewater pricing for the five years from 2008–09, the Commission engaged the engineering consulting firm Halcrow Pacific Pty Ltd (Halcrow) to undertake a brief review of proposed expenditure associated with the implementation of the water security measures in the ACT Government’s water security program announced in October 2007. These measures included the ECD project (Halcrow 2008).

At the commencement of the current investigation, the Commission again sought the assistance of Halcrow given the company’s broad familiarity with the ACT’s water security program and specialist expertise in dam construction, construction costings, and hydrological modelling. Halcrow’s terms of reference were to:

- investigate the projected costs of the project through a review of all relevant documents and determine whether the costs are prudent in terms of meeting the water security standards required of ACTEW (including the provision of advice on whether the upgraded dam design is optimised and fit for purpose and whether the hydrological data supporting that design is valid and takes into account the impacts of climate change)
- determine whether the costs are efficient in terms of meeting the water security standards required of ACTEW (including the provision of advice on whether the scope of work in the design is accurately costed and on the risk of significant, unfavourable cost variations
- investigate the contractual and alliance arrangement for the delivery of the project through the review of relevant documents, including the provision of expert advice on:
  - whether the approach taken to put in place an alliance arrangement was prudent and consistent with best practice
  - the process to develop and test the costings of the project at all stages from 2005 to November 2009 and whether this process is consistent with best practice for major capital works design and implementation
  - whether there is potential for any new cost variations under the Alliance contract
  - the scope for cost savings to be passed on to ACTEW and whether these will be passed through to the benefit of ACT and regional water users
  - any other matters arising from the investigations that are undertaken and considered to require further investigation.

In undertaking its assessment work, Halcrow reviewed the documents that ACTEW provided to the Commission and conducted a series of in-depth interviews with ACTEW and Bulk Water Alliance (BWA) personnel. In order to ensure the accuracy of the information provided in the report, a copy of the draft report prepared by Halcrow was provided to ACTEW for comment prior to its finalisation and provision to the Commission. Halcrow also undertook a further assessment of the prudence of the original ‘drivers’ of the ECD project at the request of the Commission following provision of the draft report.

Halcrow provided a report to the Commission in March 2010 (Halcrow 2010). This report references where the Commission’s investigation and findings have been informed by the advice provided by the Halcrow report.
A number of the technical aspects of the dam project were reviewed by Halcrow and found to be satisfactory—for example, the appropriateness of the choice of dam design and whether the dam would fill. The Commission has provided little comment in this report on those aspects that Halcrow reported had been adequately addressed by ACTEW. The Commission is comfortable with the more fundamental elements of the engineering and hydrological modelling undertaken by ACTEW in terms of the construction of the ECD.

Halcrow’s report has been released in conjunction with the Commission’s draft report.
3 ACTEW water security strategy

3.1 Development of the ACT’s water security program

As noted in section 1.1, in October 2007 the ACT Government announced an agreed suite of measures with the purpose of creating a secure and sustainable water supply for Canberra (Stanhope 2007). These new supply measures, which included the ECD, augmented projects undertaken since 2004 by ACTEW to secure the Territory’s water supply, and other actions such as the introduction of permanent water conservation measures (PWCM) along with a new regime of water restrictions in 2006.

Key stages in the development of the ACT’s water security strategy are:

- **Think water, act water** (April 2004)
- Future Water Options process (December 2004 – April 2005)
- Future Water Options review of assumptions (June 2006)
- Water2WATER proposal (January 2007)
- Future Water Options review (July 2007)
- **Water security for the ACT and region—recommendations to ACT Government** (July 2007)
- Water Security Taskforce response (September 2007)
- the project delivery process (commenced August 2007).

A summary description of these stages is in appendix 3.

In July 2007, ACTEW presented a series of recommendations for ensuring the long-term security of water supply to the ACT Government (ACTEW 2007c). In the letter of transmittal, ACTEW’s managing director, Michael Costello, drew attention to the key message of the ACTEW report—that the ‘key challenge for the medium and long term is to build additional water supply assets that can cope not just with very much reduced long term average inflows into our dams, but with more frequent droughts which are longer and drier than that of 2001–2006, without having to go into high level water restriction for extended periods’. ACTEW set out the case for change in the following terms:

> Based on the same cautious approach that ACTEW has previously taken to the analysis conducted by CSIRO, but adjusted now for the new data from the last three years, average annual inflows are estimated to be around 105 GL a year to the three main dams. This is a dramatic reduction from average inflows in the past (around 200 GL a year) and a further reduction from the average annual inflows that was assumed based on CSIRO research from the 2005 report (132 GL a year).

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9 The ACT’s water restriction scheme is established through the *Utilities Act 2000*. Between 2002 and 2006, water restrictions were effected through the *Utilities (Water Restrictions) Regulation 2002*. This was replaced by the *Utilities (Water Conservation) Regulation 2006*, which provided for a scheme of permanent water conservation measures at all times when restrictions are not in force. The ACT’s Chief Minister approved a scheme in March 2006 (*Utilities Water Conservation Measures Approval 2006 DI 2006-59*), and subsequently a temporary water restriction scheme for potable water setting out a four-stage scheme—*Utilities (Water Restriction Scheme) Approval 2006 (No 1) DI2006-212*. The scheme established ACTEW’s power to declare the imposition of restrictions in certain circumstances. In October 2006, ACTEW’s CEO declared Stage 2 restrictions to be in force—*Utilities (Water Conservation) Declaration 2006 (No 1) NI2006-378*. In December 2006, this was revoked and Stage 3 restrictions were declared—*Utilities (Water Conservation) Declaration 2006 (No 2) NI2006-475*. 

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The ACT currently needs to abstract 65 to 70 GL a year to meet customer’s demand. After taking into account the 30 GL or so normally lost through evaporation, low environmental flows (during drought years) and spills after major storm events this means that about 100 GL must flow into the storages every year.

Therefore, water supply planning should not be based on long term average inflows of 105 GL being available each year. This is because both the CSIRO analysis and the modelling supporting this report show that within that average, there will be droughts both longer and drier than the 2001–2006 drought when flows declined to an average of 71 GL a year and in 2006 to 26 GL. Such droughts are expected to occur with significantly greater frequency than in the past.

To have the capability to deal with these longer, drier and more frequent droughts there is a need for future supply capacity that will be additional to that which is needed in years of average or higher than average inflow. The financial cost of this extra capacity is not wasted or premature investment but is essential and justified on the grounds of ensuring water security during these more frequent and more serious drought periods. (ACTEW 2007c: v)

ACTEW recommended that the ACT Government agree that ACTEW should:

1. immediately commence the detailed planning and construction of an ECD to 78 gigalitres capacity;
2. add to the capacity and operational flexibility to extract water from the Murrumbidgee River by undertaking the work necessary to proceed to construction of a pumping capability near Angle Crossing, which could also be used to transfer additional flows released from Tantangara Dam if such flows become available;
3. obtain additional water from a source not largely dependent on rainfall within the ACT catchments through either
   a. the Tantangara transfer option; or
   b. the Water Purification Scheme. (ACTEW 2007c: x)

In relation to obtaining additional water, ACTEW indicated that it would provide advice on the preferred option by December 2007 after assessing whether satisfactory legal and commercial arrangements could be made to transfer water to the ACT via the Tantangara Dam, and after examining in more detail the water purification scheme (in particular, salt management options).

A Water Security Taskforce and a Water Security Advisory Panel were established by the ACT Government to review the options identified in ACTEW’s Water2WATER program and its July 2007 recommendations to the ACT Government in respect of securing the ACT’s water supply into the future. In September 2007, the taskforce made a number of recommendations to the ACT Government and ACTEW (Water Security Taskforce 2007), including:

- enlarging the Cotter Reservoir by 2011
- progressing (undertaking design and obtaining approvals) the Murrumbidgee to Googong Transfer
- progressing arrangements for the Tantangara Transfer option (commercial negotiations and assessment of transfer alternatives)
• not progressing the proposed water purification scheme, subject to further extensive analysis (detailed design of the water purification plant to be progressed, and a review of the need for additional infrastructure undertaken before a decision is made to progress to construction)

• constructing and monitoring a demonstration water purification plant.

3.2 Enlarged Cotter Dam project overview

Site establishment work for the ECD began in November 2009, and construction commenced in January 2010. The site of the dam is around 125 metres downstream from the existing dam on the Cotter River. When completed, storage capacity of the reservoir will be increased from 4 GL to 78 GL. The dam will be around 80 metres high and constructed of roller compacted concrete (RCC).10 Key points in the development of the ECD project are summarised below.11

As described above, in July 2007, ACTEW provided its report *Water security for the ACT and region—recommendations to ACT Government*. The report called for immediate commencement of the detailed planning and construction of the ECD to 78 GL capacity (ACTEW 2007c: x).

The report stated that the ‘approximate capital cost of the ECD is $145 million with an operating cost of around $1 million each year’. This figure included $119 million for the dam and associated works, $4 million for clearing and site preparation, $2 million for pipelines, $15 million for the upgrade of the existing Cotter Pumping Station, and $5 million for miscellaneous works (ACTEW 2007c: 9, 23). The report did not provide any additional detail on the cost estimates of the ECD project or a detailed breakdown or analysis of costings.

• On 4 October 2007, the ACTEW Board (based on recommendations presented by ACTEW) agreed that work commence on a progressive alliance for procuring the ECD.

• On 23 October 2007, in response to ACTEW’s recommendations, the ACT Government formally approved the enlarging of the Cotter Dam from 4 GL to 78 GL, ‘with planning and design work to commence immediately and work expected to be completed within three to five years, at a capital cost of about $145 million’ (Stanhope 2007).

• In April 2008, the Commission estimated that the final cost of the ECD project could be up to 30% more than the $145 million estimate.

• In July 2008, ACTEW confirmed the possibility of a 30% increase in the final ECD project cost.

• In December 2008, ACTEW provided a progress report to the ACT Government stating that it expected that the final ECD project cost could increase by 50% to 70% due to significant increases in the cost of labour, cement and other materials.

• In March 2009, the ACTEW Board was advised that costs for the ECD project may exceed $250 million.

• In July 2009, the ACTEW Board was advised that the preliminary target outturn cost (TOC) estimate for the ECD project was ‘significantly over expectations’ (ACTEW 2009b: 12) and that the Alliance was working towards bringing the TOC to within $300 million.

• On 21 August 2009, ACTEW provided information to shareholders via ACT Treasury and the Chief Minister’s Department that the final TOC of the ECD project would be $299 million and the total project cost would be $363 million.

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11 Summary based on Halcrow (2010: 16–17), and ACTEW’s submission on water security major projects tabled in the Legislative Assembly on 17 September 2009 (ACTEW 2009b).
• On 31 August 2009, the ACT Government considered a presentation by ACTEW on the final cost estimate of the ECD project.

• On 1 September 2009, the ACTEW Board approved the $299 million TOC and the total project cost of $363 million.
4 Prudence of the decision to undertake the enlarged Cotter Dam project

4.1 Context

In assessing the prudence of ACTEW’s decision to proceed with the enlargement of the Cotter Dam, it is important to first consider:

- the appropriate framework for the assessment of the prudence of the decision
- the objective or standard against which prudence is to be assessed.

4.2 Assessing prudence

In assessing the prudence of a particular decision, it is important to consider the full circumstances that prevailed at the time the decision was taken. The assessment of prudence should be made on the basis of whether another party, acting in the same interest as ACTEW, would have made a decision similar to that made by ACTEW had the same information been presented to that party and reviewed by it at the time it made the decision.

The prudence of expenditure is usually considered in the context of a requirement to meet:

- some legal obligation
- demand growth
- asset renewal/replacement objectives/life cycle standards
- productivity benchmarks
- occupational, health and safety objectives
- reliability or quality of supply targets.

Thus, to meet the prudence test, and taking into account the information that was available to ACTEW at the relevant time, the Commission needs to consider whether the projected expenditure was reasonable in the context of the requirement to meet some predetermined and stated objective(s).

In assessing prudence, Halcrow expands on the definition used by the Independent Pricing and Regulatory Tribunal, namely:

> A prudence test will usually assess both: the prudence of how the decision was made to invest; and, the prudence of how the investment was executed (that is, the construction or delivery and operation of the assets), having regard to information available at the time. (Halcrow 2010: 8)

For the purposes of this review, the Commission will focus on the first stage of the prudence test, namely the prudence of how the decision to invest in the ECD at the revised cost estimate was made. Thus, in its assessment of prudence the Commission has conducted a detailed review of the supporting materials used by ACTEW in arriving at its decision to undertake the ECD investment, and considered whether there is evidence that a prudent approach was taken to commit to the

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12 Halcrow was citing the New South Wales Independent Pricing and Regulatory Tribunal 2009 Review of the Department of Water and Energy’s Water Management Expenditure, Request for Quote No. w03/2009, p. 3.
ECD at the revised cost of $363 million. The Commission has separately considered in chapter 6 whether the $363 million is an efficient cost for the construction of the ECD.

To address this part of the terms of reference, the Commission has undertaken a detailed examination of the supporting analysis prepared by ACTEW and its consultants. The Commission is required to analyse critically the various inputs into the decision-making processes used by ACTEW and its advisers, and to review the adequacy, consistency, and application of these processes. This review will necessarily be a detailed and targeted review of the specifics of the supporting documents that underpinned the investment rationale used by ACTEW.

4.3 Identifying the objectives

In order to assess prudence, it has been necessary to consider a number of technical, engineering, and economic issues and potential objectives. The Commission has drawn on the analysis undertaken by its engineering consultants, Halcrow, to provide it with necessary comfort on the prudence of the technical solution proposed by ACTEW. Where possible, the economic considerations have been considered separately from the technical issues.

In preparing its advice for the Commission, Halcrow sought to understand the various legislative and policy drivers that have enunciated the objectives for the ECD project. Halcrow considered the various documents presented as part of the ACT’s water security program. Halcrow noted that ACTEW had undertaken a considerable body of work between 2004 and 2009 to develop the water security measures that had been identified for implementation, including the ECD project.

Halcrow identified the following as the key legislative and policy drivers for the ECD project:

- *Think water, act water* strategy documents
- *Water Resources Act 2007*
- National Urban Water Planning Principles.

Halcrow’s review of those documents found that there was no explicit *legislated* minimum levels of service standards requirements or objectives for ACTEW with regard to the avoidance of water restrictions or maintaining minimum levels of storages. Halcrow noted:

> Under various forms of ACT legislation and national urban water policies, it could be interpreted that there is a requirement for ACTEW to ensure that the management and use of ACT water resources sustain the physical, economic and social wellbeing of the people of the ACT, while also ensuring that water resources are able to meet the reasonably foreseeable needs of future generations.

> However, in doing so, there is a requirement for ACTEW to consider the full portfolio of water demand and supply options to optimise economic, social and environmental outcomes and reduce system reliability risks. (Halcrow 2010: 21)

Notwithstanding an apparent lack of any legislated objective against which a test of prudence can be applied, it is evident from a review of the documentation that there have been a number of ‘expressions’ of the main objectives that ACTEW should seek to achieve. This is considered further below.
4.4 Water security standard

Water security has been central to the debate in the ACT on the need for new water storage, treatment and reticulation infrastructure as well as investment in water reuse, saving, and conservation measures. A clear enunciation of the water security requirement is central to any consideration of the prudence of investment decisions designed to meet long-term water requirements for consumption. To the extent that a water security standard in the ACT can be said to have existed in previous years, it has primarily focused on a combination of the requirements on ACTEW for the safe and timely operation of the water reticulation system and the periodic statements of government regarding the amount of time in restrictions.

ACTEW operates the water supply under a set of self-imposed operational rules and in compliance with its licences under the Utilities Act (and related codes), the Water Resources Act (and related environmental flow guidelines and authorisations) and Public Health Act (and related codes). From minimum dam levels, to the application of water restrictions, to the allocation of water for environmental flows, these operational rules guide and determine the day-to-day management of the ACT’s water resources. However, they do not necessarily specify the water security standard.

A number of ACTEW and ACT Government reports over the past seven years have referred to the need to improve the ACT’s water security. In 2002, water restrictions in the ACT were being applied for the first time in over 30 years. In 2004, ACTEW noted that ‘the current drought has highlighted how vulnerable the existing water supply can be during long periods of low rainfall’ (ACTEW 2004: 1). ACTEW noted that there was currently a consensus that restrictions should be for no more than 5% of the time and that restrictions should occur, on average, in no more than 1 in every 10 years (ACTEW 2004: 13).

This level of service (LOS) expression of the water security standard was further elaborated on by ACTEW in 2005 to encompass:

- minimum storages of 5%
- 5% of time in restrictions
- frequency of restrictions being 1 year in 10 years
- 1% of time in Stage 3 or higher restrictions
- frequency of Stage 3 or higher restrictions being 1 year in 25 years. (Halcrow 2010: 24)

Halcrow notes that ACTEW’s 2005 expression of the water security standard incorporates common targets used by water authorities across Australia as a basis to plan for future water augmentation. At the same time, Halcrow (2010: 89) notes that these ‘are considered to be aspirational targets and, by their nature, could be deemed to reflect a conservative approach to water security’. The standards themselves were not mandated by the Water Resources Act 2007 (ACT) or the utility services licence granted to ACTEW under the Utilities Act 2000 (ACT).

While the 2005 statement provides some clarification on the interpretation of the water security standard, there is no guidance from government on the assumptions that should be applied regarding water inflows. Notwithstanding the lack of any formal clarification from government on the interpretation of LOS, ACTEW advises that the use of this criterion was possible in its planning and operational decision making. However, ACTEW acknowledges that once the LOS approach was used in detail it showed itself to have a number of major flaws.
In recognition of these limitations, ACTEW provided the Commission with documentation stating that the LOS criterion that it used in 2005 was superseded in 2007 by the Water Services Association of Australia’s planning guidelines, *Framework for urban water resource planning*. WSAA outlines the approach adopted in its planning assessment guidelines thus:

> The objective of system performance criteria can be summarised as a trade off between the social, economic and environmental costs of supplying water and benefits of not restricting supply. (WSAA 2005)

ACTEW’s adoption of the WSAA guidelines represents an important shift in the assessment approach used within ACTEW. Rather than being focused on the *time in and frequency of restrictions*, the WSAA approach broadened the objectives to embrace the benefits of not being in restrictions, with those benefits to be considered against the social, economic and environmental costs of supplying water. This required that ACTEW use a process involving a consideration of the net economic benefit (NEB) of the options under review. This new approach focused on the underlying drivers for investment rather than targeting a specific outcome LOS of the investment.

To comply with this preferred assessment framework, ACTEW undertook an assessment of the NEB of the various water supply options. The NEB approach has therefore been central to ACTEW’s presentation of its preferred options to the ACT Government and to the wider ACT community. However, it appears that for the ACT Government, time in restrictions remains the key driver of infrastructure planning. For example, the ACT Minister for the Environment, Climate Change and Water, Simon Corbell MLA, noted in a speech in the ACT Legislative Assembly on 26 March 2009:

> The cost of time in water restrictions can be gauged against the cost of future capital expenditure to ensure water supply. The parameters being used by the government draw upon those being used elsewhere in Australia and are based around one year in 20 in temporary water restrictions. The use of this parameter enables the government to gauge supply and supply augmentation proposals against climate change scenarios.\(^\text{13}\)

At the same time, the Commission notes that there was no formal direction from the ACT Government to ACTEW in 2007 regarding the need to consider any particular water security standard in determining what would be appropriate water supply augmentation projects.\(^\text{14}\) The statement by Minister Corbell appears to have been the first official statement of a service standard, and was not made until March 2009. Nevertheless, this statement, which incorporates both a cost comparison element and a time in restriction target, provides an official objective which the final decision on the ECD can be assessed against for prudence purposes.

Halcrow describes ACTEW’s approach to the water security standard as a ‘hybrid framework’ (2010: 22, 90). Since 2007, ACTEW has adopted a methodology which focuses on the cost of restrictions and the cost of ensuring additional water supply through the NEB calculation as the appropriate mechanism for determining new infrastructure investment requirements, while at the same time it has been guided by the government’s policy objective of 1 year in 20 in temporary restrictions. These objectives are not necessarily mutually exclusive. For example, the frequency of restrictions will inform the determination of the cost of these restrictions and the cost of ensuring additional water supply. In assessing prudence it is important to consider both the drivers associated with the NEB approach and the outcomes of various investment options in terms of the service levels they generate.

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\(^{14}\) In defining what is meant by 1 year in 20 in temporary water restrictions, the Commission has assumed that these restrictions will be applied no more than 365 days over a 20-year period.
This is a fundamental methodological issue in terms of assessing the prudence of a major infrastructure development project. To illustrate this point, the Commission notes the work conducted for ACTEW in 2002 and 2003 by NERA (Hensher et al. 2006) in assessing the willingness of consumers to pay for particular levels of service standards. This research found that consumers appeared to be unwilling to pay to avoid low-level restrictions at all, and to avoid higher level restrictions which are not in place all the time. This suggests that the 1 year in 20 objective should take into account the severity of the restrictions, rather than simply the time in restrictions.

Thus, there is an important conceptual difference between the time in restrictions objective included in the government objective and the methodology adopted by ACTEW. Rather than optimise the time in restrictions criterion as targeted by the ACT Government (albeit without any specification as to the level of restrictions and the climate change impact on weather events), ACTEW seeks to optimise the cost of those restrictions against the cost of various augmentation options. Where the cost of restrictions, or more importantly the benefits from avoiding these restrictions, is greater than the costs of the augmentation option, ACTEW is likely to proceed with the investment.

To demonstrate this point, figure 4.1 is reproduced from the 2007 Future Water Options paper prepared by ACTEW. The figure summarises the probability of being in restrictions across a number of infrastructure investment options being considered.

Figure 4.1: Probability of restrictions across each option

Under these scenarios, the likelihood of being in restrictions under the ECD alone option (78 GL Cotter in 2011) was a little less than 7.5% of the time (that is 1.5 in 20 years), assuming the worst-case 2030 climate change scenario presented by CSIRO. With the adoption of the ECD, the Murrumbidgee to Googong 90 ML/d transfer and the Tantangara storage option (78 GL Cotter + 90 ML/d Murrumbidgee to Googong + Tantangara), the time in restrictions is less than 2.5% of the time, again under the worst-case climate change scenario. This effectively results in a likelihood of restrictions of 1 year in 40, or twice that of the standard announced by the ACT Government. Under this analysis, the ECD alone option does not necessarily achieve the operating standard of the 1 year in 20 target announced by Minister Corbell.
It is important to note that in figure 4.1 all levels of restrictions have been included in the assessment of the probability of being in restrictions. However, the exclusion of the least severe level of restrictions from the analysis (as suggested by the Hensher willingness-to-pay studies) reduces the probability of being in levels of restrictions that are unacceptable to the community below the 1 year in 20 target for all options presented in this analysis. Thus, the adoption of an objective for prudence testing that is not well specified can significantly influence the result of the analysis and adoption of possibly suboptimal solutions.

Furthermore, the Commission notes that the frequency of restrictions is driven by assumed climate change scenarios. As discussed in greater detail below, ACTEW used the 2030 worst-case CSIRO climate change scenarios. While it is acknowledged that ACTEW needs to adopt a precautionary approach in this regard, the assumptions that are to be applied in setting the objectives to be achieved clearly have a significant impact on the results, and therefore on any assessment of whether the prudence test has been met. Thus, for example, while the adoption of the ECD alone scenario as presented above would result in the time in restrictions being 1.5 years in 20 years, a climate change scenario less pessimistic than the worst case adopted by ACTEW would bring this option well within the 1 year in 20 requirement specified by the government; more severe climate change scenarios would increase the amount of time in restrictions.

Thus, the adoption of an objective that is ‘based around one year in 20 in temporary water restrictions’ requires more definition than has been provided to date. Furthermore, the use of a NEB approach does not necessarily recognise the level of service objective.

When ACTEW moved to adopt the NEB approach, it was generally recognised that this methodology represented a more rigorous way of assessing future water supply options. However, in assessing prudence, the Commission also needs to consider what objectives ACTEW was expected to meet and whether ACTEW best met these objectives in its final decision on the ECD.

Before considering whether those objectives have been met for purposes of the prudence test, the Commission needed to consider in some detail the assumptions included in the NEB assessment of the available options.

### 4.5 Climate change and the frequency of restrictions

The impact of climate change on the water supply network in Canberra is one of the great uncertainties in planning water infrastructure requirements. The uncertain nature of the impact and implications of failing to adequately meet the water needs of the ACT has led ACTEW to use the 2030 worst-case climate change scenarios prepared by CSIRO (2003) and presented in the 2007 Future Water Options paper (2030 worst-case scenario) in modelling the frequency of various restriction levels. This conservative approach has so far been supported by the length and severity of this current dry period. Figure 4.2 outlines the projections for the ACT’s average inflows, historically and using the CSIRO estimates.
The circulated areas indicate the worst-case reduced levels of inflow into the ACT catchments as at 2030 and 2070 forecast by CSIRO under its 2003 climate change model. These need to be compared to the long-term median inflows for the period 1871 to 1993 and the inflows during the Federation and World War II droughts and the current drought. Irrespective of the impact that climate change will have on the water supplies of the ACT, the depth of the current drought is without precedent.

The current drought is far worse than the other two major drought events, at least in terms of the net inflows in the Cotter, Corin, Bendora and Googong systems:

Even without accounting for climate change, the ACT is almost certain to experience future droughts worse than those experienced in the past. In fact, this current drought is now the worst on record and would have been difficult to predict even a few years ago. (ACTEW 2004)

ACTEW undertook its NEB modelling on the basis of the worst-case scenarios presented by CSIRO. This reflects the conservative nature of the assumptions, something which is clearly stated in all of ACTEW’s reports, as well as the belief within ACTEW, based on the past 15 years of data, that there is a step change in the climate currently being observed in the ACT catchment area. The CSIRO projections estimate reduction in rainfall against the mean of 9%, while the increase in the evaporation rate is estimated to be 9%. Based on these assumptions, ACTEW models mean inflows to fall by approximately 47% (ACTEW 2007b). Thus, the frequency of restrictions assumed in the ACTEW modelling is based on these significant projected reductions in inflows.

The modelled reduction in mean inflows is considerably higher than the combination of projected reductions in rainfall and increases in evaporation rates arising from the modelled CSIRO climate
change estimate. In discussions with the Commission, ACTEW\(^\text{15}\) has advised that this is explained by the hydrological modelling, which incorporates reduced rainfall translating into considerably less runoff into the catchments’ existing storage infrastructure.

The Commission notes that the approach taken by ACTEW to use the 2030 worst-case scenario is consistent with the approach to be taken by an operator taking account of possible expected outcomes (the precautionary approach). Halcrow noted that other water utilities have undertaken planning on a similar basis.

ACTEW’s use of the worst-case scenario represents the bottom end of the range of possible results for the 2030 climate provided by CSIRO. Effectively, CSIRO’s approach to modelling climate change was generated from the outputs of 13 Global Climate Change models, with results ranging from changes in mean annual rainfall of \(-9\%\) to \(+2\%\) by 2030 and \(-29\%\) to \(+7\%\) by 2070. The range of results points to the considerably high level of uncertainty regarding the potential impact of climate change on the mean annual rainfall.

Thus, as part of its precautionary approach to future investment decisions on the ECD, the Murrumbidgee to Googong 90 ML/d transfer and the Tantangara projects, ACTEW has modelled that the ACT will be out of water restrictions 97.5\% of the time based on the CSIRO 2030 worst-case analysis; that is, a reduction in average rainfall of 9\%. This effectively means that the ACT will be in water restrictions 1 year in 40 under this climate change scenario. Under the less severe CSIRO scenarios, the likelihood of restrictions decreases, which means that the ACT would face less time in restrictions than the 1 year in 40 result projected by ACTEW. Meanwhile, under the more severe 2070 CSIRO scenarios, the likelihood of restrictions increases, meaning that the ACT would face more time in restrictions than currently projected.

The Commission notes that the precautionary planning approach adopted by ACTEW supports the use of the CSIRO 2030 worst-case climate change scenario when considering infrastructure options. The Commission notes, however, that the adoption of this approach means that the presentation of benefits associated with future infrastructure spending are those available at only one potential outcome rather than the benefits that would occur under an average of possible climate change scenarios.

As an example of this point, ACTEW presented a range of NEB estimates for the ECD in the Future Water Options paper 2007 of approximately minus $10 million to $1.5 billion, with an average NEB over this range of $400 million (ACTEW 2007b: 26, 138). This represented the range of NEBs over the stochastic modelling of the CSIRO 2030 worst-case climate change scenario.\(^\text{16}\) This approach generated a probabilistic range of results over this singular climate change expectation rather than generating a range of NEB over the various climate change results. With the adoption of the 2030 worst-case climate change scenario, ACTEW assigns a relatively high probability that the community will face restrictions compared with the less severe end of the range presented by CSIRO and therefore will incur the costs of these restrictions.

One of the key determinants within ACTEW’s NEB calculation is the expected time in restrictions. The key drivers supporting the assumptions regarding time in restrictions are the

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\(^{15}\) Meeting between ACTEW and Commission staff, 24 February 2010.

\(^{16}\) Effectively, ACTEW took its existing 10,000 year climate model and applied the CSIRO 2030 worst-case reductions to generate 10,000 years of expected rainfall patterns. The 10,000 years were broken into 50-year replicates. Each 50-year series was broken into the four seasons to generate an expected rainfall over the year. Each of these 200 replicates was then processed by the model to generate the expected time in restrictions over a given 50-year period. The NEB calculations were then used to generate an estimated benefit across the 200 observations which are used in the range identified above.

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30 — Draft Report — Enlarged Cotter Dam Water Security Project ICRC
amount and nature of infrastructure and the climate change scenario adopted. The amount of infrastructure is a relatively static choice and is generally being considered in the context of the investment decision and the NEB. Where only one climate change scenario is assumed, the consequential cost to the community is potentially overstated or understated as the full range of results is not considered.

Where various investment options are being assessed for ranking purposes, the choice of the scenario is immaterial so long as each option is assessed on a consistent basis. However, where the NEB is used to assess the actual benefits that are likely to accrue to the ACT community from a particular investment option, considerable care is required in the interpretation of the results. The need for this care in interpretation of the data is driven by the uncertainty of climate change predictions—the more severe the climate change assumption, the higher the NEB; the less severe the climate change assumption, the lower the NEB. ACTEW has been transparent regarding the use of the 2030 worst-case climate scenario throughout the process of identifying options to secure the ACT’s water needs. While ACTEW has undertaken multiple runs of the 2030 worst-case climate change scenario, there has been no additional sensitivity testing of other climate change outcomes, at least in terms of generating an NEB.

Given the uncertainty regarding the potential impact of climate change, the Commission considers the absence of climate change sensitivity analysis a matter for comment. At a minimum, the Commission would have expected at least three climate change scenarios would have been tested, namely:

- high impact (upper end of the CSIRO range)
- medium impact (middle of the CSIRO range)
- low impact (bottom of the CSIRO range).

This presentation of results would have provided a clear context for the decision and the likely impacts or risks associated with the various investments.

These observations are of direct relevance in making any assessment of the prudence of ACTEW’s investment decision. The Commission acknowledges the complexity of the task required when objectives are not clearly identified in advance either in legislation or in other official ways (for example licence requirements). However, there is a need for greater clarity in the presentation and interpretation of results that have been derived from the analysis undertaken by ACTEW, particularly when these are to be interpreted against the water security objective as part of a test of prudence.

The need for a clearer understanding and interpretation of the data surrounding the costs and benefits that have been presented is demonstrated by the calculation and use of the NEB assessment.

### 4.6 Net economic benefit

ACTEW’s approach to the calculation of the NEB is unique in the Australian water industry and reflects the adoption of the WSAA recommendations soon after their presentation. Its approach is a combination of cost of restrictions, rainfall data, and net inflows data under numerous scenarios, including climate change and bushfire scenarios. However, the basic principles applied are completely consistent with the normal business case presentation of costs and benefits. The process by which these calculations are used in the models prepared by ACTEW appears to be
sufficient to measure the benefit of one project over another. ACTEW explains its application of NEB analysis thus:

The primary measure used to determine whether water supply infrastructure should be constructed is Net Economic Benefit (NEB) analysis. This method may also be used to determine the optimal timing of future augmentations. Other measures may also be considered when evaluating options, such as probability of water restrictions, volumes of water that can be supplied from each source, greenhouse gas emissions and operational convenience. (ACTEW 2009a: 47)

Under the NEB, there are four key drivers:

- the cost of the project (considered in chapter 6)
- the cost of operating the system with and without the project
- the frequency of time in restrictions—as derived from ACTEW’s climate change model and the CSIRO climate change model (discussed in section 4.5)
- the cost of the restrictions—as derived from various work undertaken by ACTEW, the Centre for International Economics (CIE), and NERA (discussed in section 4.7).

ACTEW has demonstrated the model to the Commission and described how the chosen climate change assumption is included to model the frequency of drought, and consequential time in restrictions over a range of potential scenarios, and the impact that those dry periods have on dam storages throughout the ACT. This modelling has been completed in relation to the ECD option.

The Commission has been unable to determine how successfully the model is able to dynamically account for the interplay of all various water security options in determining the appropriate staging of investment options. On review of the 2007 Future Water Options paper, the Commission notes that rather than dynamically accounting for all options in selecting the appropriate staging of the water security program, the 2011 ECD option was selected as the best individual option as it had the highest standalone NEB—by approximately $21 million—albeit with a capital cost of $145 million. In addition, it scored relatively well in terms of probability of restrictions (ActewAGL 2007b: 25). Once the 2011 ECD was rated the preferred option on the basis of this criterion, as applied in 2007, there was limited review of the ordering of the other options against the revised NEB resulting from the higher ECD construction cost estimate once these higher cost estimates became available.

Through the application of the NEB assessment criteria, ACTEW has committed to three projects that jointly achieve a water security objective considerably higher than the 1 year in 20 time in temporary restrictions under the 2030 worst-case climate change assumption. The Commission notes that the assessment using the NEB results does not directly account for a stated LOS objective. Projects that result in the achievement of a higher LOS level than that targeted are still included in the assessment process, which is driven by NEB outcomes. As noted in 4.4 above, a specific water security objective was not clearly stated by government until March 2009. It is not evident that this resulted in any reconsideration of the ordering of the favouring of the three main options, particularly in the context of revised costing for the ECD.

Further consideration of the application of the NEB is required to establish the appropriateness of the NEB in supporting the prudence of the investment decision. Within this consideration, the Commission has looked at three important aspects of the NEB as it was presented to the ACT Government in the Future Water Options paper in 2007. These areas are:

- the estimates of the cost of water restrictions
• the use of ACTEW and ACT Government costs in the cost of restrictions
• the application of the 3.5 risk aversion factor in the 2007 assessment of the cost of Stage 4 water restrictions.

Cost of restrictions

The NEB is a function of the time in water restrictions, discussed above, and the cost of these restrictions. In preparing the NEB, ACTEW engaged various consultants to undertake a range of economic studies to establish the cost of these restrictions. NERA was engaged in 2003 to conduct a willingness-to-pay survey across a range of utility services. In addition, CIE was engaged by ACTEW to prepare an economic benefit–cost analysis of the new water supply options for the ACT in 2005 (CIE 2005). Subsequent to the 2005 engagement, CIE was retained by ACTEW to update its estimates of the cost of water restrictions in 200717 and 2008 (CIE 2008).

The cost of restrictions have been estimated across a range of stakeholders, activities and amenities, including households, commercial and industrial users, water businesses, street trees, recreational values, tourism, transaction costs, ACTEW profits, and the ACT Government.

Households

The 2003 NERA study and subsequent academic journal articles which drew on the study (Hensher et al. 2005, 2006) found that there was a lack of evidence that household customers were willing to pay any significant amount to avoid low-level water restrictions or restrictions that were in place over short periods. At the same time, customers were willing to pay, on average, $237 per year to reduce the frequency of severe water restrictions (defined as those in place over a full year).18

In 2005, CIE estimated the cost of restrictions across all five levels of water restrictions19, using the 2003 NERA study as the starting point for the calculation of customers’ willingness to pay to avoid restrictions. While Hensher et al. stated that at restriction levels 1 and 2 customers did not report a willingness to pay that was statistically different from zero, CIE included the cost estimates across these first two restrictions levels as reported in the NERA study in its calculation of the cost of restrictions.

The work of Hensher et al. suggested that consumers were willing to pay an average of $237 to avoid Stage 3, Stage 4 and Stage 5 restriction levels. Obviously, within the diverse group of people surveyed, there was a range of results from the respondents. Across this range, the 95th percentile confidence interval included a lower estimate of $90 per year and an upper estimate of $420 per year. In discussions with the Commission, Hensher advised that the use of the average result rather than the upper end of the 95th percentile confidence interval would be appropriate to establish the average costs that consumers would be willing to pay to avoid these restrictions.20

17 CIE 2007 estimates were not published; they have been inferred from the 2008 CIE report.
18 The 95th percentile confidence interval for this willingness to pay is from $90 to $420 per household.
19 Until 2006, the ACT had five restrictions levels, each targeting a specific percentage reduction in water use. In 2006, the first of these stages was adopted as a ‘permanent water conservation measures’ scheme along with a four-stage temporary water restriction scheme (see footnote 9).
20 Professor David Hensher, email to P Baxter, 24 February 2010.
In 2005, CIE estimated the cost of restrictions for households in 2003 and 2005. These costs were estimated from the willingness-to-pay information from workshops and calibrated using the NERA study, and a linear expenditure system, to assign a value to the loss, or costs, associated with water restrictions at the household level. The estimate that was used in this calibration was Hensher et al.’s upper 95th percentile confidence interval estimate; that is, CIE calibrated its results against the $420 estimate of consumers’ willingness to pay to avoid these restrictions. The use of the upper end of the confidence interval was based on additional information which became available to ACTEW through community engagement which suggested that the results of the initial NERA study undervalued the cost of restrictions. CIE’s estimates of the cost of restrictions were further updated in 2007 for the Future Water Options paper and again in 2008. The 2008 updated analysis was based on a new survey of consumers’ willingness to pay, although, as discussed further below, it adopted a different approach to deriving a value for consumers’ willingness to pay (a ‘stated preference’ approach versus the ‘revealed’ approach used by Hensher et al.).

The CIE 2003 and 2005 willingness-to-pay estimates were prepared before the changes in the restriction regime brought about by the ACT Government’s adoption of PWCM, while the 2007 and 2008 estimates were prepared after the changes. Effectively, the old five-stage restriction regime became a four-stage restriction regime plus PWCM; that is, the old Stage 1 restrictions were adopted on a permanent basis. This has to be considered when comparing the 2005 estimates with the 2007 and 2008 estimates—Stage 2 restrictions in 2005 are the same as Stage 1 restrictions in 2007 and 2008. Table 4.1 sets out the various estimates of the yearly cost of restrictions on households as calculated for individual years over this period.

Table 4.1: Estimates of the cost of restrictions for households ($/year)

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<thead>
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</thead>
<tbody>
<tr>
<td>PWCM (old Stage 1)</td>
<td>19</td>
<td>24</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Stage 1</td>
<td>89</td>
<td>118</td>
<td>35</td>
<td>35</td>
<td>43</td>
</tr>
<tr>
<td>Stage 2</td>
<td>233</td>
<td>360</td>
<td>236</td>
<td>236</td>
<td>255</td>
</tr>
<tr>
<td>Stage 3</td>
<td>447</td>
<td>411</td>
<td>273</td>
<td>273</td>
<td>480</td>
</tr>
<tr>
<td>Stage 4</td>
<td>579</td>
<td>769</td>
<td>502</td>
<td>1,757a</td>
<td>1,107</td>
</tr>
</tbody>
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a The original estimate of $502 is adjusted by a risk factor of 3.5.

The Commission notes the changes in cost estimates between 2003 and 2005. Although the 2003 and 2005 cost estimates were not prepared necessarily as a time sequence of the costs that households face, under normal circumstances it might be expected that the estimates of these costs, prepared at the same time with the same information, would move more or less in line with inflation or general economic growth. As observed in table 4.1, the movements in the 2003 and 2005 estimated costs over time cover a considerable range, including negative movement in the case of Stage 3 restrictions.

The Commission notes also that the CIE estimates of the cost of restrictions at the Stage 4 level across households has been increasing significantly over the five years for which estimates are presented. Whereas the 2003 CIE estimate was that consumers were willing to pay $579 per year to avoid Stage 4 restrictions, five years later the estimate had increased to $1,107 per year, a significant real increase over the period. Furthermore, the Commission notes that at the time the dam was being considered as part of the 2007 Future Water Options paper the estimated cost of
Stage 4 restrictions for households was $1,757 (which includes a 3.5 risk factor adjustment, discussed further below), significantly above the estimate for the following year, 2008.

In terms of assessing the robustness of the NEB assessment undertaken by ACTEW, the Commission notes that these cost of restrictions estimates have varied dramatically over the five years between 2003 and 2008, particularly at a time when these cost estimates were being used in the evaluation of new investment options for the supply of water in the ACT. In particular, because of the significance of these cost estimates in the NEB methodology used by ACTEW, the Commission is concerned that the current cost estimates of restrictions may not reflect households’ actual willingness to pay.

To illustrate this concern, the Commission points to the apparent inconsistency between the inclusion in these estimates of the cost of restriction levels PWCM and Stage 1, in 2003 and 2005, and the finding of Hensher et al. that consumers were unwilling to pay to avoid these levels of restrictions:

> The primary finding of our analysis is that customers evidence a lack of WTP [willingness to pay] to avoid most types of drought-induced restrictions. (Hensher et al. 2006: 65)

Consistent with the findings of this original willingness-to-pay work, the Commission does not consider that it is appropriate for the costs of old Stage 1 or old Stage 2 restrictions to be included in any NEB calculation. Indeed, CIE appears to correct for this in terms of PWCM, which is not included in the 2007 and 2008 estimates of the cost of restrictions borne by householders. However, the cost of Stage 1 restrictions (the old Stage 2 restrictions) is still included in the 2007 and 2008 estimates, which form part of the NEB calculation relied upon by ACTEW.

In considering these estimates, and in particular the significant increase in costs of Stage 3 and Stage 4 for 2008 (and Stage 4 for 2007), the Commission notes that over the past five years widely promoted demand management programs are likely to have had a significant impact on the demand curve for water, particularly in terms of discretionary outdoor use, which is typically the target of water conservation measures. The significant capital invested by the ACT community to reduce water usage—for example, by replanting numerous gardens to replace drought-affected species with drought-tolerant species and replacing sprinkler systems with more efficient water conserving systems, primarily dripper systems—has shifted the demand curve for discretionary water, thereby reducing the welfare loss associated with the various restriction levels. The movement to higher density living in the ACT, through increased apartment living or smaller block sizes, is also likely to reduce the welfare loss associated with water restriction levels. In effect, the CIE estimate of the cost of restrictions reflects a partial equilibrium approach which does not consider the impact that water restrictions, demand management programs and other changes may have had on the positioning of the demand curve for an individual household.

The Commission notes that the 2008 cost estimate of Stage 4 restrictions is approximately 166% higher than the average water bill in the ACT. Based on these latest cost estimates the CIE analysis has concluded that on average customers would be willing to pay a total water bill of over $1,500 per year to avoid Stage 4 restrictions.

In undertaking its update of the cost of restrictions in 2008, CIE included in its calculations:

- an estimated cost of $100 per household for the loss of lawn, garden areas and trees
- an estimated 0.45 hours per week per household (23 hours per year) spent hand managing greywater—at half the annual wage rate this comes to an annual cost per household of $380
• an expectation that Stage 4 restrictions would be at least twice as expensive per household as Stage 3 restrictions. (CIE 2008: 61)

CIE calculated that the cost of Stage 3 restrictions was $480 per household for the loss of lawn, gardens and trees plus the cost of managing greywater. The application of an expectation factor that Stage 4 cost would be twice as expensive appears inconsistent with the cost associated with Stage 3, in that the Commission would expect that the costs borne up to the Stage 3 level, which are included in the Stage 4 cost estimate, would be unlikely to be incurred again. For example, the loss of lawn and garden area is unlikely to occur at twice the rate that occurred across Stage 3 restrictions as under that stage watering of lawns, for example, is already prohibited. Therefore, it is difficult to envisage that the cost associated with a loss of the amenity of this facility would be double the cost of Stage 3. The reliance on greywater to maintain gardens may mean that there is an increase in the collection of this reuse water across the household sector. However, to expect that this will be double the rate already seen under Stage 3 is open to debate.

CIE has acknowledged that the methodology adopted to estimate household costs has needed to address the issue of how householders can meaningfully assess what ‘cost’ would be incurred in moving from Stage 3 to Stage 4 restrictions when there has been no direct experience of Stage 4 restrictions in the ACT. Thus, the cost estimates that have been prepared for the Stage 4 restriction level have necessarily included a degree of subjectivity. The Commission is concerned about the subjectivity that is contained in these estimates at the upper level of restrictions, particularly as they have such a significant impact on the final NEB calculation.

Potentially the true costs of Stage 4 restrictions may in fact be a marginal loss over Stage 3 restrictions rather than a significant increase as calculated by CIE. This marginal loss is illustrated by the impact that Stage 4 restrictions would have on people currently hand-watering their gardens. Under Stage 4 restrictions these consumers would be unable to continue this practice, freeing their time for other activities. Assuming that on average people currently hand-water their gardens for 0.45 hours per week, the movement to Stage 4 restrictions reduces this time to zero, creating a benefit to the average household of 23 hours per year, which, using the CIE wage rate assumption, translates to a ‘benefit’ of approximately $380 per year.

Combining this saving with CIE’s current cost estimate of Stage 4 restrictions ($1,107) would suggest that the gross cost of restrictions would need to be this cost plus the benefit from Stage 4 restrictions ($380), a revised gross cost of $1,387 per annum. The Commission has been unable to determine whether the CIE estimate of Stage 4 restrictions in 2008 included this type of ‘benefit’. However, this raises important methodological questions about the dynamic impact of restrictions on households and how these impacts were modelled in the CIE estimates. If the cost of restrictions were calculated without consideration to alternative uses of time and the ability for households to generate utility in alternative activities, the costs estimated and used in the NEB assessment could have been overstated.

The estimated costs to households of restrictions are the foundation for ACTEW’s NEB assessment. Thus, there is a need to consider carefully whether the estimates in that assessment reflect a realistic interpretation of the community’s willingness to pay to avoid water restrictions at different levels. The Commission has raised some areas of concerns which are directed at a number of methodological issues associated with the calculation of the household cost estimates. Nevertheless, the CIE approach provides a starting point for this type of analysis and could
potentially be refined to reflect any methodological concerns. The Commission accepts that some of these concerns are primarily matters of interpretation where there is potentially no definitively correct answer. However, informed use of the analysis results is greatly improved by an acknowledgment of the strengths and weaknesses of the data that has been used.

**Inclusion of population forecast in the cost of restrictions**

While CIE’s work is a partial equilibrium approach to estimating the costs of water restrictions on individual households, it does take account of the population growth in the ACT by multiplying these costs by the forecast number of households. Within the NEB assessment, this helps to ensure that population growth, with its associated impact on the demand for water in the ACT, is considered and factored into the decision to invest in new infrastructure. The ability for ACTEW and its shareholders to plan adequately for significant population growth is prudent and, if applied correctly, should have an impact on the cost of restrictions through the associated growth in demand in the context of assumed water availability.

In considering the population growth projections used by ACTEW (2005b), Halcrow (2010: 25) noted:

> In planning for future water options, ACTEW adopted what it deemed to be a ‘prudent’ planning scenario that incorporated:
> - the high population growth projections; and
> - a 12 per cent reduction in mains water use by 2012, and 25 per cent reduction by 2023, from 2003 levels.

In our opinion, this planning approach is not inconsistent with the general approaches used in the water industry. The water industry is, by its nature, a conservative industry given that the potential impact of not providing basic water supply and sewage collection services can be significant.

The Commission is satisfied that ACTEW appropriately modelled the impact of population growth and the forecast demand reductions in considering the need for the ECD project. At the same time, the Commission is concerned that while demand reductions were included in ACTEW’s forecasts, the treatment of demand reductions in CIE’s assessment of the cost of water restrictions is too static and does not attempt to model the changes that demand reductions would have on the demand curve in the longer term.

For example, a considerable proportion of the projected population growth is likely to live in higher density housing, which generally is associated with either smaller block size or an increased number of apartments. The cost of water restrictions is lower for apartment dwellers than for those living on larger blocks, because apartment dwellers have more limited gardening opportunities. While common areas within apartment blocks are likely to be affected by water restrictions, the associated average ‘costs’ of these restrictions are materially lower than for households on sizable blocks that provide more opportunity for extensive garden and lawn areas.

This would suggest that over time the average cost of water restrictions for households in the ACT will fall as a greater percentage of the housing stock is made up of apartment dwellings and smaller blocks. The Commission has been unable to determine how CIE has accounted for this

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21 Professor Jeff Bennett, Director of the Environmental Economics Research Hub in the Crawford School at the Australian National University, undertook a peer review (Bennett 2008) of the Colmar Brunton Social Research (2008) and the CIE 2008 studies of the costs of water restrictions. The Colmar Brunton Social Research study provided information used by the CIE. While Professor Bennett was supportive of the conceptual framework used by CIE as ‘appropriate to the evaluation of water supply augmentation investments’, he was of the view that the CIE’s ‘mixed’ approach may have understated some elements of cost and overstated others.

22 The ACT Government’s Treasurer and Chief Minister are ACTEW’s two shareholders.
shift in preferences in its estimates of the cost of water restrictions over time. The Commission acknowledges that the cost of restrictions estimate driven by the 2008 CIE survey does consider the impact of block size on these costs. However, it is a point-in-time estimate, and as the NEB considers the cost of restrictions into the future, the point-in-time estimate does not adequately address the longer-term impact that a more densely populated ACT will have on those cost estimates.

**Use of surveys to estimate the cost of restrictions faced by households**

The 2003 work completed by NERA (Hensher et al. 2005, 2006) and the 2008 work completed by CIE generated estimates of the cost of restrictions from surveys of the community. While the CIE 2005 and 2007 estimates of the cost of restrictions relied in part on the work conducted by NERA, its 2008 estimates were generated by a new survey commissioned by ActewAGL on behalf of ACTEW. CIE characterised this survey as ‘covering a larger number of households than previous studies but with a simpler structure’ (CIE 2008: 26).

Each survey will have its own strengths and weaknesses in terms of the design, survey sample, questions, and follow-up processes. While CIE’s sample is larger (approximately 800 respondents) than the original NERA sample (approximately 200 respondents), both sample sizes are statistically relevant. Although smaller in sample size, NERA’s respondent group was surveyed in considerable detail, so the NERA study continues to be relevant in the context of any consideration of the community’s willingness to pay to avoid water restrictions.

In determining the cost of water restrictions, or any good where consumers are unable to reveal their preferences in a market environment, survey design is an important consideration. This is particularly pertinent where respondents are asked to nominate the cost of particular action. In the case of water restrictions, those within the sample group with strong views on the impact of restrictions are likely to nominate a considerably inflated cost of restrictions, thereby potentially skewing the lower and upper estimates of the cost of restrictions, which could lead to an understatement or an overstatement of the costs of restrictions.

NERA’s work attempted to normalise this by asking consumers which option they would prefer: restrictions at a particular level and specified cost or lower levels of restrictions at a higher level of specified cost (a revealed preference approach). CIE’s estimates appear to be based on the respondent’s own estimate of costs made at the time the survey was taken (a stated preference approach). As respondents can give any estimates that they wish (which may or may not be informed), this approach can result in potential understatement or overstatement of the costs and therefore of the consequential benefits associated with the NEB calculation. CIE sought to correct for any possible bias by using various techniques on selected focus groups to distinguish between participants’ own assessments and the influence of others on their responses. Lessons learned from this process were then included in the full survey undertaken on behalf of CIE by Colmar Brunton Social Research.

Where there is an understatement or an overstatement of household costs, it reduces the effectiveness of NEB calculation in supporting the prudence of the ECD. That is to say an adjustment would be required for any bias of the cost of restrictions faced by households to generate a more accurate NEB.

It is not possible to determine to what extent there has been any bias, either overestimation or underestimation, in the cost of restrictions estimates that have been prepared from the surveys that have been used. The Commission has noted above the differences in the quantum of cost estimates.
estimates that have been prepared over the period leading up to 2008, and the variation in estimates from one set of estimates to the next. The Commission has also noted with some concern the approach adopted in setting a value for the costs for Stage 4 restrictions for 2008. It is sufficient to note that the approach used to derive the cost of restrictions estimates, which are fundamental to the calculation of the NEB, raises issues that need to be considered in the context of the way in which the NEB was itself calculated.

Inclusion of ACTEW and ACT Government costs

Household costs were only part of the overall assessment of the cost of restrictions prepared by CIE and ultimately used in the NEB. In assessing the various other costs associated with water restrictions, CIE estimated the costs to commercial and industrial users, water businesses, ACTEW profits, and the ACT Government, plus the cost in terms of street trees, recreational values, tourism, and transaction costs. Table 4.2 sets out these estimates together with household cost estimates used in the 2007 cost of restrictions estimates.

Table 4.2: 2007 cost of restrictions estimates

<table>
<thead>
<tr>
<th></th>
<th>Household costs</th>
<th>Commercial and industrial users, water businesses</th>
<th>Street trees, recreational values, tourism</th>
<th>Transaction costs, ACTEW profits, and the ACT Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWCM</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Stage 1</td>
<td>$3.5 million</td>
<td>$1.3 million</td>
<td>Nil</td>
<td>$0.8 million</td>
</tr>
<tr>
<td>Stage 2</td>
<td>$23.7 million</td>
<td>$5.7 million</td>
<td>$8.6 million</td>
<td>$3.8 million</td>
</tr>
<tr>
<td>Stage 3</td>
<td>$27.4 million</td>
<td>$9.4 million</td>
<td>$18.6 million</td>
<td>$6.6 million</td>
</tr>
<tr>
<td>Stage 4</td>
<td>$50.3 million</td>
<td>$13.9 million</td>
<td>$59.9 million</td>
<td>$14.5 million</td>
</tr>
</tbody>
</table>


Unlike the cost for households, the values assigned to each category have been relatively stable between years in the various CIE estimates. Understandably, a number of methodological issues arise in connection with the use of more abstract valuation concepts to determine, for example, the costs associated with losing street trees, recreational activities and tourists. Further, the calculation of losses across commercial users is problematic, particularly in the light of businesses having limited responsiveness to water restrictions in terms of their total consumption of water. However, the approach taken by CIE appears to estimate these costs and consider these issues adequately.

In estimating the loss of recreational values, CIE undertook a more dynamic equilibrium approach than it used for estimating the cost for households, and was careful to estimate only the forgone consumer surplus associated with the reduction in recreational activities. In this area, CIE made a specific allowance for the reallocation of consumers’ household budgets (CIE 2008: 63), which it did not do in its assessment of the cost of restrictions for households.

The inclusion of the costs borne by ACTEW and the ACT Government in the calculation of the cost of restrictions is of concern to the Commission. Within a cost–benefit framework the Commission would expect that such costs would reflect mere transfers between consumers, ACTEW and the ACT Government. The Sustainable Futures Initiative and ACIL Tasman shared this view:

Reduced ACTEW profits and loss of revenue from abstraction charge—these are not an economic cost but transfers and hence should not be included in total costs. (ACIL Tasman and UTS 2009: 5)
While these costs are important to ACTEW and the ACT Government, they are not costs of water restrictions, as no economic surplus is lost from the application of water restrictions. Rather, consumers retain money when restrictions limit ACTEW’s ability to sell water and ACTEW collects money when it is not restricted in its water sales.

When asked directly by the Commission about the treatment of these costs, CIE noted that it represented the forgone return on capital which would have otherwise been employed should the restrictions not have been in place. The Commission notes that the demand forecasts it used to determine the current price of water made an allowance for the amount of time that consumers will be in restrictions. That is, the prices paid by water users, which were calculated based on restricted water availability, already take into account the returns required to generate a sufficient return on the capital invested by ACTEW. Therefore, there is minimal ‘lost revenue’ to ACTEW as a consequence of water restrictions, as prices are already set higher than they would otherwise be if demand for water was unconstrained. Likewise, the water abstraction charge is set in relation to the additional costs of managing the non-ACTEW water infrastructure in the ACT; again, this charge is set in relation to demand, including reduced demand resulting from restrictions. Any adjustment to the cost of restrictions to take into account volumetric impacts of water restrictions are already notionally included in the cost of water and should not be seen as an additional cost of restrictions. It would be appropriate to adjust the NEB downwards to exclude these costs from the calculation of the net benefits of individual water supply projects.

The inclusion of ACTEW and ACT Government ‘costs’ distorts the estimates of the costs of restrictions. Once again there are methodological differences between the approach taken by CIE and the Commission’s viewpoint. The Commission, while questioning the estimates themselves, is accepting of the inclusion of all other costs in the NEB, but has great difficulty in accepting the inclusion of the ACTEW and ACT Government costs in the NEB, irrespective of the final estimate. In the Commission’s view the NEB would be strengthened as a decision support tool by the exclusion of these costs.

Risk aversion factor

As part of the Future Water Options review and the Recommendations to Government report, ACTEW calculated the following cost of water restrictions in support of the adoption of the ECD project (table 4.3).

<table>
<thead>
<tr>
<th>Table 4.3: Estimated community costs of water restrictions for 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water restriction stage</strong></td>
</tr>
<tr>
<td>Stage 1</td>
</tr>
<tr>
<td>Stage 2</td>
</tr>
<tr>
<td>Stage 3</td>
</tr>
<tr>
<td>Stage 4</td>
</tr>
<tr>
<td>Effective Stage 4 (adjusted)</td>
</tr>
</tbody>
</table>


It is noted that, as presented in table 4.3, the Stage 4 cost of restrictions (Effective Stage 4) have been adjusted by a factor of 3.5 to reflect ACTEW’s risk aversion to Stage 4 water restrictions. ACTEW (2007c) explained the 3.5 adjustment factor as follows:

A difference between the water volumes assumed by the Commission and those that actually occur in the year in question may result in the ex ante estimates of the revenue generated by ACTEW differing slightly from the ex post outcomes, but the differences are not as significant as CIE estimated.
Because Stage 4 is considerably more severe than lesser stages and is indicative of supply insecurity, there is a strong view that Level 4 restrictions should only be applied in exceptional circumstances. To reflect this view, a risk aversion factor is applied to the Stage 4 component of the total cost of restrictions. This factor, estimated at 3.5, is multiplied by the cost of Stage 4 restrictions. The effect of this change is to provide increased economic benefits from options that are more effective at reducing the probability of Stage 4 restrictions.

In making this adjustment, ACTEW considered that the ACT community had not fully understood the severity of Stage 4 restrictions, and therefore had underestimated the ‘cost’ in their response to willingness-to-pay surveys. ACTEW considered the likelihood of going into Stage 4 water restrictions was extremely low; indeed, ACTEW had sought to avoid moving to this stage. Thus, concern within ACTEW that the community may not have valued in an informed way the costs involved of moving to this stage of restrictions required an adjustment to the responses that consumers had made to questions on the cost of this stage of restrictions. The impact of the 3.5 risk aversion factor increase in the cost of restrictions increased the economic benefits of the various water security supply options sufficient to generate sizable benefits for purposes of the NEB assessment.24

At the time these estimates of ‘benefits’ were presented to the ACT Government, the ACT Treasury commented that it believed that the calculation substantially overstated the economic benefits (ACTEW 2007c: 60). Certainly there is a significant methodological and data question as to the origin and value of the 3.5 risk aversion factor. In discussions with ACTEW and CIE, it emerged that the 3.5 risk aversion factor was the result of a private survey of the ACTEW Board as to the risk associated with going into Stage 4 restrictions. This raises two important questions:

- Was it appropriate to apply a risk aversion factor to the original estimates?
- Was the survey of the ACTEW Board an appropriate and representative sample of the broader ACT community?

The Commission notes that the NERA study was a complete and impressive study of the ACT community’s attitudes to water security. Further, the Commission notes that the results of this study have subsequently appeared in two well-regarded academic journals and were used by CIE in its original estimates in 2005. The Commission is unaware of the risk neutrality of respondents to the study having been questioned before the 2007 Future Water Options report. The assessment of risk neutrality within the context of the willingness-to-pay study is addressed by the range of results that apply across restrictions levels. Where the severity of the restrictions is increasing and the associated costs are also increasing it is likely that respondents understand that each stage brings additional pressures on their behaviour and the responses have taken this into account. Within the NERA study, respondents suggested that the costs of the earlier stages of restrictions were approximately zero. At the same time, their assigned cost estimates increased rapidly as the restrictions increased, suggesting that respondents were far from risk neutral in their responses.

Furthermore, the estimated cost of restrictions for 2003 and 2005 included in the initial 2005 CIE report reported a considerable increase in the cost of restrictions from Stage 2 (the current Stage 1 restriction level) through to Stage 5 (the current Stage 4 restriction level). Consistent with the NERA study, the CIE study found that the community appreciated that each higher water restriction stage imposed a tougher, more restrictive arrangement, which they valued consistently higher in terms of the costs that they believed would occur. This appears to indicate that the

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24 Thus, there are no ‘increased economic benefits’ as referenced by the Recommendations report (ACTEW 2007c), but rather an assumption that the value assigned by consumers is undervalued and therefore needs some form of adjustment.
community is risk averse to these increases rather than risk neutral, as CIE and ACTEW (2007c) claimed in their conclusions on the cost of Stage 4 restrictions. The Commission is therefore not convinced that it was necessary to apply a risk aversion factor to the initial survey estimates for the cost of restrictions.

Irrespective of the merits of the inclusion of a risk aversion factor, the Commission is concerned about the way that this factor was derived. The Commission is not convinced that the membership of the ACTEW Board, which is appointed primarily for its ability to oversee the operation of water business rather than representing a cross-section of the ACT community, is diverse enough to be representative of the ACT community on a matter that has such a significant (and to some extent decisive) impact on the NEB results. In addition, the Commission is concerned that the basis of the derivation of this risk aversion factor was not clearly articulated in the various public reports to government and the wider community.

As part of the 2008 CIE study, an upper estimate for the cost of restrictions is provided. This upper estimate is derived by taking the median value of the cost of restrictions to households from the CIE survey of households and doubling this estimate. However, as discussed above, CIE, in its 2008 study, already doubled the cost estimates from Stage 3 restrictions to arrive at the cost estimates of Stage 4 restrictions. In effect, therefore, the approach used by CIE appears to have escalated the Stage 3 restriction costs by a factor of four to arrive at a revised estimate for Stage 4 restrictions. The Commission has been informed that this doubling of the cost estimates represented the upper bound or the 95th percentile confidence interval of the CIE survey group.

The Commission has found that once this cost is doubled, the estimate derived from the CIE 2008 study broadly matches the estimated cost of restrictions, which were reported as the 3.5 risk-adjusted values for Stage 4 restrictions cited in the 2007 Future Water Options paper (ACTEW 2007b). However, the Commission does not consider that this provides any support for the risk-adjusted values presented in the 2007 Future Water Options paper.

The significance of the use of the upper end of the confidence interval for the cost of restrictions should not be underestimated in considering the prudence of the decision to undertake the ECD. ACTEW, in both formal publications (ACTEW 2009a; ActewAGL 2009) and correspondence to the Commission, has referenced the cost of restrictions as being between $7 million per year for Stage 1 restrictions and $324 million per year for Stage 4 restrictions. The Commission notes that these estimates appear as the upper bound estimates from 2008 CIE Report. The Commission does not consider that it is appropriate for these figures to be used as the cost of water restrictions as they do not represent the average view of the ACT community surveyed by CIE in its 2008 study.

From the information available to the Commission, it would appear that, on an annualised basis, the use of the 3.5 risk aversion factor in 2007 overstated the cost of restrictions by more than 100%. This then affects the calculation of the NEB and, ultimately, the final decision taken on the available options to address the ACT’s future water needs. Likewise, the continued use in public statements of the upper end of the estimates prepared also overstates the cost of restrictions.

While there may be methodological questions regarding the use of the 3.5 risk aversion factor, the Commission considers that, more significantly, the use of the upper end of the confidence interval from the surveyed results is inconsistent with standard statistical understanding and interpretation of results.

The WSAA planning framework used by ACTEW has as its key the determination of the NEB. Where the costs of a project option are lower than the expected benefits as derived through the
NEB process, it is normally considered prudent to invest in the relevant option. While not the only measure, the NEB is nonetheless a vital tool used by ACTEW to determine if a particular investment option should proceed. Correct application of the NEB would provide the Commission with a useful tool for assessing the prudence of individual investments. However, the application of the 3.5 risk aversion factor in 2007 and the inappropriate use of the 2008 survey results limits the ability of the NEB to be used in the Commission’s assessment of prudence.

4.7 Commission observations

The Commission notes that the NEB, as presented to the ACT Government, has been influenced by the number of elements that have potentially overestimated the costs of water restrictions in the ACT. While in 2007 the ECD was approved on the basis of a positive NEB, the Commission is concerned that the estimates of the NEB that have been used, and in particular that have been incorporated in advice given by ACTEW as the true costs of the ECD have become more apparent, may have been insufficient to support the ECD option on purely cost and benefit grounds.

Importantly, this does not necessarily mean that it was an imprudent decision to proceed with the ECD. However, it does suggest that in undertaking project evaluations and assessments of the type required to consider various water supply options, further consideration and development of the methodology to estimate the cost of water restrictions needs to be undertaken. This would include greater use of sensitivity analysis around the range of estimates that can be derived from surveys of willingness to pay, and the climate change scenarios that are used in the assessments.

An NEB analysis, as with any form of cost-benefit analysis, is usually undertaken in the context of comparing alternative options to meet some agreed objective. As noted, there has been some imprecision in the statement of water supply security objectives in the ACT, and while the NEB calculation can be represented as the driver of the decision and the LOS the outcome, the fact remains that the use of the NEB approach by ACTEW has resulted in an outcome that exceeds the government’s stated LOS objective. An evaluation that included an updated comparison of the NEB for the various alternative options available to ACTEW, especially as the true costs of the ECD became apparent, was not undertaken. A final decision on the ECD, which may not have been different from the decision to proceed even at the higher costs, would have been strengthened by a like-for-like comparison of the options using the NEB methodology.
5 Alliance arrangements with contractors for delivery of the enlarged Cotter Dam project

Under the Commission’s terms of reference it is required to consider the contractual arrangement between ACTEW and the Alliance contractors. Alliance contracting is one of numerous approaches available to procure the ECD. In this chapter, the Commission explores:

- the selection of the alliance method of procurement for the delivery of the ECD
- the competitive tension evident throughout the alliance process
- the development of the total outturn cost (TOC) estimate
- the appropriateness of the risk allocation between ACTEW and the Alliance contractors
- the process by which the TOC can be revised
- the incentive mechanism included in the alliance contract.

5.1 Description of ECD alliance contract

The Alliance for the delivery of the ECD is a contractual arrangement between ACTEW/the Board of ACTEW as the owner/client, GHD as the designer and Abigroup and John Holland as the constructors (both the designer and the constructors are referred to in this document as the Alliance contractors). The Alliance covers major water security projects, including the bulk water program covering the ECD project, the Murrumbidgee to Googong Transfer Project, and the Googong Dam Spillway project. However, each project has a separate TOC developed specifically for it.

The TOC for the ECD project was set at $299 million in August 2009; this represents the most complete cost estimate for the ECD and has been established as the cost that all parties in the Alliance are managing toward. The Alliance contract states that the TOC for the ECD project may only be altered in the case of significant change to the scope of the project (as opposed to the design of the project) and only following significant governance rigour. Changes to the TOC require the sign-off of the Alliance Leadership Group, which includes two ACTEW and ActewAGL representatives, and a representative of each Alliance contractor and the Board of ACTEW.

5.2 Procurement process

For any project there are a number of possible procurement or project delivery models. The choice of a procurement model is typically made under a value-for-money consideration assessed against the needs of the project and priorities of the key stakeholders, where stakeholders are typically limited to the final owners of the asset being procured. Table 5.1 below lists some of the models that are commonly used by agencies in delivering substantial infrastructure projects.
Table 5.1: Procurement methodologies

<table>
<thead>
<tr>
<th>Delivery model</th>
<th>Elements and comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design/Bid/Build</td>
<td>The more traditional form of procurement methodology whereby the works are designed and then contracted for construction.</td>
</tr>
<tr>
<td>Alliance</td>
<td>An emerging and increasingly utilised cooperative procurement methodology that is based on equitable risk sharing and gain-share/pain-share outcomes.</td>
</tr>
<tr>
<td>Managing Contractor</td>
<td>Commonly used in the building construction sector.</td>
</tr>
<tr>
<td>Design/Build (Also known as D&amp;C or Design and Construct)</td>
<td>A combined design and construction methodology very commonly utilised for infrastructure delivery.</td>
</tr>
<tr>
<td>Progressive Engagement Design Build</td>
<td>A variant of the Design/Build methodology where the designer is appointed prior to the constructor.</td>
</tr>
<tr>
<td>DBFO (Design, Build, Finance and Operate)</td>
<td>A methodology that requires the works to be privately financed and subsequently privately operated for a defined period of time.</td>
</tr>
</tbody>
</table>


Each procurement methodology has its own strengths and weaknesses and the selection of one over another is dependent on the consideration of these against the project characteristics and objectives. Importantly, irrespective of the choice of procurement methodology, the focus throughout the procurement process should be on maximising the value for money that could be delivered from the project. This section of the report examines the process undertaken by ACTEW to select the alliance contracting procurement model and the competitive tension within the alliance contracting process.

Selection of an alliance contract as the preferred methodology

Alliance contracts are an increasingly common means of public sector project delivery. Projects delivered by alliance contracts make up one-third of the total value of public sector infrastructure projects currently delivered in Australia (DOTF 2009).

While alliance contracting is commonly used to deliver infrastructure projects, it was appropriate for ACTEW to consider the various alternative procurement models against the needs of the project before ultimately selecting the alliance contract model. The Commission notes that ACTEW undertook an assessment of the various procurement methodologies. For this purpose, in July 2007 ACTEW engaged IDSM Pty Ltd to review and report on the various procurement methodologies and their appropriateness in this instance. A project delivery workshop was conducted to assess the identified objectives of ACTEW and the project. Representation at this workshop included ACTEW water security program personnel and capital works personnel and ActewAGL project and capital works personnel. In its report to the Commission, Halcrow (2010: 73) noted:

Using a scoring system (IDSM’s 3DM Model), the workshop concluded that an Alliance project delivery methodology was the most favoured. Further sensitivity analysis was undertaken, but the Alliance methodology remained the most favourable.

...  

Halcrow considers that the process for the selection of a project delivery methodology was systematic and rigorous. The project delivery methodologies under consideration were broad ranging and inclusive of those commonly utilised by similar agencies. Likewise, the objectives and issues used to evaluate the project delivery methodologies are those of common concern to similar agencies for the delivery of substantial infrastructure projects.
The Commission is satisfied that all the appropriate procurement options were considered, and that the appropriate people from ACTEW were involved in the identification and selection of the procurement model. From Halcrow’s report, the Commission is satisfied that ACTEW came to the selection process with a clear set of objectives and, consistent with good practice, used an independent party to evaluate the selected procurement models against those objectives. Ultimately, the alliance methodology was selected as presenting the most appropriate procurement methodology for the ECD project.

As part of an ongoing review of procurement methodologies, the Victorian, Western Australian, New South Wales, and Queensland governments formed an Inter-Jurisdictional Alliancing Steering Committee to benchmark the use of alliancing in the public sector. A research study was undertaken, and in October 2009 the Victorian Department of Treasury and Finance delivered a report titled *In pursuit of additional value: a benchmarking study into alliancing in the Australian public sector* (the Victorian Report). The study looked across 46 alliance contracts in various industries, including approximately 29 alliance contracts in the water industry. As part of the Victorian Report, it was noted that alliance contracts are most suited to delivering projects that have the following characteristics:

- complexity, with factors that need to be managed collectively—these include complex stakeholder issues, complex external threats and opportunities, or unpredictable risks
- tight timeframes
- undefined output specifications
- a high likelihood of changes to the scope of the project during design and construction
- a need for the owner to be involved in delivery of the project. (DOTF 2009: 35)

The Commission notes that these characteristics were identified by ACTEW and IDSM as part of the project delivery workshop, suggesting that the ECD project had characteristics consistent with those most commonly associated with alliance contracts.

Halcrow has advised that the alliance procurement model is commonly used throughout the water industry, and is regarded as a means of obtaining the engagement of the best available designers and constructors for projects in this sector. Alliance contracts are seen as appropriate in an industry that is faced with lumpy capital projects that occur on an infrequent basis for the individual asset owning entity but sufficiently frequently in a market to support specialist design and construction experts working across a variety of clients and projects. The provision of dam infrastructure is an example of such a project where it would be impractical for an agency such as ACTEW to have the in-house knowledge and skills required to undertake such as task. The Commission accepts that in these circumstances it is more appropriate to outsource these skills through either an alliance contract or another form of contractual arrangement.

**Adequacy of the process to select the alliance procurement methodology**

The Commission notes the process that ACTEW followed in its decision to enter into the alliance contract and that the decision to proceed with the Alliance was sound based on the known conditions at the time, despite what Deloitte noted was ‘ACTEW’s limited familiarity with the alliance model’. The Commission echoes Deloitte’s comments and its warning:

> Given the conditions in the market at the time and the rigour of the process that was adopted to create the Alliance, the decision to use an alliance mechanism to deliver the ECD Project appears reasonable. However, careful planning and monitoring around the actual operation and governance of the alliance is critical to successful project delivery. (Deloitte 2009: 33)
The Commission is confident that, in selecting the alliance procurement methodology, ACTEW followed a robust process which considered the various alternatives for delivering the ECD project. However, the process could have been enhanced by clearer communication to the ACT Government and the community more generally of the needs of the project and how they were met by the alliance contract methodology.

**Competitive tension in the alliance process**

The importance of competitive tension throughout a procurement process cannot be overstated. Competitive tension is the primary driver of value-for-money outcomes in the procurement process.

To assess the efficiency of the Alliance arrangement, the Commission has sought to understand the competitive tension evident throughout the alliance process. However, the very nature of the alliance model has the potential to reduce the competitive tension in the process as there is a greater focus on the selection of the appropriate design over the least-cost alternative. Alliance contracts are often used in situations where the final technical solution is unknown, or at best a work in progress, with the designers, constructors, and owners working collaboratively to ensure that the most suitable outcome is achieved. The Commission notes that within this context the lack of competitive tension throughout the contract may have been appropriate so long as there was adequate competitive tension at the time the various Alliance contractors were bidding for their individual roles in the Alliance. To maximise this competitive tension once the Alliance contractors were selected, there should be no significant information asymmetry between the Alliance contractors and the owner, because such asymmetry would lead to the owner being unable to challenge the assumptions of the Alliance contractors.

The tendering process for the Alliance contractors to the ECD project consisted of an industry briefing, followed by the submission of a proposal, and a process of assessment and financial audit, and finally commercial closure. Halcrow (2010: 76) advises that this process was consistent with the practice of similar agencies throughout Australia.

**Selection of designers**

For the design role, two proposals were received by ACTEW, with both proposals fully conforming to the conditions set out in the tender documents. The Commission’s consultant Halcrow advises that the fact that there were only two tenderers to the design aspect of the project meant that there was limited scope to maintain ‘competitive tension’ throughout the remainder of the selection process for designers. Halcrow (2010: 77) notes, however, that the lack of competing participants was beyond the control of ACTEW, as the tender for the project occurred during, arguably, the height of the skills shortage in the design capability of the water industry.

The Commission acknowledges that the tendering process for the project occurred at a time of considerable skills shortages in the market for these services. The Commission does not believe that only two designers submitting conforming tenders is indicative of an uncompetitive market. The Commission finds comfort in the fact that there was some contestability in the process as no single designer was in a position to exert considerable market power. Although skills shortages in the market may mean that designers in general have had a degree of market power, it also results in escalating prices, which ultimately attracts new designers to the market. This is consistent with a competitive market process when there is relative freedom of entry for new designers in the market.
The Commission is therefore confident that, while at another time the tender process may have incurred more responses, given the market conditions the tender process was sufficient to ensure some competitive pressure. The Commission can see no market failure or disadvantageous issues with the approach taken by ACTEW, notwithstanding the limited competitiveness in the design tendering process.

Selection of constructors

For the construction role, four fully conforming proposals were received and evaluated by ACTEW. The construction partners were chosen in a selection process that involved the input of the preferred design participant. The Commission finds no issue with the fact that the designer was involved in the selection of the constructor and notes that this is typical practice in alliance contracting.

Halcrow reports that it was informed by ACTEW that competitive tension was maintained throughout the tendering process for both designer and constructor, with pricing becoming progressively keener as the process progressed. The competitive tension was maintained partly through a detailed commercial and financial audit of the participants. The audit assessed and challenged cost rates, margins, and billing procedures to facilitate a value-for-money outcome. The Commission finds this to be consistent with good practice and reduces the concern that there is potentially an imbalance between the Alliance contractors and the owner.

5.3 Preparation of the TOC

Having selected the Alliance contractors, ACTEW and the contractors commenced the preparatory work to establish a TOC. The process of developing a TOC for an alliance-delivered project typically involves the alliance partners working together during the design phase (that is, prior to the commencement of construction) to compile a sophisticated and robust cost estimate for the delivery of the project. The alliance process includes early contractor involvement to assist in developing cost-effective designs, value management workshops to further refine designs (and hence costs), and other construction details. Halcrow noted that the process followed by the Alliance for the development of the TOC for the ECD project was consistent with normal industry practice.

Development of cost estimates

Having undertaken the necessary design work, including conducting a number of value-for-money workshops to test the design, cost estimates were prepared. Following the establishment of a more complete design, the Alliance contractors undertook a tendering process for subcontractors from which the Alliance contractors were able to develop detailed cost estimates for the full range of works involved in the ECD project.

In its report to the Commission, Halcrow (2010: 32) noted that only 30% of the design work was complete. The Commission was initially concerned that, with 70% of the design work outstanding, there could be further unforeseen cost escalation. Discussions with Halcrow and ACTEW have indicated that the reference to the 70% of design still outstanding related to the ‘TOC design freeze’ in April 2009 and that this was used to inform the determination of the TOC in August 2009. At that time, design specifics of the 70% of work uncompleted were reportedly of relatively minor detail (for example, finalisation of spillway design, detailed thermal analysis of the dam, detailing of structural steelwork, detailing of concrete reinforcement, finalising construction

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25 Meeting with the Commission on 9 March 2010.
specifications, finalising selection of valves, detailed electrical design) and were unlikely to result in significant cost adjustments. ACTEW has reported to the Commission that as at the end of March 2010 three design packages had been approved for construction (100% design)—diversion works, main dam foundation and saddle dams—and the remainder of the main dam was at approximately 50% design status. Final design (100%) completion is due for completion by the end of April or early May 2010. The major capital cost components of the project (labour, concrete and contractor costs) have been clearly defined in the existing design and consequentially in the TOC estimate.

In August 2009, based on the design and the various responses from its subcontractors, the Alliance contractors estimated the TOC for the ECD at $310.9 million. This estimate included allowances for:

- Alliance contractors’ fees
- project risks
- cost escalation estimates.

However, the TOC estimate did not include ACTEW’s costs associated with the ECD project. The Alliance Leadership Group, when presented with a TOC of $310.9 million, took a commercial decision to reduce the TOC to $299 million. At the same time, as part of the renegotiation of the TOC, a decision was taken to modify the incentive mechanism associated with the BWA. This modification to the incentive mechanism is discussed further in section 5.4. With the inclusion of ACTEW’s costs, the total cost of the ECD project was projected at $363 million.

Following its review of the processes and actions involved, Halcrow reached the conclusion that the development of the TOC in the manner undertaken by ACTEW and the Alliance contractors was consistent with normal industry practice, albeit with two material differences:

These differences are that, per the Bulk Water Alliance contract, the Program Alliance Agreement (the PAA):

- The development of the TOC is time and expense limited. That is, the Alliance participants are required to undertake all of the work required to develop the TOC to a predetermined budget.
- Should the TOC fail to be accepted by the ACTEW Board, the commercial participants will only be paid their costs in the development of the TOC (i.e. no profit payment will be made to the commercial participants).

These differences only serve to add commercial pressure to the TOC development phase of the Alliance; serving to add rigour to the TOC development and hence, theoretically, giving rise to a more competitive TOC. (Halcrow 2010: 78)

**Analysis of risk assessments**

Included in the TOC is an allowance for risk. Risk allowances are included in most construction contracts as a mechanism for sharing the potential risk for costs to differ from what was expected at the time the estimates were prepared. As costs can potentially move both positively and negatively, it is important that any risk allowances take account of both potential outcomes and assign the benefits and costs of these movements between the various contracting parties.

An important element of alliance contracts is the ability to share risks between the various alliance participants. As in all procurement processes, it is important to ensure that these risks are adequately identified and appropriately allocated between the contract partners. The Commission notes that all construction processes embed a degree of riskiness between the designer and the construction contractors, and the owner. Ultimately, while estimates can be made, the true risks
and costs of the project are unknown until project completion. Therefore, it is important that these risks are not incorrectly estimated or allocated inefficiently between the parties.

The Commission notes that risk assessments were completed as part of the Future Water Options analysis prior to the establishment of the ECD project as one of the preferred alternatives of the water security program. However, the risks allowance made in the initial cost estimate was factored in by ACTEW’s consultants at a conservative level, as evident in the application of a top down 30% contingency factor in the capital costs presented in the Future Water Options paper. Prior to the appointment of the Alliance contractors, ACTEW undertook several risk mitigation strategies through the tendering process. These included the appointment of an independent financial and probity auditor to assist throughout the project tendering and award processes. Once the Alliance was entered into, risk assessment workshops were completed by the various Alliance partners as part of the finalisation of the TOC.

One of the strengths of the alliance model of contracting over other procurement models is the participation of the project construction and design team at an early stage of the project. This helps to ensure that the project partners are well informed and, in theory, limits the likelihood that costs are later found to be higher than initially estimated (that is, it reduces the risk associated with the project). As noted by Halcrow (2010: 78), this process, which includes the involvement of contractors, assists in the development of cost-effective designs and facilitates value management workshops to help to further refine these designs, thus increasing the cost-effectiveness of the designs.

In addition to the value-for-money workshops, ACTEW and its Alliance contractors participated in a series of risk and opportunity workshops as part of the development of the final TOC. During these risk and opportunity workshops, each cost item was allocated a probability as to whether the expected cost of delivery would be lower (opportunity) or higher (risk) than the costs used in the TOC estimate.

The risk and opportunity workshops were attended by the designer and constructor representatives as well as ACTEW’s representatives. In developing the level of risk allocation (contingency) during the risk and opportunity workshops, the predicted variability of each deliverable was analysed. This involved estimating:

- the percentage underrun
- the best-case outcome
- the most likely outcome
- the percentage overrun
- the worst-case outcome. (Halcrow 2010: 79)

The permutations of these various results were subsequently modelled and allocated to the Alliance partners using predictive modelling, forecasting and Monte Carlo simulation. The Commission has studied the details of the arrangements for risk allocation adopted by the Alliance and is comfortable that these arrangements are appropriate, on the assumption that the risks to be included in the simulation were adequately identified in the first place.

The level of risk allocation calculated from the Monte Carlo simulation and adopted by the Alliance represents approximately 9% of total direct costs\(^{26}\) of the TOC. Halcrow notes that for a project of similar complexity and level of detailed design, the risk allocation could reasonably be

\(^{26}\) Not including any allowance for contractor margins, cost escalations or ACTEW’s costs.
expected to be in the order of 15% to 20%. The Commission notes that the approach adopted by
the Alliance partners results in a smaller than usual amount of risk being borne by the ACT
consumer, with most of the risk being transferred to the Alliance contractors. The Commission
expects that this provides an incentive to the Alliance contractors to manage risk carefully in order
to minimise the impact of costs increases. This is likely to result in a better value-for-money
outcome for ACT consumers.

Robustness of TOC

With the assistance of its technical consultants, Halcrow, the Commission has analysed the
development of the TOC and considers that on the basis of the design work the TOC is a robust
estimate of the costs which are likely to be incurred by ACTEW in the delivery of the ECD
project. The cost estimates underpinning the TOC were developed using competitive tender
responses from subcontractors and include allowances for the various direct costs, excluding
ACTEW’s costs, likely to be incurred while building the ECD. Halcrow noted that the risk
allowance to be borne by ACT consumers and included in the TOC is less than could reasonably
be expected from projects of similar complexity, suggesting that the risk allowance included in the
TOC represents a value-for-money outcome for the ACT consumer. The Commission is satisfied
that the TOC was developed in a competitive environment and represents a robust cost estimate for
the ECD project.

Process for amending the TOC

Once the TOC is established, it effectively serves as the budget for the project, with any cost
underruns or overruns being managed from within the Alliance. To ensure that these parties
actively manage the costs, the alliance contracting model, and indeed all procurement models,
incorporates a pain-share/gain-share incentive mechanism which provides an incentive for parties
to at the very least achieve the TOC and potentially to better the TOC.

Over the duration of an alliance contract, it is possible that unforeseen changes in the scope and
costs of the project could give rise to the TOC being updated and revised to reflect the actual costs
of the project. There is also an incentive in any alliance arrangements for the alliance contractors
to revise a TOC if there were errors in the initial cost estimate prepared by these contractors or if
there is a change in the scope. Thus, changes in the TOC estimates will be of particular interest
where cost increases, of whatever type, result in significant pain for the alliance contractors. In
these circumstances, this pain is incurred by the alliance contractors when the actual outturn cost
(AOC27) of the project is somewhat higher than the TOC.

Therefore, it is important to consider the process by which the TOC for the ECD can be amended
to ensure that the potential for revisions to the TOC is limited to actual scope changes rather than
cost increases, which should in this instance be borne by the Alliance contractors. Further, there is
a need for the Commission to be satisfied that there are appropriate controls in place to ensure that
cost overruns and scope changes will be treated appropriately, so that ACT consumers do not bear
an unacceptable proportion of the cost overrun risk, which should be within the control of the
Alliance participants.

Halcrow has described in its report the process by which the TOC could potentially be amended:

The definition of a Scope Change in accordance with the PAA’s Clause: 1.1—Definitions is as
follows:

'Scope Change means:

27 The AOC is the direct costs associated with Alliance exclusive of ACTEW’s owner costs.
(a) a change that has a significant impact on:
the extent and nature of the Works as described in the Program Brief or applicable Project Brief or as otherwise required by this Agreement; and
the AOC or the ability to meet a Target Date or KPIs: or
(b) an event which the Alliance is unable to avoid, remedy or abate and which has a significant impact on the ability to meet a Target date; or
(c) any other event which is stated in this Agreement to be a Scope Change.’

Accordingly, a design change could be defined as a change to the design that may or may not affect the resultant construction methodology, etc. but that does not change the ‘extent and nature of the Works as described in the Program Brief or applicable Project Brief’. Design changes could result, in a minor way, in increases or decreases to the AOC during the course of the project. (Halcrow 2010: 85)

Halcrow notes that design change refers to a change to the design of the project that may or may not affect the resultant construction methodology. Design changes may alter the AOC but may not create cause for an adjustment of the TOC. As noted by Halcrow:

Design changes could result, in a minor way, in increases or decreases to the AOC during the course of the project. (Halcrow 2010: 86)

In considering the mechanism for revisions to the TOC estimate, Halcrow (2010: 86) was satisfied that:

• The contract (the PAA) sufficiently allows for design changes and scope changes; the latter requiring significant rigour.
• ACTEW has in place a design change procedure to be followed by the Alliance for this project.
• The Alliance has successfully followed this process for its other projects.

Halcrow concluded that, while there are processes in place to implement design changes that will alter the AOC during project delivery, the Alliance contract is written in such a way that the TOC will not be altered except for significant changes to the scope of the project and only following significant governance rigour.

Likelihood of revisions to the TOC

The Commission has been assured by ACTEW that there is a high likelihood the TOC will remain unchanged through to completion of the project. However, the Commission is also aware of comments made in the Victorian Report:

An increase in the TOC of approximately 5–10% during project delivery raises doubts on the widespread perception of certainty of the initial TOC compared to traditional methods. Savings on the TOC are negligible. (DOTF 2009: xvi)

The level of assurance given by ACTEW is comforting, but there is a possibility that the TOC will change over the duration of the construction of the ECD. The issue of the efficiency of the cost estimates that have been developed under the alliance model are discussed in more detail in the following chapter. However, for the purposes of considering the practical aspects of the operation of the alliance arrangements, the Commission has needed to consider the appropriate due diligence approach that ACTEW should adopt in considering or accepting any changes to the TOC.

As an example of possible areas for cost increases, Deloitte (2009: 35) expressed the view that delivery of the construction phase is optimistic and that failure to meet the optimistic timeline will undoubtedly lead to an increase in cost. To address this issue, Deloitte noted that it considered
there were opportunities to improve the value for money by ‘increasing the rigor within the alliance process’. A particular area of good management focus identified by Deloitte was:

… during construction, the claims process needs to be closely monitored to ensure all claims are properly married up to progress and costs tracked against expected costs to complete in order to help achieve the TOC and limit any potential variances. (Deloitte 2009: 35)

The Commission endorses this view on cost management, and expects that ACTEW will be vigilant in ensuring that any scope change and consequent TOC change represent value for money to the ACT consumer. The Alliance arrangements do not of themselves ensure that ACTEW will achieve best management practices. This will require a clear commitment by ACTEW to a vigilant approach to any potential claims for scope changes which can readily escalate into significant cost changes beyond the TOC now publicly released.

5.4 Incentive mechanisms

The Alliance contract has two primary incentive mechanisms which are aimed at ensuring that the contractors are adequately incentivised to maintain quality and costs throughout the project. These incentive mechanisms are:

- the quality pool
- the pain-share/gain-share mechanism.

Quality pool

To incentivise the Alliance contractors to deliver outstanding performance on non-direct cost related criteria, a quality pool has been established. This quality pool has been ‘seed funded’ by ACTEW to less than 10% of total owner costs. Halcrow has informed the Commission that the establishment of a quality pool or performance incentive bonus pool is common practice in alliance frameworks/contracts and generally follows a consistent theme in its application.

The quality pool is available to be paid to the Alliance contractors for outstanding performance as identified against a specific performance indictor (that is, not ‘business as usual’ performance). While it is not possible to say definitively that the quality pool will be sufficient to drive the necessary behaviours of the contractors, the quality pool is considered to give a strong stimulus to drive these desirable quality performance behaviours by the contractors.

In this instance, the quality pool is available for outstanding performance by the Alliance contractors in a number of predetermined key result areas (KRAs). The KRAs in this instance comprise:

- safety
- environment
- cost
- time
- operability
- legacy
- community engagement and stakeholder management
- quality.

28 This cost is included in the $64 million of ACTEW’s owner costs.
For each of these KRAs there are a number of key performance indicators (KPIs) which are scored and aggregated throughout the term of the Alliance to determine the ultimate share of the quality pool available to the Alliance partners.

This share of the quality pool can be adversely affected should any of the program modifiers (factors that can override the aggregated performance of the Alliance for its KRAs) come into play. The program modifiers in this instance relate to safety and environmental performance. The program modifiers refer to specific events (for example, a safety-related prosecution) and, once initiated, serve to proportionally reduce the amount of the overall quality pool available to the Alliance contractors.

For any alliance, the selection of the KRAs and their relevant KPIs should vary from project to project and from client to client, depending on the critical factors associated with each project and client circumstance. Accordingly, comparison of KRAs and KPIs between projects is not readily possible and should be unique to each project. Notwithstanding, there does exist some commonality of KRAs and KPIs from alliance project to alliance project.

For the Alliance, Halcrow (2010: 80) found, and the Commission has accepted, that the KRAs and KPIs accord with industry practice and are sufficiently well defined.

**Pain-share and gain-share mechanism**

The Alliance employs a pain-share/gain-share cost incentive mechanism that is designed to incentivise all Alliance partners to complete the project for lower than average costs (that is, lower than the final TOC). Under the TOC, the final construction cost estimate has been set at a specific level and the project management fee has been added to arrive at the final TOC estimate of $299 million. The pain-share/gain-share mechanism effectively places the project management fees of the contractors at risk, providing opportunities for the Alliance contractors to increase their fees if they are able to better the TOC, while reducing these fees if the project is delivered at a cost above the TOC.

The mechanism to incentivise cost underruns and to disincentivise cost overruns, as originally included in the BWA, is described by Halcrow (2010: 81):

- Should the AOC be less than the TOC, 50% of the cost saving will be paid to the Alliance contractors (the designer and the constructor) up to a cap determined by the quantum of the project fee at risk by the Alliance contractors. ACTEW gets the other 50% of the cost saving up to the cap and then gets all of the cost savings below the cap.
- Likewise, should the AOC be more than the TOC, 50% of the additional costs will be paid by the Alliance contractors (the designer and the constructor) up to a cap determined by the quantum of the project fee at risk by the Alliance contractors. ACTEW has to pay the other 50% of the cost increase up to the cap and then has to pay all of the remaining increased costs.

However, the gain-share/pain-share regime was amended as part of the final negotiation of the TOC and the initial estimate of $310.9 million as the TOC was reduced by $11.9 million (to $299 million). The amended gain-share/pain-share regime is now as follows:

- Should the AOC be less than a defined minimum amount which is the direct cost of the TOC less $10.4 million, then all of the first $10.4 million of cost saving plus 50% of the difference between the AOC and the defined minimum amount will be paid to the Alliance contractors (the designer and the constructor) up to a cap determined by the quantum of the project fee at risk by the Alliance contractors. ACTEW will in effect forgo the initial cost saving of $10.4 million.
$10.4 million but would benefit from 50% of the cost saving for an AOC less than the defined minimum.

• Should the AOC be less than the TOC but more than the defined minimum, all of the cost saving will be paid to the Alliance contractors (the designer and the constructor). ACTEW will in effect forgo benefits of any cost saving between the TOC and the AOC.

• Should the AOC be equal to the TOC, the Alliance contractors (the designer and the constructor) will get zero gain-share/pain-share.

• Should the AOC be more than the direct cost of the TOC but less than the defined maximum, the Alliance contractors (the designer and the constructor) will suffer no pain share (that is, they will not have to pay any additional amount for the cost overrun). ACTEW will have to pay 100% of the cost overrun to the defined maximum, up to an additional $13.4 million.

• Should the AOC be more than the TOC and more than the defined maximum, the Alliance contractors (the designer and the constructor) will have to pay 50% of the cost overrun greater than the defined maximum. ACTEW will have to pay 100% of the cost overrun to the defined maximum and then 50% of the cost overrun value thereafter.

The incentive mechanism provides for a floor and ceiling on the TOC estimate which effectively limits the Alliance contractors’ exposure to the pain-share mechanism, while giving them first access to the gain-share mechanism. This outcome was generated only after ACTEW had extracted a $1.5 million reduction in the project fees and a $5.2 million reduction in the TOC, a $6.7 million saving on the initial TOC estimate. At the Commission’s direction, Halcrow examined the gain-share/pain-share arrangement in some detail. Based on this review, Halcrow commented while it was familiar with the gain-share/pain-share mechanism originally described in the BWA, it did not have experience with the amended mechanism, which included a floor and ceiling on any increases or decreases in the TOC. Further, Halcrow noted:

In Halcrow’s view this amended gain-share/pain-share regime is skewed in favour of the commercial participants (Alliance contractors). While it creates a greater incentive to the commercial participants (Alliance contractors) to attain an AOC much better than the TOC (by more than $10,431,830) it has reduced the disincentive for cost overruns because the TOC can be exceeded by up to $13,409,593 without penalty to the commercial participants. (Halcrow 2010: 82–83)

At one level the Commission can see that the incentive to bring the project in beneath the construction cost is heightened by the amended gain-share/pain-share arrangements. At the same time the incentive for the Alliance contractors to contain costs once the target is, or is likely to be, reached is significantly reduced until the project costs increases by some 5.3% to the defined maximum.

The impact of the incentive mechanism is to limit the exposure of the Alliance contractors to increases in the cost estimate while at the same time increasing their potential for gain through the savings made in delivering the project. The Commission notes that the incentive mechanism was amended in part because of the commercial decision taken by the Alliance partners to reduce the TOC from $310.9 million to less than $300 million. This reduction represented a value-for-money outcome to ACT consumers arising from the $6.7 million cost reduction on what would otherwise have been achieved if the TOC was agreed at $310.9 million and retained the original incentive mechanism.

While at no stage is the ACT consumer worse off under the revised TOC and incentive mechanism compared with the initial TOC estimate, there are different incentives on the parties as a result of the changed mechanism. On balance, the Commission notes that the revised gain-share/pain-share
arrangement transfers the risks associated with the project back onto ACTEW to control costs over
the agreed TOC, as the incentive mechanism does not reduce the project fee generated by the
Alliance contractors until the project costs have increased by 5.3%. However, when compared to
the initial TOC, the Commission notes that ACTEW’s customers are better off under the revised
TOC and incentive mechanism.
6 Costing of the enlarged Cotter Dam project

6.1 Cost estimates for the ECD project

Within the context of the decision to proceed with the 78 GL ECD, three important cost estimates should be considered:

- the $120 million estimate presented in the 2005 Future Water Options paper
- the $145 million estimate presented in the 2007 Future Water Options paper
- the $363 million estimate announced in August 2009, which includes owner costs of $64 million and a final TOC of $299 million from the BWA.

A key consideration of this investigation is the difference between the $145 million estimate presented as part of the 2007 Future Water Options paper and the $363 million estimate, which is the TOC plus ACTEW’s costs. This represents a cost differential of $218 million. However, it is acknowledged that, at the time of the 2007 Future Water Options paper, ACTEW repeatedly stated that there was a contingency of approximately 30% on its $145 million estimate. Once this contingency is included, the $145 million estimate increases to approximately $174.5 million. Therefore, the difference between this estimate and the final costs estimate for the dam is an increase of 93%.

Each of the cost estimates that have been prepared and presented was based on a set of cost assumptions made at the time and with the assistance of external consultants:

- $120 million estimate completed in 2005 by GHD, which included a contingency of 30%. This cost estimate was used by CIE in an assessment of the various water supply options available to ACTEW. The GHD cost estimate was based on a preliminary desktop review. In considering other water supply options, CIE calculated a NEB of $204 million for the ECD option at this estimated cost using the worst-case 2030 CSIRO rainfall modelling.

- $145 million estimate completed in 2007 by GHD and reviewed by Rider Levett Bucknall (ACTEW 2007a) and Halcrow (2008). GHD updated its 2005 estimate for changes in cost factors and included a contingency of 30%. This cost estimate included $25 million for pipes, pumping station development and miscellaneous works all of which have been excluded from subsequent estimates of the ECD costs and predominately included as bushfire recovery projects. ACTEW calculated a NEB of $400 million using the worst-case 2030 CSIRO rainfall projection modelling. This project cost and NEB estimate was used in the project approval process.

- $363 million estimate completed in 2009 as part of the BWA TOC process on the basis of a detailed design and competitive tender process. This estimate includes a TOC of approximately $299 million, including a contingency of 9%, and ACTEW costs of $64 million. No NEB of the project which includes this revised cost estimate has been made available to the Commission although ACTEW has stated that the project continues to generate a positive NEB for costs to at least $400 million.
6.2 The TOC estimate

As discussed in chapter 5, the process for developing the TOC was thorough and consistent with normal commercial practice when establishing an alliance. The final TOC estimate provided by the BWA and accepted by ACTEW was established over a 15-month period from May 2008 to August 2009. Both ACTEW and the BWA have undertaken considerable reviews, both internally and externally. Table 6.1 sets out this review process.

Table 6.1: Reviews undertaken to develop the cost estimates

<table>
<thead>
<tr>
<th>Type of review</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>An independent estimator (Project Support) was engaged by ACTEW to review all project estimates throughout the project lifecycle and before the TOC was submitted to the ACTEW Board. The aim of the independent estimator was to review the rates for the different cost items as stated by the Alliance and report on their reasonableness. A Technical Review Panel (TRP) was also established by ACTEW. It consisted of independent experts from the design and construction areas with the task of independently reviewing the design of the ECD.</td>
</tr>
<tr>
<td>Internal</td>
<td>Value-for-money workshops were held throughout the concept design phase. The workshops were attended by owner, designer and constructor representatives with the goal of reducing the costs of the proposed design. Various deliverables were discussed and the appropriateness of assumptions and the design and construction methodology were questioned. As part of risk and opportunity workshops, each deliverable was allocated a probability that the expected cost of delivery will be lower (opportunity) or higher (risk) than the TOC estimate. The risk and opportunity workshops were attended by the designer and constructor representatives as well as the owner’s representatives.</td>
</tr>
<tr>
<td>Mixed</td>
<td>Challenge panels were created as an additional layer of review and were tasked to criticise the proposed solution. Separate challenge panels exist for design and construction methodology. GHD (Alliance design partner) also has an internal process that requires the proposed design to go through a GHD challenge panel.</td>
</tr>
</tbody>
</table>

Source: Adapted from Deloitte (2009: 15).

In its role as independent estimator, Project Support could identify only limited cost differential (Deloitte 2009: Appendix Project Support) through its ‘point of difference’ estimates against a total direct cost\(^{29}\) of the project, or approximately 2.2\% of the project cost. In the experience of Project Support, a tolerance of +/-2.5\% is within the realistic range of accuracy.

Halcrow has advised the Commission that it is satisfied with the approach taken by ACTEW to engage an independent estimator. Further, Halcrow noted that in terms of the direct and indirect costs there was no difference between Project Support’s estimates and the TOC estimates; the key points of difference were in the more subjective areas of the estimation such as risk and escalation factors (Halcrow 2010: 92).

In terms of the internal reviews undertaken by ACTEW and the BWA, Halcrow (2010: 69) found that the value-for-money workshops and the corresponding value-for-money outcomes reports contributed to ensuring that value management was a focus throughout the development of the TOC.

\(^{29}\)Direct costs represent the non-risk adjusted costs of the project—see risk discussion in section 5.3.1.
Halcrow made no comment regarding the use of challenge panels; however, the Commission considers that they provide a degree of comfort that each element of the design and construction methodology was continually reviewed to ensure the least cost or most efficient approach was taken by the BWA.

The Commission notes, however, that as part of its review of the development of the TOC estimate, Deloitte commented:

> It is not apparent that the non owner partners of the Alliance had a strong value for money focus during the development of the design and TOC estimate. (Deloitte 2009: 7)

This observation is of concern to the Commission. If there were limited cost pressures, or a limited value-for-money focus by the Alliance contractors, there is the potential for the TOC to have been overestimated.

At the same time, the Commission notes the results of the reviews undertaken by Project Support and more recently by Halcrow. The outcomes of these two reviews suggest to the Commission that, while there may be some opportunities to further refine the cost estimates, the TOC represents a robust estimate of costs.

In support of this view, the Commission notes that Project Support’s review of all project estimates found that there were only limited points of difference between the original TOC estimate of $310.9 million and its own independent assessment of costs. Since the undertaking of Project Support’s review, the Alliance has decided to reduce the TOC from its original estimate by approximately $11.9 million. Any point of difference between Project Support’s estimate and the revised TOC estimate is now positive, meaning that the final agreed TOC is now lower than the cost supported by Project Support’s assessment. Furthermore, Halcrow’s review of the efficiency of the $363 million cost estimate for the ECD project found that the process used to develop this estimate is based on a developed, detailed, comprehensive, robust review of design and construction methodologies and cost estimates (Halcrow 2010: 92).

The Commission is confident that, given the time that was available to develop the TOC, it represents a significant improvement on the initial $145 million estimate.

### 6.3 Comparison of estimates

The apparent cost increases over the period from 2005, particularly in the cost estimates that were publicly available, have been a matter for some concern within the community. To assist in an understanding of the differences in these costs, a reconciliation of the 2007 estimate and the 2009 estimate is provided in table 6.2. This reconciliation of the 2007 estimate with the preliminary TOC was derived from Project Support’s Independent Estimator Review.
Table 6.2: Reconciliation of the 2007 estimate with the 2009 preliminary TOC

<table>
<thead>
<tr>
<th>ACTEW ECD Update Report July 2007</th>
<th>July 2009 BWA TOC estimate</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>$120 million&lt;sup&gt;a&lt;/sup&gt;</td>
<td>$310.92 million</td>
<td>$190.92 million</td>
</tr>
</tbody>
</table>

Reason for differences in respective estimate values

- Uplift on like items: $82.10 million
  - Due to scope growth, design costs, quantities, rates, and scope additions
- Other costs: $108.82 million
- Contractor indirect and margin costs: Included in $108.82 million
- Unallocated direct costs items: Included in $108.82 million
- Escalation: Included in $108.82 million
- Total: $190.92 million

<sup>a</sup> This figure represents the direct costs of the construction of the dam estimated in the 2007 Future Water Options paper.

Source: Halcrow 2010, tables 4.4 and 4.5.

These figures represented the difference between the initial direct costs of the ECD project in 2007 and the preliminary TOC presented in July 2009. The final TOC of $299 million was approximately $11.9 million lower than this estimate as the result of a decision by the Alliance partners to make an overall reduction in their cost projections (see comments in section 5.2.1). As a consequence, an adjustment to the TOC and therefore the cost differential is required to fully reconcile the 2007 cost estimate of $120 million (excluding the bushfire-related projects) and the TOC, as now advised, of $299 million. In addition to this TOC estimate, ACTEW’s owner costs need to be included. These have been estimated at $64 million, which brings the total cost estimate for the ECD project to $363 million.

While the table 6.2 reconciliation summarises the differences between the 2007 estimates of the costs and the TOC estimate as announced in 2009, it does not explain how and why the costs were materially different between the 2007 estimate and the final cost estimate of $363 million. This is addressed more fully below.

Reviews of the $145 million cost estimate

The key decision to proceed with the ECD was taken as part of the 2007 review of water security in the ACT. Within the context of the decision to proceed with the dam the following documents noted the cost of the dam at $145 million:

- the Future Water Options Paper
- the Recommendations to Government paper
- the Water Taskforce report
- the Commission’s own 2008 pricing decision.

The Commission notes that there is considerable public concern over the apparent cost increase from the 2007 Future Water Options paper to the final costs of $363 million. In 2007, the ACT Treasury was suitably concerned about the preliminary nature of the $145 million estimate that it undertook sensitivity analysis on the NEB using the much higher 30% contingency factor in the cost estimates. The Commission itself recognised that there was the potential for additional costs. In its 2008 Price Determination for Water and Wastewater Services, it acknowledged that the capital costs for the ECD could prove to be up to 30% higher once the development had been completed and all costs identified.
The robustness of the 2007 estimate may have been overstated by ACTEW in its Recommendations to Government paper, which included the following statement:

The cost of the dam was estimated in 2005 and again, by two consultants, in 2007. The 2007 cost estimate is approximately $119 million for the dam and associated works. Allowances of $4 million have been made for clearing and site preparation, $2 million for pipelines, $15 million for the pump station and $5 million for miscellaneous works, giving a total cost of approximately $145 million. (ACTEW 2007c: 23)

This suggested that the initial estimate was tested at least three times. However, in representing the figure to ACTEW, GHD (2007) clearly stated that the estimates were fit for preliminary budgeting only. This caveat was included by ACTEW (2007a: 7) in its review of the cost estimates completed in 2007. However, the 2007 cost estimates report also included an updated estimate by Rider Levett Bucknall of the GHD 2005 estimates. These revised estimates were between 9% lower and 26% higher than the estimates originally prepared by GHD. The 9% reduction applied to the dam extension design ultimately selected by ACTEW. Given this revised estimate was lower than the original estimate it is perhaps understandable that ACTEW would have exhibited confidence in the original estimate provided by GHD despite comments by GHD that the estimate was preliminary in nature.

In undertaking a review of the dam costs for the Commission in 2008, Halcrow made the following observations on the $145 million cost estimate:

On the basis of ... the documentation reviewed, the process adopted to determine the least capital cost estimate for the enlargement of the Cotter Dam is considered to be robust and there can be reasonable confidence that (at this stage) it allows for the efficient implementation of this project. (Halcrow 2008: 31)

It is important to note that Halcrow’s review at that time was undertaken in a very short time and addressed the costing for the then four water security measures that the Commission was examining as part of making the price determination, namely:

- increasing the size of the Cotter Dam
- installing infrastructure to transfer water from the Murrumbidgee River to Googong Dam
- trialling smart metering systems
- designing a demonstration water treatment plant.

Rather than recalculating the cost estimate, Halcrow at that time undertook a review of the process of arriving at the $145 million estimate. Halcrow concluded that the process used was sufficient to determine the least-cost alternative for the ECD. This was consistent with the requirements of the Commission to make an assessment at that time on the prudence and efficiency of the proposed investment for purposes of rolling the cost into the price path. Under normal price determination procedures, a final cost could be included in future prices if, once that final cost was known at the completion of the ECD project, that cost was still considered to be an efficient cost for the work undertaken.

In re-examining the estimates undertaken in 2005 and 2007 by GHD, Halcrow (2010: Appendix D: p. D-12) has observed that it is unlikely that sufficient site investigation was conducted as a prelude to either the 2005 or 2007 cost reviews. Halcrow reports that it was common for ‘at least limited site investigations’ to be completed as part of a feasibility study. It is therefore likely that GHD’s review was not a feasibility study; rather, it should be viewed as an options review that

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30 Rider Levett Bucknall was one of the consultants referred to by ACTEW that reviewed the cost of the dam.
subsequently warranted an additional and more detailed costing study. In this circumstance, Halcrow (2010: 92) concluded that while the GHD study was sufficient for comparative costing purposes, it was not suitable for use in making a final recommendation on the best option to meet the ACT’s water needs.

Limitations of the 2007 estimate

As part of this review, the Commission has identified the following limitations within the 2007 estimate:

- uplift factors for like items—there have been considerable price variations in the cost items used in the costing model beyond normal inflationary pressures which could not have been foreseen by GHD at the time the 2007 estimate was presented
- exclusion of owner costs—the 2007 GHD estimate did not include any allowances for ACTEW costs
- exclusion of contractor indirect costs and margins—the 2007 GHD estimate did not include an allowance for the total costs likely to be incurred by contractors.

The Commission has considered each element below.

Uplift factors for like items

In comparing the various cost estimates there are numerous cost items which have increased over time. Project Support has identified approximately $82 million worth of cost increases which are related purely to cost inflation since the 2007 estimate. An example of one of these cost increases is presented in table 6.3.

Table 6.3 Cost increase for concrete

<table>
<thead>
<tr>
<th>Rider Levett Bucknall 2007</th>
<th>GHD 2007</th>
<th>TOC $299m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage increase on original 2005 GHD estimate</td>
<td>8.3%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Sources: ACTEW (2007a); Deloitte (2009).

The impact of these cost increases for materials on the total cost of the dam should not be underestimated as they represent a significant percentage of the direct dam costs (GHD 2007). Cost increases due to factors which reflect market realities should not be seen as a shortcoming of the initial estimate as it is difficult to predict the impact that external drivers, such as a resources boom, will have on the costs of an individual project. In total these costs of materials increased by 56.5% over the initial $145 million cost estimate (or 68% over the 2007 estimated construction costs of $120 million).

Exclusion of owner costs

As part of the reconciliation between the final project cost of $363 million and the 2007 estimate of $145 million, Halerow has identified $64 million worth of non-TOC costs including:

- pre-TOC costs for project inception, planning, preliminary design, approvals and the like
- ACTEW’s costs as owner of the facility
- fish studies and habitat protection costs
- Cotter precinct mitigation works.
The Commission understands that $33.6 million of pre-TOC costs have already been spent by ACTEW (Deloitte 2009: Appendix Project Support, 8) in developing the project. As part of the 2007 estimate ACTEW included approximately $25 million in cost allowances for the clearing and site preparation works, pipelines, pump stations, and miscellaneous. Some of these costs have been incurred as parts of other projects (for example bushfire recovery costs) while the clearing costs, perhaps surprisingly, have now been excluded from the capital costs of the project. The Commission notes that no pre-TOC costs were included in the 2007 estimate.

Project Support found that the GHD 2007 estimate had specifically excluded the following owner costs:

- owner’s project team and related costs
- land acquisition/ownership costs
- permitting costs
- finance costs
- government liaison
- operation staff training
- escalation. (Deloitte 2009: Appendix Project Support, 8)

Project Support reported that the inclusion of these costs in the $145 million estimate would have added $33.6 million of ACTEW project team and related costs incurred between July 2007 and July 2009, and $11.2 million for environmental programs. Inclusion of these costs in the then $145 million estimate would have added $44.8 million to the estimated cost, bringing the total cost based on the initial $145 million estimate to $189.8 million. Since the preparation of the 2007 estimate, ACTEW has further quantified its total costs at an additional $19.3 million, bringing the total owner costs to $64.1 million, or 17.7%, of the total costs of the ECD project.

**Exclusion of contractor indirect costs and margins**

In its reconciliation of the preliminary TOC with the $145 million estimate included in the Future Water Options paper, Project Support (Deloitte 2009: Appendix Project Support, 9) noted that contractor indirect costs and margins were excluded in the GHD estimate. Project Support noted neither GHD nor Rider Levett Bucknall made an allowance for contractors’ indirect costs and margins/fees.

These costs are now fully embedded in the TOC estimate and are clearly identified as such. It is unclear to the Commission why these costs were not included in the initial estimates prepared by GHD. The omission of these costs has further confused the comparison between the 2007 estimates and the latest total cost estimates. It also has important implications for the way in which the costs of the ECD were used in the NEB evaluation upon which a final decision was taken to proceed with the dam enhancement.

The Commission notes that in the TOC these contractor indirect costs and margins account for more than 20% of the total cost. Applying this overhead rate to the 2007 direct cost estimate of $120 million, the Commission notes that the exclusion of contractor costs notionally understated the 2007 estimate by more than $24 million.

**Inclusion of owner costs and contractor margins in the 2007 cost estimate**

The Commission notes that some costs were excluded from the 2007 cost estimate. In addition, some of the costs included in the 2007 estimate are now included in separate projects being
undertaken by ACTEW. When making a comparison between the 2007 estimate and the latest TOC estimate, it is important to consider the costs that should have been included in the 2007 Future Water Options paper. Table 6.4 provides a summary of the differences between the 2007 cost estimate and the 2009 TOC estimate by including those costs that it would have been reasonable to expect to be included, or at the very least identified as potentially occurring, at the time the 2007 estimate was presented.

Table 6.4: Adjusted cost estimates comparison

<table>
<thead>
<tr>
<th></th>
<th>2007 estimate</th>
<th>What should have been included in the 2007 estimate</th>
<th>August 2009 TOC estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct costs</td>
<td>$120 million</td>
<td>$120 million</td>
<td>$120 million (see adjustments below)</td>
</tr>
<tr>
<td>Pumping costs</td>
<td>$25 million</td>
<td>Accounted for as part of water treatment works for bush fire recovery</td>
<td>Accounted for as part of water treatment works for bush fire recovery</td>
</tr>
<tr>
<td>Uplift and scope increases</td>
<td>No allowance</td>
<td>No allowance</td>
<td>$82.1 million</td>
</tr>
<tr>
<td>Owner costs</td>
<td>No allowance</td>
<td>$64 million</td>
<td>$64 million</td>
</tr>
<tr>
<td>Other costs</td>
<td></td>
<td>$108.8 million</td>
<td></td>
</tr>
<tr>
<td>Contractor costs—indirect and margins</td>
<td>No allowance due contracting methodology not being finalised</td>
<td>$24 million (20% of 120 million)</td>
<td>Included in $108.8 million of other costs</td>
</tr>
<tr>
<td>Direct cost items not included in GHD assessment</td>
<td>No allowance</td>
<td>No allowance</td>
<td>Included in $108.8 million of other costs</td>
</tr>
<tr>
<td>Escalation</td>
<td>No allowance for 2012</td>
<td>No allowance for 2012</td>
<td>Included in $108.8 million of other costs</td>
</tr>
<tr>
<td>Fatal Flaw analysis</td>
<td>30% potential variance identified</td>
<td>30% potential variance identified</td>
<td>Included in TOC estimate</td>
</tr>
<tr>
<td>Cost savings identified by value management studies</td>
<td>No savings</td>
<td>No savings</td>
<td>–$11.9 million</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$145 million plus 30%</strong></td>
<td><strong>$208 million plus 30%</strong></td>
<td><strong>$363 million</strong></td>
</tr>
</tbody>
</table>

Sources: Commission estimates and Project Support.

Table 6.4 provides a ‘like for like’ comparison between the 2007 and 2009 estimates. In its review of these cost differences, Deloitte (2009: 7) noted:

The shortfalls in previous estimates can be primarily attributed to considerable increases in the rates and quantities used, changes to scope, increasing design costs and items not estimated (missing direct cost items as well as indirect costs and margins) [emphasis added]. Whilst some degree of scope growth would be expected, insufficient contingency existed within early estimates to absorb this. The missing elements are believed to now have been identified and included. However, their initial exclusion is a cause for concern.

Allowing for the 30% contingency factor assumed in the 2007 estimates plus the addition of costs that were not accounted for in the 2007 estimate, the total cost of the ECD project would have been more than $270 million, whereas the total cost estimate announced in 2009 was $363 million, approximately a third more than the adjusted 2007 estimate. The primary reason for this difference
is the uplift and scope increases that occurred between the preparation of the 2007 estimate and the 2009 cost assessment.

As noted in the Victorian study (DOTF 2009: 15), the lack of accuracy in the business case estimates is a considerable disadvantage for the majority of projects which are delivered through alliance contracts. The Victorian study went further and suggested that either the accuracy of the capital estimate needed to be improved or business cases should include explicit advice to decision makers regarding the potential of costs increases. The inclusion, or at least the recognition, of these costs would have enhanced the community’s understanding of the true costs of the ECD project.
7 Key draft findings against the terms of reference

The conclusions detailed in this chapter are preliminary findings that the Commission seeks to test through the release of the draft report and the public consultation process.

7.1 Projected costs

<table>
<thead>
<tr>
<th>Findings on first term of reference: whether the projected costs of the ECD water security project are prudent and efficient in terms of meeting the water security standards required of ACTEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 ACTEW has used a net economic benefit (NEB) approach to assessing alternative water security supply options and this is supported as being an appropriate approach for such an evaluation.</td>
</tr>
<tr>
<td>1.2 The ACTEW NEB analysis supports the adoption of the ECD at the higher cost of $363 million.</td>
</tr>
<tr>
<td>1.3 The government’s stated water security standard is 1 year in 20 in temporary restrictions.</td>
</tr>
<tr>
<td>1.4 Notwithstanding a positive NEB under ACTEW’s analysis, the ECD alone may not meet the 1 year in 20 temporary restrictions objective.</td>
</tr>
<tr>
<td>1.5 However, the water security program, which includes ECD, Murrumbidgee to Googong transfer and Tantangara storage, is likely to meet this level of service objective under ACTEW’s assumptions.</td>
</tr>
<tr>
<td>1.6 The ECD provides one option for meeting part of the water security standard identified by the government, but alternative options should have been given further consideration as standalone options in the NEB evaluation as the true costs of the ECD became apparent.</td>
</tr>
<tr>
<td>1.7 There are some concerns about the calculation and presentation of the NEB for the ECD and other options, and this may have influenced a decision on the ordering and timing of investment in these options.</td>
</tr>
</tbody>
</table>

Assessment process

The Commission notes the complexity of planning the optimal timing of investment within the water industry is largely driven by factors outside the control of the water business. Getting the optimal investment time correct is a function of various factors, including:

- the current storage capacity and the productive capacity of the catchments which support those storages (the inflows to the catchments)
- demand factors such as population growth and the impact of demand management programs
- operating standards and requirements
- assumptions about the impact of climate change and the resultant assumptions about the probability of time in particular restriction levels
- the cost assigned to the various restriction levels and therefore the benefits ascribed to individual augmentation projects.
**Current storage capacity and the inflows to catchments**

The Commission notes that there has been considerable variability in the ACT’s dam levels over the past 10 years. Googong has suffered from extremely low yields, while Corin and Bendorra have faced considerable pressures from bushfires and relatively lower yields than were historically available. These factors have created unprecedented pressures for ACTEW in terms of managing these catchments. The Commission notes that each of the major water security program options identified by ACTEW is likely to reduce the pressure on all three existing catchments.

Within the Corin, Bendorra and Cotter systems, Halcrow (2010: 40) found that the current operational modelling undertaken by ACTEW is appropriate and consistent with good practice, and that the projected inflows to these storages can be considered reasonable.

**Demand factors including population growth and the impact of demand management programs**

While raising concerns about the use of just two demand reduction scenarios, Halcrow noted that the adoption of the prudent planning scenario used by ACTEW was not inconsistent with the approaches used more widely within the water industry.

The Commission is satisfied that ACTEW has appropriately modelled the impact of population growth and demand reductions in considering the need for the ECD project, notwithstanding the potential need to make some revision for the impact that demand factors are likely to have on the cost of restrictions estimates.

**Operating standards and available options**

There is a lack of clarity surrounding the water security standard in the ACT. On the one hand, for ACTEW the NEB is the primary driver in deciding whether to proceed with an investment; on the other hand, for the ACT Government time in restrictions remains the key consideration for infrastructure planning.

The Commission has concerns about the definition of the water security standard in the ACT. The lack of definition surrounding the operating requirements, including the security of supply standard set by the ACT Government in terms of what is meant by time in restrictions, and under what climate change scenario, provides very little guidance to ACTEW as to what it should be aiming to achieve in terms of its operating deliverables.

The operational interpretation of the level of restrictions which should be included in the 1 year in 20 temporary restrictions objective announced by the government in March 2009 is not clear. For example, the ACT amended its water restrictions regime in 2006 by adopting the old Stage 1 restrictions as permanent restrictions, known as PWCM. The adoption of these measures on a permanent basis was supported by the 2003 willingness-to-pay study of ACT consumers which concluded that consumers were unwilling to pay to avoid restrictions at this level. In addition, consumers’ responses demonstrated that there was an unwillingness to pay to avoid the then Stage 2 restrictions (which have subsequently become Stage 1 restrictions in the current regime). The Commission notes that an important methodological question is whether the current Stage 1 restrictions should be included in the definition of the 1 year in 20 temporary restrictions objective if the ‘cost’ for households of this level of restrictions (represented by their willingness to pay to avoid this level of restriction) is effectively zero. The impact of the inclusion of this restriction level on the ability of ACTEW to meet this objective is demonstrated by figure 7.1, which sets out the various time in restrictions probabilities across the augmentation options considered in the 2007 Future Water Options paper.
Figure 7.1 indicates the probability of being in different stages of restrictions under various water supply options (5% probability is effectively a 1 year in 20 outcome). Stage 1 restrictions (previously Stage 2), have been included in arriving at the total probability of being in restrictions. As figure 7.1 demonstrates, the exclusion of Stage 1 restrictions from the operating standard, means that the ECD to be completed in 2011 option (78 GL Cotter in 2011) as a standalone project generates an expectation of the time in restrictions which is within the 1 year in 20 water security standard.

However, figure 7.1 also demonstrates that there are other options that were considered that, after allowing for the removal of the Stage 1 restrictions, met the 1 year in 20 restrictions standard. For example, it would appear that the two Tennent options also achieve the operating standard although it is understood that this option had other issues which precluded it from further consideration. Excluded from the standalone options presented in the 2007 Future Water Options paper was the Murrumbidgee to Googong option and the combination of the Murrumbidgee to Googong option with access to water from Tantangara and flow of river water from the Murrumbidgee system.

As demonstrated in figure 4.1 in chapter 4, the ultimate augmentation options considered by ACTEW took as their starting point the adoption of the ECD, and then considered the additional water security offered by combining this option with other projects such as the Murrumbidgee to Googong proposal. As stated in the 2007 Future Water Options paper:

Eight combinations of future water options are examined in this section. All combinations build on the best individual option from the proceeding section, an enlarged Cotter dam [emphasis added]. (ACTEW 2007b: 29)31

The Commission has not seen any evidence from ACTEW that a standalone assessment of the Murrumbidgee to Googong project option was undertaken as part of the 2007 Future Water Options paper or the 2009 approval process for the ECD. As Deloitte (2009: 32) also noted, in its independent review of the ECD project, ‘a rigorous review of alternative options for the ECD was not undertaken’.

31 The Commission notes that throughout this paper the Murrumbidgee to Googong option is only ever referred to as an incremental option to the ECD.
Without a clear presentation of this standalone assessment it is not possible to confirm that the Murrumbidgee to Googong option would not have been sufficient to meet the water standard objective. The failure to consider this as a standalone option creates uncertainty as to whether the accepted ECD option represented the prudent solution to the water supply objective. Furthermore, an assessment of whether the ECD solution met the prudent requirements has also been clouded by the lack of definition surrounding the 1 year in 20 temporary restrictions water security objective.

Assumptions about the impact of climate change and the probability of time in restrictions

The Commission notes that ACTEW has based its climate change modelling on the most severe 2030 estimate provided by CSIRO; other more severe, and less severe, climate change scenarios were outcomes of the 2070 CSIRO climate change models. ACTEW has understandably decided to take this more precautionary approach to its forward planning. The estimate of rainfall derived from this modelling has been applied to the various inflow models to determine the amount of time the ACT is likely to be in restrictions assuming various augmentation options. This has been applied to data from the willingness-to-pay studies to derive a NEB on the assumption that the extreme climate change outcomes will occur.

The calculation of the NEB has been further influenced in terms of its outcomes and potential unbiased interpretation by the use of the upper end estimates of the costs of restrictions. Thus, the Commission is concerned that the NEB as currently applied loses some of its transparency and usefulness as a decision tool.

Given the uncertainty associated with the modelling of climate change impacts the Commission would have expected greater testing of the time in restrictions and the NEB calculations under various climate change scenarios presented by CSIRO. At a minimum, a worst-case (extreme) scenario, medium (average) scenario, and low-impact (no change) scenario should have been presented by ACTEW to illustrate this uncertainty. The usefulness of the NEB as a transparent decision-making tool would have been enhanced if ACTEW had undertaken sensitivity testing of the NEB within the range of climate change estimates provided by CSIRO, rather than just the 2030 worst-case scenario.

The cost assigned to the various restriction levels

The benefits included in the NEB are primarily derived using the cost of restrictions estimates supplied by CIE. The Commission is concerned that the CIE estimates lack sufficient detail to substantiate the assumptions which underpin the various cost estimates used in the calculation of the cost of restrictions. The Commission notes the National Water Commission’s Consultants comments which were critical of the CIE approach with a particular emphasis on the use of upper bounds to calibrate costs plus the lack of sensitivity testing of key assumptions, such as the elasticity of demand (ACIL Tasman and UTS 2009).

The Commission also has concerns about other aspects of the cost of restrictions work completed, including the:

- use of the upper estimate of the original willingness-to-pay work completed by Hensher et al for households, and the use by ACTEW of the upper bound of the CIE survey data in determining the cost of restrictions
- escalation of these estimates over time
- use of the 3.5 risk aversion factor to ‘revise’ upward the cost of Stage 4 restrictions in the 2007 Future Water Options paper
• inclusion of the cost of restrictions estimates for costs which represent a transfer between consumers, and ACTEW and the ACT Government, and thus should not have been treated as an additional cost to the ACT economy.

The Commission notes that while the NEB approach used by ACTEW is consistent with standard cost–benefit assessment methodologies, it is concerned that the various inputs used in the ACTEW/CIE calculation of the NEB considerably diminish the effectiveness of the approach as a decision-making tool.

**Prudence and efficiency of ACTEW's decision to invest in the ECD**

Under the assumption that the 2030 worst-case climate change scenario presented by CSIRO is in fact the actual climate scenario that ACTEW is facing, not investing in any additional augmentation works would have been an imprudent course of action for ACTEW. This is largely driven by the expectation that the ACT would have been in some form of water restrictions two years in every five years if this 2030 worst-case climate change scenario occurred. The Commission is satisfied that if this climate change scenario is the most likely outcome, the ‘do nothing’ option was not available.

ACTEW’s decision making was based on the need to increase the water storages as assessed within the framework of the NEB methodology. That is, ACTEW was targeting only economically justifiable projects to improve the water security of the ACT in absolute terms. The lack of an official statement from government of the required water security objective until March 2009 results in a clear definition of this standard being absent at the time the 2007 Future Water Options Review was being undertaken and the decision to proceed with the ECD was taken.

The Commission considers that this lack of a clearly defined water security standard was unhelpful in the consideration of the various water supply options over the period. Greater official guidance should have been available to ACTEW, and indeed the community, on what was an acceptable water security standard, and under what climate change scenario, before funds were committed to proceed with any new investment projects. Notwithstanding the absence of any specific guidance on the water security objective, the NEB approach is a reasonable approach to assessing water security options, assuming that inputs into the NEB are appropriately considered and calculated.

The Commission notes that the water security program which is built around the ECD will, on the basis of ACTEW’s own analysis, result in the ACT facing water restrictions 1 year in every 40 years, under the 2030 worst-case climate change scenario presented in the 2007 Future Water Options paper. This is twice the water security objective subsequently set by the ACT Government of 1 year in every 20 years in temporary restrictions. Should the climate change scenario be more severe than the 2030 worst-case climate change scenario, the time in restrictions would be higher than 1 year in 40 (that is, more often than 1 year in every 40 years). Likewise, climate change scenarios which are less severe than the 2030 worst-case would be significantly above the 1 year in 20 requirement set by the ACT Government.

The Commission notes that the application of the NEB, while potentially overstated, was an attempt by ACTEW to quantify the benefits associated with avoiding the costs of restrictions against the cost of individual augmentation options. The Commission suspects that, of itself, the NEB may not have been sufficient grounds for undertaking the ECD investment. However, the requirement to meet the Government’s water security objective implies that a positive NEB is not necessarily the only driver of prudence. In such circumstances, the NEB approach would be used to assess the ability of various options to meet the policy objective set by the government at the
least cost to the community; that is, it would be used to identify the most efficient option for delivering that particular level service.

The Commission has a number of concerns about the application of the NEB framework in determining whether or not the ECD was an efficient option. The Commission is concerned that the NEB does not necessarily indicate that the ECD project would have been the most efficient option in the search to provide greater water security. The Commission notes that, at least in the information provided by ACTEW, the two other water security projects (the Murrumbidgee to Googong and the Tantangara releases), which have also been approved, were not assessed as standalone options once the full cost of the ECD was known in 2009. In the 2007 Future Water Options paper the Murrumbidgee to Googong option was only ever presented as an incremental option to the ECD. Therefore, the Commission is unsure how close these two projects would have been to meeting the water security objective without the ECD project. Further, the Commission notes that the next best option presented in the 2007 Future Water Options paper was approximately $21 million lower in NEB terms than the ECD. The additional costs of building the ECD project which have now been revealed suggest that had the 2007 Future Water Options analysis been completed with this additional costs information, or at the very least retested, the ECD may not have been considered the ‘best individual option’.

While the Commission initially accepted both the prudence and efficiency of the ECD project in its 2008 Price Determination (ICRC 2008), it did so based on the considerably lower capital cost estimate of $145 million when the ECD was presented as the best individual option under consideration. However, since that time, the cost of the ECD has grown significantly, and the Commission would expect ACTEW to have undertaken further evaluation of the ECD option on a standalone basis against the list of alternatives included in the 2007 Future Water Options paper. It is unclear to the Commission whether a revised cost–benefit assessment that considered these alternatives as standalone options was completed by ACTEW or assessed by the ACT Government. Further, the Commission is unsure about the degree to which these options would have met the water security objective at a more efficient NEB outcome without including the ECD project as a possible additional guarantee that the security standard would be achieved. Given the Commission’s concerns about the calculation of the NEB (see chapter 4), it questions whether any NEB assessment that did not consider the alternative options once the higher ECD costs were known could have provided appropriate guidance on the least-cost option and the willingness of consumers to pay the much higher price of the ECD project.

The need to make at least some augmentation to the existing water supply capabilities is clear under the assumption that the 2030 worst-case climate change outcome has occurred. The decision to proceed with the ECD once the final costs of the project were known is less clear. The Commission notes that the projected economic return/NEB on the ECD project, at a cost of $363 million, is likely to have been negative if ACTEW had calculated the NEB using the median results instead of the upper bound estimates in the 2008 CIE study. Furthermore, the Commission considers that the project was considerably more marginal in NEB terms than the original 2007 presentation of the NEB suggested due to the inclusion of certain data that the Commission questions, primarily the 3.5 risk aversion factor and the ACTEW and ACT Government ‘costs’, and the exclusion of margins and owners costs which were not included in the original cost estimate of the project. Coupled with the significant cost increases between the 2007 cost estimate and the 2009 TOC, the Commission would have expected a more comprehensive review of the decision in 2009, including a reassessment of the two standalone options.
7.2 Alliance arrangement

Findings on second term of reference: the approach taken to put in place an alliance arrangement with contractors to secure delivery of the ECD water security project to provide water security for the ACT and region

2.1 The adoption of the Bulk Water Alliance approach to project procurement and delivery is considered to be appropriate and is an increasingly used delivery methodology for water-related infrastructure projects.

2.2 The tendering process for selecting the Alliance contractors used by ACTEW was systematic and rigorous, and consistent with the practice of similar agencies throughout Australia.

Procurement process

Once the decision to proceed with the ECD was made, ACTEW undertook a review of the various procurement options available to it. The Commission has found that ACTEW engaged in a detailed and robust assessment of the various procurement options available. Following this assessment an alliance contract was deemed to be the most satisfactory procurement method. This decision appears to have been taken in the context of the normal commercial considerations associated with the procurement of major projects.

Having decided on the alliance procurement methodology, ACTEW undertook a competitive process to appoint Alliance contractors. While a competitive tender was undertaken for both the design and construction elements of the Alliance, only two parties responded to the design tender. The Commission accepts that this was largely due to the considerable capacity constraints in the market for designers, due to the growth in the Australian economy at the time. While more tenderers would have yielded a more competitive outcome, the Commission is satisfied that the process did not limit the number of tenders received. The Commission notes that four responses were considered for the construction element of the Alliance. The Commission is satisfied that ACTEW conducted an open and transparent tender to select the Alliance contractors.

Development of the TOC

The Commission is confident that the TOC has been significantly improved since the initial $145 million estimate. It was developed using competitive tender responses from subcontractors and includes allowances for the various direct costs, excluding ACTEW’s costs, likely to be incurred while building the ECD. The Commission is satisfied that the TOC was developed in a competitive environment and represents a robust cost estimate for the ECD project.

Allocation of risks

The Commission has found that ACTEW and the Alliance contractors have gone through a detailed review and allocation of risks consistent with good commercial discipline. Further the Commission notes that the Alliance contractors have agreed to a considerably lower risk amount than the Commission’s consultant, Halcrow, has seen in similar contracts.

Incentive mechanism within the contract

The Commission notes that, on balance, the renegotiated gain-share/pain-share arrangement transfers the risks associated with the project back onto ACTEW to control costs over the agreed TOC, as the incentive mechanism does not reduce the project fee generated by the Alliance.
contractors until the project costs have increased by 5.3%. Despite this, ACTEW’s customers are better off under the revised TOC and incentive mechanism than they would have been under the initial TOC estimate, because the TOC was negotiated down to $299 million in the TOC determination process.

The Commission notes that there is potentially an increased incentive, particularly as the project nears completion, for the TOC to be revised upwards. However, the Commission is confident that a revision upwards is unlikely for the following reasons: first, ACTEW has given public assurances that the scope for the project will remain unchanged; second, the definitions and operation of both ‘change’ and ‘scope change’ clauses set out in the PAA for the Alliance establish strict guidelines for the possible activation of these provisions. The fact that the TOC of the ECD project was eventually set at a level considerably higher than the original 2007 cost estimates also serves to place further pressure on ACTEW to ensure that any potential changes to the TOC are not approved except where the changes are certain to provide an increase in the value for money for ACT consumers.

The Commission is of the view that any price increases above the current TOC, whether in the form of changes to the initial TOC, the current scope of works, or a higher AOC, must represent value for money for the ACT consumer. ACTEW will need to provide strong evidence of this value-for-money outcome as part of any potential change in the cost of the project that is presented to the Commission in its final regulatory price submission as part of the next price determination to be made by the Commission prior to 2013–14.

**Conclusion on the Alliance**

The Commission is satisfied that ACTEW undertook a detailed study of available procurement models and that it conducted a competitive and transparent tender process. The Commission would expect that ACTEW’s cost control processes throughout the implementation of the Alliance contract and the project construction stages would be extremely robust so as to assure the community, the Commission and the ACT Government that any concerns about aspects of the Alliance costing and risk-sharing arrangements are unfounded and that the final cost of the dam represents value for money and an appropriate sharing of the risks and rewards from the undertaking of a project of this magnitude.

### 7.3 Costings process

<table>
<thead>
<tr>
<th>Findings on third term of reference: the process undertaken to develop and test the costings of the ECD water security project at all stages from 2005 to November 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 The 2005 and 2007 cost estimates were deficient in that they excluded owner costs and potential margins and management costs from external contractors.</td>
</tr>
<tr>
<td>3.2 The 2009 cost estimate of $363 million includes these omitted costs.</td>
</tr>
<tr>
<td>3.3 The 2009 estimate is based on a robust process to estimate the efficient costs of the ECD.</td>
</tr>
</tbody>
</table>

The Commission notes that there were four costs estimates between 2005 and 2009. The first two cost estimates were inadequate to be used as the basis for final approval of the ECD project.

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32 The activation of the change and scope change provisions must be approved by the ALG; ACTEW and ActewAGL have a joint majority membership of ALG.
Significantly, these estimates explicitly excluded costs which would have been reasonably expected to be included at the time the decision to proceed with the ECD was being taken. These costs were:

- owner costs—subsequently revealed to be $64 million or a little over 50% of the direct construction costs which were being considered at the time the decision was taken to proceed with the ECD
- contractor margins and fees—subsequently revealed to be a significant percentage of the direct construction costs.

It is clear to the Commission that the $145 million estimate was deficient for the purposes of approving the ECD project due to the preliminary nature of the estimates as well as an absence of market testing of the costs assumed in 2007. Additional feasibility studies were required to ensure that the costs were tested and the design of the dam refined. The Commission is concerned that the $145 million estimate was used in the decision to proceed with the dam, given that the most up-to-date estimate of the cost of the ECD project was considerably higher than the 2007 estimate. As a consequence, ACTEW at that time made decisions which favoured the ECD, and the favouring of this one option influenced the process for considering other options: that is, in the NEB assessment process it considered the other options as add-ons to the ECD rather than as possible standalone options.

Despite these deficiencies, the 2007 estimates were used to make the decision to proceed with the ECD. Once that decision had been made, and as the more realistic cost estimates became available following the establishment of the Alliance arrangement and the associated detailed costing of the project, the process that was adopted was one of seeking to justify the additional costs on the basis of revised NEB estimates as discussed above.

The TOC presented in 2009 and now accepted by ACTEW is a considerably improved estimate of the actual cost of procuring the ECD project. Based on a detailed review of the ECD design, it includes market-tested subcontractor cost estimates and contractor margins. The $363 million cost estimate also includes ACTEW’s owner costs.

### 7.4 Contractual arrangements for cost variations

<table>
<thead>
<tr>
<th>Findings on fourth term of reference: The potential for any new cost variations to be incurred by ACTEW under the contractual arrangements put in place for the ECD water security project delivery</th>
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<tbody>
<tr>
<td><strong>4.1</strong> The 2009 estimate of $363 million includes an allowance for risk and escalation costs which is consistent with allowances included in similar infrastructure projects and alliance models.</td>
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<tr>
<td><strong>4.2</strong> The agreed TOC and associated contractual arrangements provide ACTEW with significant project control, which suggests that new cost variations are unlikely to occur.</td>
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<tr>
<td><strong>4.3</strong> Under the final negotiated gain-share/pain-share arrangements, there is an increased requirement on ACTEW to monitor and control any cost variations.</td>
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</table>

Two elements have the potential to increase the costs of the ECD project:

- the design work which is yet to be completed
- the gain-share/pain-share mechanism between the Alliance contractors and ACTEW.
The Commission is concerned that such a large portion of the dam design remained unspecified at the time the final TOC was developed, but accepts Halcrow’s comments that the remaining design work will not have a material impact on the AOC. The Commission takes comfort from the fact that the level of design now in place is robust enough for the current TOC estimate to be regarded as realistic, and will result in a TOC which is closely aligned with the AOC.

The pain-share mechanism has the potential to allow an increase in the direct construction cost of the project by approximately 5% without the Alliance contractors experiencing any pain. Insulating the Alliance contractors from cost increases results in shifting the risk from them to ACTEW, and could be considered a material risk. The amended risk-sharing mechanism, however, is a result of the across-the-board cost estimate reduction that brought the final TOC estimate below $300 million.

This outcome was generated only after ACTEW had extracted a $1.5 million reduction in the project fees and a $5.2 million reduction in the TOC, a $6.7 million saving on the initial TOC estimate. While at no stage is the ACT consumer worse off under the revised TOC and incentive mechanism compared with the initial TOC estimate, there are different incentives on the parties as a result of the changed mechanism. On balance, the revised gain-share/pain-share arrangement transfers the risks associated with the project back onto ACTEW to control costs over the agreed TOC as the incentive mechanism does not reduce the project fee generated by the Alliance contractors until the project costs have increased by 5.3%. However, when compared to the initial TOC, the Commission notes that ACTEW’s customers are better off under the revised TOC and incentive mechanism arrangements.

### 7.5 Cost savings

**Findings on fifth term of reference: the scope for cost savings to be passed on to ACTEW to the benefit of ACT and regional water users**

5.1 Negotiation and final agreement on the TOC achieved immediate cost saving benefits for ACTEW as part of a trade off in terms of the operation of the gain-share/pain-share arrangements.

5.2 The final gain-share/pain-share arrangements incentivise the Alliance contractors to achieve additional cost savings to those negotiated to ACTEW’s benefit as part of the TOC setting process.

5.3 ACTEW will benefit from any additional cost savings should they exceed $10.4 million.

The incentive mechanism entered into between ACTEW and the Alliance contractors is slanted in favour of the Alliance contractors in terms of cost savings which are potentially generated by these parties. This outcome was generated only after ACTEW had extracted the initial savings discussed earlier. At the same time the Alliance contractors have a considerable incentive to deliver the project for less than the revised TOC of $299 million. This is highlighted by the gain-share element between the Alliance contractors and ACTEW, which allows for a considerable percentage of any initial cost savings to be retained by the Alliance contractors. That is, the AOC would need to be approximately 5% lower than the TOC before ACTEW and ACT consumers shared in any additional savings on the contract.
7.6 Other relevant matters

Findings on sixth term of reference: other matters the Commission considers relevant to the inquiry

6.1 The original decision in 2007 to adopt the ECD over other water security supply options should have been tested against these other options on a standalone basis once it became clear that the true cost of the ECD was significantly higher than the 2007 estimate.

6.2 While the NEB evaluation methodology adopted by ACTEW is supported, there is concern about the use of the upper end of the cost of restriction estimates in the NEB calculations supporting ACTEW’s decision.

6.3 The opportunity to further develop the principles and practice surrounding the derivation and use of data in future NEB calculations should be considered.

Having reviewed in detail the use of the NEB assessment methodology, the Commission confirms its support for the use of this approach in major investment evaluations of the type undertaken by ACTEW in addressing the ACT’s water security requirements. It is readily apparent that there are some issues surrounding the veracity of the data used in this form of analysis and the need for complete transparency in any assessments of this type. The ‘rules’ that should be applied to the use of the NEB analysis are not dissimilar to those that apply to the use of cost-benefit analysis (CBA). There are numerous publications available on this issue, and for use in the assessments of infrastructure and public utility decision making. For example, the Australian Government Department of Finance and Deregulation through its Office of Best Practice Regulation has produced a number of informative reports and guides on this subject which, while not directly applicable to a NEB analysis on water security options, address a number of the data issues and forms of comparative assessment that apply equally to assessments using a NEB methodology and cost–benefit analysis assessments.

The approach undertaken by ACTEW in seeking to apply the NEB methodology has been informative and, in a number of instances, pioneering. It is clear, though, further development of some of the data estimation and application techniques is needed. Nevertheless, the Commission believes that the experience of the use of this methodology in the context of the water supply security evaluations in the ACT provides a useful starting point for undertaking further work to guide public utilities such as ACTEW in any future work requiring detailed NEB assessments.
Appendix 1    Terms of reference

Australian Capital Territory

Independent Competition and Regulatory Commission
(Investigation into Projected Costs of the enlarged Cotter Dam
water security project) Terms of Reference Determination 2009

Disallowable instrument DI2009–227

Made under the

Independent Competition and Regulatory Commission Act 1997, Section 15 (Nature of
industry references) and Section 16 (Terms of industry references)

Reference for investigation under Section 15

Pursuant to sections 15 (1) and 16 of the Independent Competition and Regulatory Commission
Act 1997, I refer to the Independent Competition and Regulatory Commission (the Commission)
the task of undertaking an investigation of the projected costs and other matters provided by
ACTEW of the enlarged Cotter Dam project to provide enhanced water security for the ACT.

The Commission is to report on:

I. whether the projected costs of the enlarged Cotter Dam water security project are
   prudent and efficient in terms of meeting the water security standards required of
   ACTEW;

II. the approach taken to put in place an alliance arrangement with contractors to secure
    delivery of the enlarged Cotter Dam water security project to provide water security for
    the ACT and region;

III. the process undertaken to develop and test the costings of the enlarged Cotter Dam water
     security project at all stages from 2005 to November 2009;

IV. the potential for any new cost variations to be incurred by ACTEW under the contractual
    arrangements put in place for the enlarged Cotter Dam water security project delivery;

V. the scope for cost savings to be passed on to ACTEW to the benefit of ACT and regional
    water users; and

VI. other matters the Commission considers relevant to the inquiry.

The Commission will report by the end of June 2010.

Simon Corbell MLA
Attorney General
12 November 2009
Appendix 2  Submissions

The Commission received the following submissions in response to an invitation to comment on matters related to the terms of reference for the investigation. The submissions are available on the Commission’s website (www.icrc.act.gov.au).

• Submission 1 (25 November 2009) Zed Seselja MLA
• Submission 2 (30 November 2009) BDA Group
• Submission 3 (1 December 2009) J Kershaw.
Appendix 3  Water security program—overview

A brief overview of the development of the ACT’s water security program is summarised below. Key stages in the development of the program are:

- *Think water, act water* (April 2004)
- Future Water Options process (December 2004 – April 2005)
- Future Water Options review of assumptions (June 2006)
- Water2WATER proposal (January 2007)
- Future Water Options review (July 2007)
- *Water Security for the ACT and region—recommendations to ACT Government* (July 2007)
- Water Security Taskforce response (September 2007)
- the project delivery process (commenced August 2007).

**Think water, act water**

In April 2004, the ACT Government released *Think water, act water*—a water resources management strategy which defined actions to achieve sustainable water use in the ACT to the year 2050.

Supply augmentation options were identified in an options report produced in April 2004 (ActewAGL 2004). Following an initial assessment of some thirty options and more detailed assessment of 11 short-listed options, the following three were identified for further investigation:

- building a new dam near Mount Tennent
- enlarging the existing Cotter Dam
- transferring water from Tantangara Dam (in New South Wales) to the Cotter catchment.

Other options considered, but not short listed for further consideration at that stage, included:

- water farm (advanced water reclamation plant at the Lower Molonglo Water Quality Control Centre)
- cross-border supplies (other than the Tantangara to Cotter option)
- groundwater
- stormwater reuse
- enlargement of the existing Corin, Bendora or Googong Dams
- construction of new dams at various alternative locations.

The three options identified for further investigation were then considered in detail as part of the Future Water Options process discussed below.

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33 This overview is based on information prepared by consultants Halcrow Pacific as part of the report commissioned by the Commission to support conduct of the investigation (Halcrow 2010: 9–15).
Future Water Options process

The Future Water Options process involved a review of the need and required timing for augmentation of the ACT water supply. This was followed by a detailed assessment of the options identified under the *Think water, act water* strategy for provision of a long-term reliable source of water for the ACT Region. The review of the need and required timing for augmentation of the ACT water supply was documented in a report produced in December 2004 (ACTEW 2004).

Detailed assessment of the three primary long-term water source options identified under the *Think water, act water* strategy is documented in the *Future water options* report from April 2005 (ACTEW 2005a). The report assessed a total of 25 variations based around the three identified options, and recommended that:

- implementation of the option to pump water from the Murrumbidgee River near Angle Crossing to Googong Reservoir commence immediately. (This option was identified during the assessment process as the Virtual Tennent Option. This option effectively secures the yield associated with the Tennent Dam option without the need to build a new dam)

- the remaining options of an enlarged Cotter Dam (78 GL), a small (43 GL) or a large (159 GL) Tennent Dam and transferring water from Tantangara Dam down the Murrumbidgee River into the ACT be retained as future viable options, and that ACTEW be ready to implement one of these options without delay, if required, through the development of a work program, implementation of formal processes for regularly reviewing the six assumptions, and completing analysis, design and other relevant technical studies for an approval process

- additional technical analysis be undertaken for each of the dam options, including refining the dam design, further detailed examination of pipeline routes and additional examination of the benefits of building a new water treatment plant near the Tennent Dam versus transferring water from the Tennent Dam into the Mt Stromlo Water Treatment Plant.

Concurrent to the Future Water Options investigations for long-term water security, work was also undertaken to implement works aimed at securing water supply in the short term (primarily in response to bushfire and drought). These included:

- construction of the Mt Stromlo Water Treatment Plant to adequately treat water harvested in the Cotter catchment following the 2003 bushfires

- optimisation of use of ‘current water’—water, which would previously be spilled from Bendora Reservoir, was transferred via the Mt Stromlo Water Treatment Plant and the distribution system to Googong Reservoir (the so-called Stromlo to Googong Reticulation Transfer)

- upgrade of the Cotter Pumping Station to transfer flows directly to the Mt Stromlo Water Treatment Plant (which facilitated the so-called Cotter to Googong Bulk Transfer system)

- extraction of water from the Murrumbidgee River (which led to an arrangement comprising extraction from downstream of Cotter Reservoir and pumping, via the Cotter Pumping Station, to the upgraded Mt Stromlo Water Treatment Plant).

Further analysis carried out in 2006 resulted in the deferral of the Angle Crossing option and the implementation of the Extended Cotter to Googong Bulk Transfer option, which was able to be implemented earlier and at a lower cost. The Extended Cotter to Googong Bulk Transfer option involved pumping water from the Murrumbidgee River, near the Cotter Pump Station, to the Mount Stromlo Water Treatment Plant to supplement supply to Canberra. Any excess water could be pumped to Googong Reservoir for storage via the water reticulation system.
The Angle Crossing option, involving extracting water from the Murrumbidgee River at Angle Crossing, was deferred as pumping from the Cotter Pump Station was possible by the end of 2007, whereas pumping from Angle Crossing could not be implemented within this timeframe.

**Future Water Options review of assumptions**

A review of the assumptions made in respect to planning variables and demand assessments in the Future Water Options process was undertaken and reported in June 2006 (ACTEW 2006). The primary findings were that:

- The assumptions with respect to climate change and variability, and bushfire impacts, had not changed over the previous 12 months in such a way as to change the judgements made in *Future Water Options* and subsequent advice.
- Minor changes had been identified for trends in water demand reduction targets and population projections and with the new 2006 environmental flow guidelines.
- Further work was identified and initiated with respect to reviewing system performance criteria (time in restrictions), particularly in response to new Permanent Water Conservation Measures.

**Water2WATER proposal**

In January 2007, the Board of ACTEW committed in principle to enlarging the Lower Cotter Dam to increase its storage capacity from 4 GL to 78 GL.

The Board also committed in principle to investigating the further purification of water discharged from the Lower Molonglo Water Quality Control Centre to drinking water standard. The purified water would be pumped to a stream in the Lower Cotter catchment from where it would flow into the Cotter Reservoir. The water would then be further treated at Mt Stromlo Water Treatment Plant before supply to consumers. The Water Purification Scheme would only proceed if ACTEW could provide assurance that the quality of water produced would be of a standard at least equal to, and most likely higher than, the water currently available.

The ECD project and implementation of the Water Purification Scheme were subsequently identified as the Water2WATER proposal.

**Future Water Options review**

A detailed review (ACTEW 2007b) of the Future Water Options program was undertaken and reported in July 2007 in response to extremely low inflows to water supply storages over 2006. It is understood that this review may have been preceded by the annual review of planning assumptions which was documented in early 2007 (ActewAGL 2007).

The review of the Future Water Options program identified some fundamental changes to the assumptions underlying the original Future Water Options assessment. These changes included changed climate scenarios that indicated significant reductions in runoff, scenario modelling using actual storage levels rather than assumed full levels as the modelling starting point, and revised planning guidelines published by the Water Services Association of Australia.

The review identified and assessed a total of nine individual and eight combinations of the individual options that would (potentially) form part of the water security program. The
assessment resulted in a series of recommended actions (see ‘Water security recommendations’ below), which were dependent upon a variety of climate scenarios.

**Water security recommendations**

In July 2007, ACTEW presented a series of recommendations for ensuring the long-term security of water supply to the ACT Government. These recommendations were documented in a report dated July 2007 (ACTEW 2007c).

ACTEW’s recommendations, which were based primarily on the observed change and variability of climate in recent years, included the following:

- immediately commence the detailed planning and construction of an enlarged Cotter Dam to 78 GL capacity
- add to the capacity and operational flexibility to extract water from the Murrumbidgee River by undertaking the work necessary to proceed to construction of a pumping capability near Angle Crossing, which could also be used to transfer additional flows released from Tantangara Dam if such flows become available
- obtain additional water from a source not largely dependent on rainfall within the ACT catchments through either
  - the Tantangara transfer option, or
  - the Water Purification Scheme.

ACTEW indicated that it would advise the ACT Government on which option was preferred for the future by December 2007 after determining whether satisfactory legal and commercial arrangements could be made to transfer water to the ACT via the Tantangara Dam, including the establishment of an ACT Water Cap; and, after more detailed examination of the Water Purification Scheme, especially further analysis of salt management options.

**Water Security Taskforce response**

A Water Security Taskforce and a Water Security Advisory Panel were established by the ACT Government to review the options identified in ACTEW’s Water2WATER program and their July 2007 recommendations in respect of securing the ACT’s water supply into the future.

In September 2007, the Taskforce made a number of recommendations to the ACT Government and ACTEW (Water Security Taskforce 2007) in respect of water supply security, including:

- enlarging the Cotter Reservoir by 2011
- progressing (undertaking design and obtaining approvals) the Murrumbidgee to Googong Transfer
- progressing arrangements for the Tantangara Transfer option (commercial negotiations and assessment of transfer alternatives)
- not progressing the proposed Water Purification Scheme, subject to further extensive analysis (detailed design of the Water Purification Plant to be progressed, and a review of the need for additional infrastructure undertaken before a decision is made to progress to construction)
- construction and monitoring of a Demonstration Water Purification Plant.
Actions recommended in respect to demand management included improvement of the metering of water in the ACT, with ACTEW/ActewAGL being requested to implement a pilot Smart Metering Program, for commencement in 2008/09.

**Project delivery process**

In August 2007, the ACTEW Board considered a proposal to use an alliance approach for the ECD project along with the Murrumbidgee to Googong bulk water transfer system and the proposed Water Purification Scheme. The decision was deferred until further information was provided. In October 2007, the Board decided to adopt an alliance model for each of these projects. In November 2007 it was further decided to undertake the projects through a single alliance structure, which has become known as the Bulk Water Alliance.

The Bulk Water Alliance was developed over the period from September 2007 to May 2008 after a competitive tendering process for both the designer and constructor roles with the formal alliance agreement executed in May 2008. Development of the ECD project design was subsequently undertaken by the Alliance.
# Abbreviations and acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ACT</td>
<td>Australian Capital Territory</td>
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<td>ACTEW</td>
<td>ACTEW Corporation</td>
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<td>Alliance contractors</td>
<td>GHD, John Holland and Abigroup Contractors</td>
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<td>Alliance partners</td>
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<td>Centre of International Economics</td>
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<td>Commission</td>
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<td>consumer price index</td>
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<td>enlarged Cotter Dam</td>
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<td>WTP</td>
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References and further reading

References


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—— (2008), *Updated estimates of the cost of water restrictions in the ACT region*, report prepared for ACTEW, September.

CIE—see Centre for International Economics.

Colmar Brunton Social Research (2008), *ACT water users research*, report prepared for ACTEW.


CSIRO—see Commonwealth Scientific and Industrial Research Organisation.

Deloitte—see Deloitte Touche Tohmatsu.


DOTF—see Department of Treasury and Finance, Victoria.


Halcrow—see Halcrow Pacific Pty Ltd.


ICRC—see Independent Competition and Regulatory Commission.


NERA study—see Hensher, D, Shore, N and Train, K.


WSAA—see Water Services Association of Australia.

**Further reading**

