



Submission on the Review of the Snowy Water Inquiry Outcomes Implementation Deed

Conservation Council of the ACT Region

February 2026

Dear Dr Craik, Mr Bailey and Mr Swift,

Please find attached our submission on the review of the Snowy Water Inquiry Outcomes Implementation Deed (SWIOID; Deed). The review is a crucial opportunity to restore the health of the upper Murrumbidgee and Snowy Rivers and other montane rivers affected by the Deed. We are optimistic that the review will prove to be a pivotal moment and that the resulting changes will deliver improved environmental and social outcomes for these important rivers. The upper Murrumbidgee River is in crisis, with river health continuing to decline. River health, and important species such as the Macquarie Perch, Murray Cod, rakali and platypus, will only recover once more water flows from Tantangara dam and flows are better able to mimic natural seasonal variation.

Our recommendations are summarised below, with detail provided in the following pages.

We believe that implementing these measures would cost just a fraction of the around \$10 billion currently being spent on the Snowy 2.0 development and that this investment is necessary to lift management and governance to an acceptable standard and would deliver substantial ecological and social benefits.

Yours sincerely,

Simon Copland, Conservation Council ACT Executive Director

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Summary of recommendations

February 2026

1. Deliver best practice governance:
 - a. Revise the entire Deed.
 - b. Include the ACT Government as a party to the revised Deed.
 - c. Mandate periodic review of the Deed.
 - d. Apply standard, volumetric environmental release targets for the Murrumbidgee and montane rivers.
 - e. Improve governance of the Snowy Water Licence.
 - f. Reconsider the current exemption of the Deed and Snowy Water Licence from the provisions of the Commonwealth Water Act.
 - g. Consider expanding the role of the Inspector-General of Water Compliance to cover the montane rivers.
2. Respect the rights and knowledge of Traditional Owners and provide opportunities to participate in water management decisions
3. Address key issues that have undermined successful implementation of the Deed:
 - a. Set enforceable environmental release targets that are science-based and report on their delivery.
 - b. Establish ecological performance measures against which progress will be measured.
 - c. Improve delivery of base passing flows.
 - d. Increase the outflow capacity from Tantangara Dam.
 - e. Protect environmental releases from Tantangara to Burrinjuck reservoirs.
 - f. Set enforceable, science-based environmental release targets and environmental objectives for the Snowy River.
4. Address the historic imbalance that has enabled ongoing environmental damage
 - a. Remove compensation clauses to Snowy Hydro for changes.
 - b. Remove any requirement for the environment to 'pay back' dam spills.
 - c. Require the water user (Snowy Hydro) to pay.
5. Make better use of environmental water
 - a. Change environmental releases from being based on the previous year's rainfall to intra-annual flexible releases.
6. Take the opportunity for further measures to improve river health
 - a. Remove Mowamba Weir.
 - b. Install fish passage devices on all weirs and causeways from Tantangara to Burrinjuck reservoirs.
 - c. Restore degraded peat ecosystems in the headwaters.
 - d. Remove weeds and restore riparian revegetation.
7. Adjust environmental release volumes to account for climate change.
8. Identify opportunities for increasing environmental benefits with any further hydropower development.

Response to consultation questions

Q1. Is the current framework of the Deed effective? What changes or improvements could make the Deed more inclusive and better aligned with existing water management frameworks?

No, it is not effective. The Deed is overly complex, lacks transparency, does not set meaningful targets, or set benchmarks for ecological health. Reporting is complex and does not include all relevant information (e.g. Base Passing Flows). Governance lacks rigour, for example allowing environmental releases to meet the flow targets for Base Passing Flows, not protecting environmental releases. In addition, there is a lack of accountability for not meeting targets, and no inbuilt review mechanism for the Deed. Please see our recommendations 1a-g for delivering best practice governance.

Q2. How can non compensable adjustments be made to the Deed in the absence of a formal review?

We do not advise attempting to implement minor fixes in the absence of an overhaul of the Deed. The entire Deed needs to be reviewed, and new governance arrangements put in place. Minor workarounds will not be able to deliver the changes required.

Q2. How can the Deed encourage stronger community engagement and stewardship in river management? Who should be involved in this process?

Increased transparency and better management will help to rebuild public confidence in river management. Limited, selected community voices currently play a role through the Snowy Advisory Committee. The complexity of management and lack of transparency have precluded broader engagement and participation, and this needs to be addressed.

Q3. How can the Deed provide opportunity for optimising the use of the resource for energy, community needs, the environment and other social outcomes?

The review of the Deed offers an opportunity to reset the balance between competing water uses. The balance is currently strongly weighted in favour of hydropower generation, with up to 99% of headwaters diverted for hydropower generation and this needs to shift if we are to restore river health.

Q4. Which Deed clauses merit review on the basis that they are inconsistent with contemporary water management?

The entire Deed must be reviewed as the current governance arrangements are inconsistent with contemporary water management in that they lack transparency and accountability and fail to adequately assess risks (e.g. climate change), or balance competing water uses. Please see recommendations 1a-g and 4a-c.

Q5. What parameters constitute a healthy Upper Murrumbidgee River?

The upper Murrumbidgee and Snowy Rivers are in a state of declining ecological health as a result of inadequate environmental releases (Bender et al., 2022; McGuire and Pittock, 2024). A healthy upper Murrumbidgee River would feature spring high flow events that scour the riverbed of sediment, removing the sand that has built up along the river and re-establishing deep pools that provide important habitat and refuges in times of drought.

Weed control, restoration of riparian vegetation and bank stabilisation would have improved riparian habitat and reduced bank erosion and sedimentation. Water quality would be improved and species would be showing signs of recovery. A healthy upper Murrumbidgee River would be a thriving and biodiverse montane river ecosystem, with clean water, sections of rocky riverbed, supporting a range of species and resilient to the impacts of drought.

Q6. How can the environmental flow releases in the Deed make an improved contribution to environmental outcomes? Can staged increases of environmental flows be related to specific environmental outcomes?

More water needs to be allocated to environmental releases. The environmental release target for Tantangara dam has not been met in most years since 2005. Water that is released is not automatically protected from extraction, and the timing and volume of releases are set a year in advance which doesn't allow for flexibility in delivery to make the most of natural conditions. To resolve these issues, we need to set science-based, enforceable targets, allow greater flexibility in timing of releases and protect all environmental releases. Please see recommendations 3a-f and 5.

Q7. How can arrangements and activities under the Deed include obligations to protect threatened aquatic species and enhance and restore biodiversity? Are there any other matters related to the environmental health of the Upper Murrumbidgee that the Deed should include?

New governance arrangements could feature a requirement for Snowy Hydro to pay a water use fee that could fund an ecological monitoring program. Lack of funding has prevented a thorough ecological monitoring program from being implemented, despite this being a requirement of the Deed. Establishing this monitoring and reporting on progress is crucial for understanding the impacts of environmental releases. Further, Snowy Hydro could be required to include in their annual reporting a section on health of threatened species (informed by the monitoring program). Please see recommendations 6a-d for additional environmental measures.

Q8. What are the environmental objectives that the Deed should be aiming to achieve? How can these objectives be best supported by water management arrangements?

Environmental objectives and performance measures need to be set for the upper Murrumbidgee River and publicly reported on. These should be based on the latest science and could be advised by experts. Please see recommendation 3f regarding environmental objectives for the Snowy River.

Q9. How can the operation of Deed (i.e. water releases from Tantangara Dam) support environmental health during drought conditions?

Firstly, more water needs to be allocated to the environment. The current target of 27 GL/yr (not to mention the reduced volume that is actually delivered), is insufficient to allow water managers to deliver high spring flows and to maintain base flows during dry months. This forces them to make difficult decisions about either further reducing spring flows or allowing the river to dry up in summer, or perhaps both. See recommendation 3a.

Secondly, there needs to be greater flexibility in how flows are delivered. This would allow managers to make the best use of available water. See recommendation 5.

Third, it is crucial that environmental releases are protected from extraction through to Burrinjuck dam. This is particularly important because the Deed, while intending to ensure Base Passing Flows are in addition to environmental releases, fails to clearly distinguish between these. The requirement to deliver Base Passing Flows is triggered when flows fall below 32 ML/day at Mittagang Crossing. However, if environmental releases are made they cause this threshold to be exceeded and so mitigate the need for Base Passing Flow to be released. This means that if environmental releases are not protected, they will be extracted for consumptive use downstream. This issue needs to be addressed, for the sake of protecting environmental releases, but also for securing enough water for Cooma. If protected environmental flows are keeping flows above 32ML/day at Mittagang Crossing and Base Passing Flows are therefore not required to be released, this means it is not a good outcome for Cooma residents. Protected environmental releases flowing past Mittagang Crossing does not help to meet Cooma's water needs. The trigger for releasing Base Passing Flows should exclude protected environmental releases. See recommendations 3c and 3e.

Q10. What opportunities are there that provide enhanced environmental outcomes with increased water releases, but minimise long-term impacts on the National Electricity Market, have an acceptable impact on shareholder dividends, and support the Australian Government's commitment to 82% renewable electricity by 2030?

We believe that setting a target of at least 87 GL/yr from Tantangara dam is consistent with providing enhanced environmental outcomes while minimising long-term impacts on the NEM and supporting Australia's commitment to renewable electricity. See recommendations 3a and 8.

Q11. What are the strengths and opportunities from the current arrangement that you would like the review to explore?

A strength of the current arrangement is that it involves NSW, Victorian and Commonwealth governments and has a formal structure around this. The value of this could be enhanced by including the ACT as a party to future governance and clarifying roles and mechanisms for review of governance over time. See recommendations 1a-g.

Q12. How should compliance activities, including independent oversight, be incorporated into the governance arrangements?

We recommend reconsidering the current exemption of the Deed and Snowy Water Licence from the provisions of the Commonwealth Water Act. We also recommend considering expanding the role of the Inspector-General of Water Compliance to cover the montane rivers. This would provide independent oversight that would help to address the current lack of rigour and transparency. See recommendations 1f and 1g.

Q13. How can relationships, obligations and future arrangements be made clearer and contemporised to be consistent with the Water Act and Basin Plan under an amended Deed / Licence?

Please refer to our response to question 12, and recommendations 1a-g.

Q14. How could water management arrangements better align with the National Agreement on Closing the Gap?

New governance arrangements need to place recognition of Indigenous rights and knowledge at the centre of management and planning. This needs to be done in close partnership Traditional Owners along this stretch of river. The Review should consult directly with Traditional Owners on the measures they want to see adopted and how they would like to be involved. Future governance needs to provide opportunity for Traditional Owners to participate in decision-making.

One option that could be considered, if support by Traditional Owners, is for a water use fee to be paid by Snowy Hydro to the NSW Government to be used in part to fund Indigenous river ranger programs for the Snowy, upper Murrumbidgee and south west slopes rivers. Drawing on the experience of Indigenous river rangers in the Murray-Darling Basin, these Indigenous-led programs could focus on restoring cultural and environmental values of the river catchments impacted by the Snowy Hydro scheme. See recommendation 2.

Q15. How should the Deed be updated to better align with the objectives of contemporary water management (including the Murray-Darling Basin Plan, the *Water Act 2007* (Cth) and the draft National Water Agreement)? Are there examples of good practice in contemporary water governance that should be considered?

See recommendations 1a-g.

Q16. What and how can improvements in environmental water science, planning, management, operations and transparent stakeholder engagement be brought into Snowy water management arrangements, and specifically for the Upper Murrumbidgee?

See recommendations 1-8.

Q17. How could the release infrastructure at Tantangara Dam be modified to support the provision of flows that that can more closely mimic natural timing, variability and magnitude of flows that are needed to support ecological processes and consequent river health?

The outlet of Tantangara dam needs to be upgraded to allow the release of up to 6 GL/day. This is required for delivery of spring flow events that are needed for ecological health. See recommendation 3d.

Q18. How can the Deed arrangements provide an adaptive, flexible framework for responding to climate change and energy market change, whilst supporting improved river health, for example how decisions are made on flow releases?

Greater flexibility on delivery of flows is needed to enable water managers to make the most of available water, see recommendation 5. There needs to be a mechanism for adapting to climate change impacts, see recommendation 7. The energy market will fluctuate and we recommend that environmental releases be made available independent of energy market conditions.

Q19. How should changes in the energy market and future reforms be considered in the Deed?

Future governance arrangements should have an inbuilt review mechanism. At review points, new information can be considered and adjustments made if needed. See recommendation 1c.

Q20. How should the Deed include the role of Snowy Hydro in the energy transition and provision of energy? How should competing demands (water flows vs energy provision) be dealt with?

The Deed, and any future governance framework, should remain focused on improving the health of the rivers and delivering better outcomes for communities that live alongside the rivers.

Q21. Should the Deed provide additional water releases for critical human water needs and industrial water security? How could arrangements under the Deed be modified to support water demand outlooks for regional development goals?

Future governance arrangements need to ensure that Base Passing Flow releases are in addition to environmental releases, that communities are receiving the Base Passing Flows they are meant to, and that environmental releases are protected. See recommendation 3c.

Q22. How can catchment health and complementary water-land management be considered by the review, specifically in the context of the Upper Murrumbidgee River?

In addition to delivering increased environmental releases, there are a range of measures that can be implemented to improve environmental outcomes. These measures, such as weed control, revegetation and invasive species management, are important but are not a substitute for increased water. They need to be pursued in addition to increased flows. See recommendations 6a-d.

Q23. What investment models could promote community stewardship and longer-term funding certainty to improve water-land management?

We recommend a water user fee be introduced that could fund river restoration and ecological monitoring. See recommendation 4c.

Detailed recommendations

1. Deliver best practice governance

- a. **Revise the entire Deed.** The SWIOID needs to be revised in its entirety, including Snowy River provisions, not just the sections relating to the Murrumbidgee and montane rivers. The Deed's provisions have serious omissions and failings, as acknowledged in the Review Issues Analysis (DCCEEW, 2025) and detailed below, that impact on Snowy, montane and upper Murrumbidgee rivers. These omissions include failures to apply national water management principles, no consideration of climate change or rights of Traditional Owners, as well as a failure to define and deliver environmental outcomes. These omissions and failings must be systematically addressed in the recommendations of this Review.
- b. **Include the ACT Government as a party to the revised Deed.** The ACT Government has significant responsibilities for managing the Murrumbidgee River. The critical human water needs of the Tharwa community in the ACT depend on the Murrumbidgee River. The ACT Government's business enterprise Icon Water supplies the rapidly growing population of Canberra and surrounding NSW communities. The regional population of nearly half a million is expected to reach 700,000 people by 2050. The Murrumbidgee River is the emergency water supply for these communities. Under national water policy, the ACT Government should have but is not afforded priority access to Murrumbidgee River water to meet critical human needs and sustain the river environment. Now that the Commonwealth Government fully owns Snowy Hydro, the ACT Government is in the same position as the Victorian Government as a downstream jurisdiction without direct regulatory responsibilities but relying on the Snowy Hydro scheme for environmental, social and economic outcomes. For these reasons, the ACT Government deserves the same legal certainty and ability to influence decisions as the other state parties to a revised Deed.
- c. **Mandate periodic review of the Deed.** A manifest failing of the Deed is that there is no inbuilt mechanism for review. This does not align with good governance and has allowed the current Deed to remain in place for 23 years despite its failings. This lack of periodic review contrasts poorly with related processes, including the decadal reviews required by regulation for the Murray-Darling Basin Plan and the NSW Snowy Water Licence. The climate is changing, social values are changing (e.g. recognition of Indigenous rights), and economic values are changing (e.g. Snowy Hydro's investment in pumped storage). For all these reasons, periodic review of the Deed is needed to inform the subsequent decadal review of the NSW Snowy Hydro Water Licence.
- d. **Apply standard, volumetric environmental release targets for the Murrumbidgee and montane rivers.** The environmental release targets in the Deed for the Snowy Montane Rivers Increased Flows (SMRIF)

program, is for water up to the equivalent of 150 GWh per year of foregone energy for flow in the Goodradigbee and Geehi rivers, the Snowy River above Jindabyne Dam and the upper Murrumbidgee River. If the full allocation of 212 GL is available for the Snowy River, the full 150 GWh of generation potential equivalence amounts to around 118 GL. This approach to allocating water is deeply problematic for two reasons. Most importantly, this arbitrary allocation is not linked to achieving specific environmental outcomes in any of the impacted rivers. This does not align with the principles in the National Water Agreement and the Water Act that all rivers should receive flows sufficient to maintain a basic level of ecological health. The second problem is the lack of transparency inherent in using an obscure measure to define a water allocation to be split among many rivers with no coherent justification for how to make these allocations and only minimal monitoring and reporting on the outcomes. We recommend that each of the Snowy Montane Rivers should receive a separate volumetric allocation linked to defined environmental targets that are monitored and subject to annual public reporting (as occurs in the rest of the Murray-Darling Basin).

- e. **Improve governance of the Snowy Water Licence.** This can be done by improving access to data (e.g. publishing base passing flow data); publishing environmental monitoring data; adequately funding NSW management of rivers (e.g. through water user fee).
- f. **Reconsider the current exemption of the Deed and Snowy Water Licence from the provisions of the Commonwealth Water Act.** Extending the Water Act's provisions to the Snowy and montane rivers would ensure that the same sustainability principles and measures that apply in the rest of the Murray-Darling Basin are extended to the upper Murrumbidgee and Snowy rivers. The Stream Flow Indicator sites and Environmental Water Requirements used in the Basin should be extended to the upper Murrumbidgee and Snowy rivers.
- g. **Consider expanding the role of the Inspector-General of Water Compliance to cover the montane rivers.** The mandates of the Commonwealth Inspector-General of Water Compliance and NSW Natural Resources Access Regulator should be extended to cover the upper Murrumbidgee and Snowy rivers, with requirements that they periodically (e.g. every 5 years) review implementation of the Basin Plan, revised Deed and Snowy Water Licence by Snowy Hydro and WaterNSW.

2. Respect the rights and knowledge of Traditional Owners and provide opportunities to participate in water management decisions

New governance arrangements need to place recognition of Indigenous rights and knowledge at the centre of management and planning. This needs to be done in close partnership Traditional Owners along this stretch of river. The Review should consult directly with Traditional Owners on the measures they want to see adopted and how they would like to be involved. Future governance needs to provide opportunity for Traditional Owners to participate in decision-making.

One option that could be considered, if support by Traditional Owners, is for a water use fee to be paid by Snowy Hydro to the NSW Government to be used in part to fund Indigenous river ranger programs for the Snowy, upper Murrumbidgee and south west slopes rivers. Drawing on the experience of Indigenous river rangers in the Murray-Darling Basin, these Indigenous-led programs could focus on restoring cultural and environmental values of the river catchments impacted by the Snowy Hydro scheme.

3. Address key issues that have undermined successful implementation of the Deed

- a. Set enforceable environmental release targets that are science-based and report on their delivery.** A key failing of the Deed is that the environmental release targets are maximum volumes and are not enforceable, therefore are often not met. Failing to meet the targets has no consequences for Snowy Hydro and because of the scheme design the volume of water available for environmental releases is usually well below the target volumes. The target of 27 GL/yr was intended to represent 30% of Annual Natural Flow (ANF), however based on the estimated inflow to Tantangara of 290 GL/yr, the target actually represents around 9% of ANF. 30% of ANF would be around 87 GL/yr and we recommend a target of at least 87 GL/yr for environmental releases from Tantangara dam. This is necessary for restoring river health, is consistent with past expert advice on flows required and would not significantly impact on Snowy Hydro operations.
- b. Establish ecological performance measures against which progress will be measured.** The Deed required that by 2004 ‘for each river ... the parties must (1) determine a set of objectives ... together with associated performance measures, and (2) prepare a riverine management strategy that includes provision for the management of habitat, native plant and animal species, introduced plant and animal species and river banks’ (Commonwealth of Australia et al. 2002, Annexure Two, Section 2.2). In a breach of the Deed provisions, a riverine management strategy has not been developed for the upper Murrumbidgee or the other impacted rivers. The 2022–23 Annual Plan for SMRIF releases sets the objective for the Murrumbidgee River as ‘to facilitate the rehabilitation and evolution of the Murrumbidgee River below Tantangara Dam into a smaller but healthy river’ (New South Wales Department of Planning and Environment 2022, p. 14). It does not set performance measures against which progress towards this objective will be assessed. We recommend ecological performance measures be agreed and reported against annually.
- c. Improve delivery of base passing flows.** Under the Deed, in addition to environmental releases, Snowy Hydro and Water NSW are required to release base passing flows to meet the needs of downstream water users, including the towns of Cooma and Tharwa. The Snowy Water Licence (Schedule Four, Section 12A.1) requires that base passing flows must be released each day from Tantangara Dam up to the lesser of 83 ML day or equal to the inflow into Tantangara Reservoir to ‘as far as practicable maintain the flow of the Murrumbidgee River at Mittagang Crossing at 32

mL/day'. However, only one of the rivers flowing into Tantangara Reservoir (contributing an estimate 50% of inflows), has a gauge and so it has been left to Snowy Hydro to model inflows and decide what flows to release. In our research we found that WaterNSW did not hold data on base passing flows released by Snowy Hydro that would enable them to perform their regulatory responsibilities for this element of the Deed and the Licence. Further, the Deed specifies that environmental releases are to be in addition to base passing flows yet our research shows that environmental releases are serving to substitute for base passing flows when releases are made during dry times (McGuire and Pittock, 2025). This demonstrates a failure of accountability. We recommend that if accurate inflow data is not available, the requirement to release base passing flows be written in a way that does not rely on this information; and the requirement to release base passing flows is written and monitored in a way that ensures environmental releases are not substituting for base passing flow releases by contributing to meeting the flow target at Mittagang Crossing e.g. monitoring of flows at Mittagang Crossing should take into account any environmental releases.

- d. **Increase the outflow capacity from Tantangara Dam.** The outflow capacity of the Tantangara Dam outlet is restricting the ability to deliver high flow events, especially events of sufficient duration to scour the riverbed of sediment (McGuire and Pittock, 2025). The Deed specified an outlet flow capacity of at least 2 GL per day. Although the current outlet can technically deliver up to 2.64 GL per day when the dam is at full capacity, when operated at the usual low-water levels, the outlet can only release up to 1.5 GL per day. The maximum daily volume released from Tantangara since 2011 is 1.5 GL. Daily releases in excess of 2 GL are required to restore the health of the Upper Murrumbidgee River. An expert panel established by the NSW Government in 1997 to evaluate environmental flow requirements recommended that flows of 4-6 GL/day were required to mimic a spring high flow event. To restore river health we recommend that Snowy Hydro be required to increase the outflow capacity of Tantangara Dam (as they did for Jindabyne Dam in 2003-06 at the cost of approximately \$50-80 million) to enable delivery of 6 GL/day.
- e. **Protect environmental releases from Tantangara to Burrinjuck reservoirs.** Environmental releases are not protected once released from Tantangara Dam, unless Water NSW orders a temporary water pumping restriction. This means that, if a restriction is not in place, the water can be extracted by downstream users, negating the environmental benefits of the release. In 2016 (the most recently available public data), there was a total of 23.7 GL per year of licenced entitlement for surface-water take across the upper Murrumbidgee catchment, excluding the ACT. Of this entitlement, 10.7 GL per year was in the Murrumbidgee I and II catchment areas directly alongside the Murrumbidgee River between Tantangara Dam and the ACT border. This is a significant volume compared with the long-term average environmental release volume of 17.8 GL per year and demonstrates the high likelihood of environmental releases being

extracted downstream if they are not protected. Temporary pumping restrictions were implemented to protect environmental releases in the upper Murrumbidgee River in 2023 and 2024 and were foreshadowed to remain in place until the water sharing plan is amended to provide long term protection. We recommend that all environmental releases are protected from Tantangara to Burrinjuck reservoirs.

- f. **Set enforceable, science-based environmental release targets and environmental objectives for the Snowy River.** The Environmental objectives for environmental releases for the upper Snowy River need to be revised and confirmed. When the Deed was agreed, the overall environmental objective was to improve the habitat for a diverse range of plant and animal species. To achieve this, there were five environmental objectives (Commonwealth of Australia et al. 2002, Annexure 1 Pt. 1 s.1 ss.1). No quantified targets for these objectives or indicators of success were defined. In 2010, the New South Wales Office of Water reported that four of the five environmental objectives could not be achieved with the available water (New South Wales Office of Water 2010). In 2016, the NSW Department of Primary Industries acknowledged that the environmental objectives stipulated in the SWIOID did not reflect current scientific understanding of good practice for e-flow delivery (Williams 2016). They proposed 12 revised environmental objectives (see Supplementary Table S8, S9). It is not clear whether these revised objectives have been adopted by the NSW Government. We ask the Review to recommend for the Snowy River:
- i. Formal adoption of the 12 environmental objectives proposed in 2016;
 - ii. An increased environmental release target for the Snowy River that represents 28% MANF (as foreshadowed in the Deed);
 - iii. Monitoring, reporting and research to inform the next decadal review of the Deed and the Snowy Water Licence.

4. Address the historic imbalance that has enabled ongoing environmental damage

- a. **Remove compensation clauses to Snowy Hydro for changes.** The current Deed requires Snowy Hydro to be compensated for any loss of electricity generating capacity that results from increased environmental releases. More recently, Snowy Hydro has asked the NSW Government for compensation for the most basic new measures to mitigate its environmental impact, such as employing a staff member to oversee more variable environmental releases. This compensation requirement does not seem fair or reasonable. Snowy Hydro is a publicly owned company using public land and water. It has a moral obligation to minimise its environmental and social impacts. There will always be a value judgement between how much hydropower to generate versus minimising the environmental impacts. That judgement now rests primarily with the owner, the Commonwealth Government, who should direct Snowy Hydro

via its ministerial board as to what additional environmental restoration measures should be implemented based on recommendations from this review. The Review should recommend that Snowy Hydro as a government business enterprise should not be compensated for any costs incurred in implementing new cultural and environmental measures.

b. **Remove any requirement for the environment to 'pay back' dam spills.**

The Deed has numerous clauses that favour water retention for hydropower generation over water for the environment. One of the more egregious is the requirement for water spilled from dams to be docked from subsequent environmental release allocations. Our view is that: a) if Snowy Hydro's infrastructure is incapable of storing inflows then the environment should not bear the costs, and b) this is another example of where the Deed provides Snowy Hydro with benefits that are not provided to other water entitlement holders in the Murray-Darling Basin. We recommend that any uncontrolled spills of water from Snowy Hydro infrastructure should not be deducted from environmental release allocations.

c. **Require the water user (Snowy Hydro) to pay.** The Deed currently does not include any requirement for Snowy Hydro to pay for its use of publicly owned land and water. This omission offends the principles established under the Commonwealth Competitive Neutrality Policy Statement and the Australian Government Charging Policy. Snowy Hydro is not charged either bulk water use fees to WaterNSW nor the full local rates directed to Local Land Services in NSW to cover the operating costs incurred to the public for monitoring, regulation and remediation of impacts on the environment. Further, the National Water Initiative requires full cost recovery from water users and price transparency (Commonwealth of Australia et. al., 2004: cl. 65). Lack of resources is one of the reasons for WaterNSW's poor administration, such as the lack of monitoring and limited on ground environmental mitigation works. A water and catchment use fee payable by Snowy Hydro would enable professional state government management of its impacts.

5. Make better use of environmental water

a. **Change environmental releases from being based on the previous year's rainfall to intra-annual flexible releases.** Under the Deed the volume of environmental water available each is linked to water yields in the previous water year. This has the negative environmental impact of smoothing regulated river flows, for example, when more water is available in a dry year due to high inflows in a preceding wet year. We are not Europe. Our river ecology is driven by boom and bust water flows. Magnifying these fluctuations is a key way to restore the health of regulated Australian rivers, e.g. shifting more accumulated sediment in a high flow to restore the rocky river beds required by some fish species. The Deed should be changed to allow flexible and more ecologically beneficial environmental releases (Chessman et al., 2022). Beneficial flexibility could include i) carryover of water entitlements between years, ii) synchronizing releases with those of naturally flowing rivers, iii) enabling

ecologically opportunistic within-year changes, and iv) allowing variability in daily release rates. Snowy Hydro has claimed that the lagged releases were required to enable better commercial manage storage for power production. The impending commencement of Snowy 2.0 largely removes any such need since water can now be recirculated through pumping to Tantangara as the highest reservoir in the system.

6. Take the opportunity for further measures to improve river health

Rectifying a number of environmental issues along the impacted rivers requires more than just increasing environmental releases. The following points are made for the Review as they provide win-win opportunities to restore the health of the rivers downstream of Snowy Hydro dams.

- a. **Remove Mowamba Weir.** This weir diverts all but a small base flow from the Mowamba River into Jindabyne Reservoir. The Mowamba River is the highest tributary on the Snowy River below Jindabyne Dam. Removing this weir to restore an unregulated headwater river would improve the health of the Snowy River in several ways (Chessman et al. 2022). There would be natural flows of water at natural temperatures in response to seasonal conditions, magnifying high and low flow conditions. There would be greater flows of sediments and nutrients into the Snowy River again, supporting river health and food webs. The river would also enable eels and possibly Australian bass to pass freely between the lower river and headwaters. The Mowamba River only represents a minor portion of the environmental flows released into the Snowy River at Jindabyne Dam. We recommend the removal of Mowamba Weir without compensation to Snowy Hydro.
- b. **Install fish passage devices on all weirs and causeways from Tantangara to Burrinjuck reservoirs.** Currently there are no fish passage devices on weirs and causeways on the upper Murrumbidgee River in the ACT and NSW. A program is needed to assess fish passage needs, identify options for passage, and undertake modification of the structures to enable migratory fish passage along the length of the river.
- c. **Restore degraded peat ecosystems in the headwaters.** The Snowy Scheme depends on the health of the alpine peatlands for reliable water yield, steady environmental flows and high-quality water. The majority of these wetlands have been damaged by past cattle and increasing horse trampling. Restoration work is needed to maintain historic water delivery. In some locations incision into peat deposits has been so great, that low scale engineering responses will be needed to reinstate the original wetland. A programme of wetland restoration is needed (as was proposed but not implemented in the 1950s). Restoring peatlands has the benefits of enhancing stream flows, sequestering a lot of carbon, forming green firebreaks in the high country, and conserving biodiversity.
- d. **Remove weeds and restore riparian revegetation.** Following the 2002 Deed, extensive weed control measures were undertaken along the

Snowy River banks. Unfortunately this program was not extended to other rivers impacted by Snowy Hydro. Weed removal is needed to reduce evapotranspiration from deciduous trees and mobilise sediment in the river bed. Replanting banks with indigenous species will provide habitat and shade surface waters. While some restoration work has commenced, a systematic program is needed to restore the Murrumbidgee and montane river corridors, as well as any follow work required on the Snowy River.

7. Adjust environmental release volumes to account for climate change.

This review needs to consider how the Deed should be revised to adapt to the impacts of climate change on decreasing water volumes and quality, and resulting impacts on water for the environment and use for hydropower, domestic consumption and irrigation. It would be untenable for the review to ignore the impacts of climate change. As academics, and given the inherent uncertainty in the timing and magnitude of climate change impacts, we argue that it would be unacceptable for the Review to just recommend more research rather than the obvious on ground actions that are available now and will generate adaptation benefits. Here we ask the Review to recommend a range of adaptation measures that can proceed imminently:

- a. **Water volumes.** The Review needs to recommend how climate induced water losses will be shared between commercial and consumptive users versus the environment. We argue that the priority of use principles enshrined in the National Water Initiative, Water Act, and NSW Water Management Act should take primacy, that is, critical human (domestic) needs and basic environmental health come first. This suggests that base passing flows for critical human needs, and environmental releases to sustain basic ecological health should take priority over water diversions for hydropower and irrigated agriculture. Further, with ongoing water scarcity, the Review could recommend the option of the purchase of agricultural water entitlements between Tantangara and Burrinjuck reservoirs on a temporary or permanent basis to further support environmental releases and higher value hydropower generation. As previously detailed, Snowy Hydro's growing pumped storage capacity to recirculate water is a major adaptation for maintaining hydropower generation with limited water.
- b. **Water quality.** Water quality declines in the form of higher temperatures and nutrients increase with low flows. Requiring higher minimum eflows as proposed above would maintain higher water quality. Riparian forest restoration can also reduce influxes of sediment and other pollutants, and lower water temperatures through shading.
- c. **Ecosystem based adaptation.** A number of basic natural resource management measures, detailed below, aid adaptation. These include: restoring fish passage over barriers, restoring deep holes in the river bed, as well as riparian revegetation.
- d. **Infrastructure.** All water infrastructure, especially Snowy Hydro's infrastructure is aging and periodically requires re-operation and new safety measures as climate change alters the risk profile. NSW Fisheries

already requires upgrades to any in stream barrier in the state to include new fish passage devices where feasible. We ask the review to recommend that any time Snowy Hydro has to upgrade its infrastructure, including rebuilding road crossings, reinforcing structures, increasing spillway capacity and replacing generator equipment, that it is required to apply best practice measures where feasible to reduce environmental impacts. These measures would include where relevant fish passage devices, thermal pollution control and site rehabilitation. Further, any redundant infrastructure should be removed.

8. Identify opportunities for increasing environment benefits with any further hydropower development.

The physical nature and economic value of hydropower is changing, and the Deed needs to be reviewed to rebalance the trade-offs between socio-economic development from hydropower versus the environmental and social harms that hydropower generation inflicts. This review should occur with every major augmentation of the Snowy Hydro Scheme, beginning in this review with the Snowy 2.0 development. In the past, Snowy Hydro electricity generation and income was substantially linked to ‘once through’ use of water in conventional hydropower. In a drying climate where less water is available, the reliability of conventional hydropower generation is reduced. With the addition of the Snowy 2.0 development, 63% of Snowy Hydro’s 6.3 GW generating capacity will be in its two pumped storage hydropower facilities (Tumut 3 – 1.8 GW; Snowy 2.0 – 2.2 GW capacity). With increasing excess wind and solar generation in the middle of the days, there will be an opportunity for Snowy Hydro to pump water from lower to higher reservoirs at these times for low cost (even being paid to consume electricity at times). This increased pump-up and recirculation capacity will significantly reduce the risks posed by droughts to Snowy Hydro’s generating capacity. Snowy Hydro have plans for at least three additional pumped storage hydropower augmentation projects, at Wandilla, Jagumba and Upper Tumut (Table 1; from (Snowy Hydro et al., 2019)). Since the 1991 study, ANU’s Global Pumped Storage Hydropower Atlas has identified further development options that SHL may exploit.

Table 1: Ranking Study (1991) pumped storage hydro options (Smith, 2019).

Scheme option	New storages required	Potential storage	Potential head	Tunnelling required
Yarrangobilly (Snowy 2.0)	No	238GL	680 m	~27km
Wandilla	Yes	6.3GL	270 m	~1.5km pressure pipeline
Jagumba	Yes	25.5GL	680 m	~10km
Upper Tumut	No	52GL	610 m	~24km

There are two important points regarding these changes to the physical and economic circumstances for Snowy Hydro. First, more water can be reallocated from Snowy Hydro to the environment because two thirds of their generating capacity can be maintained with water that is indefinitely recirculated. Second, the Deed should be amended to require that each time one of these new pumped storage hydropower development proceeds, environmental release targets are reviewed to assess whether they can be increased as an environmental offset.

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