

Independent Review of the  
**Snowy Water Inquiry**  
**Outcomes Implementation Deed**

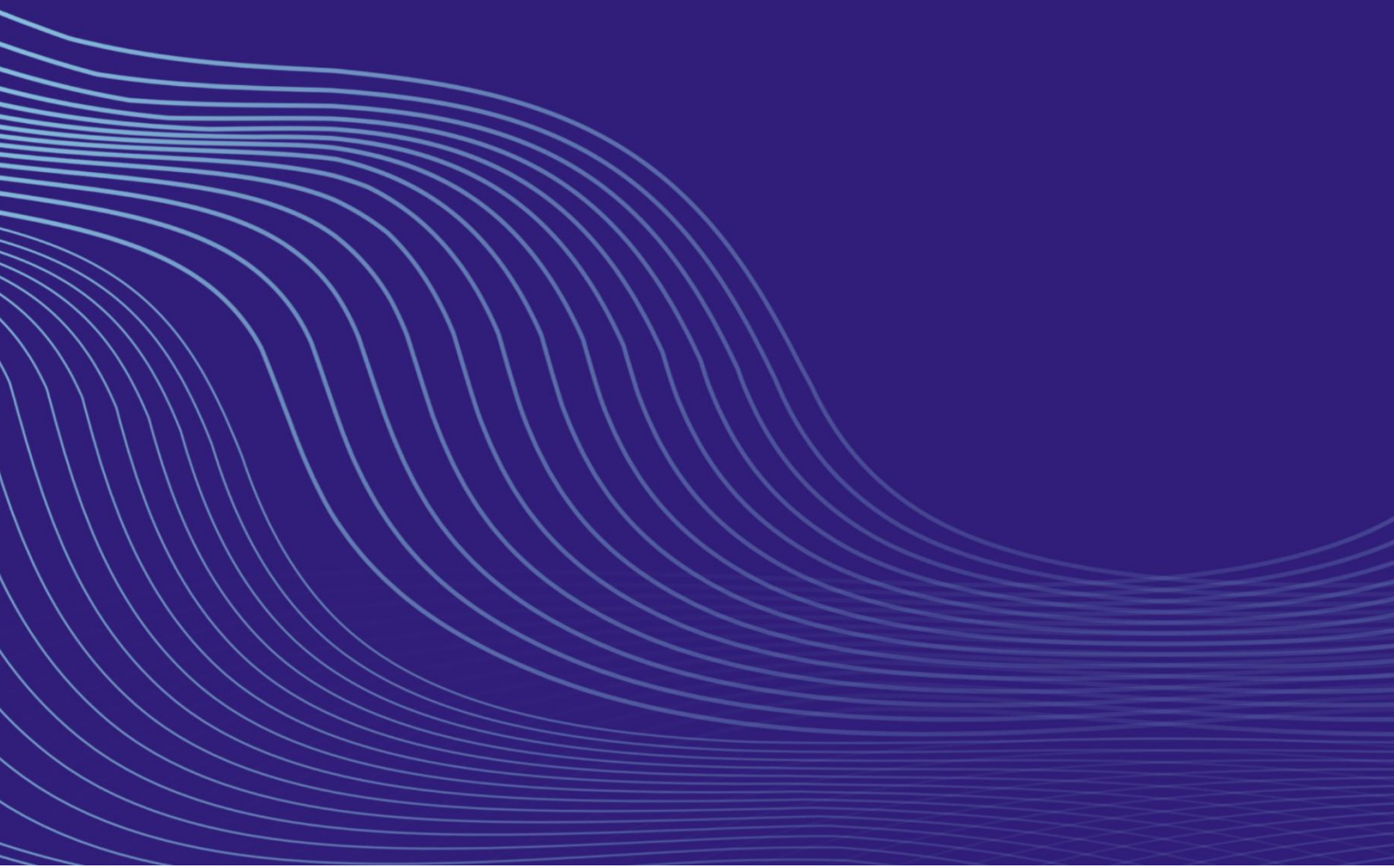
# Draft Report

July 2026

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#### **Artificial Intelligence**

The Panel was supported by a DCCEEW Secretariat drafting team in the preparation of this report. Artificial intelligence tools were used to provide editorial support only, including assisting with structuring chapters, improving clarity and consistency of language, reducing duplication, and refining responses to reviewer comments. These tools were not used to develop the analysis, findings or recommendations. The content of the report remains the responsibility of the Panel.

#### **Acknowledgement of Country**

Our department recognises the First Peoples of this nation and their ongoing connection to culture and country. We acknowledge Aboriginal and Torres Strait Islander Peoples as the Traditional Owners, Custodians and Lore Keepers of the world's oldest living culture and pay respects to their Elders past, and present.

# Foreword

We are pleased to submit our draft of the Review of the Snowy Water Inquiry Outcomes Implementation Deed (the Deed).

The nation-building Snowy Scheme, constructed between 1949 and 1974 (with first generation of power in 1955), was designed to provide water to downstream irrigators and funded by hydro generation. While it has delivered many benefits, it has significantly reduced flows in montane rivers, including the Snowy and Upper Murrumbidgee rivers. After considerable community concern, a public inquiry resulted in an agreement, the SWIOID or Deed, being adopted by the Commonwealth, New South Wales and Victorian governments to increase the volume of water flowing down the montane rivers.

The Deed, established in 2002, reflects the understanding of environmental water management at the time. While it resulted in increased flows down the montane rivers compared with preceding arrangements, most notably in the Snowy River, the passage of time has shown that the flows are manifestly inadequate in volume and timing to ensure the health of the rivers and catchments involved in the Snowy Scheme. For example, the poor state of the Upper Murrumbidgee River at times provides a risk to water security and human health.

While revised environmental flow provisions in 2002 increased the target release from Tantangara Dam to an average of 27 GL per year, this represents about 9 to 10% of its mean annual natural flow, estimated to be 290 GL. These inadequate volumes of water are exacerbated by a poor record of catchment management activities by governments and others.

This Review was focused on the Deed, its governance and related operating arrangements. Although it considered the montane rivers in general, the focus of more technical work and modelling was the Upper Murrumbidgee River. The Review found that the Deed is outdated and is not delivering the outcomes required and justified by cost-benefit analysis. In particular, the Deed has delivered poor outcomes in the Upper Murrumbidgee River.

Feedback to the Review, including 136 submissions, overwhelmingly expressed great concern about the state of the Upper Murrumbidgee River and catchment, and the absence of environmental care for the area. Advice from three independently facilitated community groups (First Nations, community interests and representatives from four governments) was clear on the need to improve the Upper Murrumbidgee River and catchment while wanting to ensure that impacts on the National Electricity Market (NEM) and Snowy Hydro Limited's (Snowy Hydro) energy production were minimised.

The current Deed does not include the ACT even though the Murrumbidgee flows through its length, and the community and First Nations have little in the way of formal roles in the arrangements. Further, First Nations have little access to the river and catchment areas. The Deed discourages adaptive and innovative water management as NSW is liable for compensation to Snowy Hydro for any changes which are not supported by Snowy Hydro.

Modelling of various adaptive flow options which use a higher volume of water than is currently delivered to take advantage of weather and climate events, shows that improved river health can be

achieved without compromising energy production. The scale of foregone generation is approximately 0.05 to 0.1% of total NEM generation and less than 4% of Snowy Hydro's annual generation. The Review also found that catchment repair is important and that increased flows alone will not be sufficient to restore the health of rivers.

The Review recommends a staged approach where environmental flows are increased to achieve environmental outcomes equivalent to the delivery of an average annual target of 30% (87 GL equivalent) of the average annual inflows into Tantangara Dam. This staged delivery should commence immediately with an increase in the volume of water to an average annual target of 23% (68 GL equivalent) of average annual inflow, which is Option 5 of the modelled environmental watering options.

The Review also recommends that within two years an independent study determine feasibility-level costs of upgrading the outlet valve on Tantangara Dam, to enable flushing flows that are required to support ecosystem recovery. A cost-benefit analysis should then be undertaken to determine whether the upgrade proceeds. Additional actions are also contingent on further work being undertaken prior to decisions being made. Also recommended is an upgrade to the objective setting, compliance, monitoring, reporting and review of environmental flow activities.

Greater input from the community, including First Nations, is to be provided for in the new arrangements and a key recommendation is support for First Nations to enhance their access to the rivers and their role in their management.

The Panel believes that this package of reforms, if implemented collectively and in a timely manner, will lead to a significant improvement in the health of some of Australia's most well-known rivers. Should governments decide not to proceed with this package of reforms, the Upper Murrumbidgee will likely die, with its flora and fauna irreversibly lost. Downstream communities will also suffer.

The Panel would like to thank all those who have contributed to this Review. The three advisory groups – the Stakeholder Advisory Group, the First Nations Advisory Group and the Review Consultation Group from governments – have provided us with helpful information and advice. We would like to thank those who put in submissions and contributed to meetings which has assisted our understanding of the issues and possible remedies. We also sincerely thank the consultants whose modelling and analysis of environmental flows, system operations, energy impacts and costs greatly informed the Review.

Finally, the Panel would like to express its enormous thanks to the secretariat from DCCEEW whose commitment to assisting us with the Review has been unwavering and who have been unfailingly cheerful in responding to our requests. They have been a pleasure to work with and have done a wonderful job working with us to put this report together.

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# Executive Summary

This Review of the Snowy Water Inquiry Outcomes Implementation Deed (SWIOID) is being undertaken to improve the health of the Upper Murrumbidgee River between Tantangara and Burrinjuck dams by identifying opportunities to enhance environmental outcomes for river systems impacted by the operation of the Snowy Hydro Mountains Electric Scheme, while minimising impacts on the National Electricity Market (NEM), Snowy Hydro Limited (Snowy Hydro) and downstream water users. Opportunities to improve community and First Nations involvement in the management of the river were also to be identified. The Review is also intended to bring the SWIOID'S twenty plus –year old governance up to contemporary standards.

Since the Deed was agreed in 2002, the policy, environmental and community context for water management has evolved significantly. This first formal review of the Deed occurs in the context of contemporary water management which now places greater emphasis on a hierarchy of water uses, integrated catchment management, adaptive environmental water use, community and First Nations participation and coordination across jurisdictions. While the Deed has delivered increased environmental flows compared to pre-Deed conditions, the current state of the Upper Murrumbidgee is abysmal with its inhabitants, like Macquarie Perch, threatened with localised extinctions. Existing arrangements fail to meet evolving expectations for water management particularly in light of changing climatic conditions and increasing use.

A consistent theme emerging from the Review is the need to move to a more integrated, coordinated and defined outcome-focused framework for the Snowy and Upper Murrumbidgee systems.

The Panel recommends a coordinated package of reforms to strengthen river health outcomes, improve system performance, and establish an integrated, adaptive and transparent governance framework for the Snowy and Upper Murrumbidgee systems. The Panel intends that these recommendations be implemented as a cohesive package, rather than in part, and considers this critical to achieving the intended outcomes.

A central recommendation of the Review is the replacement of the existing arrangement with a new Deed between the Commonwealth, Victorian, New South Wales and the Australian Capital Territory governments for the delivery of environmental flows from the Snowy Scheme. This would be supported by more specific objectives, strengthened accountability mechanisms, and where necessary, transparent processes for managing trade-offs between the use of water for the environment and energy. The Review recommends the objectives of this new arrangement include specifying ecological outcomes, maintaining water security, minimising impacts on energy system outcomes and Snowy Hydro revenues, improving First Nations outcomes, improving community participation and achieving public trust and confidence.

The Review emphasises the need for these increased environmental water flows to be delivered through an adaptive management approach that responds to changing conditions and emerging evidence. The recommended flow proposal provides for an increase in water volume plus specifically timed flows to capitalise on weather events, such as high rainfall. The flows have been assessed against the volumes needed to meet specific environmental watering requirements for

particular ecological characteristics, such as sustaining populations of Macquarie Perch. The Panel has explicitly considered the implications of the recommended increased flows on the NEM and Snowy Scheme operations as well as downstream water users. The Panel recommends that minor transmission losses associated with the additional environmental water allocations be met by recovered system inflows, so there is no impact to water allocations below Burrinjuck Dam. The Panel recommends an immediate transition to higher flow volumes which will improve river health, with the potential for further increases in the future that are informed by the outcomes of feasibility studies for enabling infrastructure.

The Panel also recommends an increased emphasis on integrated catchment management, where water management and land-based activities complement each other. This approach recognises that long-term river health depends on system-wide interventions, not additional volumes of water alone.

A central component of the Review is the progression of First Nations water interests. The Review finds that current arrangements do not reflect First Nations custodial responsibilities to water and Country. It recommends a staged transition of First Nations participation and capacity building, enabling a greater role in decision-making, recognition of cultural water and support for First Nations-led stewardship and care for Country.

Implementation of these reforms should occur through a staged pathway, building on existing programs and institutional arrangements. Recommended early actions should focus on strengthening governance foundations, increasing environmental flows to the Upper Murrumbidgee, supporting community participation in planning processes and increased river access for First Nations people. Other actions require further work prior to decisions being made. If implemented, over time these reforms would progressively enable more integrated decision-making, enhance environmental outcomes and strengthen cultural and community benefits.

Analysis of the economic, social, environmental and cultural costs and benefits of the proposed initial package of reforms (Option 5 of the environmental watering options) yields an expected net present value of approximately \$68 million compared with the current situation. This package would see strong improvements in baseflow reliability and ecological condition below Tantangara Dam (representing the upper reach), with more moderate outcomes at Mittagang Crossing (representing the middle reach) and comparatively limited benefits at Lobbs Hole (representing the lower reach). The impact of these improved and more targeted environmental flows would be reflected in improved water quality, habitat persistence and local productivity, and would, for example, lead to substantial increases in Macquarie Perch abundance within occupied reaches. However, limited delivery of higher magnitude flows will restrict channel maintenance and species dispersal.

A decision not to implement this package of reforms will save money (at least in the short term), avoid putting into practice a raft of new initiatives and programs which will involve challenging coordination of funding, people and activity and inconvenience for Snowy Hydro. However, such a decision will effectively condemn the Upper Murrumbidgee to a gradual death. Australia's reputation for ecological mismanagement and local extinctions will unfortunately be enhanced and local communities will be devastated. In the longer term, impacts on downstream communities will require innovative solutions to ensure human water needs are met, among other things.

Overall, the Review concludes that replacing the Deed presents a significant opportunity to align water governance with contemporary expectations. With a proposed integrated governance approach to environmental flows, catchment management and First Nations participation, the revised framework can deliver more resilient river systems and more durable environmental, cultural and community outcomes over the long-term. A five-yearly independent audit and a ten-yearly independent review will enable timely adaptation to changing conditions.

The declining condition of the Upper Murrumbidgee River underscores the urgency for a timely and coordinated policy response upon the Panel’s submission of its final report. The Panel advises that the Australian, Victorian, NSW and ACT governments will need to act expeditiously on the Review’s recommendations. These recommendations are essential to support species persistence, maintain water quality, protect human health, and secure critical human water needs, at the same time as supporting the national energy market.

**Figure 1: The Upper Murrumbidgee at Tintangara Dam (January 2026). Source: Australian Government DCCEEW (January 2026)**



# Recommendations

## Recommendation Summary

The Panel’s recommendations should be read as a cohesive package. They are deliberately interdependent, with each reform reinforcing the others—implemented in isolation, individual measures will be less effective and may undermine intended outcomes. A holistic approach, sequenced and coordinated across policy, regulatory, and operational settings is therefore essential to realise the full benefits of the Review.

Taken together, the Panel’s recommendations provide a practical pathway to a more coherent and resilient Deed framework. By strengthening information foundations, improving coordination and aligning incentives across the system, the recommendations seek to enhance trust, support efficient investment and operational decisions and ensure the framework remains fit for purpose in a rapidly changing environment.

Note that references to ‘governments’ in the recommendations mean the Australian, NSW, Victorian and ACT governments.

### **Recommendation 1 – Upper Murrumbidgee River environmental flows**

Environmental flows in the Upper Murrumbidgee River are increased to achieve environmental outcomes equivalent to the delivery of an average annual target of 30% (87 GL equivalent) of the average annual inflows into Tantangara Dam, delivered through redirecting a portion of the Required Annual Release from the Snowy-Tumut Development through Tantangara Dam. Meeting this requirement is to be delivered through:

- a. planned environmental water - rules-based variable baseflows and small freshes that provide certainty in operations and minimum outcomes
- b. adaptive environmental water - managed through flexible operating arrangements with the scale and timing of releases aligned with climate conditions and proportionate to Tantangara Dam inflows
- c. the volume is in addition to other environmental flows for the associated montane rivers and the Snowy River
- d. staged delivery, commencing with an increase in the volume of water to an average annual target of 23% (68 GL equivalent) of average annual inflow, with further increase subject to a 5-year audit on the effectiveness of environmental water delivery.

### **Recommendation 2 – Tantangara Dam Outlet Upgrade Feasibility Study**

Snowy Hydro to commission and submit to the Australian Government, within 2 years from the acceptance of this Review report, an independent study to determine feasibility level costs of upgrading the outlet valve on Tantangara Dam, to enable flushing flows that are required to support ecosystem recovery. Following this, the cost benefit analysis should then be updated to determine whether the upgrade should proceed.

The development of the business case must be consistent with Infrastructure Australia's Assessment Framework to reflect national standards for best-practice infrastructure development.

**Recommendation 3 – Environmental Water Monitoring Program**

The Commonwealth Environmental Water Holder, with governments, should establish, as a priority, a monitoring program that builds a baseline for assessing the effectiveness of environmental water delivery by governments when considering the business case for infrastructure upgrades.

**Recommendation 4 – ACT Water Entitlement Contribution to Environmental Flows**

The ACT Government provides water entitlements to the Commonwealth Environmental Water Holder of a volume that offsets the actual volumetric risk to water reliability in the regulated Murrumbidgee from the additional minor transmission losses associated with improving environmental flows. This entitlement is a dependency for the increased environmental water and contributes towards the ACT Government's inclusion as a Party to the new Deed.

**Recommendation 5 – Snowy River Increased Flows**

For the final report the IRP further investigate the impact on the NEM of Snowy Hydro delivering an annual average of 212 GL to the Snowy River, noting that this was the original intent of the Deed and that water was purchased for this purpose and that rather than being delivered to the Snowy River the water has been used for energy and irrigators. In this context, the Panel notes, there is no reasonable basis for applying existing compensation arrangements to deliver on the original policy intent of governments.

**Recommendation 6 – Evaluation of Snowy River Increased Flows and other Snowy Montane Rivers**

Within 3 years of the acceptance of this report, the effectiveness of the existing Snowy River Increased Flows to be subject to a thorough, quantitative evaluation for delivering on the original agreed commitment of governments to restore the health of the Snowy River. This review is to:

- a. be undertaken by the Australian Government, in consultation with relevant jurisdictions
- b. review the effective volume and adaptive flow approach of environmental water required to achieve the policy objective, with consideration for climate projections and growth in water demands along the river
- c. develop measurable ecological objectives for the Snowy River as a priority under the renewed arrangement to support outcome-based environmental water delivery and long-term system performance
- d. investigate the impact on the NEM of Snowy Hydro delivering up to 294 GL to the Snowy River
- e. on completion of the exercise for the Snowy River, prepare a plan and costings for undertaking a similar exercise for the other rivers in the Snowy scheme.

**Recommendation 7 – Decommissioning of Mowamba Weir**

Decommission the Mowamba Weir within 5 years of acceptance of this review, giving effect to recommendations from the Ten-Year Review of the Snowy Water Licence.

**Recommendation 8 – Adaptive Operating Framework for the Upper Murrumbidgee**

NSW implement, in consultation with other governments and with advice from Snowy Hydro, an adaptive operating framework to provide flexible operating arrangements that deliver environmental outcomes and provide flexible responsiveness to critical weather, water and energy events within the Upper Murrumbidgee River.

The environmental water flow program for the Upper Murrumbidgee is to be supported by:

- a. enhanced environmental water planning with measurable objectives within the Annual Water Operating Plan
- b. flexible operating arrangements and processes within a flexibility envelope will include a water accounting framework that will establish annual and interannual water use
- c. a monitoring, evaluation and science program
- d. First Nations and stakeholder participation
- e. reporting and reviews.

The operating arrangements must be consistent with Snowy Hydro's responsibilities as a NEM participant and support AEMO's planning and operation of the NEM.

Following the completion of Recommendation 6, investigate if this approach could be applied to other Snowy and Snowy Montane Rivers.

**Recommendation 9 – Governance and decision-making framework**

NSW, in consultation with the Australian Government, establish a decision-making framework that:

- a. provides transparent and consistent processes for assessing trade-offs between environmental outcomes, water availability and energy system considerations
- b. establishes an independent dispute resolution mechanism as a statutory appointment of an independent Snowy Water Commissioner under *the Water Management Act 2000* (NSW). The appointment is subject to consultation with Victoria, the ACT and the Australian Government.
- c. defines escalation pathways and decision-making timeframes
- d. requires documentation and public reporting of decisions and trade-offs.

**Recommendation 10 – New Deed and system objectives**

Governments replace the Snowy Water Inquiry Outcomes Implementation Deed with a new Deed that:

- a. establishes clear, system-level objectives across environmental, water, energy, cultural and community outcomes

- b. includes all relevant jurisdictions, with the ACT joining as a full participant following agreement on the contribution of the ACT to the arrangement
- c. defines roles, responsibilities and decision-making arrangements across governments
- d. provides the foundation for coordinated planning, funding, implementation and monitoring
- e. establishes 5-yearly audits and 10-yearly reviews.

The new Deed should be clearly structured and accessible, supported by appropriate explanatory material, and include:

- a. measurable ecological performance indicators for the Upper Murrumbidgee and, in time, the Snowy and other Snowy Montane rivers
- b. responsibility for transparent public reporting on performance, monitoring outcomes and compliance (including in line with Recommendation 14 on compliance and enforcement).

#### **Recommendation 11 – Intergovernmental coordination (Senior Officials)**

Governments establish a senior officials level committee with authority and accountability to support implementation and whole-of-system operation.

This function must:

- provide whole-of-system oversight of implementation, sequencing and coordination
- ensure alignment across water, environment, energy, First Nations and community objectives
- Approve an annual plan, for example, from the MDBA, which coordinates as necessary, activities under the Deed
- support effective collaboration across jurisdictions
- include and respond to the advice of First Nations, the community and scientific input.

#### **Recommendation 12 – Advisory and participatory inputs**

Governments strengthen advisory and participatory arrangements to support decision-making across the system.

This includes:

- a. NSW expanding advisory arrangements (such as the Snowy Advisory Committee) to include additional ACT, First Nations and community representation
- b. ensuring input into planning, decision-making and review processes is consistent and coordinated
- c. including the Commonwealth Environmental Water Holder in relevant advisory and coordination forums
- d. supporting transparency and community confidence through clear engagement processes and public reporting.

**Recommendation 13 – Monitoring, reporting and review**

Governments establish an integrated monitoring, reporting and review framework which brings together monitoring undertaken by relevant entities (including the Commonwealth Environmental Water Holder) that:

- a. assesses performance against agreed objectives and indicators
- b. provides independent, transparent reporting on system outcomes
- c. supports adaptive management through feedback into decision-making
- d. includes regular independent audit (e.g. 5-yearly) and 10-yearly Deed review
- e. provides coordination across jurisdictions.

**Recommendation 14 – Compliance and enforcement**

Governments establish a strengthened compliance and enforcement framework that:

- a. supports delivery of system-level objectives
- b. separates compliance and enforcement functions from policy decision-making and operational and delivery to ensure independent oversight and clear accountability
- c. applies proportionate enforcement mechanisms
- d. provides transparent and regular (e.g. annual) public reporting on compliance
- e. integrates with monitoring and review processes to support continuous improvement.

**Recommendation 15 – ACT and NSW Regional Growth Strategy**

The ACT and NSW governments jointly develop a regional growth strategy to manage water resources in a way that meets Canberra and surrounding NSW region water needs including during dry and drought periods.

This strategy must:

- a. explicitly account for trade-offs between different water uses and be adaptive, enabling responses to changing climatic, environmental and operational conditions
- b. provide sufficient certainty for long-term planning outside of scheduled review points
- c. deliver on the environmentally sustainable level of take
- d. engage the NSW Cross Border Commissioner.

**Recommendation 16 – First Nations custodianship framework**

Governments proactively work with all Nations of the Upper Murrumbidgee and Snowy River systems to establish a First Nations custodianship framework, described in Chapter 6.1, that provides a structured pathway towards shared governance and decision-making on matters affecting cultural values, and to progress broader aspirations that may include river rights, cultural water ownership and access to river Country.

Governments are to invest appropriately to support the implementation of this recommendation.

**Recommendation 17 – Water entitlements for First Nations**

Governments proactively work with and support First Nations along the Upper Murrumbidgee and Snowy rivers, including through targeted and sustained investments to enable access to water entitlements that may be progressed through a Nation-led program that:

- a. identifies the mechanism for legal authority to hold and manage water interests
- b. supports First Nations defining objectives, timing, location and use of cultural water
- c. develops strategic guidance, coordination and long-term capacity building/knowledge sharing prepared by the First Nations Authority
- d. establishes operational arrangements for coordinating cultural water delivery alongside environmental and other water uses
- e. establishes monitoring and reporting against cultural objectives.

**Recommendation 18 – Integration of environmental water delivery and catchment management actions**

Governments ensure that environmental water delivery and targeted catchment management actions are integrated through a coordinated, whole-of-system approach. This may include:

- a. delivering environmental releases with complementary on-ground interventions (such as riparian restoration, erosion control and habitat improvement) to deliver ecological outcomes
- b. strengthening integration between land and water management across planning, delivery and monitoring processes.

**Recommendation 19 – Whole-of-system catchment investment coordination and alignment**

Governments improve coordination and alignment across jurisdictions, agencies and programs to enable a more integrated, whole-of-system approach for catchments, under the oversight of the senior officials committee and coordinated by, for example, the MDBA. This may include:

- a. establishing a coordinated, cross-jurisdictional approach to catchment investment that builds on existing arrangements and progressively strengthens delivery
- b. providing sustained, long-term funding to support continuity of on-ground works, enable scaling of successful initiatives, and build regional capability
- c. ensuring monitoring, evaluation and learning is embedded within a structured adaptive management framework to support continuous improvement in catchment and environmental flow outcomes.

**Recommendation 20 – Supporting First Nations custodianship and community stewardship in catchment management activities**

Governments embed First Nations and community in catchment management activities through enduring stewardship roles.

This includes:

- a. expanding participation in catchment management from the outset, including planning, delivery and monitoring, moving beyond consultation toward shared decision-making
- b. investing in ranger programs, on-Country stewardship and workforce development to support long-term capability
- c. supporting the integration of cultural and local knowledge and indicators of river health in catchment activities and monitoring.

#### **Recommendation 21 – Shared government funding**

The Australian, NSW, Victorian and ACT governments establish a shared funding model, including coordinated contributions to support system-level functions, planning and investment across the catchments.

These contributions are to reflect system roles and responsibilities and may take different forms, including financial contributions, provision of water or entitlements, and targeted investment in catchment and system functions. Governments should establish enduring funding arrangements to:

- a. support coordinated, cross-jurisdictional investment
- b. allocate funding based on agreed system-level priorities.

Funding is to be allocated based on:

- a. scientific evidence and monitoring
- b. agreed system-level priorities
- c. input from community and First Nations.

The arrangement is to be transitional and staged, including interim measures to extend the Australian Government investments to ensure continuity (including the Restoring the Upper Murrumbidgee River Program and drought response).

#### **Recommendation 22 – Snowy Hydro funding**

Consistent with the beneficiary-pays principle, Snowy Hydro make an ongoing financial contribution to support environmental and system outcomes under the renewed Deed arrangement.

This contribution:

- a. reflects its role in operating and influencing outcomes across the system
- b. contribute to the costs of environmental, catchment and system functions, coordinated by governments
- c. provide certainty over time
- d. include a base contribution and where appropriate, an additional contribution linked to system-level effects of operations.

The level and structure of these contributions are to be determined through an independent pricing or regulatory process (such as IPART), to ensure transparency, consistency and objectivity.

**Recommendation 23 – Alignment of Corporate Governance (Snowy Hydro)**

The Australian Government should strengthen alignment between Snowy Hydro’s corporate governance and system-level objectives.

This includes:

- a. revising Statements of Expectations to reflect environmental, water and public benefit outcomes
- b. incorporating specific performance measures linked to river environmental flow and system outcomes in Snowy Hydro’s Balanced Scorecard framework to inform performance assessment for bonuses for senior staff
- c. ensuring board capability is balanced across priority sectors and functions, including water, environment, public policy (in addition to energy, risk, strategy, finance and other relevant skills)
- d. appointing the Australian Government Minister responsible for water as a shareholder minister.

**Recommendation 24 – Establish a Rule-based Compensation Framework**

Governments establish a rule-based compensation framework that limits compensation to clearly defined circumstances and supports adaptive system management. Under this framework:

- a. no compensation applies to changes agreed through periodic reviews, audits or updates to objectives and operating arrangements
- b. compensation applies only where outcomes fall outside a defined operating envelope, with impacts assessed against agreed criteria
- c. the amount of any compensation is determined using a transparent, publicly available method or formula.

The framework is to also include:

- a. clear triggers and rules for when compensation applies
- b. compliance enforcement, including financial penalties for non-performance against agreed obligations.

# Introduction

## Purpose of the Review

The Australian Government commissioned this independent review of the Snowy Water Inquiry Outcomes Implementation Deed (the SWIOID or Deed). The Deed is a legally binding agreement made in 2002 between the Australian, New South Wales and Victorian governments to provide more water for rivers affected by the operations of Snowy Hydro Limited (Snowy Hydro). The Deed has not been reviewed since its inception.

The Deed states the volume or energy equivalent of water in the Snowy Hydro Mountains Electric Scheme (Snowy Scheme) system which will be provided for the environment. This includes the Snowy River, the Upper Murrumbidgee River and several other high-altitude Snowy montane rivers. While its intent was commendable, implementation of the Deed over two decades has demonstrated that the releases of environmental water are inadequate and, with the exception of recent trials, inflexible and poorly timed, at a time of increasing demands on water for energy, agricultural production, regional development and urban supply.

The Review provides independent advice on whether, and how, water management arrangements in the Snowy Scheme should be contemporised with a focus on improving the health of the Upper Murrumbidgee River.

This Review has been undertaken in a substantially changed policy and governance context from that which existed when the Deed was agreed in 2002. Since that time, water reform frameworks have evolved, expectations of environmental stewardship have increased, and governments have adopted broader strategies and agreements relevant to river health, climate resilience, intergovernmental coordination and First Nations and community engagement.

These developments include environmental water reforms, contemporary national water policy settings, the National Agreement on Closing the Gap commitments, climate resilience strategies, and related governance and accountability expectations. Together, these contextual matters are relevant to the Review because they shape both the contemporary objectives against which existing arrangements should be assessed and the broader institutional conditions needed to support enduring river health.

Any contemporary review of the Deed must consider not only the adequacy of existing arrangements, but also how prospective changes would interact with downstream users, the operational role of Snowy Hydro in the NEM, the national decarbonisation agenda, intergovernmental responsibilities, local communities, First Nations' interests, and the wider implementation settings on which enduring river health depends.

## Terms of Reference

The Review's [Terms of Reference](#) reflect the breadth of considerations relevant to the Deed and require the Independent Review Panel (the Panel) to assess it in its full environmental, social, cultural, economic and energy context. While the Deed is the formal subject of the Review, the Terms of Reference make clear that its operation cannot be understood in isolation from the wider governance, regulatory and operational settings through which it is implemented.

In practice, the Deed gives effect to environmental water commitments through a suite of interrelated instruments, including Snowy Hydro's operating licence and associated documents, water sharing and licensing arrangements, operational protocols, and governance and compliance mechanisms. Consistent with this broader framing, the Panel considered the Deed not as a stand-alone instrument, but as part of the wider system through which environmental outcomes are delivered, governed, monitored and adapted over time.

The [Terms of Reference](#) also require the Panel to pay particular attention to the health of the Upper Murrumbidgee River upstream of Burrinjuck Dam. The Panel concluded that some of the changes needed to improve river outcomes sit outside the formal scope of the Deed itself. Enduring improvement in river health would depend not only on changes to Deed economic based arrangements, but also on complementary regulatory, policy, investment and governance actions beyond the Deed framework.

In addition, the Panel was to consider the broader Scheme-wide implications of any changes, including interactions with energy generation, downstream water users and whole-of-system reliability.

The Review did not include detailed quantitative re-modelling of the River Murray Increased Flows package or full re-modelling of Snowy River hydrology. Consistent with the Terms of Reference, Snowy River outcomes were considered qualitatively, with analytical effort prioritised toward the Upper Murrumbidgee River between Tantangara and Burrinjuck dams, where the most pressing ecological concerns had been identified.

During the course of the Review, the Terms of Reference were updated. Following feedback from NSW, Victoria and the ACT through the Intergovernmental Review Consultation Group. The Australian Government published revised Terms of Reference in October 2025, including explicit reference to clauses associated with delivery of the 212 gigalitres (GL) increased flows to the Snowy River.

Figure 2: Map of the Snowy Hydro Scheme



## The Review Process

The Review has been informed by a structured, deliberative methodology combining stakeholder engagement, technical analysis and iterative testing of reform options. Input has been drawn from advisory groups, including intergovernmental, stakeholder and First Nations forums, together with public consultation on the Panel's [Issues Consultation Report](#), and extensive direct engagement with governments, Snowy Hydro Limited, market bodies, technical experts and community stakeholders.

The Issues Consultation Report outlined matters within the scope of the Review and sought feedback on ways in which the Deed could be improved to meet contemporary water management objectives and community expectations. The public consultation process ran from 12 December 2025 to 13 February 2026, with the Panel receiving 136 submissions from a broad cross-section of stakeholders, including industry groups, First Nations people, academia, catchment management organisations, landholders, community members and government agencies. This input has informed the Panel deliberations and the development of draft recommendations.

Consistent with the [Review Framework](#), the Panel has applied a structured deliberative design to test potential reforms against multiple objectives, integrating environmental, water, energy and community considerations. This has involved iterative development and assessment of reform scenarios, informed by technical modelling and stakeholder feedback, to evaluate trade-offs and identify options capable of delivering improved environmental outcomes while maintaining broader system performance.

The Panel's deliberations have been supported by technical analysis assessing alternative environmental flow arrangements for the Upper Murrumbidgee River and their implications for connected water systems, energy generation and the broader community. This has included hydrological modelling, ecological assessment, integrated river system modelling, energy modelling, and economic and social analysis. Together, this work has enabled the Panel to evaluate environmental outcomes alongside system-wide impacts in a consistent and transparent manner. Further data on the consultation and analytical approach are provided in **Chapter 2** (Review Methodology).

# 1. Background

## 1.1 A river under pressure

The Upper Murrumbidgee River is one of the headwater systems of the Murray–Darling Basin and a river of ecological, social and cultural importance. Yet for decades its condition has been shaped by a water management system designed for a different era — one in which the diversion and regulation of mountain rivers was acceptable as rivers were understood primarily as infrastructure for nation-building, irrigation development and electricity generation.

The Snowy Mountains Scheme (the Snowy Scheme) delivered profound national benefits. But it also altered the natural flow patterns on which river health depends. In the Upper Murrumbidgee, those changes have contributed to a long period of ecological degradation, including diminished flow and flow variability, habitat simplification, pressure on already endangered native species, and declining resilience in the face of drought, increased bushfire risk and climate change.

These impacts have not always received the same public attention as the impacts experienced in the Snowy River, although the degradation is more profound. They are the product of cumulative decisions made over many decades, and they now require a contemporary response grounded in evidence, accountability and adaptive water management.

Improving the health of the Upper Murrumbidgee River is not straightforward. It cannot be achieved through a single intervention, nor by reference to environmental flows alone. The river’s condition is shaped by a complex interaction of hydrology, infrastructure, catchment and river ecology, governance, climate, catchment processes and competing water and energy demands.

Any contemporary review of the Deed must therefore consider not only the adequacy of existing arrangements, but also how prospective changes would interact with downstream users, the operational role of Snowy Hydro Limited (Snowy Hydro) in the National Electricity Market (NEM), intergovernmental responsibilities, local communities, First Nations’ interests, and the wider implementation settings on which enduring river health depends.

## 1.2 Energy context: the National Electricity Market and Snowy Hydro Limited

Snowy Hydro is an important participant in the NEM. The NEM provides electricity to eastern and south-eastern Australia including the interconnected regions of Queensland, NSW, the ACT, Victoria, South Australia and Tasmania. It supplies around 80% of Australia’s electricity or around 200,000 gigawatt-hours (GWh) per annum to approximately 10 million customers.<sup>1</sup>

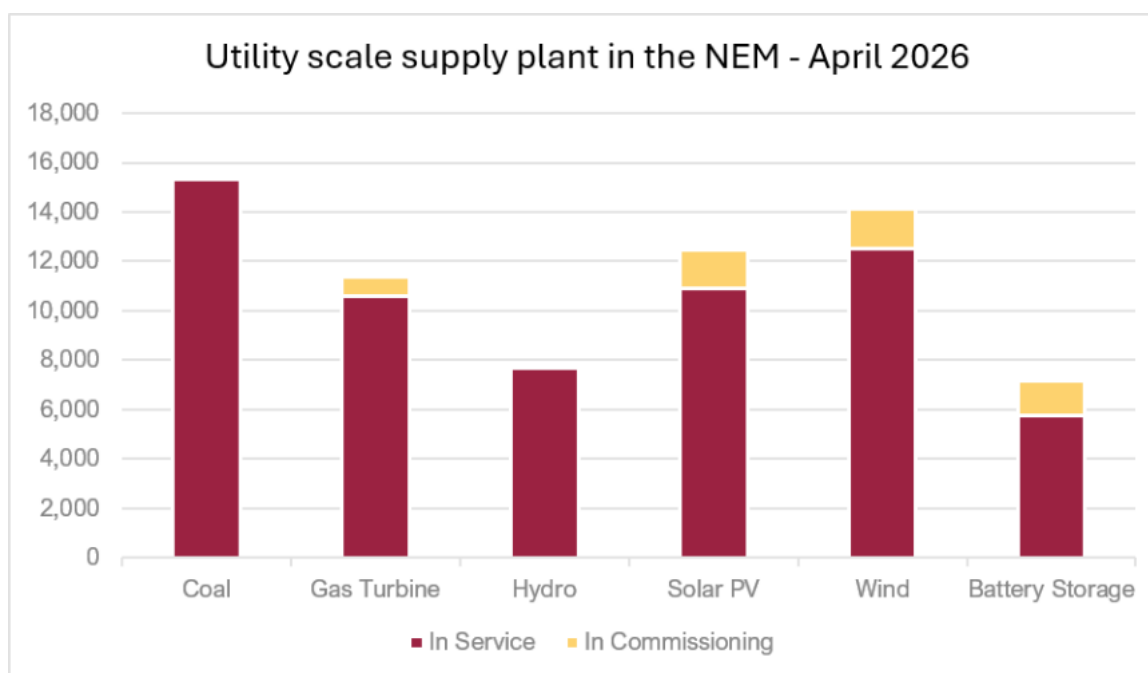
The electricity is supplied competitively through a 5-minute spot market managed by the Australian Energy Market Operator (AEMO). There are currently around 340 registered providers of generation

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<sup>1</sup> The Australian Energy Market Commission (AEMC), ‘National Electricity Market’, [www.aemc.gov.au/energy-system/electricity/electricity-system/NEM](http://www.aemc.gov.au/energy-system/electricity/electricity-system/NEM).

and storage in the NEM with a total capacity of 68,000 megawatts (MW) of various types (see Table 1 below).<sup>2</sup>

**Table 1: Utility Scale Supply Plan in the National Electricity Market (NEM), April 2026**



The NEM is in transition from a system primarily based on coal fired generation to one based on renewable generation firmed by storage and gas fired generation. Over 7,000 MW of ageing coal and gas-fired plant have announced they are withdrawing from the market while 12,700 MW of plant is currently committed to construction.<sup>3</sup> Just over half of the new entrant plant committed to construction is battery storage. Further plant is in various stages of consideration as the Australian Government targets 82% renewables by 2030 and net zero greenhouse gas emissions by 2050.

Snowy Hydro plays an important role in the NEM because of its ability to dispatch electricity when needed and to ramp its generation up and down quickly. Snowy Hydro currently has 4,114 MW of hydrogeneration registered in the NEM which is supplemented by 1,909 MW of registered gas and liquid fuelled plants across the NEM.<sup>4</sup> Snowy 2.0 is under construction and will add 2,200 MW of generation and around 2,000 MW of pump capacity.<sup>5</sup> In recent years, Snowy Hydro’s plant has generated around 4,500 GWh per annum.<sup>6</sup>

As the NEM continues its transition, the existing Snowy Hydro generation, supplemented by Snowy 2.0 will play an even more important role in the NEM. Snowy Hydro also pays an annual dividend to the Australian Government.

<sup>2</sup> Graph based on data from AEMO’s Generation Page for April 2026. Data available on [https://www.aemo.com.au/-/media/files/electricity/nem/planning\\_and\\_forecasting/generation\\_information/2026/nem-generation-information-apr-2026.xlsx?rev=9c92608b02494f9da3b120e8ac4e7b9d&sc\\_lang=en](https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/generation_information/2026/nem-generation-information-apr-2026.xlsx?rev=9c92608b02494f9da3b120e8ac4e7b9d&sc_lang=en).

<sup>3</sup> As above.

<sup>4</sup> As above.

<sup>5</sup> As above.

<sup>6</sup> As above.

The Review considered energy impacts of environmental watering regimes at two distinct but related levels:

1. impacts on the NEM as a whole; and
2. impacts on Snowy Hydro as the operator of the Hydro Scheme and, in the future, the pumped hydro facility (Snowy 2.0)

Consistent with the [Review Framework's](#) structured, evidence-based approach, a cost-benefit analysis (CBA) was undertaken to support transparent comparison of reform options and their system-wide impacts. The CBA supports informed decision-making by quantifying trade-offs between environmental outcomes, energy system performance and broader economic and social effects, and by identifying options that deliver the greatest net benefit across these objectives.

The CBA is based on the impacts of the different levels and timing of environmental flows on the NEM and the customers it supplies. This reflects the potential impact on society and the economy given the scale of the NEM and the importance of electricity. At the NEM level, consideration of changes to environmental flow arrangements will reduce the energy Snowy Hydro can provide to the NEM over a year.

However, because of the storage within the scheme, Snowy Hydro has flexibility to choose when it generates and when it pumps although that flexibility is limited by the operational capability of the scheme and a range of constraints on its operation.

As part of the Review, different environmental flow regimes have been applied to meet the differing environmental water requirements of key indicator species and ecosystems. Their impact on the NEM was analysed taking into account the capabilities and limitations of Snowy Hydro's plant, noting its importance to the reliability of the NEM and Australia's ongoing transition to a more diversified and renewable energy mix.

At the level of Snowy Hydro's operations, changes to flow timing, flexibility or volumes may have implications for operational optimisation, opportunity costs and commercial risk. These impacts are an important consideration for governments, given Snowy Hydro's dual role as a commercial entity, government business enterprise and a key part of Australia's energy and water infrastructure.

The Review has therefore treated NEM-level impacts and Snowy Hydro business impacts as analytically distinct, while recognising their interrelationship. A reduction in the water available to Snowy Hydro's generation may also lead to reductions in the revenue Snowy Hydro provides to the Australian Government.

Importantly, the Panel has placed strong emphasis on minimising the adverse effects of increased environmental flows on Snowy Hydro's power generation operations and on Australia's transition to net zero, and its recommendations reflect that aim.

The NEM spot market provides a dynamic 5-minute price for each region of the NEM which reflects the supply-demand balance in real time, influenced by renewable energy generation peaks and seasonal demand. To allow firming and peaking plants to recover their costs over a year, the NEM

operates over a wide range of prices from  $-\$1,000$  /MWh to  $\$20,300$  /MWh.<sup>7</sup> This is important in the economic analysis as spot prices received by generators and storage should reasonably reflect their value to the market.

Such a volatile price is generally not preferred by customers or by generators who need some price certainty to manage their budgets. Financial derivative markets are therefore important, allowing market participants including retailers acting on behalf of customers, to contract around the spot market and fix prices in the medium-term.

Snowy Hydro is an important participant in financial markets operating around the NEM and particularly in the provision of contracts to manage periods of very high pool prices. The Panel's recommendations aim to minimise or eliminate any effects of increased environmental flows on Snowy Hydro's ability to support its important role in financial markets or to firm its own retail load.

## 1.3 The Snowy Scheme - a legacy of ambition

When the Snowy Scheme was conceived and constructed in the 1950s, it stood as a nation-building achievement of extraordinary scale and vision. Bringing in more than 100,000 workers from over 30 countries, the Snowy Scheme reflects an era defined by post-war optimism, engineering ingenuity and a determination to fuel economic growth, the diversion of mountain rivers to support inland irrigation paid for by generating electricity was widely celebrated.

Water was viewed as something to be captured, redirected and put to work - rivers were valued primarily for what they could deliver to farms, cities and industry.

While large-scale water and hydro-electric developments were distinguished in the mid-20th century as symbols of national progress and modernity, this vision was not uncontested. In the United States, conservation organisations such as the Sierra Club were, by the 1950s, actively opposing major dam projects in environmentally significant areas, contributing to the emergence of the modern environmental movement and reshaping public attitudes to river systems and wilderness protection.

Similar debates emerged in Australia from the late 1960s onwards, including campaigns opposing the flooding of Lake Pedder and later, the Franklin River dam proposal in Tasmania. These movements reflected a growing recognition of the ecological, cultural and social values of free-flowing rivers, and marked a shift away from a purely developmental view of water resources toward more balanced and contested approaches to their management.

That said, the environmental consequences of such large-scale river regulation remained poorly understood at the time as ecological science was in its infancy in Australia and the concept of 'environmental water' had not yet emerged. Despite some vocal pockets of opposition, the health of river systems was rarely considered a constraint on development.

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<sup>7</sup> Australia Energy Market Commission (AEMC) (27 February 2026), 'AEMC updated market price cap for 2025-26,' [www.aemc.gov.au/news-centre/media-releases/aemc-updates-market-price-cap-2025-26](http://www.aemc.gov.au/news-centre/media-releases/aemc-updates-market-price-cap-2025-26).

Over the decades that followed, the consequences of these interventions became increasingly evident. Reduced flows led to noticeably declining river health, simplified habitats, stress on populations of native fish and other organisms, and altered water quality and temperature regimes.

## 1.4 The gradual shift

At the same time, public awareness and scientific understanding were deepening. Landmark community advocacy during the 1990s focused strongly on the highly visible degradation of the Snowy River downstream of Jindabyne, which became a powerful national symbol of environmental loss. By contrast, impacts on the Upper Murrumbidgee River — located upstream of major storages and less visible to the broader community — received comparatively limited public attention, despite experiencing substantial ecological degradation.

The shift in understanding culminated in the 1998 Snowy Water Inquiry and the subsequent Snowy Water Inquiry Outcomes Implementation Deed (the Deed). The Deed resulted in landmark reforms at the time. For the first time, governments formally acknowledged that environmental outcomes in the Snowy Mountains Scheme rivers mattered and that operation of the Scheme needed to ensure river health alongside irrigation reliability and electricity generation.

The Deed represented a significant course correction, applying contemporary knowledge to a system designed in a very different time.

## 1.5 From nation building to environmental accountability

More than two decades later, the policy and environmental contexts have again shifted. Climate change is altering hydrological regimes with a general reduction in the Scheme's water availability predicted and increasing frequency and severity of extreme events. Regional population growth and economic development have intensified competition for water resources, increasing pressures on already stressed river systems.

Expectations of environmental stewardship are higher and community understanding of the ecological processes that sustain montane rivers, including the Snowy and Upper Murrumbidgee, is more sophisticated.

The role of the Snowy Scheme within the NEM has also evolved, even as its contribution to energy security remains significant. That role is expected to continue evolving with the commissioning of Snowy 2.0 and the continued growth of renewable energy in the NEM.

While the Deed delivered measurable improvements for the Snowy River relative to its pre-Inquiry condition, it was a point-in-time response. Subsequent ecological understanding indicates that both the Snowy River and the Upper Murrumbidgee River now face challenges that were not fully appreciated in 2002.

In particular, the Upper Murrumbidgee River has experienced sustained ecological degradation, while the Snowy River, although comparatively better provided for under the Deed, is also unlikely, under current arrangements, to be receiving the volume, variability and adaptive management attention required to support long-term river health under changing climatic conditions.

### **1950s–1970s | Nation-building era**

The Snowy Mountains Scheme is designed and constructed to support inland irrigation and paid for by electricity generation. Environmental impacts of large-scale river regulation are largely unrecognised or unaddressed.

### **1980s–1990s | Emerging consequences**

Reduced river flows and altered hydrology contribute to declining river condition. Scientific understanding of river ecology and flow dependence begins to mature.

### **1998–2002 | A turning point**

The Snowy Water Inquiry leads to the Snowy Water Inquiry Outcomes Implementation Deed (SWIOID), formally recognising the need for environmental water.

### **2000s–2010s | Implementation and learning**

Environmental flows are progressively delivered, although inconsistencies remain between the Deed, its Annexes and the operating licence. Monitoring and evaluation occur intermittently, scientific understanding improves, but gaps in continuity and long-term datasets remain a persistent shortcoming.

Formal reviews of whether objectives were achieved, and of the Deed itself, were not instigated. Even when licence reviews were undertaken (a 5-year review in 2007-2009 and the 10-year review in 2017-2018) and recommended changes, agreed compensation arrangements requiring the NSW Government to compensate Snowy Hydro for any licence change with which they do not agree.

### **Today | A new context**

Climate change, higher community expectations and improved ecological knowledge place new demands on water management and governance. Contemporary water management has changed significantly since 2002, but the Snowy Scheme's governing arrangements have not kept pace to the same extent.

## **1.6 Why this review matters now**

The Deed has not been comprehensively reviewed since it was signed, despite significant changes in water availability, river science, national water policy settings, the NEM, the transition to net zero, social and cultural expectations, and the role of the Snowy Scheme within the NEM.

Against this backdrop, the review of the Deed is both a practical necessity and a collective responsibility. It reflects an acceptance that the challenges facing the Upper Murrumbidgee River today are not the result of a single decision, but of cumulative choices made over generations, often with the best available knowledge of the time. The task is not to revisit those choices with hindsight alone, but to respond using the best evidence, tools and governance arrangements available today.

Past decisions, including the original design of the Snowy Scheme and the parameters set by the Deed, have materially shaped present day river condition. The Review therefore starts from a clear acknowledgment that these arrangements are a significant cause of current outcomes, notwithstanding that they reflected prevailing practice at the time.

These legacy places a heightened responsibility on today's governments and institutions to act decisively, transparently and accountably to address the consequences, in a manner which adapts to future changes.

In effect, the Review asks whether arrangements designed as an early response to environmental decline are still adequate in a world where signals of stress in regulated rivers are clearer, and the consequences of inaction better understood.

This Review is an opportunity to take stock of how far Australia has come in understanding river systems and to determine how that understanding should be reflected in the contemporary management of one of the nation's most significant pieces of water and energy infrastructure.

## 1.7 More than just the Deed

Experience over recent decades demonstrate that environmental recovery cannot be achieved through flow rules alone.

Although the Review focuses on the Deed, the Panel recognises that achieving contemporary best practice outcomes for the Snowy, the Upper Murrumbidgee and other affected montane rivers will depend on governance, regulatory, community engagement and investment settings that extend beyond the Deed.

The Deed is an intergovernmental arrangement governing water sharing and operational arrangements, with environmental flow commitments implemented through Snowy Hydro's operating licence. As such, its scope is inherently confined to matters directly related to water releases, operational flexibility and intergovernmental governance. Many of the drivers of ecological condition in the Upper Murrumbidgee River — including catchment processes, riverine habitat condition, water quality, and resilience to climate variability — are also shaped by complementary actions and decisions that sit outside the Deed.

These actions include:

- regulatory and policy settings administered by water, environmental and land management authorities
- catchment-scale rehabilitation and protection measures
- investment in river restoration, monitoring and adaptive management capacity
- governance and coordination arrangements that support integration across water, environment and land use management systems
- urban planning and development.

The Panel considers it important to identify and make explicit the dependencies between Deed-based water management arrangements and broader policy and management settings, because those dependencies influence the feasibility, effectiveness and durability of any options considered.

Accordingly, the Panel has approached its task on the basis that:

- the Review can assess how the Deed currently operates and identifies options to improve environmental outcomes through changes to flow management and governance and by adopting adaptive management arrangements
- the Review can identify interactions with and dependencies on actions outside the Deed including the establishment of operating arrangements and responsible bodies to deliver on the objectives in the Deed and ensure compliance
- achieving the Review's intended outcomes will ultimately require governments to consider and, where necessary, commit to complementary actions beyond the Deed.

In this sense, the Review is an opportunity to consider whether Australia's approach to managing the Snowy Scheme, across water, energy and environmental dimensions, continues to reflect contemporary best practice, or whether a new Deed is required.

## 2. Review Methodology

This chapter outlines the methodology adopted by the Panel, in accordance with the Terms of Reference released in October 2025 (available at the [Australian Government DCCEEW website](#)). It details the consultation processes, technical analysis, and key limitations that have informed the Panel's assessment and recommendations for this report.

### 2.1 Consultation process

A comprehensive consultation program was undertaken to inform the Review, ensuring that a wide range of perspectives were captured and meaningfully considered.

The Panel met on a number of occasions and carefully considered the input of the First Nations Advisory Group (FNAG), the Intergovernmental Review Consultation Group (RCG), energy, water and environment agencies in the Australian Government, NSW, Victoria and the ACT, and the Stakeholder Advisory Group (SAG) throughout the Review. Each of the three stakeholder groups were independently facilitated through a deliberative process designed to bring them along and to gather informed perspectives on the complex trade-offs presented by the Review. The advice of the three groups to the Panel can be found at [Review of the Snowy Water Inquiry Outcomes Implementation Deed - DCCEEW](#).

In addition to formal advisory groups, the Panel engaged directly with a broad range of key stakeholders, including academics, First Nations representatives, irrigators, environmental advocates and relevant government bodies, including catchment management authorities. A comprehensive list of consultation activities undertaken for this Report is provided at **Appendix A**.

In addition to the Upper Murrumbidgee stakeholders, the Panel undertook consultation activities across the Snowy region, including visits to Marlo, Victoria and Dalgety, NSW in January 2026, to engage directly with local stakeholders. The Panel also undertook site inspection of the Mowamba Weir which provided further context for community concerns. First Nations' perspectives in the Snowy region were conveyed to the Panel through the appointed First Nations facilitator.

The Panel also met with Snowy Hydro on a number of occasions throughout the review process, captured at **Appendix A**. The Panel visited Snowy Hydro facilities, as part of a tour of key infrastructure assets including Tantangara Dam. This site visit provided valuable context, enabling the Panel to better understand the operational, engineering and environmental considerations associated with water management and delivery across the Scheme.

The Review also considered findings from the public Have Your Say consultation on the Panel's Issues Consultation Report, published in December 2025. The Panel received 136 submissions, reflective of the strong community interest in the review. Insights from the consultation have been incorporated throughout this draft report, with stakeholder feedback carefully considered in shaping and testing the recommendations. Key findings from this consultation process are available on the Commonwealth DCCEEW website.

Overall, the Review consultation process was designed to ensure that diverse stakeholder views were captured and systematically integrated into the Review. Further detail on the consultation methodology is provided in the [Commonwealth DCCEEW's Review Framework](#).

**Figure 3: Community Consultation in Marlo, Victoria (February 2026). Source: Australian Government DCCEEW.**



## 2.2 Technical evidence considered by the Panel

The Review was supported by an integrated program of technical analysis designed to assess how alternative environmental flow arrangements could improve environmental outcomes in the Upper Murrumbidgee while considering implications for connected water systems, energy generation and the broader community.

The technical program combined hydrological modelling, ecological assessment, integrated river system modelling, energy modelling and economic and social analysis. Each technical workstream served a distinct purpose within the Review, however these workstreams were not undertaken independently. Outcomes from each workstream iteratively informed the other workstreams, creating a linked evidence base that enabled the Panel to evaluate environmental outcomes alongside broader system impacts.

**Figure 4** summarises the relationship between the technical workstreams considered by the Panel.

### Technical workstreams and evidence integration

The technical program commenced with a detailed assessment of current ecological conditions, and the development of ecological objectives and Environmental Water Requirements (EWRs) for the Upper Murrumbidgee. Ecological objectives defined the environmental outcomes sought through the Review and provided the basis for assessing alternative environmental flow

arrangements. The EWRs translated those objectives into measurable flow components, specifying the magnitude, timing, duration and frequency of flows required to support ecological processes and river health.

Upper Murrumbidgee Hydrological modelling formed the central analytical platform for the Review. The modelling tested alternative environmental flow options and quantified the water required to achieve different combinations of EWRs. The hydrological modelling also provided the inputs required for all subsequent technical assessments. Further information is published on DCCEEW's website: [Technical Expert Group input into the Review of the Snowy Water Inquiry Outcomes Implementation Deed](#).

Three assessments were then undertaken using the Upper Murrumbidgee hydrological modelling outputs.

The ecological assessment examined the extent to which EWRs were achieved under each option and assessed the likely ecological response of the river system. This included consideration of river connectivity, habitat condition, geomorphic processes, water quality and native fish populations.

Integrated river system modelling assessed implications of the options for the regulated Murrumbidgee River and other connected water systems. This work examined changes to downstream flows, water availability, allocations, diversions, storage behaviour and transmission losses.

Energy modelling assessed implications of the options for Snowy Hydro operations and the NEM. This included consideration of generation outcomes, storage operations, market impacts and energy system reliability.

The outputs from these technical assessments were then integrated through an economic assessment, including cost-benefit analysis and evaluation of broader socio-economic outcomes. This work combined ecological, hydrological and energy outcomes to assess the relative costs and benefits of alternative environmental flow options.

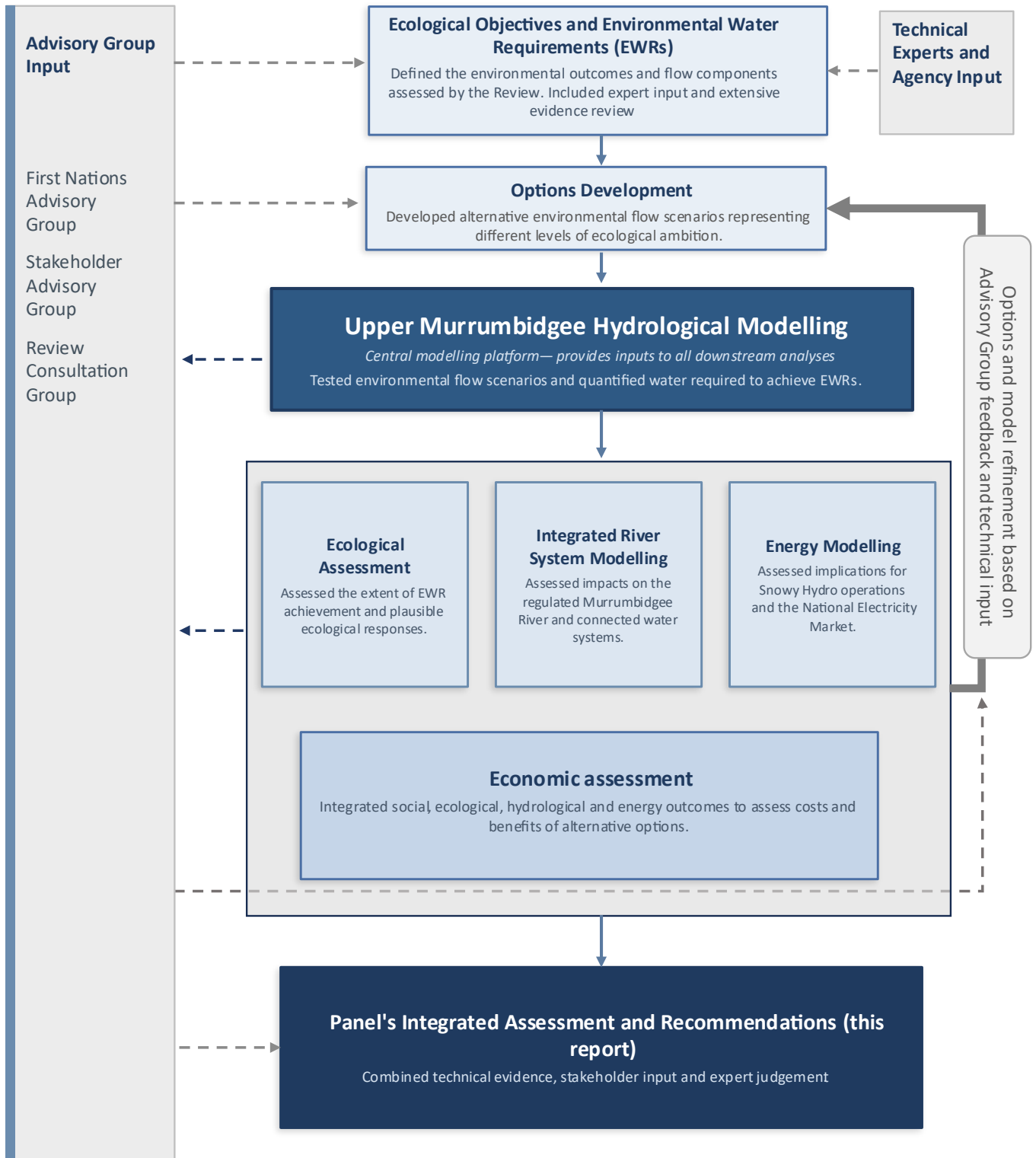
While the economic assessment drew together information from multiple workstreams, the Panel considered each technical assessment directly. The Panel's conclusions were informed by the full body of evidence rather than any single model or assessment framework.

The final stage of the process involved the Panel's integrated assessment, which combined technical evidence, stakeholder input and expert judgement to develop recommendations.

Further information is published on DCCEEW's website: [Technical Expert Group input into the Review of the Snowy Water Inquiry Outcomes Implementation Deed](#).

Throughout the Review, advisory group input regularly informed the technical program. The FNAG, SAG and RCG provided advice on ecological objectives, environmental water requirements, option design, modelling assumptions and interpretation of results including considerations about impacts (to the NEM, downstream water users etc). Technical experts and government agencies also provided specialist input throughout the process.

Figure 4: SWIOID Review Technical Modelling Process



- > Assessment streams inform the Cost–Benefit Analysis and are each considered directly in the Panel's assessment.
- -> Advisory Group input informs key stages of the Review.
- ← - - - Outcomes from technical assessments inform Advisory Group input
- > Technical assessment and Advisory Group input inform refinement of options development over 3 iterative rounds of hydrological modelling

## Development of ecological objectives and Environmental Water Requirements

The development of ecological objectives and EWRs provided the starting point for the Review. This reflected the focus of the Review on the declining ecological condition of the Upper Murrumbidgee and the need to design a flow regime that would protect and enhance river health.

### *Ecological objectives and evidence review*

A structured process involving ecological experts, government agencies and advisory groups was undertaken to understand the current condition of the Upper Murrumbidgee and identify key ecological values, flow-dependent processes and environmental outcomes that should guide the Review. This process was supported by an evidence review that drew together existing information on river condition, hydrology, ecology and flow-ecology relationships. A summary of the evidence review is published on DCCEEW's website: [Technical Expert Group input into the Review of the Snowy Water Inquiry Outcomes Implementation Deed](#).

The primary ecological objectives for assessing the environmental flow options were:

- improved and resilient Macquarie Perch population
- improved and resilient Murray Cod population
- improved and resilient macroinvertebrate populations
- improved and resilient in-stream vegetation
- improved and resilient riparian and pocket wetland vegetation
- flow components align with aspects of the natural regime
- flow regime that mobilises sediment
- maintain water quality sufficient to protect and restore ecosystems and ecosystem functions.

Macquarie Perch was used as a key indicator species for the quantitative assessment because, as a flow-dependent threatened native fish with well understood life history requirements, its population response provides a sensitive and integrative measure of how changes in flow regime, connectivity, habitat condition and water quality affect river health in the Upper Murrumbidgee. Additionally, as the Macquarie Perch populations are well studied in the Upper Murrumbidgee improvements resulting from increased flows and improved flow patterns can be attributable.

### *Environmental Water Requirements*

The ecological objectives were then translated into a set of EWRs using the best available scientific and technical evidence. The EWRs were informed by expert workshops, existing environmental flow studies, NSW and ACT environmental water planning frameworks, analysis of modelled natural and current flow conditions, and advice from NSW and ACT agencies. Together, these inputs were used to identify the flow components required to support ecological outcomes, including low flows, baseflows, freshes, bankfull flows and channel maintenance flows. For each of these flow components, their magnitude, timing, duration and frequency were specified on a reach-specific basis at three locations in the Upper Murrumbidgee River:

- downstream of Tantangara Dam, representing the upper reach

- Mittagang Crossing, representing the middle reach
- Lobbs Hole, representing the lower reach.

The EWRs provided the foundation for option development and assessment. They were used as a consistent framework for testing alternative environmental flow scenarios, assessing ecological performance and understanding the trade-offs associated with different levels of environmental improvement. They were not intended to represent a final environmental watering plan.

Further information on the EWRs, the evidence base for option development and the ecological assessment of the options is published on DCCEEW's website: [Technical Expert Group input into the Review of the Snowy Water Inquiry Outcomes Implementation Deed](#).

## Development, modelling and refinement of environmental flow options

Environmental flow options were developed through an iterative process that combined technical analysis, expert input and advisory group feedback over three rounds of modelling and refinement. The options were developed to investigate how different combinations of flow volume, delivery flexibility and infrastructure constraints influence ecological outcomes, operational feasibility and system-wide trade-offs.

These options represent alternative scenarios with step changes in the volumes of environmental water, different operating strategies, flow characteristics, release patterns and infrastructure upgrades or augmentation. These strategies and characteristics are the focus for considering the nature and scale of improved arrangements, rather than any single option being preferred as a final rule set that could be implemented without further refinement.

Chapter 4 describes each of the different options and the environmental performance of each.

### *Hydrological modelling – purpose and approach*

Hydrological modelling was used to simulate flow regimes in the Upper Murrumbidgee River, in the ACT Upper Murrumbidgee Source hydrological model, to assess the volume of water required to deliver different flow regimes and to determine the extent to which EWRs could be achieved under each option.

Each of the modelled flow options was then tested in the Murray–Darling Basin Authority's Framework for Integrated River Models (FIRM) to assess impacts to the regulated Murrumbidgee River system downstream of Burrinjuck and Blowering dams.

The modelling approach prioritised:

- use of Basin-accepted hydrologic models to ensure consistency with Basin Plan processes and acceptance across jurisdictions
- representation of existing operational rules and infrastructure, including Snowy Montane rivers Increased Flows (SMRIF) release practices, as the Base Case
- testing of alternative release strategies from Tantangara Dam that reflect contemporary environmental water management in the Upper Murrumbidgee River, including targeting specific EWRs rather than applying fixed release schedules

- assessment of downstream hydrologic, water availability and operational impacts, including in the Regulated Murrumbidgee (downstream of Blowering and Burrinjuck dams) through integrated modelling.

A contemporary ‘current conditions’ Base Case represented the Snowy Scheme operations and SMRIF release practices. In the Base Case, environmental releases from Tantangara Dam are represented as scaled annual schedules (wet / moderate / dry years), derived from historic patterns.

A key structural assumption in the modelling is that additional releases from Tantangara Dam are accounted as Required Annual Release (RAR) from the Snowy-Tumut development of the Snowy Scheme, effectively delivering a portion of the Snowy-Tumut RAR into the Regulated Murrumbidgee via the Upper Murrumbidgee. Under current conditions, the RAR is delivered into the Regulated Murrumbidgee through Jounama and Blowering dams. This approach simplifies the modelling but also means that trade-offs with downstream systems and energy generation are explicit and traceable.

### *Modelling iterations and options refinement*

Modelling of the environmental flow options was undertaken in three rounds, progressively refining options in response to advisory group feedback, to address emerging system behaviours (within the model), to test infrastructure constraints and different operating approaches to target EWRs. Early rounds were used to establish indicative relationships between release volumes and ecological outcomes—EWR achievement—while later rounds focused on increased flexibility, mitigating trade-offs, and near-term feasibility.

The process commenced with the ecological objectives and EWRs described above. These provided the foundation for developing alternative flow scenarios capable of delivering different levels of environmental improvement.

The initial purpose of option development was to test a range of ecological ambitions for the Upper Murrumbidgee River. Given the degraded condition of the river and uncertainty regarding the volume of water required to achieve different environmental outcomes, the Review did not begin with a preferred flow regime. Instead, the initial options were deliberately designed to represent different ecological trajectories, ranging from maintaining ecological persistence and reducing low flow stress through to restoring key ecological and geomorphic processes required for ecosystem recovery.

The first round focused on establishing indicative relationships between environmental water volumes, EWR achievement and ecological outcomes, without operational flexibility—that is, assuming an environmental release pattern would be “fixed” before the start of each water year, consistent with current arrangements. The modelling tested options representing different levels of ecological ambition, providing an initial understanding of the scale of change required to move from ecological persistence toward recovery.

The second round refined the options in response to technical advice and feedback from advisory groups. This included the introduction of seasonal variable baseflows, delivery flexibility, cultural water allocations (6 GL/year added to all subsequent options) and higher-magnitude flow

components, including channel maintenance flows to mobilise sediment and restore geomorphic processes.

The results of the second round were presented to advisory groups and technical experts. Feedback highlighted opportunities to further improve ecological outcomes and better reflect contemporary environmental water management principles.

The third round responded to this feedback through the development of an additional scenario, which involved a more climate-responsive approach to environmental water delivery and greater emphasis on improving environmental outcomes in the reach immediately downstream of Tantangara Dam.

This iterative process was underpinned by a feedback loop that involved technical analysis and advisory group input. Outcomes from modelling and technical assessments were presented to back to advisory groups to support deliberations. The technical assessments and advice from advisory groups informed subsequent option refinement and further modelling. The final options assessed by the Panel therefore represent the outcome of multiple cycles of technical testing, expert review and stakeholder deliberation rather than a single modelling exercise.

The Panel considers this iterative approach to be a significant strength of the Review. It enabled alternative environmental flow scenarios to be progressively refined in response to emerging evidence, identified trade-offs and stakeholder feedback, while providing a clearer understanding of the environmental outcomes associated with different levels of ecological ambition. Each environmental flow scenario is not defined in terms of a fixed annual water volume released, but rather a different level, frequency and spatial extent of various flow components aligned with the EWRs (ranging from low flows, baseflows and freshes, up to larger bankfull flows and channel maintenance flows). The freshes, bankfull flows and channel maintenance flows are each adapted to natural flow events and hence vary year to year. Some flows may not occur in dry years.

## Energy modelling

The Review took the alternative environmental flow scenarios and examined how they would impact the critical role of Snowy Hydro's role in the NEM and consequently electricity customers. This analysis considered the operational and system-level impacts of each environmental flow option relative to a base case (current conditions) option without change to Snowy Hydro's water releases.

The Base Case was developed by Frontier Economics in their Energy42 model and is primarily based on the Step Change Scenario in AEMO's Integrated System Plan (ISP). Most inputs in the model were derived from AEMO's "2025-26 Inputs, Assumptions and Scenarios" for the ISP but using a newly developed model of the Snowy Scheme inclusive of Snowy 2.0 from 2028, which was developed in consultation with Snowy Hydro. The model optimises investment in generation and storage across the NEM to reliably meet customer demand and optimises the half-hourly dispatch of that plant in the NEM until 2054.

Having established the Base Case, the model was then run with the environmental water releases by Snowy Hydro being the only change under each option and the corresponding adjustment to RAR at Blowering Dam. The dispatch in each run was based on the marginal operating cost of all renewable generators and historical costs of legacy coal and gas-fired generation. Hydrogeneration,

pumped hydro storage and battery storage were dispatched based on shadow prices. The cost differences between each option and the Base Case represent the underlying resource cost of the additional environmental water releases in that option.

The outputs from the Base Case and each option were examined to highlight differences in investment across the NEM, changes in dispatch patterns and the implications for energy market outcomes. It is important to note that the additional releases to the Upper Murrumbidgee are offset by reduced releases from Blowering Dam to the Tumut River. The different options therefore leave the same quantity of water within the Scheme although the Scheme holds less stored energy with that water in lower elevation reservoirs.

The cost-benefit analysis is based on the incremental resource cost of each option, but the costs borne by Snowy Hydro are important to understand. The operation of the Snowy Scheme within the model needs to reflect feasible operation within the Scheme's limitations, to ensure the model reflects impacts on the NEM and indicates the potential financial outcomes on Snowy Hydro. The Scheme operation is more complex within the model and, given the period of interest, incorporates Snowy 2.0 which will allow pumping and storage in Tantangara Dam and in Lake Eucumbene.

The model outputs and detailed data from the model have been analysed to understand the impacts of the additional environmental water releases from the Scheme on the NEM and Snowy Hydro. The most efficient outcome for the NEM and profit maximising behaviour for Snowy Hydro is to forego the generation lost from the additional environmental releases at times where the NEM spot price is low. This will also ensure minimal or no impact on reliability of supply and importantly, maintain the ability of Snowy Hydro to support trading in financial risk management instruments. The model aims to deliver that outcome through shadow bidding of its output, but this is constrained in several ways. Scrutiny of the market model and further off-market analysis has therefore focused on the way the Snowy Hydro manages, within the broader NEM portfolio of generation, storage and interconnection, through extreme events including extended winter periods of high demand and low renewable generation.

Further information is published on DCCEEW's website: [Technical Expert Group input into the Review of the Snowy Water Inquiry Outcomes Implementation Deed](#).

## Cost-Benefit Analysis

A cost-benefit analysis (CBA) was undertaken to assess the trade-offs between environmental, social and economic outcomes, including energy system impacts, to inform decision making. The analysis includes broad consideration of costs and benefits and incorporates the results of hydrological and energy modelling to quantify the economic implications of each flow option. All costs and benefits are the incremental cost between each option and the Base Case.

The largest cost items are the incremental cost of replacing foregone energy generation, in both capital and operating expenditure and the cost of increasing the outlet capacity of Tantangara Dam in Options 3 and 4. Several lesser costs have been valued and included in the analysis.

The benefits are more widespread and required an evaluation of broader environmental and socio-economic outcomes including:

- improved environmental outcomes including support for endangered, vulnerable or near threatened species/communities
- improved cultural outcomes
- improved water security for downstream communities
- improved water quality.

Where possible these benefits have been quantified and included in the CBA. Where that was not possible, a qualitative assessment is made of the additional costs and benefits, including materiality and expected magnitude. A sensitivity analysis was also undertaken to test the robustness of the CBA to some of the key parameters and assumptions used in the assessment.

Distributional impacts have also been considered. Most importantly, the costs are primarily borne by Snowy Hydro, an Australian Government-owned Government Business Enterprise. The impacts on Snowy Hydro's business have been assessed including the cost of foregone energy generation, loss of spot market revenue, and any additional pumping costs driven by the increased environmental water releases. The business's ability to provide the most critical and valuable services to the NEM have also been identified.

Further information is published on DCCEEW's website: [Technical Expert Group input into the Review of the Snowy Water Inquiry Outcomes Implementation Deed](#).

### 3. Original Deed Effectiveness

This chapter assesses the effectiveness of the Deed in accordance with section 11(a) of the Terms of Reference. It examines the extent to which the Deed has achieved its original objectives since its commencement in 2002, with a particular focus on the delivery of increased environmental flows to the Snowy River and Snowy Montane Rivers. This chapter also considers how the Deed operates in practice through its implementation and governance arrangements, recognising that effectiveness is shaped not only by the design of the Deed itself, but by the institutional and regulatory framework through which it is applied.

The assessment draws on input from the intergovernmental Review Consultation Group, the Stakeholder Advisory Group and the First Nations Advisory Group, as well as stakeholder submissions, targeted engagement and relevant literature.

Overall, the Panel finds that the Deed has been only partially effective in achieving the intent agreed by the Deed parties and is no longer fit-for-purpose. Although some minor increases in environmental flows were achieved progress has been uneven and, in several key respects, insufficient to meet contemporary expectations for environmental water management or deliver sustained ecological improvement.

The Panel considers that these limitations reflect a fundamental design issue. The Deed operates predominantly as an output-focused framework, emphasising the delivery of prescribed water volumes, rather than an outcomes-focused framework that defines, measures and adapts to the environmental results those flows are intended to achieve.

Consistent with the analysis in this chapter, limitations in effectiveness are attributable to a combination of interrelated factors, including:

- absence of precision of objectives and limitations on formal intergovernmental coordination, including limited mechanisms to update objectives over time and restricted formal participation
- the absence of clear and transparent frameworks for decision-making and trade-off management, resulting in implicit balancing of competing environmental, water and energy objectives
- operational arrangements that prioritise predefined rules over adaptive management, constraining the effectiveness of environmental flow delivery
- regulatory and compliance frameworks focused on delivery of outputs rather than achievement of measurable, system-level environmental outcomes
- monitoring, reporting and audit arrangements that are primarily compliance-focused, with limited evaluation of ecological outcomes or independent system-level oversight
- a lack of structured mechanisms for system review and adaptation, including the absence of a mandatory review cycle for the Deed
- absence of a dispute resolution mechanism and a compensation arrangement that likely disincentivise changes to operational settings and constrain flexibility.

## 3.1 Current Deed Arrangements

The Deed is an intergovernmental arrangement established in 2002 between the Australian, NSW and Victorian governments. The Deed gives effect to the outcomes of the 1998 Snowy Water Inquiry following the corporatisation of Snowy Hydro.

The Deed sets the overarching policy framework for the management of Snowy water resources including commitments to environmental water recovery while recognising the ongoing role of the Scheme in electricity generation and downstream water supply.

The Deed operates as a high-level agreement between governments. It sets policy intent and agreed outcomes but does not itself provide direct mechanisms for implementation, ensuring compliance, review, dispute resolution or adaptation.

Implementation of the Deed is primarily delivered through subordinate instruments, most notably the Snowy Water Licence issued under NSW legislation.

### Current implementation of the Deed

The Snowy Water Licence is the key instrument through which the Deed is implemented. It defines Snowy Hydro's rights and obligations to collect, divert, store and release water, and establishes the rules for environmental flow releases. The licence is subject to mandatory review, initially after five years and then at intervals of ten years.

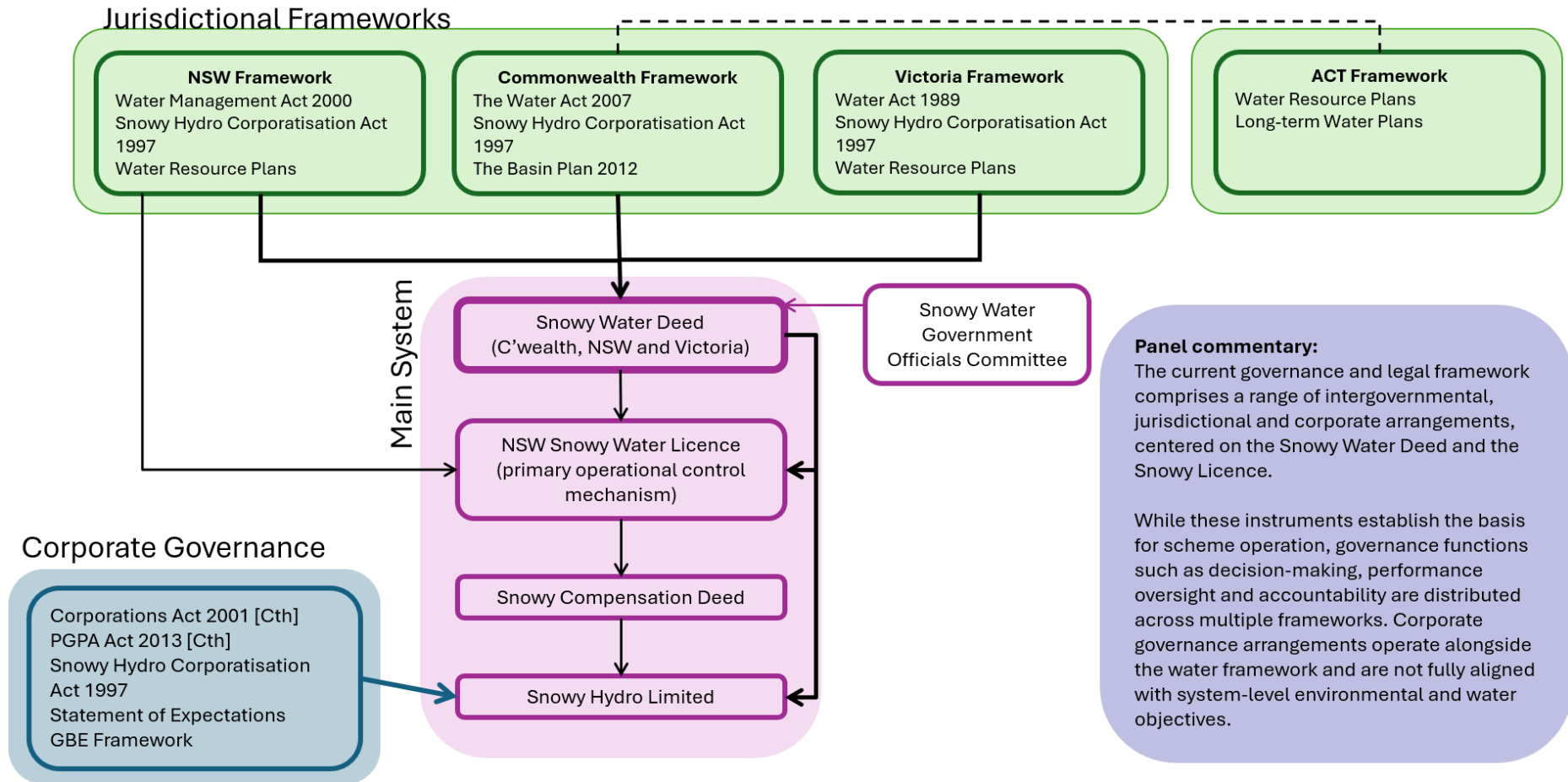
The Snowy Water Licence is issued by the NSW Water Administration Ministerial Corporation (WAMC), with administrative and operational functions delegated to the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW).

The current committee structure illustrates the distributed and function-specific nature of governance under existing arrangements. It comprises a range of bodies with responsibilities for policy oversight, coordination, compliance and advisory input, including the WAMC, Snowy Water Government Officials Committee (SWGOC), Water Consultation and Liaison Committee (WCLC) and the Snowy Advisory Committee (SAC). These arrangements provide multiple points of input and oversight but are distributed across functions, with responsibilities for coordination, decision-making and advisory input not always clearly integrated at a system level.

As shown in **Figure 5**, these arrangements operate across multiple levels and institutions, with responsibilities for decision-making, delivery, performance oversight and compliance distributed across the system. While these components collectively support scheme operation, they are not integrated through a single, coherent governance framework.

The current governance and legal framework for the Snowy Scheme system comprises intergovernmental, jurisdictional and corporate arrangements. These include the Deed, the Snowy Water Licence, relevant Commonwealth and state legislation and associated planning frameworks.

Figure 5: Current Governance and Legal Framework - For Draft Purposes Only\*



\*This diagram is provided for draft purposes only and remains subject to further review and amendment prior to finalisation.

## Snowy Hydro

Snowy Hydro is an Australian Government-owned corporation established under the *Snowy Hydro Corporatisation Act 1997 (Cth)* and companion legislation, the *Snowy Hydro Corporatisation Act 1997 (NSW)* and the *Snowy corporatisation Act (Vic) 1997* and is responsible for operating the Snowy Scheme. The key operational and advisory bodies are the WCLC which coordinates water interests balancing downstream agricultural/environmental needs with the electricity market demands of Snowy Hydro, and the SAC which provides formal recommendations to the NSW Government on the timing and volume of environmental water releases into the Snowy and montane rivers.

Snowy Hydro operates within:

- the policy framework established by the Deed
- the legal obligations set out in the Snowy Water Licence
- broader corporate frameworks, including the *Corporations Act 2001 (Cth)*, *Public Governance, Performance and Accountability Act 2013 (Cth)*, the Statement of Expectations issued by the Commonwealth Shareholder Ministers, Government Business Enterprise guidelines, ASX Corporate Governance Principles<sup>8</sup>
- energy market frameworks, including participation in the National Electricity Market
- the Annual water operating Plan approved by the WAMC, which includes planned and trigger flexible flows.

Snowy Hydro plays a role in operational decision-making, including the timing and delivery of water releases in consultation with NSW DCCEE and the Snowy Advisory Committee.

As a government-owned corporation, Snowy Hydro operates within the broader Australian Government corporate governance frameworks noted above. These frameworks establish obligations relating to financial performance, accountability and stewardship of public assets.

The Statement of Expectations (SoE) issued by the Shareholder Ministers to Snowy Hydro provides high level guidance on the Government's priorities and expectations for the company's performance. The most recent SoE was issued in 2024, emphasising energy generation, financial returns and broader energy system contributions.<sup>9</sup>

The SoE also states that “in achieving its primary policy objectives, Snowy Hydro is expected to continue to ...recognise environmental, social and sustainability responsibilities, including the health of the broader river system and downstream water needs, pursuing good outcomes for all water users, within its regulatory and policy frameworks, while delivering on its commercial objectives and balancing the needs of the NEM”...and “comply with all relevant water obligations, including the Snowy Water Licence and the *Water Act 2007 [Cth]*”.<sup>10</sup>

Snowy Hydro operates within the NEM and is subject to the *National Electricity Law* and *National Electricity Rules*. These frameworks govern participation in electricity markets, including dispatch,

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<sup>8</sup> Department of Finance, 'Snowy Hydro Limited,' <https://www.finance.gov.au/government/government-business-enterprises/snowy-hydro-limited> and Snowy Hydro (2025), Annual Report for the Financial Year ended 30 June 2025.

<sup>9</sup> Australian Government (2024), Snowy Hydro Limited Statement of Expectations.

<sup>10</sup> Australian Government (2024), Snowy Hydro Limited Statement of Expectations: 2.

pricing and system reliability requirements, and create strong operational and commercial incentives linked to energy system performance.

## Current Deed objectives

High level environmental objectives are specified for environmental flow releases under the existing Deed framework. However, in practice the Deed operates predominantly as an output-based rather than outcomes-based framework. The stated objectives are relatively narrow in scope and exert limited influence on implementation, which is largely driven by the delivery of fixed water volumes rather than the achievement of measurable ecological outcomes.

Under the current Deed, the objectives for Snowy Montane Rivers Increased Flows (SMRIF), delivered to the Upper Murrumbidgee River through the Snowy Water Licence, are prioritised as follows:

- protection of endangered or threatened species
- maintenance of natural habitats
- maintenance of wilderness and national park values.<sup>11</sup>

In the 2025-26 water year, 19,800 megalitres (ML) was allocated to the Upper Murrumbidgee River for environmental releases.<sup>12</sup> This volume represents foregone electricity generation of approximately 36.86 gigawatt hours (GWh)<sup>13</sup>

The environmental release target is 27,000ML equivalent to approximately 9% of mean annual natural flow.

For the Snowy River Increased Flows (SRIF), the stated objective is to improve habitat for a diverse range of plant and animal species through:

- improving river water temperature regimes
- achieving channel maintenance and flushing flows
- restoring longitudinal connectivity for migratory species
- improving triggers for fish spawning
- enhancing the aesthetics of degraded riverine environments.<sup>14</sup>

In the 2025-26 water year, 176,860 ML of environmental water was available for the Snowy River to contribute toward these objectives, compared with a target of an average of 212,000 ML.<sup>15</sup>

While the Panel views that a target *average* of 212,000 ML is not in dispute (and has not been met), the Deed in section 7 uses the term ‘Target’ many times, including ‘target levels’, ‘target volume’ and

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<sup>11</sup> Snowy Water Inquiry Outcomes Implementation Deed (Deed), Annexure 2, Part 2.1.

<sup>12</sup> NSW DCCEEW (2025), Annual environmental water priorities in the Snowy and Snowy montane catchment 2025-26,’ [www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26](http://www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26).

<sup>13</sup> NSW DCCEEW (2025), Annual environmental water priorities in the Snowy and Snowy montane catchment 2025-26,’ [www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26](http://www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26).

<sup>14</sup> Deed, Annexure 1, Part 1.

<sup>15</sup> NSW DCCEEW (2025), Annual environmental water priorities in the Snowy and Snowy montane catchment 2025-26,’ [www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26](http://www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26).

'target annual'. Use of the term target is imprecise; hence a lesser amount could be deemed as meeting Deed requirements.

## Planning and delivery

Environmental water releases from the Snowy Scheme are governed by the Deed and the Snowy Water Licence.

The WAMC is the legal decision-making entity responsible for water resource management functions under the NSW *Water Management Act 2000*, including issuing and administering the Snowy Water Licence under Part 5 of the *Snowy Hydro Corporatisation Act 1997*. Statutory functions are delegated to NSW DCCEEW Water.

The Annual Water Operating Plan (AWOP), approved by WAMC, outlines how Snowy Hydro delivers its water release obligations under the Licence and Deed, and reports on delivery in the previous year.

The Snowy Advisory Committee (SAC), established under the *Snowy Hydro Corporatisation Act 1997* (NSW), provides advice to WAMC. The SAC is appointed by the NSW Environment Minister and includes representatives of community, environmental, Aboriginal and government interests. Observers include ACT Government, Victorian Government (EWH), Snowy Hydro Limited and relevant NSW agencies.

The Water Consultation and Liaison Committee (WCLC), established under the Deed, provides advice to WAMC on the AWOP. Membership includes NSW DCCEEW, Australian Government representatives, Victoria, South Australia (observer), MDBA and Snowy Hydro.

The Safety Technical Advisory Committee provides advice on operational risks and safety of releases, drawing on expertise from government agencies, emergency services, local government and other stakeholders.

Delivery of both SMRIF and SRIF is managed by the NSW DCCEEW in particular the Conservation Programs, Heritage and Regulation (CPHR) group, in consultation with the SAC.<sup>16</sup> Environmental flow releases are planned up to 15 months in advance, with timing and volume formalised through Snowy Hydro's AWOP. **Figure 6** provides an indicative overview of roles and responsibilities for planning and management of environmental releases. **Figure 7** provides an indicative overview of annual planning and delivery process for environmental releases (SRIF and SMRIF).

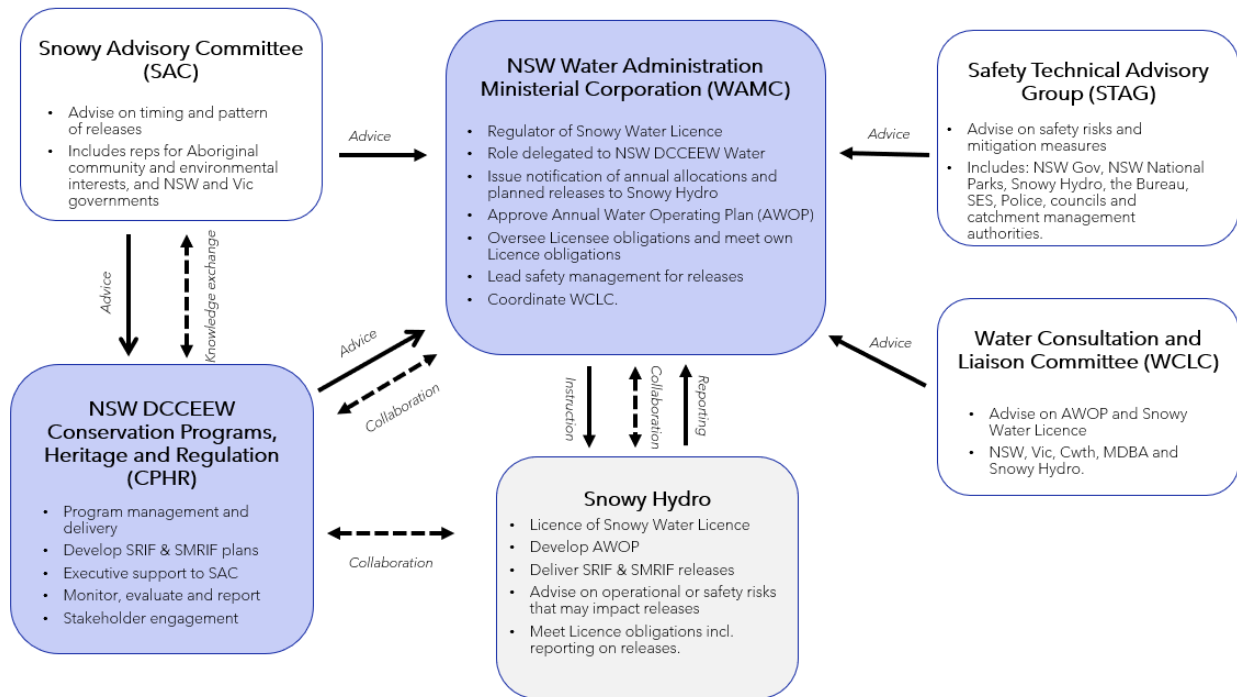
For 2025–26, priorities focus on supporting native fish breeding and movement, maintaining aquatic vegetation and habitats, and improving overall river health. This includes strategically timed flow events designed to restore natural river processes, improve channel condition, and sustain water-dependent ecosystems as much as possible.<sup>17</sup>

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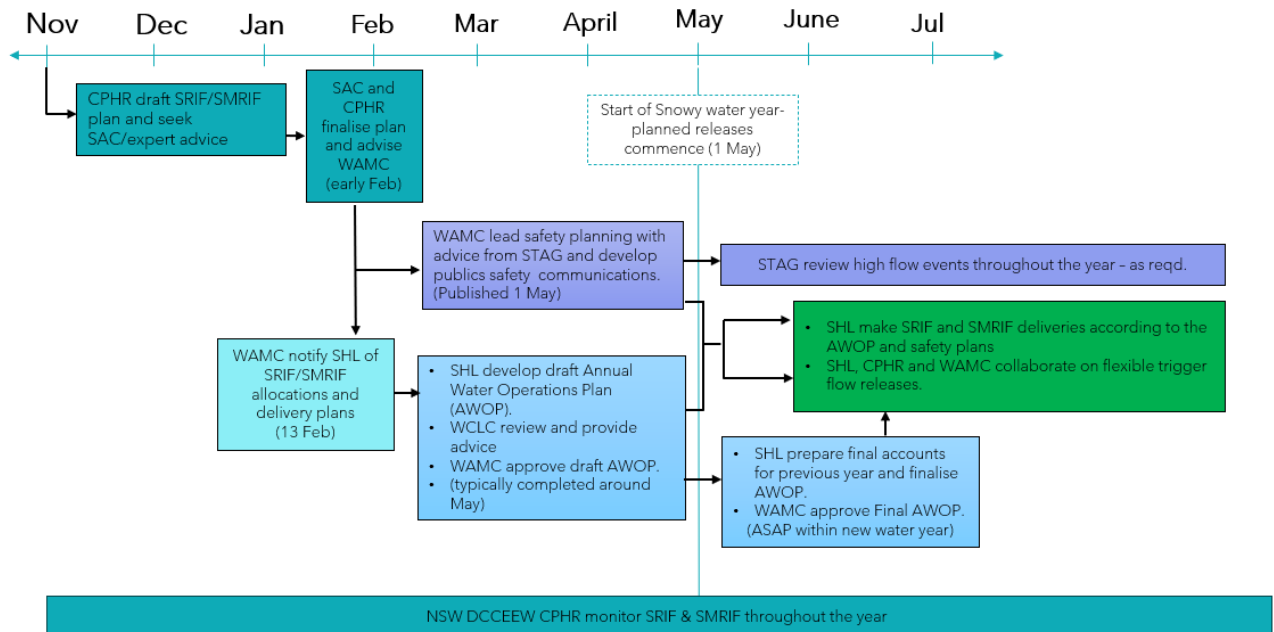
<sup>16</sup> NSW DCCEEW (2025), Annual environmental water priorities in the Snowy and Snowy montane catchment 2025-26,' [www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26](http://www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26).

<sup>17</sup> NSW DCCEEW (2025), Annual environmental water priorities in the Snowy and Snowy montane catchment 2025-26,' [www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26](http://www.environment.nsw.gov.au/topics/water/water-for-the-environment/catchments/snowy-and-montane/snowy-and-montane-rivers-environmental-water-priorities-2025-26).

**Figure 6: Indicative Overview of Roles and Responsibilities for Planning and Management of Environmental Releases. Source: NSW DCCEEW.**



**Figure 7: Indicative Overview of Annual Planning and Delivery Process for Environmental Releases (SRIF and SMRIF). Source: NSW DCCEEW.**



## 3.2 What we heard

Stakeholder and advisory inputs reflect a clear case for governance reform, particularly in relation to accountability, coordination and inclusion. It also highlights important constraints and trade-offs, emphasising that the design of any revised governance framework will need to balance ambition for reform with practicality, system complexity and the need for institutional stability.

### Public Submissions

Stakeholder submissions received through a public ‘Have Your Say’ on the Panel’s Issues Consultation Report raised consistent concerns regarding the effectiveness, transparency and adaptability of the current governance framework, as well as differing perspectives on appropriate reform.

#### *Governance effectiveness and fit-for-purpose*

Many stakeholders questioned whether the Deed remains fit-for-purpose and able to support contemporary water management.

*“The current framework of the Deed is not effective... it has failed to keep pace with... contemporary governance standards.”*

— Australian River Restoration Centre (Submission 129)

Some submissions identified more fundamental structural issues in the current arrangements:

*“The Deed is failing both the [Snowy and Upper Murrumbidgee] river systems through the same structural deficiencies - inadequate water volumes, lack of transparency and enforceability ... and absence of scheduled review mechanisms.”*

— East Gippsland Conservation Management Network (Submission 124)

Some stakeholders emphasised the importance of clearly defining how trade-offs will be managed in a renewed agreement:

*“The Deed is primarily an enabling agreement...the renewed Deed should also articulate how and where the parties have collectively agreed to address the tension and trade-offs between competing interests.”*

— Coleambally Irrigation Co-operative Ltd (Submission 59)

Others emphasised the need for more comprehensive reform of governance arrangements:

*“Deliver best practice governance, [and] revise the entire Deed... include the ACT Government... mandate periodic review...apply standard, volumetric environmental release targets for the Murrumbidgee and montane rivers...require the water user (Snowy Hydro) to pay...improve governance of the Snowy Water Licence...reconsider the current exemption of the Deed and Snowy Water Licence from the provisions under the Commonwealth Water Act...[and] consider expanding the role of the Inspector General of Water Compliance to cover montane rivers.”*

— Prof Jamie Pittock & Ms Anna McGuire (Submission 130)

However, some also cautioned against expanding the scope of the Deed:

*“The Deed is not the appropriate mechanism to underwrite critical human needs which are the responsibility of State and Territory governments and are covered in part in the Murray Darling Basin Plan which is also currently being reviewed.”*

— Ricegrowers’ Association of Australia (Submission 144)

### *Transparency and accountability*

A number of stakeholders highlighted concerns regarding transparency in decision-making and the need for clearer accountability mechanisms:

*“[The Council recommends that new arrangements] require regular, transparent public reporting of release decisions, trade-off processes, and environmental outcomes.”*

— Snowy Monaro Regional Council (Submission 150)

*“The Deed itself lacks transparency, and the lack of transparency continues through operational decisions.”*

— Senator David Pocock (Submission 121)

Concerns were also raised regarding the integrity of the data and assumptions underpinning the framework:

*“It is becoming apparent that none of the figures on which the Deed is based have been correctly applied.”*

— Snowy River Alliance (Submission 148)

### *Adaptive management and flexibility*

Stakeholders emphasised the need for more adaptive and responsive governance arrangements:

*“Improving the health of the upper Murrumbidgee River... cannot be achieved with a ‘set and forget’ management approach.”*

— ACT Review Consultation Group members (Submission 140)

Some submissions noted that changes to operational arrangements may be constrained by broader system considerations, including infrastructure and reliability requirements.

*“...physical attributes [of the Tantangara Dam outlet] currently do not allow for the maximum utilisation of water available to the upper Murrumbidgee and limit the opportunity for adaptive management.”*

— Snowy Hydro (Submission 127)

### *Coordination, inclusion and participation*

Submissions highlighted limitations in current arrangements in reflecting the full range of affected jurisdictions and stakeholders:

*“The ACT Government, surrounding council areas and Traditional Custodian groups... currently has no say in Deed management, even though the Upper Murrumbidgee... is a critical source of water for social, cultural, ecological and economic outcomes.”*

— ACT & Region Catchment Management Coordination Group (Submission 126)

There were also strong calls for more meaningful community and stakeholder participation in governance processes:

*“Governance must include affected landowners, farmers, rural communities...with a real decision making voice ... not token consultation.”*

— Save Our Surroundings Riverina (Submission 131)

### *First Nations participation in governance*

Stakeholders emphasised the importance of embedding First Nations perspectives and decision-making within governance arrangements.

*“First Nations people are excluded from governance arrangements under the Deed, and cultural values of the river are not embedded in water management objectives or decision making...current arrangements do not align with national commitments under Closing the Gap framework”*

— Jimmy Hooper (Submission 54)

### *Managing trade-offs and system priorities*

Submissions highlighted the need for clearer and more transparent frameworks to manage trade-offs between competing objectives, including environmental, energy and water use priorities:

*“The Deed should articulate how Snowy Hydro’s energy functions is to be balanced with its environmental, social and cultural obligations.”*

— Australian River Restoration Centre (Submission 129)

Some stakeholders also emphasised that these trade-offs must be managed in a way that maintains reliability for existing users and supports broader system outcomes:

*“Changes to operational arrangements... must not reduce entitlement reliability or shift risk onto licence holders.”*

— National Farmers’ Federation (Submission 137)

### *Regulatory clarity and alignment*

Stakeholders identified the importance of aligning the Deed with contemporary national water policy frameworks and governance systems:

*“The Deed needs to be consistent with... the Commonwealth Water Act, the National Water Initiative and the Murray Darling Basin Plan and ongoing reforms. These reforms have ensured that best-practice, adaptive management is applied to our rivers and waterways.”*

— Bush Heritage Australia and Upper Murrumbidgee Demonstration Reach (Submission 138)

## **Advisory Groups**

### *First Nations Advisory Group*

The FNAG provided detailed guidance on governance reform concluding that the current arrangements are structurally insufficient, and that incremental improvements to consultation would not address underlying issues. Instead, the FNAG called for a shift from advisory participation to custodianship-based governance.

*“We are not asking to be consulted about how someone else manages our Country. We are asking to be the ones who manage it — with... support, with resources, with our authority recognised.”<sup>18</sup>*

Central to this perspective is the distinction between advisory roles and custodial authority, with current arrangements positioned as the former.

The FNAG emphasised the need for formal governance institutions to support this shift, including an interim First Nations Custodianship Council and a pathway to a legislated Custodianship Authority, alongside stronger accountability mechanisms such as regular review cycles and reporting frameworks.

*“What is required is a framework that treats the Deed as a living obligation... continuously held to account.”<sup>19</sup>*

The FNAG also proposes reframing governance objectives to recognise the river as a living entity, with First Nations communities acting as its primary voice.

*“The Murrumbidgee River is not a resource. It is not infrastructure. It is not a line on a water sharing plan. It is a living presence — one with its own continuity, its own needs, and its own place in the web of obligations that connects communities to Country across generations.”<sup>20</sup>*

### **Stakeholder Advisory Group**

The SAG report identified clear concerns that the Deed needs to establish contemporary governance and a regulatory framework that better aligns the Upper Murrumbidgee River with broader Basin Plan reforms, with members noting “the 2002 Deed has not been reviewed since its establishment, despite major shifts in water policy, environmental water science, and stakeholder engagement expectations”.<sup>21</sup>

Strengthening what works and reforming what does not was a key theme in the SAG’s advice, with members encouraging the Panel to consider building on existing agencies and governance, to clarify and look to build on the roles of existing groups, introduce new governance if there are gaps, to recognise the unique role of Snowy Hydro, elevate First Nations into decision making space, and apply reforms to all Snowy and Montane Rivers.<sup>22</sup>

At the same time, the SAG emphasised that governance reform must be supported by enabling conditions, including long-term funding, coordination and integrated catchment management, and noted that views in the group were not uniform, with some members raising concerns about implementation risks, modelling gaps, and impacts on existing water users.

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<sup>18</sup> First Nations Advisory Group (April 2026), From Advisory to Custodianship – Cultural Recommendations to the Independent Review Panel: 4.

<sup>19</sup> First Nations Advisory Group (April 2026), From Advisory to Custodianship – Cultural Recommendations to the Independent Review Panel: 36.

<sup>20</sup> First Nations Advisory Group (April 2026), From Advisory to Custodianship – Cultural Recommendations to the Independent Review Panel: 10.

<sup>21</sup> Stakeholder Advisory Group (May 2026), Restoring the Upper Murrumbidgee, Improving Flows, Balancing Interests - Initial Report from the Stakeholder Advisory Group to the Independent Review Panel: 14.

<sup>22</sup> Stakeholder Advisory Group (May 2026), Restoring the Upper Murrumbidgee, Improving Flows, Balancing Interests - Initial Report from the Stakeholder Advisory Group to the Independent Review Panel: 44-45.

## *Intergovernmental Review Consultation Group*

The Review Consultation Group (RCG) discussions indicated that the Deed has been only partially effective in achieving its original intent, with environmental flow targets not achieved in wetter years and governance arrangements constraining delivery and reform.<sup>23</sup>

The RCG report notes that “the Deed and Licence have failed to provide a framework and point of authority to resolve drafting errors or differences in interpretation, such as the intent of delivering 212 GL as an average annual flow target for SRIF”.<sup>24</sup> Structural governance issues were a key concern, including that the Deed “lacks an effective dispute resolution mechanism or clear authority to resolve such interpretation issues [such as the intent behind agreed objectives]”,<sup>25</sup> and that compensation arrangements create “a structural disincentive to pursue changes... even where these align with the original intent”.<sup>26</sup>

The RCG characterised the framework as rigid and outdated, with the Deed and Licence having “generally remained static since its establishment”,<sup>27</sup> and no longer aligning with modern approaches, particularly in relation to adaptive environmental management and regulatory flexibility.

There was broad recognition of the need to modernise governance, with support for a contemporary governance and regulatory framework, guided by principles that emphasise “a clear division of roles, where governments setting strategic direction and review cycles, and regulators empowered to act independently and proportionately within agreed frameworks, without triggering compensation”.<sup>28</sup>

## **3.3 Effectiveness of increased flows against original targets**

A key limitation of the Deed is its reliance on an implicit assumption that increased flow volumes alone (outputs) will translate into improved ecological condition (outcomes). In the absence of clearly defined, measurable environmental outcomes, it has not been possible to assess this assumption. While environmental flow releases in both the Snowy Montane Rivers and the Snowy River have seen marginal increases compared to pre-Deed arrangements,<sup>29</sup> these have not translated into the environmental outcomes originally envisaged under the Deed framework.

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<sup>23</sup> Intergovernmental Review Consultation Group (May 2026), Snowy Water Inquiry Outcomes Implementation Deed: Review Consultation Group Discussion Summary: 2.

<sup>24</sup> Intergovernmental Review Consultation Group (May 2026), Snowy Water Inquiry Outcomes Implementation Deed: Review Consultation Group Discussion Summary: 6.

<sup>25</sup> Intergovernmental Review Consultation Group (May 2026), Snowy Water Inquiry Outcomes Implementation Deed: Review Consultation Group Discussion Summary: 6.

<sup>26</sup> Intergovernmental Review Consultation Group (May 2026), Snowy Water Inquiry Outcomes Implementation Deed: Review Consultation Group Discussion Summary: 6.

<sup>27</sup> Intergovernmental Review Consultation Group (May 2026), Snowy Water Inquiry Outcomes Implementation Deed: Review Consultation Group Discussion Summary: 7.

<sup>28</sup> Intergovernmental Review Consultation Group (May 2026), Snowy Water Inquiry Outcomes Implementation Deed: Review Consultation Group Discussion Summary: 20.

<sup>29</sup> Australian Government Department of Climate Change, Energy, the Environment and Water (2025), Snowy Water Inquiry Outcomes Implementation Deed Review Issues Analysis: 8-9.

## Snowy Montane Rivers Increased Flows

Although the intent of increasing average annual flows to the Snowy Montane Rivers, including the Upper Murrumbidgee River, has been achieved in aggregate, it has been assessed as only partially effective.

The scale of these increases has been limited. While the Deed specifies a target average of 27GL per year for the Upper Murrumbidgee, described as approximately 30% of annual natural evidence indicates this figure is overstated. According to McGuire and Pittock, based on a long-term average inflow to Tantangara Dam of approximately 290 GL, the target equates to around only 9% of annual average natural flow.<sup>30</sup>

In practice, delivery has been even lower, with an average annual release of approximately 21.2 GL between 2008 and 2025, representing around 79% of the volumetric target, and only 7-8% of long-term average natural flows.<sup>31</sup> This shows that SMRIF targets are frequently not met, despite operations generally complying with the constraints of the NSW Snowy Water Licence.

More fundamentally, the Deed's targets are insufficient to deliver substantial ecological benefits. The ACT 2024 five yearly reporting for the Basin Plan (Schedule 12 Matter 8, Matter 12 and Matter 18) highlights the declining condition of environmental assets in the Upper Murrumbidgee River, which is directly attributed to the operation of Tantangara Dam and environmental flows available under the Deed.<sup>32</sup> Despite a key objective in the Deed to protect endangered or threatened species, the Macquarie Perch population is increasingly at risk of extinction. This reflects the impacts of reduced flow variability in the Upper Murrumbidgee River, particularly the loss of larger flow pulses due to Tantangara Dam, which undermines habitat quality, connectivity and recruitment, all of which are critical to the species' survival.<sup>33</sup>

Further discussion on condition of the Upper Murrumbidgee River is at **Chapter 4**.

## Snowy River increased flows

The objective of increasing average annual flows to the Snowy River below Jindabyne Dam from approximately 1 to 21% of mean annual natural flows has been assessed as partially effective.

As with SMRIF, the introduction of SRIF constituted a significant policy change and has resulted in some increased environmental water delivery compared with historical diversion regimes.

However, achievement of the Deed's flow objectives remains contested. Governments and Snowy Hydro differ in their interpretation of whether SRIF targets should be assessed as long-term averages

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<sup>30</sup>McGuire, A and Pittock, J. (2025) Environmental flows in the upper Murrumbidgee River: evaluating flow delivery and governance to inform future environmental flow agreements. *Marine & Freshwater Research* 76: 5. <https://doi.org/10.1071/MF24286>.

<sup>31</sup>McGuire, A and Pittock, J. (2025) Environmental flows in the upper Murrumbidgee River: evaluating flow delivery and governance to inform future environmental flow agreements. *Marine & Freshwater Research* 76: 5. <https://doi.org/10.1071/MF24286>; subsequent data from Snowy Hydro public AWOPs.

<sup>32</sup> Australian Capital Territory (ACT) Government (2024), 5 Yearly Matter 18 Report [www.mdba.gov.au/sites/default/files/publications/matter-18-act-5-yearly-report-2024.pdf](http://www.mdba.gov.au/sites/default/files/publications/matter-18-act-5-yearly-report-2024.pdf).

<sup>33</sup> Australian Capital Territory (ACT) Government (2024), 5 Yearly Matter 18 Report: 42, [www.mdba.gov.au/sites/default/files/publications/matter-18-act-5-yearly-report-2024.pdf](http://www.mdba.gov.au/sites/default/files/publications/matter-18-act-5-yearly-report-2024.pdf).

or as maximum annual volumes.<sup>34</sup> In practice, releases have often fallen short of higher interpretations of the targets, and no agreed mechanism exists to resolve this dispute.

The magnitude, timing and variability of environmental SRIF releases have generally been insufficient to restore key ecological processes in the Snowy River. The magnitude of flows under current flow regimes is considered to be too low to drive substantial geomorphic change, with limited capacity to mobilise sediment or meaningfully alter channel structure at a broader scale.<sup>35</sup>

## 3.4 Governance constraints on achieving increased flow objectives

The current governance arrangements constrain the effective delivery of increased flow objectives, highlighting the need for a more adaptable and enabling framework. The Panel has assessed the existing governance system against three relevant benchmarks: the OECD Principles on Water Governance, the National Water Initiative (and the direction of an emerging National Water Agreement), and the principles and expectations reflected in the Murray–Darling Basin Plan. Comparative analyses are provided in **Appendix B**.

These benchmarks emphasise clear roles and responsibilities, separation of functions, transparent and accountable decision-making, adaptive management, and effective cross-jurisdictional coordination, each of which is critical to translating policy intent into on-ground outcomes.

Across all three benchmarks, the assessment demonstrates that the governance limitations of the current Deed are systemic and structural, rather than isolated or technical in nature. While the Deed was innovative at the time it was established, it reflects governance assumptions that pre-date contemporary expectations relating to basin-scale management, adaptive governance, transparency, accountability and inclusion.

### Consistent findings across benchmarks

The comparative analyses at **Appendix B** identify a consistent pattern of misalignment between the Deed and contemporary water governance principles. In particular, issues relate to:

#### *1. Objective setting and intergovernmental coordination*

The Deed establishes a framework for intergovernmental coordination and defines the broad objectives for Snowy water management, including specific environmental flow targets and downstream water considerations.

This function remains essential and provides a mechanism for collective stewardship across jurisdictions. Intergovernmental cooperation has supported the long-term delivery of agreed water recovery outcomes and remains a necessary feature of the system.

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<sup>34</sup> Intergovernmental Review Consultation Group (May 2026), Snowy Water Inquiry Outcomes Implementation Deed: Review Consultation Group Discussion Summary: 21.

<sup>35</sup> Morton, S., Green, D., & Williams, S. (2010). Hydrological changes attributed to environmental flow release to the Snowy River, 2002-2005.

However, the effectiveness of this function is limited by the structure of the Deed. Participation is restricted to the original signatories, and there are limited mechanisms to ensure that objectives are updated, interpreted or applied in response to changing environmental, hydrological or policy conditions. This constrains the system's ability to operate at an appropriate basin/catchment scale or reflect contemporary expectations of inclusion and adaptability.

While intergovernmental coordination exists, it does not fully reflect contemporary expectations for inclusive, adaptive and system-wide governance.

The current framework does not provide for formal recognition or inclusion of First Nations or the wider community in objective setting limiting the ability to incorporate cultural values and knowledge and societal values respectively in system-wide governance.

The Panel's recommended objectives for the new arrangement are at Chapter 5 – New Objectives and Governance.

## *2. Decision-making and trade-off management*

Decision-making within the current framework occurs on the advice of a range of committees, which have differing authorisation, with approval of the Annual Water Operations Plan (AWOP) being the responsibility of the WAMC.

While this provides some flexibility in practice, the system does not include a clearly defined or transparent mechanism for assessing and resolving trade-offs between environmental, energy and water supply objectives. Trade-offs are often implicit and managed through a combination of administrative processes and operational decisions rather than through structured, accountable decision-making frameworks.

In practice, more structured processes have begun to emerge at an operational level. For example, recent NSW protocols for flexible environmental flows set out defined steps for initiating and delivering releases, including monitoring trigger conditions, provision of ecological advice, safety checks and formal confirmation by decision-makers. However, these processes are primarily focused on implementation and do not establish explicit criteria or frameworks for balancing competing environmental, energy and water supply objectives.

As a result, it is difficult to consistently identify how decisions are made, how competing objectives are balanced, or where accountability for those decisions ultimately resides.

The absence of a clear mechanism for resolving trade-offs is inconsistent with best practice expectations for transparent and accountable decision-making.

Other than limited representation on the SAC, there are also no formal mechanisms to incorporate First Nations' perspectives or cultural priorities into trade-off decision-making processes.

## *3. Operational delivery*

Snowy Hydro has strong capability to operate infrastructure and deliver water in accordance with licence conditions, although would benefit from automation and telemetry for quicker response capability (for example on the Tantangara Dam outlet).

Operational arrangements are primarily based on pre-defined rules and planning processes, and do not support adaptive management consistent with contemporary water governance approaches. In practice, operational and commercial considerations intersect closely with environmental outcomes, limiting the ability to prioritise environmental objectives independently.

#### **4. Regulation and compliance**

Regulatory and compliance functions are delivered through established statutory frameworks, primarily under NSW legislation, including the *Snowy Hydro Corporatisation Act 1997* and the *Water Management Act 2000*.

These frameworks provide mechanisms for monitoring and enforcing compliance with the Snowy Water Licence. This regulatory and compliance function is established and provides an important component of system assurance.

Compliance requirements for environmental flows are set out in the Snowy Water Licence, including specific provisions for Snowy River Increased Flows (SRIF) and Snowy Montane Rivers Increased Flows (SMRIF) under Schedule 3. These provisions establish the formal obligations for annual flow releases and associated operational requirements. In practice, however, historical processes to clarify and enforce these requirements have highlighted ambiguity in how key obligations are defined and applied. For example, intergovernmental processes in 2023 identified uncertainty in the relationship between allocated volumes and actual releases and sought amendments to the Deed and Licence to better reflect policy intent. While these processes demonstrate that mechanisms exist to address compliance issues, they have relied on intergovernmental negotiation and administrative action rather than clear, self-executing regulatory settings.

The effectiveness of compliance mechanisms is constrained by the absence of clearly defined system-level objectives, performance measures against which outcomes can be assessed and ineffective penalties for breaches. The current focus on compliance with licence conditions does not necessarily provide assurance that broader environmental or system outcomes are being achieved.

There is also a lack of clear separation between policy intent, regulatory oversight and system performance accountability, which limits the effectiveness of the regulatory framework in supporting contemporary governance expectations.

Current arrangements focus compliance on specified environmental flow output rather than outcome-based assurance, limiting their effectiveness as modern regulatory expectations.

#### **5. Monitoring, reporting and audit**

Monitoring and reporting functions exist within the current framework, including requirements for annual water operating plans and compliance reporting.

Monitoring of environmental flows is undertaken through a targeted NSW-led program, which supports planning and provides some basis for adaptive management. However, monitoring is constrained by broadly defined and non-measurable objectives, limited resourcing, and the absence of a system-wide evaluation framework, reducing its effectiveness in providing assurance on environmental or broader system outcomes.

The Australian Government contributes to monitoring and science activities in the Upper Murrumbidgee through targeted program funding, most notably the [Restoring the Upper Murrumbidgee River \(RUMR\) program](#). This program supports joint ACT–NSW delivery of baseline condition monitoring, environmental flow investigations and intervention monitoring, including activities such as bathymetric surveys, water quality monitoring and ecological assessments. These activities provide important evidence to support river restoration and inform environmental watering decisions, but are program-based, time-limited and primarily implemented by state agencies rather than embedded within the ongoing governance of the Deed.

The Commonwealth Environmental Water Holder (CEWH) undertakes intervention monitoring through programs such as Flow-MER, which are linked to the delivery of Commonwealth environmental water. As the Commonwealth does not hold environmental water entitlements within the Snowy Scheme, these monitoring frameworks are not applied in the Upper Murrumbidgee system. Without a role in environmental water delivery or formal involvement in Snowy Scheme governance, the CEWH is not positioned to influence environmental flow decisions. While the CEWH does have a limited role in drought-related arrangements, such as the Upper Murrumbidgee Drought Operating Framework, a more substantive role in environmental flow delivery, and associated intervention monitoring, would require an expanded governance role and additional resourcing.

These processes provide important information on system operation and support transparency to a degree. However, monitoring and reporting are largely oriented toward compliance with pre-defined rules rather than evaluation of environmental or system outcomes.

Independent audit and evaluation functions are not consistently embedded or applied across the system, limiting the ability to assess performance at a system level or to inform improvement over time.

As a result, information generated through monitoring and reporting does not consistently support adaptive management or provide a clear basis for decision-making or accountability.

## *6. System review and adaptation*

The current governance framework provides limited mechanisms for structured review and adaptation.

While the Snowy Water Licence is subject to periodic review, the Deed itself does not include a mandatory review process and has not been systematically updated since its inception. Changes to governance settings rely on intergovernmental agreement rather than embedded processes.

This limits the system's ability to respond to new information, changing environmental conditions, or evolving policy expectations. In particular, the absence of regular, structured review reduces the capacity for continuous improvement and adaptive management.

The absence of structured review mechanisms is inconsistent with principles of continuous improvement and adaptive governance.

This also limits opportunities to embed First Nations participation and adapt governance arrangements to reflect evolving expectations of Indigenous engagement and leadership. The wider community also is not considered in the Deed.

## Overall assessment of effectiveness

Assessment of these six core functions reveals that elements of the current system perform established roles effectively, but the overall framework does not operate as a coherent, integrated system capable of delivering transparent, accountable and adaptive governance outcomes.

The core functions operate in isolation, with limited coordination between policy, decision-making, operations and system assurance. This results in fragmentation, unclear accountability and a reduced capacity to manage trade-offs or adapt to change.

A systemic gap is the absence of formal recognition and integration of First Nations and community interests across governance functions, which is inconsistent with contemporary expectations and limits the inclusiveness, legitimacy and effectiveness of the framework.

A case study is presented in **Box 1**.

### **Box 1: Case Study - Mowamba Weir**

The ongoing failure to resolve the differing views regarding the future of Mowamba Weir provides a clear illustration of limitations in the effectiveness of the current governance arrangements.

Mowamba Weir is a diversion structure within the Snowy Scheme, located near Dalgety, which redirects flows from the Mowamba River into Lake Jindabyne via an aqueduct. Under current operating conditions, only 1.3 ML/day of flow is permitted to pass downstream of the weir, except during periods when the aqueduct's capacity of 500 ML/day is exceeded, resulting in overtopping. In dry years, overtopping events may not occur, effectively limiting downstream environmental flows.

Figure 8: Mowamba Weir, near Dalgety, NSW (February 2026). Source: Australian Government DCCEEW



Concerns regarding the environmental impacts of the weir have been raised for over a decade. In 2009, the first 5-year review on the NSW Snowy Water Licence recommended the Minister ask the NSW Office of Water to investigate options for decommissioning of Mowamba Aqueduct by 2012. This was in response to significant community views that the weir should be removed to improve environmental outcomes.

This issue remained active in subsequent licence reviews. In 2018, the 10-year NSW Snowy Water Licence review identified a key action related to Mowamba weir: *Action 7: Finalise the Mowamba River investigation (by 2020). This will include:*

- *evaluating options for using the Mowamba River to provide environmental water to the Snowy River*
- *recommending an environmental flow regime for the Snowy River consisting of a combination of releases from Jindabyne Dam and the Mowamba River.*

In September 2022, the NSW Government commissioned an Independent Expert Panel on restoring flows and flexibility of Jindabyne releases of Snowy River Increased Flows to investigate this action. That Panel recommended removal of the weir, citing significant environmental benefits for the Mowamba River and consequential improvements for the Snowy River.

Despite this sustained body of analysis and recommendations, the weir remains fully operational as of 2026.

This assessment reinforces the Panel's conclusion that, while key governance functions exist within the current system, they are not structured or integrated in a way that reflects contemporary governance principles, particularly in relation to transparency, accountability, coordination and

adaptive management. These systemic gaps underpin the limitations identified and inform the design of the proposed governance framework.

**Table 2: Assessment of the effectiveness of Snowy water management functions**

Governance function	What is working	What is not working
<b>Objective setting and intergovernmental coordination</b>	Intergovernmental framework supports annual planning	Incomplete inclusion (e.g. ACT) in decision-making constrains coordination and alignment with objectives; objectives static and not outcome based; limited adaptation; limited community and First Nations input.
<b>Decision-making and trade-off management</b>	Some flexibility emerging through trials	No clear or transparent trade-off framework or explanation of decisions; decision-making fragmented and opaque; compensation risk under the Snowy Compensation Deed constrains change.
<b>Operational delivery</b>	Strong capability to deliver within rules; some flexibility in environmental water delivery by agreement between NSW and Snowy Hydro	Rule-based delivery limits adaptive environmental management and prioritises operational/commercial objectives over outcomes.
<b>Regulation and compliance</b>	Established statutory processes.	Focused on outputs not outcomes; unclear accountability; <sup>36</sup> limited separation between policy, regulation and delivery functions; no public information.
<b>Monitoring, reporting and audit</b>	Regular reporting (e.g. AWOPs, compliance reporting) provides information on system operation; targeted monitoring	Compliance-focused with weak outcome evaluation and limited linkage to decision-making or system accountability; no integrated system-wide monitoring or audit; no public information
<b>System review and adaptation</b>	Licence reviews exist	Infrequent and ineffective; compensation under the Snowy Compensation Deed disincentivises change, resulting in minimal adaptation over time; only limited licence amendments made; no mandatory Deed review

## 3.5 Considerations for a reform response

### Implications for reform

The shortcomings in Snowy water management governance arrangements stimulated the Panel to consider how they may be improved and whether other functions are required to ensure system clarity, integrity and accountability.

Key shortcomings of the Deed relate to:

- who is included in decision-making
- how trade-offs are made and explained
- how accountability is maintained
- how outcomes are monitored and assessed
- how the system adapts over time.

<sup>36</sup> The NSW Snowy Water Licence, (Schedule 3, Section 12) outlines that Snowy Hydro must 'use reasonable endeavors to target releases of water' which is relevant to assessing compliance with flexible flow procedures.

## Implications for governance design

These findings indicate that reform should go beyond incremental changes and instead take a more comprehensive approach to the way the system operates.

An effective governance framework should:

- clearly define roles and responsibilities
- provide transparent and accountable trade-off decisions
- support adaptive management through monitoring, reporting and regular review
- enable coordination across jurisdictions at the appropriate scale
- recognise First Nations interests and support stakeholder participation.

A key issue is the reliance on fixed, output-based rules (such as volume targets), which do not support adaptive management or clear decision-making. This disconnect between objectives and implementation limits the system's ability to respond to changing conditions and incorporate new knowledge. Reform should therefore strengthen the link between objectives and how they are delivered, with a greater focus on outcomes.

## A system-level reform response

These issues are interconnected and cannot be addressed in isolation. Effective reform will require a coordinated, system-wide approach that aligns objectives, decision-making, operations and oversight.

The proposed governance framework at **Chapter 5** has been developed in response to these needs.

# 4. Environmental Flows

## 4.1 Purpose and Scope

The Review Terms of Reference seek to assess the environmental water management arrangements under the Deed and present solutions for the Upper Murrumbidgee, the Snowy River and associated montane rivers. This chapter considers the following:

- environmental effectiveness of existing environmental water management arrangements under current and future conditions
- potential improvements to the environmental flow programs in the Upper Murrumbidgee and Snowy rivers
- potential impacts on the NEM, Snowy Hydro and downstream water users in the Regulated Murrumbidgee (irrigators) that may result from improvements in environmental water management.

## 4.2 Current conditions and issues

A clear finding from this Review is that the current environmental flow arrangements under the Deed are insufficient to meet ecological objectives of the Upper Murrumbidgee and Snowy rivers or protect and maintain the downstream environments.

A summary of key issues identified in this Review are:

- the environmental water provisions under the Deed are not adequate to protect and restore the ecological function of downstream environments
- in operationalising the existing provisions within the Deed, the environmental releases in the Upper Murrumbidgee and Snowy rivers have frequently fallen below target levels, with long-term average deliveries below nominal requirements
- the flow regime has been fundamentally altered in both rivers, with loss of variability, reduced high flow events and constrained connectivity
- the rivers are characterised by sediment accumulation, habitat simplification and declining species resilience
- the existing provisions under the Deed do not allow the flexibility for environmental releases to be adaptable in response to rainfall, downstream catchment conditions, further limiting environmental outcomes and the effectiveness of the current arrangements.

Increasing the volume of environmental water is required, with the Upper Murrumbidgee River requiring a significant increase in the volume of water released.

Australian environmental flow science indicates that rivers require a substantial proportion of their natural flow regime to maintain ecosystem health. Environmental flow science indicates that maintaining river ecosystems typically requires limiting hydrologic alteration to within approximately 20–40% of natural flow regimes, with around 30% often used as a precautionary benchmark where

detailed ecological data are unavailable.<sup>37 38 39</sup> The Snowy Water Inquiry (1998) evaluated a 30% average annual natural flow target for the Snowy River and concluded that this level would deliver substantial ecological restoration, producing moderately modified to near-natural river condition, with major improvements in habitat, fish populations, river geomorphology and ecological integrity. The 27GL environmental flow target for the Upper Murrumbidgee was intended to provide 30% of the natural flow however appears to have been miscalculated.<sup>40</sup> The Snowy Scientific Committee reported that the water allocation for the Upper Murrumbidgee was inadequate for achieving the environmental water requirements.<sup>41</sup>

However, increasing the volume of environmental water alone is not enough, as illustrated by the river condition and ongoing issues summarised below, and raised in the Commonwealth DCCEEWS [Review Issues Analysis](#) and through public consultation. These findings are consistent with the scientific case that underpinned the original environmental flow targets established under the current Deed.<sup>42</sup>

A core problem is the continued inability of current environmental water management arrangements to deliver ecologically effective flow regimes (especially variability, timing and disturbance events) within current infrastructure arrangements and a rigid governance framework that stifles adaptive management across the whole river system. The current condition of the Upper Murrumbidgee and Snowy rivers and their trajectories reinforce the benefits of changing environmental flow regimes and the operating frameworks under the Deed. The value of this change is reinforced by the results of the “flexible flow protocols” agreed by NSW and Snowy Hydro under which the date of four releases approved in the AWOP may be changed in response to natural hydrological cues such as rainfall events.<sup>43</sup>

The solutions to improve the effectiveness of environmental flows need to respond to a set of system-level issues including:

- declining ecological condition of the Upper Murrumbidgee River
- inadequate volume, timing and configuration of environmental flows
- limited flexibility and adaptability in current operating arrangements and infrastructure
- governance arrangements that constrain transparency, accountability and participation
- competing objectives across environmental outcomes, water supply reliability and energy security
- monitoring, reporting and adapting environmental flow impacts.

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<sup>37</sup> Poff et al., (2010), ‘The ecological limits of hydrological alteration: a new framework for developing regional environmental flow standards’, *Freshwater Biology*, 55: 147-170, [doi:10.1111/j.1365-2427.2009.02204](https://doi.org/10.1111/j.1365-2427.2009.02204).

<sup>38</sup> Arthington, A., (2012), ‘Environmental Flows: Saving Rivers in the Third Millennium’, *University of California Press*.

<sup>39</sup> Arthington, A., (2014), ‘Environmental flows or a natural, hybrid and novel riverine ecosystems in a changing world,’ *Frontiers in Ecology and the Environment*, 12(8): 446-473, <https://doi.org/10.1890/130134>.

<sup>40</sup> McGuire, A and Pittock, J., (2025) Environmental flows in the upper Murrumbidgee River: evaluating flow delivery and governance to inform future environmental flow agreements. *Marine & Freshwater Research* 76. <https://doi.org/10.1071/MF24286>.

<sup>41</sup> Snowy Scientific Committee, (2010), ‘the Adequacy of environmental releases to the upper Murrumbidgee River,’ [https://publications.water.nsw.gov.au/watergroupjspui/bitstream/100/3281/1/Snowy\\_Scientific\\_Committee\\_2010\\_-\\_The\\_adequacy\\_of\\_environmental\\_flows\\_to\\_the\\_upper\\_Murrumbidgee.pdf](https://publications.water.nsw.gov.au/watergroupjspui/bitstream/100/3281/1/Snowy_Scientific_Committee_2010_-_The_adequacy_of_environmental_flows_to_the_upper_Murrumbidgee.pdf)

<sup>42</sup> Bender, I et al., (2022), ‘Snowy River environmental flows post-2022: lessons to be learnt,’ *Marine and Freshwater Research*, 74 (4): 454-468. <https://doi.org/10.1071/MF21209>.

<sup>43</sup> NSW DCCEEWS, (2025), ‘Agreed operating protocol for the trial of flexible Snowy Montane River Increased Flows from Tantangara Dam’, [www.water.dcceew.nsw.gov.au/sites/default/files/2025-07/operating-protocol-flexible-SMRIF-releases.pdf](http://www.water.dcceew.nsw.gov.au/sites/default/files/2025-07/operating-protocol-flexible-SMRIF-releases.pdf).

Other consequential, interacting issues raised during the Review include water insecurity to meet critical human water needs and urban water supply, pressures of regional growth and climate change on a diminishing water resource, and water quality events (low dissolved oxygen, thermal stress, blue-green algae blooms and episodic elevated enterococci bacteria) the latter requiring frequent closures of the Upper Murrumbidgee River to primary human contact.

These findings are drawn from the [Review Issues Analysis](#), technical analysis and modelling of the Upper Murrumbidgee River system, pre-existing scientific reporting, advice from advisory groups formed for this Review, and align strongly with stakeholder public submissions. Many of the issues raised and proposed solutions are common across the Upper Murrumbidgee and Snowy rivers, highlighting that improving the effectiveness of current and future environmental flows requires a package of foundational reforms.

## Snowy River

The Snowy River remains in a degraded and ecologically constrained condition, despite more than two decades of increased environmental water releases following the 1998 Snowy Water Inquiry. Stakeholder submissions indicate that current environmental water management arrangements have resulted in some improved environmental outcomes, however, the environmental flows have not been sufficient, and operational arrangements are a barrier to restoring key ecological processes and delivering sustained recovery.

Post-2002 environmental releases have improved baseflows and some localised conditions, but these flow regimes have not reinstated natural seasonality, been effective at flushing accumulating sediment or provided reliable connectivity between channel, floodplain and estuarine environments. As a result, sediment transport remains constrained, channel form simplified, habitat diversity reduced and recovery of native biota limited, with exotic species persisting in many reaches and fish deaths occurring in the Snowy River estuary.

A submission to the Panel's public consultation from the East Gippsland Conservation Management Network (EGCMN) emphasised that the Snowy River is in a severely degraded condition due to prolonged flow reductions, which have caused sediment build-up and habitat loss. They also highlighted that altered flow regimes and elevated water temperatures continue to stress native ecosystems, with current management efforts insufficient to reverse these impacts.<sup>44</sup> These impacts undermine catchment-scale restoration efforts and demonstrate that benefits delivered upstream do not reliably translate into downstream positive ecological outcomes under the existing flow regime.

Public forums and submissions from the stakeholders along the Snowy River and the Snowy River Alliance similarly argue that the Snowy River has not recovered to a functional or resilient system, despite sustained community and government investment.<sup>45</sup> The consultation findings stress that environmental flows have been constrained by conservative, inflexible operating rules that prioritise certainty over ecological effectiveness. They note that reliance on baseflows and limited seasonal releases has failed to replicate the disturbance, variability and connectivity required for ecosystem

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<sup>44</sup> East Gippsland Catchment Management Network, (2026), 'Submission to the Independent Review of the Snowy Water Inquiry Outcomes Implementation Deed': 31-32. <https://consult.dcceew.gov.au/swioid-independent-review/new-survey/view/124>.

<sup>45</sup> Commonwealth DCCEEW (2026), 'Independent Review Panel meeting Snowy River communities', [www.dcceew.gov.au/about/news/independent-review-panel-snowy-river-communities](http://www.dcceew.gov.au/about/news/independent-review-panel-snowy-river-communities).

recovery, and that progress has stalled well short of the Snowy Inquiry's original intent to restore the river as a functioning system, rather, the current condition is improving but remains degraded.

The effectiveness of environmental water management in the Snowy River is further constrained by structural and institutional barriers. Environmental releases are governed by the Snowy Water Licence and the Deed, which limit flexibility in release timing, magnitude and sequencing. These arrangements restrict the ability to coordinate releases with natural inflows, deliver higher magnitude flushing events, or adaptively manage water in response to ecological monitoring. Monitoring and evaluation frameworks have also been criticised by stakeholders for being insufficiently integrated with decision-making, limiting learning and adaptive improvement.

Existing infrastructure also constrains the ability to deliver variable and disturbance-capable flows (Jindabyne Dam), and the Mowamba Weir and similar infrastructure has materially constrained Snowy River recovery by intercepting tributary flows, complicating environmental water delivery and embedding legacy accounting arrangements that reduced ecological effectiveness and trust. The Panel has received a consistent message that future Snowy River outcomes cannot be assessed solely through volumes released from Jindabyne Dam without also accounting for the role of Mowamba Weir and similar infrastructure in shaping the flow regime.

Climate change and poor catchment health compound these shortcomings. Projected reductions in inflows, increased variability and more frequent droughts mean that static and inflexible environmental flow arrangements are increasingly unlikely to protect ecological values, particularly in downstream and estuarine reaches where flow timing and variability are critical.<sup>46 47</sup>

## Upper Murrumbidgee River

The Upper Murrumbidgee River is in a highly constrained and declining ecological condition, with strong evidence that current water management arrangements are insufficient to maintain river health, ecosystem function or resilience under present or future climate conditions.

Evidence presented to the Panel from Basin Plan reporting, technical ecological assessments and stakeholder submissions shows the river is operating below key ecological thresholds. Native fish populations, exemplified by the endangered Macquarie Perch, are in poor condition, with declining abundance, localised species extinction, limited recruitment, poor connectivity and reduced spatial extent.<sup>48</sup> Habitat quality has deteriorated due to sediment accumulation, channel simplification and reduced hydraulic diversity. Prolonged low flow periods exacerbate water quality risks, including low dissolved oxygen, elevated temperatures and extended recreational closures due to the prevalence of blue-green algae and faecal indicator bacteria in concentrations that exceed human health guidelines.<sup>49</sup>

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<sup>46</sup> Australian Government Bureau of Meteorology, (June 2026), 'Multi-year rainfall deficiencies,' *Drought – Rainfall deficiencies and water availability*, <https://www.bom.gov.au/climate/drought/>.

<sup>47</sup> East Gippsland Catchment Management Authority, (2023), 'The Snowy River and Estuary,' <https://storymaps.arcgis.com/stories/5b1a0aebe3c9431698930ea5894fdc29>.

<sup>48</sup> Australian Government Department of Climate Change, the Environment, Energy and Water (DCCEEW) (2025), 'Snowy Water Inquiry Outcomes Implementation Deed Review Issues Analysis': 16, <https://www.dcceew.gov.au/sites/default/files/documents/review-issues-analysis-snowy-water-inquiry-outcomes-implementation-deed.pdf>.

<sup>49</sup> Australian Government Department of Climate Change, the Environment, Energy and Water (DCCEEW) (2025), 'Snowy Water Inquiry Outcomes Implementation Deed Review Issues Analysis': 15, <https://www.dcceew.gov.au/sites/default/files/documents/review-issues-analysis-snowy-water-inquiry-outcomes-implementation-deed.pdf>.

The primary driver of the river's condition is the altered flow regime associated with regulation at Tantangara Dam. Since regulation, most headwater inflows have been diverted out of the Upper Murrumbidgee catchment, substantially reducing median flows, suppressing seasonal variability and largely eliminating higher magnitude events. Environmental releases are limited in volume and often set well in advance, reducing alignment with natural hydrological cues. River baseflows are reliant on dam releases made for supplying Cooma's water supply and/or unregulated tributary inflows downstream of the dam.

Recent droughts, particularly 2018–19, demonstrate the consequences of these arrangements. Flows that would have occurred naturally were regulated at Tantangara Dam, resulting in cease-to-flow conditions that would not have occurred in an unregulated river.<sup>50</sup> These events cause ecological harm and impact downstream communities and water supply reliability.

While baseflows provide value for ecological refuge, baseflows alone are insufficient to support sediment transport, habitat maintenance, spawning habitat renewal and longitudinal connectivity. Experience from comparable regulated rivers, along with the Snowy River following post-2002 environmental releases, reinforces that incremental increases in low flows without restoring variability and disturbance deliver limited and often transient benefits. Current arrangements in the Upper Murrumbidgee support ecological persistence at best, rather than recovery or building resilience.

Climate change forecasts mean these challenges will be amplified. Forecast declining inflows, increased variability and longer droughts increase the likelihood that existing arrangements will fail more frequently and with greater ecological consequence.<sup>51</sup> Without changes to the scale, configuration and management of environmental flows, the Upper Murrumbidgee will remain degraded with an increasing risk of irreversible ecological decline.

Environmental flow effectiveness is constrained by institutional, infrastructure and governance barriers. Snowy Scheme operations are governed by the Snowy Water Licence and the Deed, which sit largely outside contemporary Basin Plan and Water Resource Plan frameworks. Environmental releases from Tantangara Dam are not treated as Planned Environmental Water and rely on discretionary, non-enduring mechanisms.

The SAG report highlights that the decline of the Upper Murrumbidgee River is not solely an environmental flow deficit, but also the result of fragmented governance, rigid delivery arrangements, infrastructure-limited operations, and insufficient integration of non-flow actions.<sup>52</sup>

The Tantangara Dam outlet limits the delivery of higher magnitude flows. Environmental water planning provides limited scope for cross-jurisdictional collaboration and prioritisation, and there is limited capacity for adaptive management that is informed by a structured program of science and monitoring and is responsive to real-time conditions.

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<sup>50</sup> Australian Government Department of Climate Change, the Environment, Energy and Water (2025) Snowy Water Inquiry Outcomes Implementation Deed Review Issues Analysis: 11, <https://www.dcceew.gov.au/sites/default/files/documents/review-issues-analysis-snowy-water-inquiry-outcomes-implementation-deed.pdf>

<sup>51</sup> Australian Government Bureau of Meteorology, (June 2026), 'Multi-year rainfall deficiencies,' *Drought – Rainfall deficiencies and water availability*, <https://www.bom.gov.au/climate/drought/>.

<sup>52</sup> Stakeholder Advisory Group (May 2026), Restoring the Upper Murrumbidgee, Improving Flows, Balancing Interests - Initial Report from the Stakeholder Advisory Group to the Independent Review Panel.

Stakeholder submissions reflect a consensus that maintaining current arrangements is not sufficient.<sup>53</sup> While views differ on the scale and implementation of change, there is broad agreement that improved environmental flows are required to prevent cease-to-flow events, restore variability and protect and restore the river's long-term ecological, cultural and community values.

Taken together, the evidence presented to the Review establishes a clear need to consider alternative environmental flow options and foundational reforms to the Deed. Without reform, current arrangements are unlikely to arrest ongoing decline or build the resilience required given future climatic and system pressures.

## 4.3 Snowy River: Improving the effectiveness of environmental water

### The effectiveness of the 212 GL Snowy River Increased Flow

The Deed established an average target of 212 GL per year for environmental flows to the Snowy River as a central benchmark for river restoration. However, evidence from the Bender et al. (2022) assessment, the NSW Ten-Year Licence Review (2018), the [Review Issues Analysis](#), and submissions including from the Snowy River Alliance, indicates that delivery of the 212 GL has not translated into sustained ecological recovery, as per the original objective.

The Bender et al. analysis provides the most comprehensive evaluation of delivery performance to date and, along with subsequent public reporting by Snowy Hydro,<sup>54</sup> demonstrates that the 212 GL target has not been achieved in any single year since implementation began, with actual releases consistently falling short due to a combination of limited entitlements, low allocations and operational constraints.<sup>55</sup> Even in years where total entitlements were sufficient, environmental allocations remained variable and often significantly below target, reflecting the dependence of environmental water on irrigation allocation systems and prevailing climatic conditions. The study concludes that, over time, environmental flows have been partially delivered and have not met the original restoration intent of the Deed, particularly given that most environmental objectives were not achieved.<sup>56</sup>

The Ten-Year Snowy Licence Review reinforces that the 212 GL remains a policy benchmark rather than a guaranteed outcome, highlighting that environmental benefits depend on timing, variability and flexibility of delivery. It identifies rigid operating rules and conservative scheduling as key constraints, limiting the ability to align environmental releases with ecological opportunity. The review emphasised the need for more flexible and adaptive delivery mechanisms.<sup>57</sup>

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<sup>53</sup> Australian Government DCCEEW (2026), Issues Consultation: Independent Review of the Snowy Water Inquiry Outcomes Implementation Deed, Summary of Public Consultation. [www.dcceew.gov.au/sites/default/files/documents/issues-consultation-ind-review-snowy-water-inquiry-summary-report.pdf](http://www.dcceew.gov.au/sites/default/files/documents/issues-consultation-ind-review-snowy-water-inquiry-summary-report.pdf).

<sup>54</sup> Annual release targets, and compliance with previous year release targets for environmental releases from the Snowy Scheme are publicly reported in Snowy Hydro's public AWOPs.

<sup>55</sup> Bender I et al. (2022) 'Snowy River environmental flows post-2002: lessons to be learnt', *Marine and Freshwater Research*, 73(4), 545. doi:10.1071/MF21209.

<sup>56</sup> Bender I et al. (2022) 'Snowy River environmental flows post-2002: lessons to be learnt', *Marine and Freshwater Research*, 73(4), 545. doi:10.1071/MF21209.

<sup>57</sup> NSW Department of Industry (2018), 'Ten-year review of the Snowy water licence – Final Report,' [www.water.dcceew.nsw.gov.au/sites/default/files/2025-07/ten-year-review-of-the-snowy-water-licence-final-report.pdf](http://www.water.dcceew.nsw.gov.au/sites/default/files/2025-07/ten-year-review-of-the-snowy-water-licence-final-report.pdf).

The [Review Issues Analysis](#) similarly concludes that the 212 GL has increasingly been treated as an endpoint rather than a means of achieving ecological objectives.<sup>58</sup> It highlights a structural disconnect between the volume-based target and environmental outcomes, noting that delivery is often dominated by baseflows and lacks the variability and disturbance required to restore ecological processes.<sup>59</sup> The analysis further notes that climate change was not accounted for in the original design of the target, meaning that declining inflows and increased variability will reduce the ecological effectiveness of a fixed volume over time unless supported by adaptive management and improved governance.

Submissions from the East Gippsland Conservation Management Network consistently characterise the 212 GL as a minimum restoration commitment, reflecting a negotiation rather than a scientifically derived requirement for recovery.<sup>60</sup> They argue that ecological outcomes depend on the water being delivered as a functional flow regime, including seasonal variability, freshes and flushing flows, and questions whether current delivery arrangements provide the functional equivalent of 212 GL in ecological terms.<sup>61</sup> More broadly, the submission highlights that environmental outcomes have been constrained not only by volumes, but by inflexible delivery, weak accountability and insufficient linkage between monitoring and decision-making.

Understanding why the full average volume of the 212 GL has not been achieved appears to be a misinterpretation of the Snowy Deed by the Licensee, drawing on a drafting error in a supporting Annexure. The Deed envisaged 294 GL as the target volume of water for the Snowy River, equivalent to 28% of the natural flow. The effectiveness of the existing governance arrangement, including compliance and dispute resolution mechanism, has been unable to resolve this issue since the Ten-year Licence Review in 2018.

Perspectives from First Nations communities, outlined in the cultural values and custodianship reports prepared for this Review, emphasise that the Snowy River is a living cultural system and that environmental water should support cultural flows, seasonal cycles and the ongoing custodial responsibility to care for Country.<sup>62</sup> From this perspective, the effectiveness of environmental water is not determined solely by volume, but by the extent to which flows restore connection, support cultural practices and enable the river to function as a living entity.

First Nations advice highlights that current arrangements do not adequately reflect cultural and ecological needs if they are not delivered in ways that support variability, renewal and responsiveness to Country.<sup>63</sup> Consistent with broader stakeholder views, there is a need to move

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<sup>58</sup> Australian Government DCCEEW (2025) 'Snowy Water Inquiry Outcomes Implementation Deed Review Issues Analysis: 18, <https://www.dcceew.gov.au/sites/default/files/documents/review-issues-analysis-snowy-water-inquiry-outcomes-implementation-deed.pdf>.

<sup>59</sup> Australian Government DCCEEW (2025) 'Snowy Water Inquiry Outcomes Implementation Deed Review Issues Analysis: 18, <https://www.dcceew.gov.au/sites/default/files/documents/review-issues-analysis-snowy-water-inquiry-outcomes-implementation-deed.pdf>.

<sup>60</sup> East Gippsland Catchment Management Network, (2026), 'Submission to the Independent Review of the Snowy Water Inquiry Outcomes Implementation Deed': 31-32. <https://consult.dcceew.gov.au/swioid-independent-review/new-survey/view/124>.

<sup>61</sup> East Gippsland Catchment Management Network, (2026), 'Submission to the Independent Review of the Snowy Water Inquiry Outcomes Implementation Deed': 31-32. <https://consult.dcceew.gov.au/swioid-independent-review/new-survey/view/124>.

<sup>62</sup> Knight, P, (2026), 'Snowy River Cultural Values and Community Expectations,' *Community Perspectives Arising from the SWIOID Review*. <https://www.dcceew.gov.au/sites/default/files/documents/snowy-river-cultural-values-community-expectations.pdf>

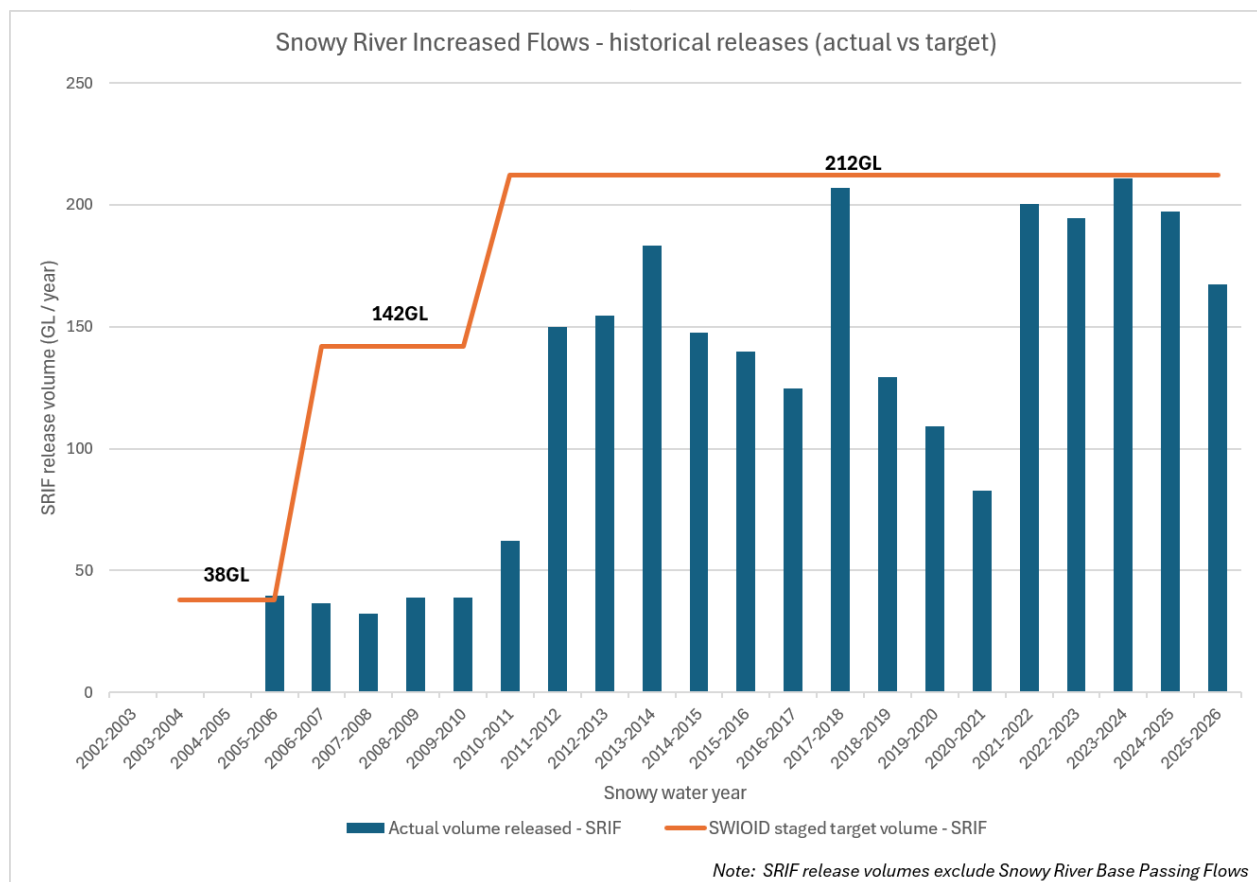
<sup>63</sup> Knight, P, (2026), 'Snowy River Cultural Values and Community Expectations,' *Community Perspectives Arising from the SWIOID Review*. <https://www.dcceew.gov.au/sites/default/files/documents/snowy-river-cultural-values-community-expectations.pdf>

toward adaptive, flexible and participatory management, with First Nations involvement in setting objectives, determining priorities and responding to changing conditions.

Taken together, these sources of information and advice point to a consistent finding: the effectiveness of the 212 GL target is limited by both under-delivery and the way water is managed. While the target remains an important reference point for environmental commitment, it does not ensure ecological recovery. Achieving the intent of the Deed therefore requires a shift toward outcomes-focused and adaptive management, in which environmental flows are delivered as a dynamic regime informed by monitoring, science and changing climatic conditions, rather than as a fixed annual volume. However, a fixed volume is a useful target to ensure that trade-off decisions on flexible flows cannot be used to avoid the release of environmental water.

Infrastructure choices, such as Mowamba Weir, have materially shaped Snowy River outcomes, and improving river health also requires revisiting how these structures constrain or enable effective, variable and culturally meaningful flows. The Ten-Year Review of the Snowy Water Licence recognises Mowamba Weir as a transitional measure and recommends that decommissioning be progressed, subject to further assessment, once borrowing arrangements are resolved, noting that its continued operation is inconsistent with the long-term intent of Snowy River restoration.

**Figure 9: Snowy River Increased Flows – Historical Releases (actual vs target).**<sup>64</sup>



<sup>64</sup> Annual volume released for environmental flows to the Snowy River compared to targets in the Deed, adapted from Bender et al (2020) 'Snowy River environmental flows post-2002: lessons to be learnt', *Marine and Freshwater Research*, 73(4). doi:10.1071/MF21209; subsequent data from Snowy Hydro Annual Water Operating Plans, 2020-21 to 2025-26.

## 4.4 Upper Murrumbidgee River: avoiding ecosystem collapse

The evidence base and technical analysis undertaken for this Review demonstrate that incremental improvements to current arrangements are unlikely to reverse the ecological decline in the Upper Murrumbidgee River unless flows are restored in a way that reactivates key processes. This requires sufficient volume to achieve a functional flow regime through operational arrangements and effective governance. The governance arrangements are considered in **Chapter 5**.

The environmental flow options assessed in this Review respond to a set of system-level issues including:

- the current and declining ecological condition of the river
- inadequate volume, timing and configuration of environmental flows
- limited flexibility and adaptability in current operating arrangements
- competing objectives across environmental outcomes, water supply reliability and energy security.

In this context, the assessment of environmental flow options represents a choice of ecological trajectories, with different implications for system function, stakeholder values and broader policy objectives. Improving environmental outcomes is compatible with other policy objectives, through the design of environmental flow regimes, within an adaptive management framework. Such a framework would utilise flexible delivery mechanisms and provide a pathway to materially improve ecological outcomes while maintaining energy system reliability and managing impacts on energy generation and downstream water users.

### Description of the environmental flow options and outcomes

Five environmental flow options were developed and tested against the Base Case (current conditions), with further detail on the approach and methods of this assessment provided in Chapter 2. The options assessed represent fundamentally different approaches to environmental flow delivery in the Upper Murrumbidgee River, rather than incremental variations on a single operating regime. They differ in total volume, configuration of flow components, spatial targeting of EWRs and reliance on operational flexibility.

Across Options 2-4, environmental ambition increases progressively, illustrating how flow volume, variability and infrastructure capability interact to determine outcomes. Option 5 also represents an increase in environmental ambition from the Base Case and was designed to be implementable in the near-term and to minimise impacts on energy generation.

The options modelled included 6 GL of cultural water to assess the cumulative impacts on the energy system and downstream water users; this is discussed further below. The volumes presented below for environmental flows exclude the 6 GL cultural flow provision.

Modelled average volumes for Options 2-4 are shown in **Figure 9**.

### *Base Case – current conditions*

The Base Case reflects continuation of current operating arrangements with the existing environmental flow provisions (SMRIF). Water releases from Tantangara Dam are limited to the release capacity of the existing outlet valve, which is rated at 1,500 ML/day at minimum storage operating level.

*The Base Case represents 9.2% of the average natural flows (ANF) without development. The mean annual volume of water released from Tantangara Dam is 25 GL. The total without development ANF into Tantangara Dam is 276 GL.*<sup>65</sup>

Most EWRs are not achieved in the Base Case, flow variability remains highly constrained, and ecological processes such as sediment transport and habitat maintenance remain largely inactive. The river is expected to remain in a simplified and vulnerable ecological state and maintain the current trajectory of rapid decline in its condition.

### *Option 1 – Drought-focused flows under existing arrangements*

Option 1 represents a baseline drought-response scenario, retaining the current pattern of fixed releases from Tantangara Dam (equivalent to the Base Case) and introduces a set of flow triggers to provide minimum base flows in response to drought-like conditions (based on the current Upper Murrumbidgee Drought Operating Framework). Option 1 was designed to protect refuge habitat and maintain water quality under very low flow conditions.

*This option represents 10.2% of ANF. The mean annual volume of water released from Tantangara Dam is 28.1 GL.*

The option reduces the frequency and duration of very low flows and cease-to-flow conditions, but it does not materially improve achievement of EWRs or broader ecological outcomes. Option 1 was considered unacceptable by the advisory groups due to poor EWR achievement and was therefore not progressed further in the analysis or included in **Figure 9**.

### *Option 2 – Incremental improvement within current infrastructure constraints*

Option 2 was designed to target EWRs at Mittagang Crossing, including low flows, stable baseflows and a limited subset of freshes, provide some operational flexibility, while remaining within the existing constraints of the dam outlet valve. It does not provide the designed variable baseflows, bankfull or channel maintenance flows. This option aims to demonstrate the scale of environmental outcomes achievable without increasing the volume of water released from the dam.

*Option 2 represents 8.3% of ANF. The mean annual volume of water released from Tantangara Dam is 22.8 GL (excluding cultural flow).*

The option focuses on reducing extreme low flow stress and improving habitat persistence in the central and lower reaches. However, as the EWRs are primarily targeted at Mittagang Crossing, the spatial extent of environmental outcomes was constrained with improvement less evident immediately downstream of the dam. Ecologically, this option is expected to provide localised stabilisation of environmental conditions without supporting ecosystem recovery.

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<sup>65</sup> This figure excludes Tantangara Dam inflows diverted from the Goodradigbee River, via the Goodradigbee Aqueduct.

### *Option 3 – Restoring variability without habitat reset*

Option 3 represents a substantial shift from the Base Case by introducing seasonally variable baseflow, increasing the frequency of small and large freshes and providing bankfull flows. EWRs for Option 3 are primarily targeted at Mittagang Crossing. An increase to the existing Tantangara Dam outlet valve capacity would be required to reliably deliver the larger freshes and bankfull flow components.

*Option 3 represents 27.2% of the ANF and targets EWRs at Mittagang Crossing. The mean annual volume of water released from Tantangara Dam is 75.2 GL (excluding cultural flows).*

Targeting EWRs at Mittagang Crossing limits the spatial extent of environmental outcomes with improvement less evident immediately downstream of the dam. Targeting EWRs immediately downstream of the dam, to increase the spatial extent of environmental improvement, is expected to increase the volume of additional water required by approximately 20 GL, which would increase the average annual release volume under Option 3 to approximately 95 GL.

The results indicate strong improvements in EWR achievement and ecological condition in central and downstream reaches. However, the option does not include the high magnitude channel maintenance flows capable of mobilising sediment and re-establishing critical refuge habitat. As a result, while productivity, water quality and habitat availability improve, geomorphic recovery and system-scale connectivity remain limited. This option supports partial ecological recovery, but not full restoration of key processes.

### *Option 4 – System-scale recovery*

Option 4 builds on Option 3 to provide the most complete expression of ecological flow components and the strongest overall outcomes, but with greater infrastructure and water release requirements. The flow regime includes variable baseflows, diverse freshes, bankfull flows and the high magnitude channel maintenance flow released from Tantangara Dam. These higher magnitude flows are designed to exceed geomorphic thresholds required for sediment mobilisation, channel maintenance and habitat resetting. The flows are designed to primarily target EWRs at Mittagang Crossing.

Delivering the channel maintenance flow is the key differentiator between Option 3 and 4, requiring the dam outlet valve to be upgraded to provide a flow of up to 6000 ML / day maximum release rate, with a corresponding increase to the volume of environmental water required.

*Option 4 represents 29.9% of the ANF and targets EWRs at Mittagang Crossing. The mean annual volume of water released from Tantangara Dam is 82.4 GL (excluding cultural flow).*

Targeting EWRs at Mittagang Crossing limits the spatial extent of environmental outcomes with improvement less evident immediately downstream of the dam. Similar to Option 3, targeting EWRs immediately downstream of the dam, to increase the spatial extent of environmental improvement is estimated to increase the volume of additional water required under Option 4 by approximately 20 GL, which would increase average annual release volume of Option 4 to 102 GL.

Option 4 consistently achieves the highest level of EWR performance and is the only scenario that restores both variability and disturbance processes necessary for system-scale ecological recovery.

Ecological benefits extend across large sections of the river network, supporting improved river condition, connectivity and a substantial increase in the abundance of the key indicator species, Macquarie Perch. This option provides a deliberate shift toward ecosystem recovery rather than stabilisation of the current conditions.

### *Option 5 – Near-term, climate responsive approach*

Option 5 presents a near-term option, which could be delivered without increasing the release capacity of the Tintangara outlet, and applies an adaptive delivery strategy which aligns the flow components (targeted EWRs) with the climate conditions.

Reliable fixed baseflows are delivered under dry conditions, with seasonally variable baseflows, freshes and higher flow components delivered in moderate to wet conditions, opportunistically aligned with the weather events, catchment conditions and water availability. Low flow and baseflow EWRs are targeted immediately downstream of Tintangara Dam, while high flows are targeting EWRs at Mittagang Crossing to ‘piggy-back’ on top of natural flows from downstream tributaries for more effective use of the available water. The magnitude of water releases is constrained to the capacity of the existing dam outlet valve.

*Option 5 represents 22.8% of the ‘natural’ flow (without development). The mean annual volume of water released from Tintangara Dam is 63.0 GL (excluding cultural flow).*

The alignment of flow targets with climate conditions reduces the volume of additional environmental water and reduces the impact on Tintangara storage volumes.

This option improves water quality, habitat persistence and local productivity in upstream reaches and reduces exposure to prolonged low flow stress. It demonstrates that improvements in low flow resilience can be achieved without infrastructure upgrades, however, reduced delivery of higher magnitude disturbance flows limits sediment transport, geomorphic recovery and downstream connectivity that constrains system-wide recovery.

### *Cultural flow allocation*

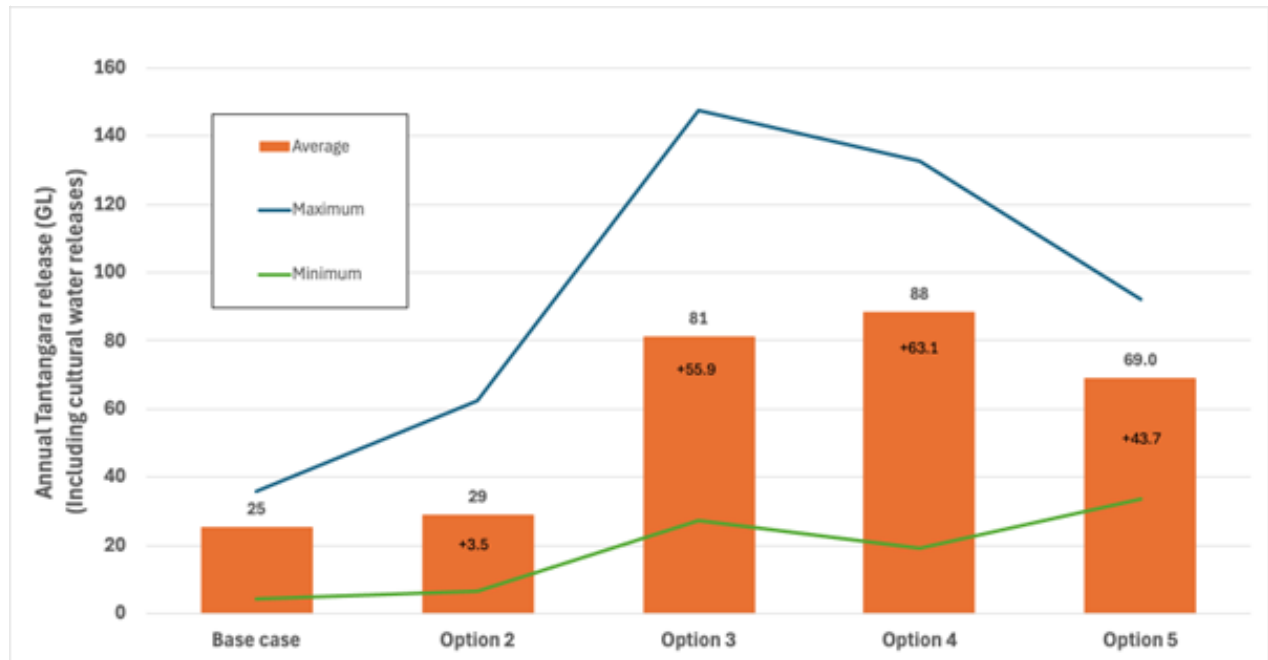
In line with advice from the advisory groups, a fixed allocation of 6 GL/year was added to Options 2-5, as an additional release requirement over and above the environmental water release volumes outlined above. This approach was initially proposed by the FNAG and broadly supported by the RCG and SAG.

For the purposes of the hydrological modelling and subsequent energy modelling, it was assumed that these additional releases of cultural water were delivered on a fixed pro-rata basis each day across the year to deliver 6 GL annually. In practice, the timing and specific use of the cultural releases would need to be determined by First Nations in a separate process outside the timeframes for this Review.

On this basis, a conservative approach was applied for the ecological assessment: cultural water was assumed to be extracted immediately below the dam, to avoid the ecological outcomes being predicated on cultural water releases. In practice, cultural water may contribute to environmental outcomes and provide additional benefits not quantified in this assessment, however this would be subject to the management decisions of First Nations in the management of this water.

**Figure 10**, below, shows the modelled annual releases from Tantangara Dam under each option, including 6 GL/year cultural water releases.

**Figure 10: Modelled releases from Tantangara Dam (including 6GL cultural water releases assumed to be extracted for cultural purposes immediately downstream at the dam)**

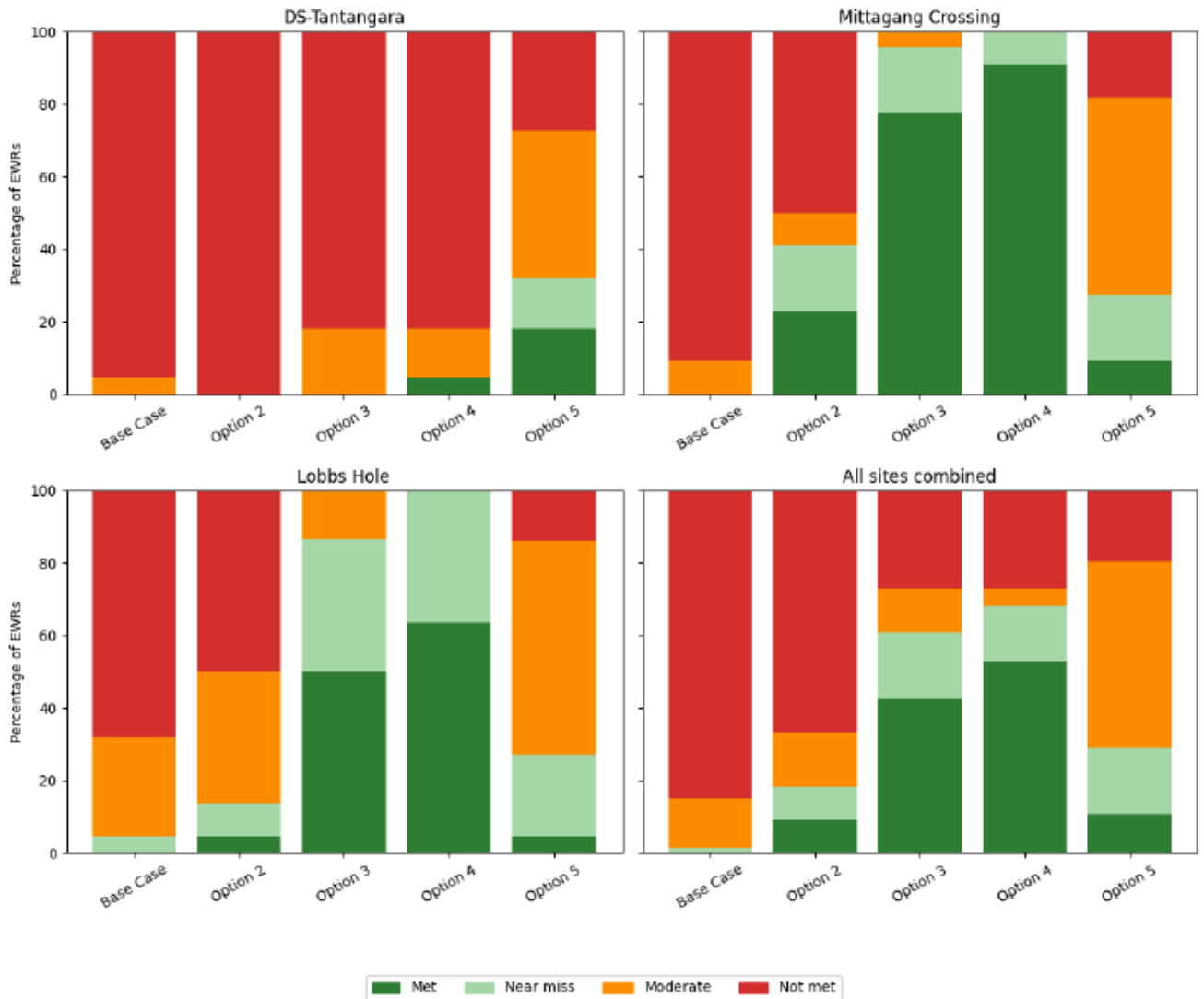


## 4.5 Upper Murrumbidgee: Evaluating environmental outcomes from environmental water delivery options

### Comparative ecological performance of options

The *Ecology Technical Report* demonstrates that the environmental flow options produce markedly different ecological outcomes, reflecting differences in both the effectiveness of water delivered and the configuration of the flow regimes. **Figure 11** below shows the proportion of EWRs met under each option.

**Figure 11: Proportion of EWRs meeting targeted frequency by Option, for each site separately and all sites combined (Source: Ecology Technical Report, 2026)**



The Base Case fails to meet the target frequency of almost all EWRs across assessed sites. The river remains in a highly constrained state characterised by limited sediment transport, reduced hydraulic diversity, degraded habitat condition and declining ecological resilience. These conditions are consistent with continued ecological simplification under a drying climate.

Option 2 provides only limited improvement relative to the Base Case. Increased low flows and stable baseflows reduce acute low flow stress and improve habitat persistence in some reaches. However, most EWRs remain unmet and the flow regime lacks variability and is highly regulated. Ecological outcomes under this option are characterised by localised benefits that stabilise the current poor condition without supporting any recovery, with disturbance-dependent processes largely inactive.

Options 3 and 4 represent a substantial improvement in ecological performance. Both restore seasonal variability through variable baseflows and increase the frequency and diversity of freshes, resulting in a much higher level of EWR achievement downstream of Tantangara Dam. These changes support improved productivity, water quality, habitat availability and ecosystem functions.

However, a key distinction emerges between the two options. While Option 3 improves many biological and physical indicators, the absence of channel maintenance flows limits sediment transport and geomorphic recovery. As a result, ecological improvements under Option 3 are significant but incomplete.

Option 4 consistently delivers the strongest ecological outcomes. It is the only option that reinstates the full suite of flow components, including channel maintenance flows capable of mobilising sediment and maintaining channel form. Quantitative indicators show that Option 4 produces the largest extent of river reaches achieving healthy condition and the greatest increase in Macquarie Perch abundance. These results indicate that Option 4 enables system-scale ecological recovery rather than local or partial improvement. Delivering environmental flows (baseflows) that target EWR directly downstream of the dam provide outcomes across a broader spatial scale.

Options 3 and 4 do not perform well in the reach immediately downstream of Tantangara Dam. This is due to the modelled flow regime targeting EWRs at Mittagang Crossing. In practice, improving the achievement of EWRs in the upper reach downstream of the dam can be improved through adaptive management and operational planning. The effect of shifting the target for environmental flows (i.e. achieving EWRs downstream of Tantangara Dam) is evident in Option 5.

Option 5 produces a different pattern of outcomes. By prioritising reliable baseflows and adopting a climate-based operating strategy, it delivers strong improvements in upstream habitat persistence and water quality immediately downstream of Tantangara Dam. However, reduced delivery of higher magnitude flows limits the ecological function achieved through flow disturbance, sediment transport and connectivity—this is the effect of operating within the existing capacity of the dam outlet valve and reduced volume of environmental water. Ecological outcomes under this option provide some regional scale benefits but not all EWRs can be achieved and system-scaled recovery is constrained. This option does provide evidence of an approach that could deliver good regional environmental outcomes efficiently.

## Process restoration versus stabilisation

A central finding of the *Ecology Technical Report* is that ecological outcomes are shaped not only by total water volume, but by the extent to which flow regimes restore key hydrological and geomorphic processes.

Options that primarily improve low flows and stable baseflows (Options 2 and to a degree, Option 5) are effective at reducing acute stress and supporting habitat persistence during dry periods. These outcomes are important for preventing further degradation but do not reactivate the natural disturbance processes required to maintain channel structure, mobilise sediment or reset habitats. As a result, these options tend to stabilise the system in a constrained state and maintain current condition, rather than shift into a recovery trajectory.

In contrast, Options 3 and 4 restore elements of the natural flow regime associated with variability and seasonal change. Variable baseflows and freshes increase productivity, improve water quality dynamics and support life-history processes for aquatic biota. However, the *Ecology Technical Report* identifies disturbance thresholds, particularly for sediment mobilisation and channel maintenance, that are only exceeded when higher magnitude flows are delivered.

Option 4 is the only scenario that consistently reinstates these disturbance processes through explicit channel maintenance flows. These flows support sediment transport, prevent channel infilling, maintain hydraulic diversity and improve longitudinal connectivity. The report concludes that without reinstating such processes ecological recovery remains constrained and increasingly vulnerable to climate stress.

The distinction between stabilisation and process-based recovery is a defining difference between the environmental flow options.

## Implications for threatened species and river resilience

The implications of these differing flow regimes are particularly evident for threatened and flow-dependent species as well as for overall river resilience.

Macquarie Perch, used as a key indicator species in the *Ecology Technical Report*, requires a combination of perennial connectivity, seasonal variability, stable spawning flows and periodic disturbance to maintain clean substrates and enable movement between reaches. Under the Base Case and Option 2 these requirements are unmet resulting in fragmented populations, low resilience and likely ongoing decline in species persistence.

Options 3 and 5 improve aspects of habitat condition and productivity and are likely to support improved recruitment and survival within existing occupied reaches. However, the absence or limited delivery of sediment-moving and connectivity-restoring flows constrains population expansion and long-term resilience, particularly under drought conditions where habitat refuges are spatially limited.

Option 4 provides the strongest pathway for threatened species recovery. By restoring variability, disturbance and connectivity, it supports improved spawning habitat, dispersal and population structure across a much larger spatial extent of the river. Quantitative modelling indicates an order-of-magnitude increase in Macquarie Perch abundance under this option reflecting both improved habitat quality and expanded river occupancy.

The *Ecology Technical Report* concludes that options restoring both variability and disturbance processes provide the greatest system-scale resilience to future climate variability. Rivers managed under regimes that focus only on stabilising current conditions remain vulnerable to prolonged drought and cumulative degradation, whereas process restoring regimes are more likely to maintain ecological function, adaptive capacity and long-term persistence of native biota.

## Implications of climate impacts for sustainable environmental outcomes

The ACT Water Security Vulnerability Assessment indicates that projected climate change and regional population growth will substantially reduce river flows and increase hydrological stress in the Upper Murrumbidgee, materially affecting the capacity to achieve environmental outcomes under current and proposed flow arrangements.<sup>66</sup>

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<sup>66</sup> ACT Government Office of Water, Environment Planning and Sustainable Development Directorate (2025), 'Assessment of potable, non-potable and environmental water indicators: ACT Water Security Vulnerability Assessment Technical'. [https://www.act.gov.au/data/assets/pdf\\_file/0011/2868455/ACT-Water-Security-Vulnerability-Assessment-Technical-Report-2025.pdf](https://www.act.gov.au/data/assets/pdf_file/0011/2868455/ACT-Water-Security-Vulnerability-Assessment-Technical-Report-2025.pdf).

Modelled climate scenarios show that, by 2050, average river flows across the ACT region and connected catchments are projected to decline by approximately 30 to 45% under moderate and extreme climate change scenarios respectively, and current growth trends in population growth.<sup>67</sup> These reductions are accompanied by longer and more severe droughts and fewer wet periods capable of resetting ecological conditions.

Under these conditions the frequency and duration of low flow periods are expected to increase, while opportunities to deliver ecologically meaningful freshes and higher magnitude flows will become less frequent and less reliable. Environmental water is the most vulnerable component of the water system, relative to potable and non-potable supplies, increasing the risk that ecological flow requirements are deferred or unmet during dry periods.

These projected flow reductions directly interact with the ecological processes identified in the *Ecology Technical Report*. Reduced volumes and increased drought frequency limit sediment transport, exacerbate channel simplification and reduce opportunities for habitat renewal and connectivity. Flow regimes that focus primarily on baseflow maintenance are particularly exposed, as declining inflows reduce the ability to sustain even minimum thresholds during extended dry periods, increasing the risk of cease-to-flow events and cumulative ecological damage. Summary conclusions for the options examined through the Review are:

- Option 2 is unlikely to prevent cumulative, ongoing ecological degradation.
- Option 3, which restores seasonal variability through variable baseflows and freshes but does not include channel maintenance flows, is sensitive to declining inflows. The constrained sediment transport and habitat renewal reduces the option's capacity to support sustained recovery as climate stress intensifies.
- Option 4, which reinstates the full suite of flow components including channel maintenance flows, remains exposed to overall reductions in water availability but is comparatively more resilient even as average flows decline.
- Option 5 prioritises reliable baseflows that perform strongly in maintaining upstream habitat persistence during dry conditions. However, this option aligns the flow components with climate conditions and water availability, therefore under projected 30 to 45% average flow reductions the occurrence of higher magnitude flows would become increasingly limited, increasing the risk that the river stabilises in a degraded state with constrained long-term resilience.

Overall, climate change acts as a risk multiplier across all environmental flow options. Options that rely on limited flexibility or regimes that stabilise the current degraded conditions are increasingly unlikely to achieve environmental objectives as flows decline. In contrast, options that restore variability, enable delivery of disturbance processes and incorporate adaptive management are better placed to support ecological resilience even as total water availability decreases.

The ACT Vulnerability Assessment highlights the importance of early and proactive intervention and flexible operating arrangements that enable responsiveness to extreme events. This finding supports

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<sup>67</sup> ACT Government Office of Water, Environment Planning and Sustainable Development Directorate (2025), 'Assessment of potable, non-potable and environmental water indicators: ACT Water Security Vulnerability Assessment Technical'. [https://www.act.gov.au/data/assets/pdf\\_file/0011/2868455/ACT-Water-Security-Vulnerability-Assessment-Technical-Report-2025.pdf](https://www.act.gov.au/data/assets/pdf_file/0011/2868455/ACT-Water-Security-Vulnerability-Assessment-Technical-Report-2025.pdf).

the case that recovery and resilience depend on sustained delivery of a minimum level flow regime over long timeframes (e.g. baseflow and small fresh operating rules) in combination with opportunistic higher magnitude flow releases during favourable years, as demonstrated under Option 5.

A management framework that combines both planned and adaptive environmental water, integrated planning, monitoring and evaluation and periodic review provides a solution set effective for responding to the high risk and uncertainty of the climate projections.

## Advice from the advisory groups on the environmental flows options

Many stakeholder submissions noted that current environmental flows are inadequate and that improved outcomes require changes to the flow regime, not just higher minimum flows. Submissions consistently call for restoration of seasonal variability, freshes and higher magnitude flows to support habitat renewal, water quality and native species recovery, noting that baseflow only approaches stabilise a degraded system. While views differ on the scale and implementation of change due to perceived impact on downstream extractive water industry and capital investment for dam upgrades, there is general agreement that improved environmental flows are essential to prevent cease-to-flow events and protect long-term ecological, cultural and community values.

The FNAG advises that environmental flow options for the Upper Murrumbidgee should move beyond minimum or technically defined flows and instead support active custodianship of a living river system.<sup>68</sup> Their report to this Review emphasises that flows must be sufficient in volume, timing and variability to enable cultural, ecological and social healing, not merely prevent further decline.

The cultural recommendations made by the FNAG support flow options that restore natural variability, deliver culturally and ecologically meaningful flows and enable long-term healing, rather than those that merely manage decline. This aligns most strongly with Option 4, while viewing Options 2 and 5 as insufficient and Option 3 as a partial but incomplete step toward custodial outcomes. Across all options the FNAG stresses that the way in which flows are governed and decided—including shared authority, adaptability and respect for cultural knowledge—is as important as the flow volumes themselves.

The SAG advice aligns with public submissions and the FNAG, that improving the health of the Upper Murrumbidgee River requires environmental flows to be delivered as a functional and adaptive flow regime, rather than as fixed volumes or rigid schedules. The SAG emphasised that outcomes depend on timing, variability and responsiveness to in-year conditions, including the delivery of variable baseflows, freshes and, where feasible, higher magnitude events to support ecological processes.<sup>69</sup> While views differed on the scale and pace of flow increases, there was broad agreement that adaptive, event-responsive delivery, supported by clear governance, monitoring and review is essential to improving ecological outcomes and managing risk under a changing climate.

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<sup>68</sup> First Nations Advisory Group (April 2026), 'From Advisory to Custodianship – Cultural Recommendations to the Independent Review Panel'.

<sup>69</sup> Stakeholder Advisory Group (May 2026), Restoring the Upper Murrumbidgee, Improving Flows, Balancing Interests - Initial Report from the Stakeholder Advisory Group to the Independent Review Panel.

### **Box 2: Modelling Insights**

Modelling is an iterative process; learning from each prior option or scenario tested, to refine successive options, and by doing so developing improved knowledge on the preferred solutions and reducing uncertainty.

The hydrological modelling conducted for this Review highlights important lessons to improve the health of the Upper Murrumbidgee River:

1. The current environmental flows under the SMRIF and other rules-based releases (i.e. current conditions) are insufficient to service the environmental water requirements, under current and projected climate conditions.
2. Baseflows are critical to protect and maintain ecological health. These requirements are well established in science, relatively low water volume and represent the minimum requirements under all climate conditions. The baseflow requirements modelled should be established as operational rules, often referred to as **Planned Environmental Water**.
3. Large freshes, bankfull and channel maintenance flows are critical for supporting ecosystem function and system recovery. These flow components require larger volumes of water and are most effective when delivered timed with natural events i.e. delivered as **Adaptive Environmental Water** and subject to near-real time operational decision making.
4. Maximising the effectiveness of environmental flows for the entire Upper Murrumbidgee River is achieved by **targeting a flow regime as measured directly downstream of Tantangara Dam**, with operational flexibility to respond in near-real time to the emerging climate conditions (e.g. piggybacking on top of natural unregulated river flow events).
5. **Infrastructure is a constraint to system recovery** - delivery of bankfull and channel maintenance flows, even during moderate-wet climate conditions, is not possible under existing outlet capacity at Tantangara Dam. Higher order ecological processes therefore depend on future infrastructure decisions as much as the volume of water available for the environment.

Step change is required in the available volume of environmental water for the Upper Murrumbidgee to approximately **30% of the average natural flow**. This volume could potentially be reduced through operational flexibility and instituting an adaptive management framework.

## 4.6 Upper Murrumbidgee: system impacts and trade-offs from improving environmental outcomes

While trade-offs between environmental flows, energy generation and water availability are inherent, analysis conducted for this Review suggests that there are substantial benefits from improving environmental flows and that adverse impacts can be substantially mitigated through careful design of release regimes and adaptive operating frameworks.

Improved environmental outcomes can be achieved without compromising the reliability of the NEM, Snowy Hydro's essential role in the energy transition or downstream reliability of water supply for irrigation. In summary:

- *Impacts on the NEM are minor*: The scale of foregone generation is small in system terms, equivalent to less than 4% of Snowy Hydro's annual generation in any year, and approximately 0.05 to 0.1% of total NEM generation across all options. Importantly, modelling indicates this generation loss occurs predominantly at lower value times with replacement largely provided by existing curtailed renewable generation. The loss of such

percentage generation to the NEM is less than the routine uncertainties in supply and demand.

- *No system security risk:* Environmental releases will not cause or increase the risk of a system black; system security and essential system services are expected to be unaffected.
- *Impacts are manageable through design:* Adaptive, near real-time release decisions, sourcing water from RAR without drawing down scheme storage, and flexibility to protect critical reliability periods will further maintain Snowy Hydro's important role in the NEM and its ability to respond to unexpected market events.
- *Clear governance enables balance:* An adaptive operating framework with explicit conflict resolution processes and decision-making authority ensures improved environmental outcomes while preserving Snowy Hydro's role in the energy transition.
- *Material impacts on downstream water resource are avoidable:* Relatively small, long-term average impacts on downstream diversions and allocations are observed in the modelling, concentrated in drier conditions and are manageable through an extension to the Australian Government's environmental water portfolio and accounting arrangements.
- *Social benefits:* Improving the health of the river provides a proportionate net benefit to the broader community with the overall benefits exceeding costs on an economy-wide basis.

## Energy system and Snowy Hydro impacts

This Review recognises that changes to environmental flow arrangements in the Upper Murrumbidgee have implications for Snowy Hydro operations and the NEM. These considerations have been a consistent focus of Panel deliberations and the advice of the advisory groups supporting the Review. However, the evidence available to the Panel indicates that environmental flow reforms can be designed to deliver substantially improved ecological outcomes while maintaining energy system reliability and managing impacts on Snowy Hydro.

New environmental flow provisions will create new release obligations for Snowy Hydro, but the Panel is not looking to impose new restrictions on how Snowy Hydro manages water resources internal to the scheme or to require a reserve of water to be held within Tantangara Dam. Snowy Hydro's flexibility to use its water resources across the system remains paramount and is a critical aspect in minimising potential impacts.

### *Assessment of impacts to the NEM*

The Panel recognises the critically important role Snowy Hydro plays in the NEM and the energy market transition underway, while balancing its role in providing reliable long-term water supply. Consequently, the release of additional water should not come at a time or in a manner which causes or exacerbates an energy crisis. However, the balance of available evidence indicates that a significant uplift in release volumes, with operational flexibility, is required to avoid ecological collapse in the Upper Murrumbidgee River.

As noted above, modelling suggests that the scale of foregone generation across all options is small in system terms, equivalent to less than 4% of Snowy Hydro's annual generation in any year, and less than 1.2% on average. This is approximately 0.05 to 0.1% of total NEM generation. Importantly, this generation loss is expected to occur predominantly at lower value times, with replacement largely

provided by existing curtailed renewable generation. Differences in the spot prices are also minor and almost indiscernible from the Base Case.

Modelling indicates additional investment of 20-51 MW is needed across Options 2-5 to compensate for reduced Snowy generation. This is considered below the typical threshold for a commercial project and represents a minor adjustment relative to the NEM-wide installed capacity of approximately 80 GW currently and up to around 180 GW by 2050. The adjustment modelled led to small changes in the timing of investment, primarily in wind and solar, and even showed a small reduction in unserved energy. On this basis, impacts on wholesale prices, investment signals and reliability are assessed as negligible.

The findings that the market can compensate the small reductions in generation from pumped hydro with an increase in renewable energy is supported by the [AEMO Q1 2026 report](#) which showed an increase in batteries displacing hydrogeneration in day-to-day energy storage and dispatch. The modelling indicates a negligible impact of the options on Snowy Hydro's ability to provide inter-seasonal energy storage in the NEM, and the Panel is considering further opportunities for flexibility to ensure that Snowy Hydro's important role in the NEM is protected.

The Panel has also considered claims that increased environmental releases could compromise energy system security. The evidence does not support these claims. The scale and design of the environmental flows will not cause or exacerbate a system black event, nor do they affect the provision of essential system services. System security in the NEM is driven by designed-in resilience and procurement of system services, which has been significantly strengthened in recent years through investments in synchronous condensers, batteries and other technologies. Snowy Hydro's provision of system services does not require water releases and is therefore unlikely to be materially affected by changes to environmental flow arrangements.

### *Impacts to Snowy Hydro energy generation*

Increasing the volume of water delivered through Tantangara Dam without opportunity for electricity generation will have a financial impact on Snowy Hydro through reduction in overall generation and spot market revenue. The Panel has also considered claims that the options may impact Snowy Hydro's ability to provide and back cap contracts in the market.

Analysis undertaken for the Review indicates that increased environmental releases from Tantangara Dam primarily affect the amount of energy stored within the Snowy Scheme, rather than causing immediate reductions in generation. As a profit maximising generator, it is expected that Snowy Hydro would forego future generation at times when the value of this foregone generation is minimised. This would not only minimise the impact on Snowy Hydro's spot market revenue but would also minimise any impacts on its ability to offer cap contracts to the NEM.

Modelled generator output by the Snowy Scheme is reduced by less than 3.7% under the options, and typically less than 1.2% on average. Impacts to generation are most pronounced in autumn and summer when spot prices are lower, with reductions of up to 8% and 6% respectively compared to the Base Case. To put this in context, the average generation lost in any season and against any environmental flow option is approximately 88 MWh. Impacts to Snowy Hydro spot market revenue (net pumping costs) is assessed as less than 4%, and less than 1.0% on average.

Analysis of Snowy Hydro's historic bidding behaviour in the NEM shows significant generation at prices below \$300/MWh, while it received an average price of around \$150/MWh in the last year. The modelling does not find a material difference in the ability of Snowy Hydro to operate at times when it is most valuable to do so—for example, the ability to operate above \$300/MWh or higher which indicates an immaterial impact of the options on the ability of Snowy Hydro to sell and back cap contracts into the market. However, greater operational flexibility could also provide further certainty by ensuring Snowy Hydro's ability to generate in response to an expected market event or outage

Modelling also indicates that the pumping and generation capacity available through Snowy 2.0 is substantially larger than the foregone electricity generation resulting from the proposed environmental releases. Annual generation from Snowy 2.0 increases over the modelled period, rising from approximately 15% to over 20% from 2040 with the increasing penetration of renewables in the NEM. This trend is consistent across the Base Case and all options, which show no material difference in the ability of Snowy 2.0 to provide inter-seasonal long-duration storage to the NEM.

There are minor changes in the storage behaviour of Tantangara Dam directly associated with the environmental flows options that do not appear to impact the operating capacity of Snowy Hydro and Snowy 2.0 in particular. Some future adaptation of Snowy Hydro operations (i.e. maximising Tantangara Dam storage level earlier in the season) may provide opportunity for large environmental flow events with less potential impact.

Overall, results of the analysis support the case that the environmental flow options are not expected to have significant impacts on Snowy Hydro's important role in the NEM, the scale of impact to Snowy Hydro's operation is modest and could be mitigated through increased operational flexibility. Where needed, the increased operational flexibility would be given effect through changes to the Deed and the Snowy Water Licence.

### *Mitigating impacts*

The Panel considers trade-offs between environmental outcomes and energy impacts are manageable with good design. The Panel therefore places strong emphasis on operational flexibility as the primary mechanism for mitigating impacts on Snowy Hydro and the NEM.

A weakness of current water management arrangements identified through the Review is that environmental releases are effectively planned up to 15 months in advance with no opportunity for revision and limited adaptation to conditions. This inhibits the ability of water managers to respond to environmental events, system conditions or market prices, with existing institutional arrangements inhibiting nimble responses to critical energy and environmental events. A more adaptive operating framework is required under which decisions on timing and magnitude, especially for larger flushing events, are made closer to real time and within an operational envelope. This approach allows releases to be delayed, reshaped or sequenced to:

- align with natural inflow events to maximise ecological benefit per unit of water
- avoid periods of high energy system stress or high market cost
- preserve Snowy Hydro's capacity to generate during critical reliability periods.

While the commissioning of Snowy 2.0 increases complexity, it also significantly improves flexibility. While the Panel recognises that Snowy Hydro has obligations relating to irrigation, critical human needs, scheme storage management and energy contracts, modelling indicates that the pumping and generation capacity associated with Snowy 2.0 is substantially larger than the generation foregone through proposed environmental releases.

Future arrangements should include rules for the flexible delivery of environmental water, decision-making processes and an independent oversight authority to manage potential conflicts between energy and environmental objectives, including timely dispute resolution mechanisms where required. These matters are discussed below and in the **Chapter 5**.

## Downstream water availability and reliability

The design choice for modelling the environmental flows by diverting a small portion of RAR from Blowering Dam to the Upper Murrumbidgee reflects the Panel's position that environmental flow reforms should not compromise long-term water security or materially affect other water users in the downstream regulated river systems.

Hydrological modelling and data analysis were conducted to assess the potential impact to water users in the Murrumbidgee River downstream of Burrinjuck Dam. The methodology and results are reported in the *Hydrological Technical Report*.

The modelling analysis using the Murray–Darling Basin Authority's Integrated River Model indicates that increased environmental releases (and the 6 GL/year cultural water allocation) delivered from Tantangara Dam result in small average impacts on downstream water systems. In some cases, the results indicate a positive direction change resulting in slight improvements to total diversions. Impacts on downstream regulated water users are concentrated in drier years, with small reductions in general security diversions (2-3% in drier years) and end-of-year allocations on average (1-3%). Allocations against high security entitlements remain unaffected. Overall, the magnitude of change for the Regulated Murrumbidgee is within the margin of error for the model.

Changes in routing of RAR lead to a redistribution of inflows between Burrinjuck and Blowering dams, with slightly increased spill volumes at Burrinjuck and reduced spills at Blowering, particularly in wetter years. Overall, the modelling indicates a slight reduction in total system spills in the options compared to the Base Case.

Analysis was conducted to examine whether increased environmental flows would result in increased 'transmission' losses in Upper Murrumbidgee River, between Tantangara and Burrinjuck dams. The Upper Murrumbidgee River is predominantly a gaining system, with transmission losses relatively small and increases in net evaporation typically less than 1 GL per year under higher release options. Modelled system-wide transmission losses are virtually unchanged across the options. These results indicate that additional releases for environmental purposes are hydrologically efficient.

Previous studies<sup>70</sup> and data analysis<sup>71</sup> show that some sections of the river lose water during extreme dry periods with flows decreasing between Tantangara Dam and Halls Crossing, but these periods are generally infrequent and relatively short lasting only a few weeks. The volume of losses during extreme dry events remains small but may form a significant proportion of very low flows during these distinct periods. Examination of losses between different extreme events does not indicate a consistent pattern in the estimated water losses. Measurement error during low flow and high flow periods compounds the ability to accurately estimate losses that could be directly attributed to additional environmental flows. Due to the infrequency and small scale of these events, mitigating any potential impact needs to occur on an event-by-event basis.

Overall, modelling suggests that downstream impacts specifically attributable to the environmental flows are minimal and manageable using a risk-based approach designed within the future management arrangements. Accounting for system losses as environmental water use, debited against an environmental water entitlement, would ensure that changes to environmental releases do not disproportionately affect downstream reliability, particularly under dry climate conditions. The accounting framework for this purpose must also ensure that the losses attributed to the environmental accounts are directly proportionate to the actual losses incurred to avoid adversely impacting the environment.

The protection of the environmental flows from extraction enroute to Burrinjuck Dam under NSW legislation further protects downstream water users from any impact associated with the proposed environmental flows.

## Cost-Benefit Analysis

A cost-benefit analysis (CBA) was conducted for this Review to assess the incremental economic, social, environmental and cultural costs and benefits associated with the environmental flow options. The costs and benefits were determined by comparing the environmental options against a Business-as-Usual Base Case over a long-term modelling period.

The economic, social and environmental assessment of the environmental flow options indicates that Options 4 and 5 deliver an overall net benefit to the community, outperforming the Base Case and other options when costs and benefits are considered holistically over the modelling period.

Option 4 delivers the largest quantified benefits, including approximately \$597 million in improved waterway health, and an additional \$37.8 million in further benefits from cultural water, increased Macquarie Perch abundance and improved water-based recreation and associated wellbeing outcomes. It generates a net present value of approximately \$29.6 million and a benefit-cost ratio of 1.05:1, indicating that benefits exceed costs on an economy-wide basis. These benefits are driven primarily by substantial improvements in waterway health, including restoration of seasonal variability, achievement of EWRs and delivery of high magnitude channel maintenance flows that support sediment mobilisation, habitat renewal and system-scale ecological recovery.

These benefits outweigh the higher costs associated with Option 4 which include infrastructure upgrades at Tantangara Dam, increased energy system costs from foregone hydrogeneration,

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<sup>70</sup> Studies conducted by ACTEW (now Icon Water) in 2013 and Marsden Jacobs and Fluvial Systems for ACTEW in 2005.

<sup>71</sup> Technical note on a proposed methodology for estimating water used by the upper Murrumbidgee River for the Drought Operating Framework.

greenhouse gas emissions, embodied carbon and reduced water availability for downstream regulated users. While these costs are material—totalling approximately \$605 million in present value terms—they are comparable to those incurred under Option 3 and are more than offset by the additional ecological and cultural benefits delivered by the inclusion of channel maintenance flows. The cost included for the infrastructure upgrade is an estimate and is not based on any technical design or detailed costing. The benefits are considered conservative and based on the available information.

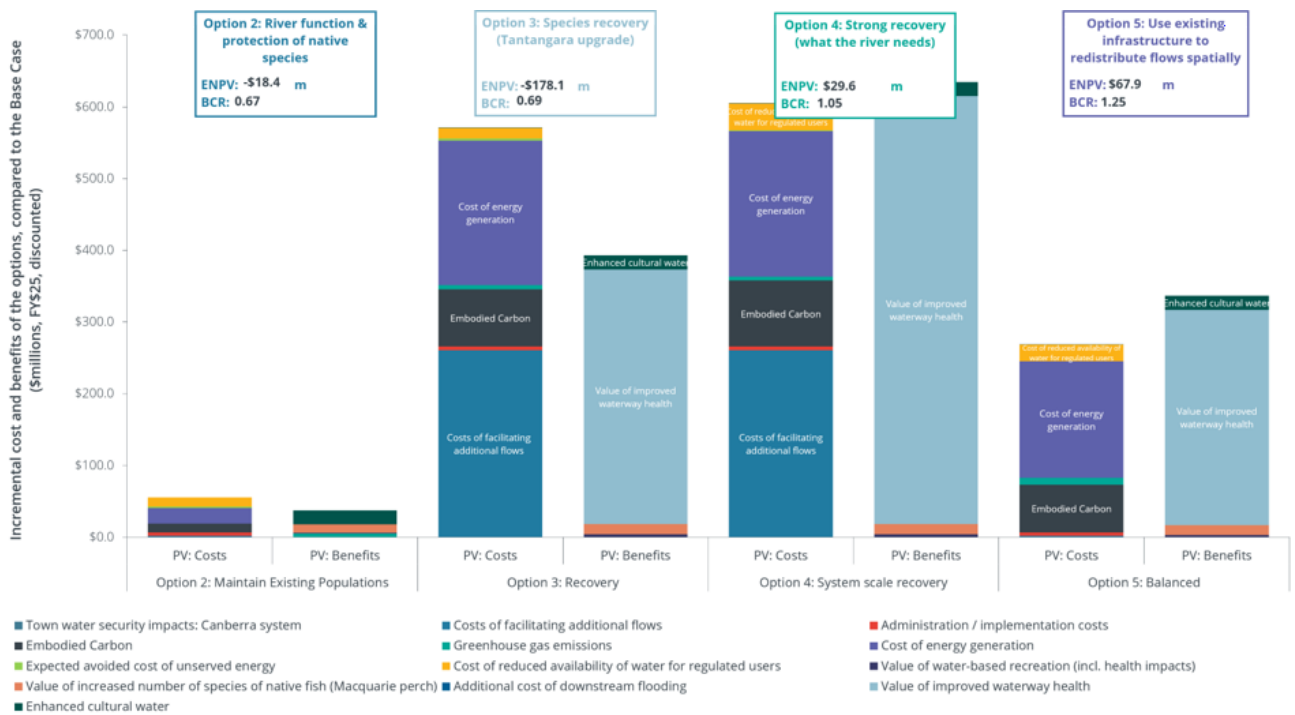
By contrast, Option 2 delivers modest ecological improvements and does not achieve a net economic benefit relative to the Base Case, while Option 3, although improving seasonal variability and species outcomes, does not restore key geomorphic processes and therefore yields a negative net present value.

In contrast, Option 5 provides greater ecological benefits than Option 2, within existing infrastructure constraints, particularly through improved baseflows upstream, but delivers more spatially uneven outcomes and foregoes the system-scale recovery enabled by higher magnitude flows. However, this option still demonstrates benefits that outweigh its associated costs, with an expected net present value of \$67.9 million and a benefit–cost ratio of 1.25:1

Sensitivity and scenario analysis indicates that Options 4 and 5 perform most favourably but results are sensitive to assumptions about the valuation of environmental benefits and (for Option 4) the cost of dam infrastructure upgrades. Importantly, the analysis also notes that a number of environmental and cultural benefits could not be fully quantified, indicating that the reported net benefits for Options 4 and 5 are likely to be conservative and further work would be required to further quantify these.

Taken together, the evidence indicates that Option 4 provides the strongest outcomes for ecological ambition and community value, delivering the only option that consistently supports system-scale river recovery while remaining net beneficial when economic, social, environmental and cultural factors are assessed together. However, Option 4 requires upgrades to Tintangara Dam to deliver channel maintenance flows and the Panel has recommended that a feasibility report and costing be developed to assess this in more detail. Option 5 should be progressed in the interim, as this offers the strongest benefit–cost ratio, particularly given the advantages associated with channel clearing flows.

**Figure 12: Incremental costs and benefits of environmental flow options analysed compared to Base Case (\$millions, EPV terms, \$FY25). Source: Frontier Economics, 2026.**



## 4.7 Adaptive operating arrangements

Across both the Snowy and the Upper Murrumbidgee rivers, the evidence consistently demonstrates that achieving ecological outcomes depends not only on the volume of water, but on how it is delivered. Fixed and pre-determined operating rules are in themselves insufficient to respond to environmental need, climate variability and system constraints. Adaptive operating arrangements are therefore required.

**Chapter 6** of this report introduces the broader adaptive management framework within which operational flexibility provides an integral component. Adaptive operational decisions enable the release of additional environmental water to be targeted when and where they deliver the greatest benefit, responding to natural climate cues and environmental needs, and support nimble action during extreme events to balance environmental, water security and energy outcomes. Adaptive operational decisions must be supported by robust monitoring and the integration of science and local knowledge.

Submissions on the Snowy River reinforce that rigid, compliance-based approaches limit long-term environmental outcomes. Energy stakeholders and agencies similarly highlight that adaptive decision-making is key to minimising energy system impacts.

The FNAG advice in the Upper Murrumbidgee reinforces this position of requiring adaptive decision-making, emphasising that caring for a living river requires ongoing, responsive decision-making guided by cultural knowledge, seasonal understanding and observation of river condition. Stakeholder advice cautions that static flow rules risk entrenching a managed but degraded state

and instead supports adaptive approaches that enable healing, renewal and intergenerational responsibility.

## Managing dry years and extreme events

Dry years and extreme events are projected to increase in frequency and severity. Managing for these events requires a high degree of operational flexibility, including for inter-annual variability in water resource availability. Rigid, pre-committed release schedules increase the risk of harm during droughts and periods of energy system stress.

Under adaptive operating arrangements environmental releases could be deferred, reshaped or targeted to flexibly respond to conditions in the downstream environment, or to preserving Snowy Hydro's capacity to respond during periods of high energy demand or reliability risk. Decisions made closer to real time, particularly for larger environmental flushes, enable alignment with hydrological opportunity and energy market conditions.

Adaptive operating arrangements designed to manage risk during extreme events should include:

- predefined decision flexibility criteria that guide the short-term prioritisation of resources between specific EWR or electricity generation
- flexibility to adjust the planning of releases during periods of prolonged low flow or shortfalls in the electricity market
- the capacity to coordinate environmental releases with events, such as floods, post-fire recovery or periods of poor water quality, to maximise ecological benefit while managing system risk
- robust system of water accounting that manages the transfer of resource across different objectives and between years.

## Establishing the foundations of adaptive operating arrangements

The foundations of an adaptive, flexible operating framework include the following key elements and are foundational recommendations arising from this Review.

### *Enhanced environmental water planning*

- **Long-term environmental watering strategy** that:
  - provides measurable ecological and cultural objectives
  - integrated environmental flow planning with broader catchment (regional) and Basin-scale objectives, ensuring upstream and downstream outcomes are considered together.
- Sophisticated **planning and decision-support tools** (modelling capability) are developed and used to support scalable planning and operational decision-making to target EWR in near real-time.

## *Flexible operating arrangements*

Establish a formal adaptive operating framework that includes:

- **Environmental water requirements** periodically reviewed that define the timing, magnitude, inter-annual variability and sequencing of planned and flexible environmental flows.
- **Operations plan** that sets out annual and multi-year water planning that provides the operating envelope for responding to changes in water availability and environmental conditions.
- **Delegated environmental water manager who has authority** for optimising the delivery of water within the terms of the Licence taking into account catchment conditions, weather forecasts, snow melt etc. Based on those considerations the manager would request Snowy Hydro to make an environmental release.
- **Water accounting framework** that establishes inter-annual water use (carryover), addresses sharing of spill risk and that gives effect to the flexible operations i.e. deferral/repay of environmental water deliveries.
- **Process for operational decision-making** in near real-time to allow releases to be aligned with natural inflow events, ecological opportunity and system conditions.
- **Flexibility criteria** define the decision parameters for exercising flexibility in response to critical water or energy market events, these establishing an operating envelope for the adaptive arrangements.

The process for operational decision-making:

- The Deed should set out the operating envelope and flexibility criteria for adaptive operations, in response to natural climate cues, environmental conditions, water availability and critical energy market risks.
- The Snowy Water Licence would need to enable flexibility for the Snowy Scheme and environmental water manager to coordinate within the scope of the Operational Plan, including exercising the flexibility criteria as required with minimal administrative procedure.
- The Operations Plan is developed as part of the AWOP in consultation with the Snowy Advisory Committee, WCLC, STAG, and CPHR with advice from Snowy Hydro, and approved by the NSW Water Administration Ministerial Corporation.
- Operational authority to implement the Operational Plan should reside with appropriate operational staff (Snowy Hydro and WAMC delegated decision maker, who is an environmental water manager), with mechanisms for risk management and escalation if required to a WAMC approved statutory position of Snowy Water Commissioner, to enable highly responsive operational decision-making on emerging critical events. A WAMC delegated adaptive flow decision maker is necessary to ensure timely decisions because approval of each adaptive flow by WAMC will be too time consuming.
- Water managers of the Snowy Scheme maintain full flexibility for the management of the water resources within the Scheme's storage and are accountable for delivering on the Operating Plan, unless otherwise directed to avoid impacting their important role in the NEM. Snowy Hydro may defer a release if deemed necessary with consideration of:
  - the terms of the licence

- energy market information from the NEM systems including pre-dispatch, the current short-term projected assessment of system adequacy and most recent medium-term projected assessment of system adequacy
- conditions within the Scheme including plant availability, weather forecasts, snow depth, water level in Tantangara Dam
- any directions from AEMO.
- Flexibility that exceeds the scope of the Operating Plan is subject to formal direction by the WAMC or statutory commissioner with authority for dispute resolution.

The Panel considers that these flexible arrangements should be formally established to ensure the intended outcomes are achieved. However, conflicts or the need for dispute resolution are expected to be infrequent.

### *Monitoring, evaluation and improvement*

- Establish robust monitoring, evaluation and reporting (MER) framework directly linked to management decisions and continuous improvement:
  - the monitoring program requires coordination across the ACT, NSW and Victoria and integrated with downstream monitoring in the Murray-Daling Basin Southern Connected Basin.
  - extension of the FlowMER program delivered by the Commonwealth Environmental Water Holder (CEWH) or similar program coordinated by the MDBA provides intergovernmental coordination and the appropriate geographical scale of implementation.
- Monitoring should assess:
  - achievement of EWRs
  - ecological responses, including habitat condition, connectivity and threatened species
  - effectiveness of different flow components under varying climatic conditions.
- Early priority is given to establishing the monitoring program for providing a baseline for future decision-making.
- Annual reporting provides public information on:
  - environmental water outcomes related to EWRs
  - environmental water accounting
  - implementation of obligations and responsibilities of Snowy Scheme and environmental water managers.

### *Integration of science*

- Establish a science program that maintains access to independent scientific advice and generates new information that integrates new evidence and climate projections into future planning and decision-making.
- The coordination of independent science to be delivered by the CEWH or the MDBA at the geographical scale of the Upper Murrumbidgee (the Murray-Darling ‘Eastern Basin’) and the Snowy River, and across the ACT, NSW and Victorian jurisdictions.

### *Stakeholder and First Nations participation*

- Embed First Nations custodianship and community stewardship in environmental water governance, including participation in setting objectives, identifying cultural flow priorities, catchment management and priority setting for adaptive operations.
- The Snowy Advisory Committee established by the NSW Government provides an existing mechanism for this purpose, with expanded scope (Terms of Reference), membership and legislated authority for the NSW environmental water manager to actively manage this committee outside of ministerial administration.

### *Independent audit and review*

- Annual independent audits of water accounts
- 5 and 10-year reviews of environmental water delivery arrangements, outcomes and governance to ensure accountability and effectiveness for mitigating risks to the NEM.

This approach reflects best practice environmental water management across the Murray–Darling Basin and provides a pathway to move from stabilising a degraded system toward long-term ecological recovery and resilience.

## 4.8 Conclusion

The environmental flow options considered through this Review present different ecological outcomes and system implications. The primary distinction is not whether impacts exist, but the extent to which environmental outcomes are pursued, the effectiveness of the operating arrangements to maximise the environmental outcomes and how associated impacts are managed through design, governance and adaptive operation.

The Panel's focus is not on whether increased environmental flows are compatible with system needs, but on how to design and govern flow delivery to achieve ecological recovery while maintaining energy system reliability and water supply outcomes.

### Overarching conclusions

#### *The status quo is not sustainable*

Current flow regimes do not meet ecological requirements and are associated with ongoing decline that includes the extinction of native fish species. The impacts of ecosystem collapse and degradation of the river system create broader impacts on urban water security, human health (water quality), regional economic growth social and cultural wellbeing.

#### *Volume alone is insufficient*

- Ecological recovery depends on restoring flow regime characteristics, particularly variability and disturbance. This requires increased volume managed under a flexible operating framework and infrastructure with the appropriate capacity to deliver the flow regime.
- Options must provide baseflow conditions that mitigate the acute stress caused by extreme dry climate events, protecting native species and maintaining basic ecosystem services.

- Flushing flows are the critical differentiator—high magnitude events underpin sediment transport, habitat reset and connectivity. To achieve this requires infrastructure upgrade to Tantangara Dam.

*Trade-offs are unavoidable and multidimensional but can be minimised through design and operational flexibility*

- Water is a finite resource and, in this case, rebalancing water use for environmental improvements inevitably reduces the available water for energy generation. Analysis conducted for this Review indicates that the impacts are minor and manageable with good design choices.
- Adaptive operating arrangements, including near real-time operations and flexibility during critical energy events, provide an effective mechanism for avoiding perverse outcomes for the NEM and minimising impacts to Snowy Hydro business outcomes.

## Recommendations

### **Recommendation 1 – Upper Murrumbidgee River environmental flows**

Environmental flows in the Upper Murrumbidgee River are increased to achieve environmental outcomes equivalent to the delivery of an average annual target of 30% (87 GL equivalent) of the average annual inflows into Tantangara Dam, delivered through redirecting a portion of the Required Annual Release from the Snowy-Tumut Development through Tantangara Dam. Meeting this requirement is to be delivered through:

- a. planned environmental water - rules-based variable baseflows and small freshes that provide certainty in operations and minimum outcomes
- b. adaptive environmental water - managed through flexible operating arrangements with the scale and timing of releases aligned with climate conditions and proportionate to Tantangara Dam inflows
- c. the volume is in addition to other environmental flows for the associated montane rivers and the Snowy River
- d. staged delivery, commencing with an increase in the volume of water to an average annual target of 23% (68 GL equivalent) of average annual inflow, with further increase subject to a 5-year audit on the effectiveness of environmental water delivery.

### **Recommendation 2 – Tantangara Dam Outlet Upgrade Feasibility Study**

Snowy Hydro to commission and submit to the Australian Government, within 2 years from the acceptance of this Review report, an independent study to determine feasibility level costs of upgrading the outlet valve on Tantangara Dam, to enable flushing flows that are required to support ecosystem recovery. Following this, the cost benefit analysis should then be updated to determine whether the upgrade should proceed.

The development of the business case must be consistent with Infrastructure Australia's Assessment Framework to reflect national standards for best-practice infrastructure development.

### **Recommendation 3 – Environmental Water Monitoring Program**

The Commonwealth Environmental Water Holder, with governments, should establish, as a priority, a monitoring program that builds a baseline for assessing the effectiveness of environmental water delivery by governments when considering the business case for infrastructure upgrades.

**Recommendation 4 – ACT Water Entitlement Contribution to Environmental Flows**

The ACT Government provides water entitlements to the Commonwealth Environmental Water Holder of a volume that offsets the actual volumetric risk to water reliability in the regulated Murrumbidgee from the additional minor transmission losses associated with improving environmental flows. This entitlement is a dependency for the increased environmental water and contributes towards the ACT Government's inclusion as a Party to the new Deed.

**Recommendation 5 – Snowy River Increased Flows**

For the final report the IRP further investigate the impact on the NEM of Snowy Hydro delivering an annual average of 212 GL to the Snowy River, noting that this was the original intent of the Deed and that water was purchased for this purpose and that rather than being delivered to the Snowy River the water has been used for energy and irrigators. In this context, the Panel notes, there is no reasonable basis for applying existing compensation arrangements to deliver on the original policy intent of governments.

**Recommendation 6 – Evaluation of Snowy River Increased Flows and other Snowy Montane Rivers**

Within 3 years of the acceptance of this report, the effectiveness of the existing Snowy River Increased Flows to be subject to a thorough, quantitative evaluation for delivering on the original agreed commitment of governments to restore the health of the Snowy River. This review is to:

- a. be undertaken by the Australian Government, in consultation with relevant jurisdictions
- b. review the effective volume and adaptive flow approach of environmental water required to achieve the policy objective, with consideration for climate projections and growth in water demands along the river
- c. develop measurable ecological objectives for the Snowy River as a priority under the renewed arrangement to support outcome-based environmental water delivery and long-term system performance
- d. investigate the impact on the NEM of Snowy Hydro delivering up to 294 GL to the Snowy River
- e. on completion of the exercise for the Snowy River, prepare a plan and costings for undertaking a similar exercise for the other rivers in the Snowy scheme.

**Recommendation 7 – Decommissioning of Mowamba Weir**

Decommission the Mowamba Weir within 5 years of acceptance of this review, giving effect to recommendations from the Ten-Year Review of the Snowy Water Licence.

**Recommendation 8 – Adaptive Operating Framework for the Upper Murrumbidgee River**

NSW implement, in consultation with other governments and with advice from Snowy Hydro, an adaptive operating framework to provide flexible operating arrangements that deliver environmental outcomes and provide flexible responsiveness to critical weather, water and energy events within the Upper Murrumbidgee River.

The environmental water flow program for the Upper Murrumbidgee is to be supported by:

- a. enhanced environmental water planning with measurable objectives within the Annual Water Operating Plan
- b. flexible operating arrangements and processes within a flexibility envelope will include a water accounting framework that will establish annual and interannual water use
- c. a monitoring, evaluation and science program
- d. First Nations and stakeholder participation
- e. reporting and reviews.

The operating arrangements must be consistent with Snowy Hydro's responsibilities as a NEM participant and support AEMO's planning and operation of the NEM.

Following the completion of Recommendation 6, investigate if this approach could be applied to other Snowy and Snowy Montane Rivers.

# 5. New Objectives and Governance

This chapter sets out the objectives and governance framework for a new Deed. These elements are intrinsically linked: objectives define the outcomes the system is intended to achieve, while governance determines how those outcomes are delivered in practice. Together, objectives and performance indicators provide a “report card” for the system, dependent on effective governance to guide decision-making, coordination and adaptation.

## 5.1 New Shared Objectives

The recommended objectives are intended to shift the system toward outcomes-based management, improve transparency and accountability in decision-making, support adaptive management over time, and provide a clear basis for assessing system performance.

Together, these objectives establish a foundation for a performance framework, enabling governments and stakeholders to assess whether the system is delivering intended outcomes and to adapt settings where required.

The Panel recommends the following objectives for the renewed arrangement:

- **Improve ecological outcomes**  
Protect, improve and maintain the ecological condition, function and resilience of rivers affected by Snowy Scheme operations, including supporting healthy biota, natural river processes and the recovery of threatened species.
- **Maintain water security**  
Maintain water security for users in the lower Murrumbidgee River, consistent with entitlement frameworks and national water principles.
- **Minimise impacts on energy system outcomes**  
Maintain minimal, transparent and manageable impacts on the NEM, ensuring impacts on Snowy Hydro operations are modest and risks to the business are minimised.
- **Improve First Nations outcomes**  
Enable the staged inclusion and elevation of First Nations in governance, planning and cultural water use, consistent with Closing the Gap commitments.
- **Improve community participation and transparency**  
Strengthen stakeholder engagement, access to information and transparent and timely release in decision-making processes.
- **Achieve public trust and confidence**  
Implement clear, measurable and enforceable arrangements that can evolve over time in response to new information, climate variability and changing community expectations.

Specific objectives proposed for the Upper Murrumbidgee River are set out at **Box 3**. These objectives focus on restoring key physical processes and improving the condition and resilience of aquatic ecosystems.

They provide a measurable and outcome-focused basis for environmental water delivery and system performance and are intended as initial targets to support recovery from current conditions, with future review to refine and adapt them over time.

**Box 3: Proposed Ecological Objectives for the Upper Murrumbidgee River**

**Physical Process Objectives**

- Flow components align with aspects of the natural regimes
- Flow regime that mobilises sediment
- Maintain water quality that is sufficient to protect and restore ecosystems and ecosystem functions

**Biotic Objectives**

- Improved and resilient Macquarie Perch population
- Improved and resilient Murray Cod population
- Improved and resilient macroinvertebrate populations

Ecological objectives for the Snowy River should be developed as a priority (within 3 years) under the renewed arrangement to guide outcome-based environmental water delivery.

## 5.2 From objectives to system governance and performance

The system objectives and associated performance indicators jointly establish a clear framework for assessing overall system performance. Together, they function as a “report card” that enables governments and stakeholders to evaluate progress and support accountability.

Performance indicators provide a consistent and measurable basis for assessing whether the system is delivering intended outcomes. They support evidence-based decision-making, enable transparency and underpin adaptive management over time.

Each objective should be supported by clearly defined, measurable performance indicators.

**Table 3: Objective and Performance Indicators**

<b>Objective</b>	<b>Performance indicators (success measures)</b>
<b>Improve ecological outcomes</b>	<ul style="list-style-type: none"> <li>• Flow regimes meet defined ecological flow components in ≥X% of years</li> <li>• Stable or increasing population trends for key indicator species over rolling 5-year audit and 10-year periods</li> <li>• Water quality and habitat condition meet agreed ecological thresholds</li> <li>• Demonstrated progress toward ecological condition targets, independently verified</li> </ul>
<b>Maintain water security</b>	<ul style="list-style-type: none"> <li>• No material reduction in reliability of downstream entitlements relative to baseline</li> <li>• Zero unplanned impacts on critical human water needs</li> <li>• All changes to water availability managed within agreed risk-sharing frameworks</li> <li>• Annual reporting confirms no systematic decline in entitlement reliability</li> </ul>

<b><i>Minimise impacts on energy system outcomes</i></b>	<ul style="list-style-type: none"> <li>• Generation impacts remain within agreed annual thresholds (GWh range)</li> <li>• No adverse impact on system reliability during critical NEM events attributable to environmental water delivery</li> <li>• Snowy Hydro retains capacity to respond to peak demand events</li> <li>• All impacts quantified and publicly reported annually.</li> </ul>
<b><i>Improve First Nations outcomes</i></b>	<ul style="list-style-type: none"> <li>• Formal participation of First Nations in governance and planning achieved and maintained</li> <li>• Measurable progress toward establishment of cultural water arrangements within defined timeframes</li> <li>• Increasing delivery of on-Country programs and stewardship activities</li> <li>• Demonstrated integration of First Nations' knowledge in decision-making.</li> </ul>
<b><i>Improve community participation and transparency</i></b>	<ul style="list-style-type: none"> <li>• All major decisions and trade-offs publicly reported within defined timeframes</li> <li>• Annual reporting provides clear, accessible information on system performance</li> <li>• Documented opportunities for stakeholder participation in planning and review each year</li> <li>• Measurable improvement in stakeholder satisfaction with engagement processes over time</li> </ul>
<b><i>Enable balanced and effective delivery</i></b>	<ul style="list-style-type: none"> <li>• All material decisions include documented trade-off assessments</li> <li>• Environmental water delivery achieves planned priorities in <math>\geq X\%</math> of years</li> <li>• Decision-making operates within defined timeframes and escalation pathways</li> <li>• Clear alignment between objectives, decisions and observed outcomes.</li> </ul>
<b><i>Achieve public trust and confidence</i></b>	<ul style="list-style-type: none"> <li>• Annual public reporting delivered on system performance</li> <li>• Independent audits completed every 5 years and publicly released</li> <li>• System-level reviews completed every 10 years with published responses</li> <li>• All instances of non-compliance publicly reported and addressed.</li> </ul>

Together, these indicators provide a comprehensive basis for assessing system performance across environmental, water, energy, cultural and community outcomes and enable consistent evaluation of progress over time.

This performance framework is supported by regular monitoring and public reporting, including structured audit (e.g. 5-yearly) and periodic review (e.g. 10-yearly). It should inform independent evaluation processes and enable adaptive management, including updates to objectives, indicators and system settings over time.

The framework is not intended to be static. Indicators and targets should be periodically reviewed and refined to reflect evolving knowledge, system performance and environmental conditions. Achieving these outcomes depends on a governance framework capable of translating objectives into decisions, coordinating delivery and responding to changing conditions and new information. In this context, the performance framework is integral to governance, informing decision-making and enabling adaptive management.

To function effectively, the system must:

- support explicit and transparent trade-off decision-making
- enable adaptive management in response to changing conditions and new information
- provide clear roles, responsibilities and accountability
- ensure coordinated planning and delivery across jurisdictions and delivery entities
- include independent oversight, monitoring and review
- embed First Nations participation and community engagement
- ensure transparent reporting on decisions and outcomes.

These requirements highlight that success depends not only on what is agreed, but on how the system operates in practice.

The Panel therefore proposes a governance framework that:

- translates objectives into coordinated system-level decisions
- supports adaptive and efficient delivery
- ensures accountability and transparency
- enables continuous learning and improvement.

The proposed governance framework is underpinned by a set of design principles that guide how the system should operate in practice.

These principles do not duplicate the system objectives or performance indicators. They guide how governance arrangements are designed and how decisions are made in practice to support delivery of the intended outcomes.

## System design principles

These principles guide how the governance framework operates in practice and support consistent, transparent and effective decision-making.

- Engagement with communities and First Nations:
  - Decision-making should reflect community priorities and incorporate Traditional Owner knowledge and values
- Transparency and clarity:
  - Arrangements should be clear, predictable, and accessible to stakeholders
- Minimising third-party impacts:
  - Impacts on other water users and communities should be carefully managed
- Protection of critical human water needs:
  - Essential water requirements must be reliably met at all times
- Maintaining energy system integrity:
  - Impacts on Snowy Hydro operations and the NEM should be managed and understood
- Clarity of objectives and operational arrangements:
  - Roles, responsibilities and processes should be clearly defined to support effective and consistent delivery
- Fit-for-purpose infrastructure:
  - Systems and infrastructure must support the delivery of intended outcomes
- Adaptive and evolving arrangements:
  - Frameworks should be capable of adjustment in response to new knowledge, climate variability and implementation experience.

## 5.3 Proposed governance framework

This section sets out how the proposed governance arrangements would operate in practice to deliver the system objectives. It focuses on how decisions are made, how trade-offs are managed, and how implementation is coordinated across the system.

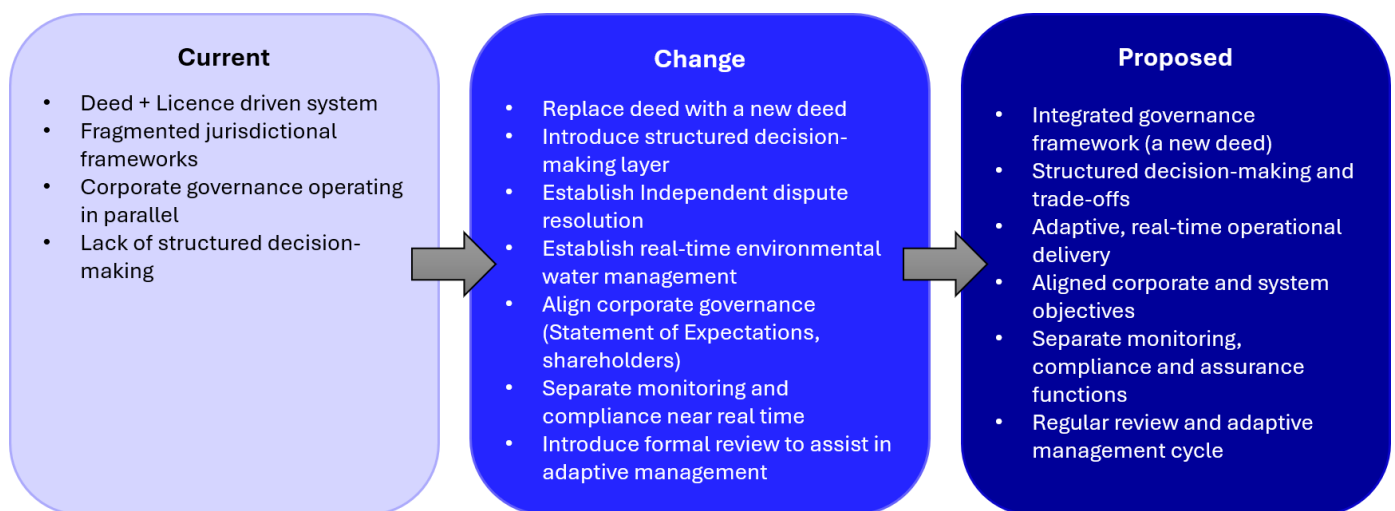
The Panel’s assessment is that incremental or partial reform will not address the structural limitations of the current arrangements. A revised governance framework is therefore required.

The proposed governance framework translates objectives and performance into decision-making, delivery and assurance arrangements. It should also support alignment with broader basin and system planning processes, including MDBA Basin planning, jurisdictional water planning and energy system coordination.

Throughout this section, shaded boxes are used to illustrate specific elements of the proposed governance framework. These boxes highlight key supporting features and design options that demonstrate how the framework could operate in practice. They provide more detailed and concrete examples, including potential institutional arrangements and implementation pathways, while allowing flexibility for governments to determine the most appropriate approach.

The Panel has proposed a set of reforms to address these structural limitations and to strengthen the overall governance system. These reforms focus on clarifying roles, improving coordination and accountability and introducing more explicit and adaptive decision-making processes.

*Figure 12: Summary of key changes in governance architecture, illustrating the shift from the current arrangements to the proposed framework.*



The proposed framework is structured around six core components:

- **A new Deed** - establishing shared objectives, roles and system foundations
- **Governance and decision-making** - strengthening decision-making processes and trade-off management

- **Operational delivery** - continuing delivery through existing entities within a clearer and more adaptive framework
- **Monitoring, reporting and review** - providing transparency, performance tracking and adaptive learning
- **Compliance and enforcement (system assurance)** - ensuring accountability and adherence to agreed requirements.
- **Review** – providing for assessment of effectiveness, adaptation and improvement

Community and First Nations participation is embedded across all components, including objective-setting, decision-making, implementation and review.

## Governance framework in practice

### *A new Deed*

The new Deed that establishes the system foundations, including:

- defining system objectives, performance expectations and review requirements
- establishing roles, responsibilities and participation across jurisdictions
- setting the parameters for decision-making and system operation
- providing the basis for accountability, transparency and periodic review.

### *Governance and decision-making*

Governance and decision-making arrangements define how:

- decisions are made within clearly defined roles and governance structures
- trade-offs are assessed using agreed frameworks and criteria
- escalation pathways are established, including independent dispute resolution where required (**Box 4**)
- decisions are documented and publicly reported.

These arrangements are supported by coordinated implementation across jurisdictions and delivery entities (**see Box 5**).

Governance arrangements should provide for ongoing input from experts, communities and First Nations people, ensuring that decision-making is informed by evidence, local knowledge and diverse perspectives (**Box 6**).

Within this framework:

- governments set policy and objectives
- designated decision-making mechanisms (including independent oversight functions where required) assess trade-offs and resolve disputes
- advisory inputs inform decision-making processes.

The proposed framework builds on these arrangements by introducing a clearer structure for coordination and decision-making, including strengthened intergovernmental coordination at the senior officials level, a more formalised coordination function across planning and delivery and an expanded role for delivery partners. Existing committees would continue to play a role but with

strengthened and clarified functions, including broader participation (for example, the inclusion of the Commonwealth Environmental Water Holder in relevant committees) and an expanded advisory function with a remit extending beyond the Snowy River to reflect broader considerations, including ACT and Victorian interests.

Alignment of corporate governance settings, including Statements of Expectations, is also critical to ensuring that system-level decisions are reflected in operational and strategic behaviour (**Box 7**).

The development and approval of the AWOP will continue under existing NSW legislative and licence arrangements, informed by existing committees (see **Chapter 3**). The AWOP sets out how Snowy Hydro will deliver its water release obligations each year under the Snowy Water Licence, including incorporation of environmental flow planning. The AWOP will also include adaptive water planning and the processes to make it happen.

The proposed senior officials group would provide system-level oversight, coordination of agreed reforms across jurisdictions and coordination and strategic direction across both water and energy interactions and support implementation of the Deed. This complements, rather than replaces, existing arrangements such as SWGOC and the statutory AWOP process.

#### **Box 4: Independent Dispute Resolution (Snowy Water Commissioner)**

##### **Proposed enhancement**

The Panel proposes establishment of an independent dispute resolution mechanism to support decision-making where agreement cannot be reached on an adaptive environmental flow volume or timing. This function would operate as a backstop within the governance framework, ensuring trade-offs can be resolved in a timely and transparent way.

##### **Design approach**

The Panel recommends this be established as a statutory independent officer, supported by a small secretariat. It could draw on existing models of independent statutory roles or expert panels and operate alongside existing governance bodies without duplicating their functions.

##### **Key elements**

- independent, evidence-based assessment of trade-offs
- decisions made within defined timeframes, including operational contexts
- use as a last-resort mechanism, not a routine decision-maker
- publication of decisions and reasons.
- authority under the WAMC
- not available for baseline flow allocations

##### **Operational principles:**

The role should operate in accordance with the following principles:

- **Independence:** operates at arm's length from governments and delivery entities, with decisions that are impartial, evidence-based and credible
- **Last resort (backstop):** used only where an adaptive environmental flow volume or timing cannot be resolved through existing processes, and applied sparingly
- **Timeliness:** capable of making decisions within defined timeframes, including rapid determinations in operational contexts (ie hours)
- **Clarity and proportionality:** intervenes only when presented with a dispute, with a response proportionate to the issue and focused on resolving specific disputes, not broader system questions
- **Consistency with agreed framework:** decisions are made within agreed objectives, rules and operating parameters and do not revisit system settings
- **Transparency and trust:** decisions and reasons, including trade-offs, are published in a clear and timely way (e.g. decision within 24 hours with a statement of reasons provided within a further defined timeframe).
- **Learning over time:** insights from prior decisions iteratively inform governance, planning and review processes, with reliance on the role expected to decrease as the system matures.

The senior officials group does not assume operational or statutory decision-making functions under the Licence and does not duplicate or override the established AWOP approval process. The governance framework distinguishes between system-level oversight and implementation (senior officials group), intergovernmental coordination and advisory input (including SWGOC and advisory committees) and statutory decision-making and delivery under the Snowy Water Licence (WAMC and Snowy Hydro).

#### ***Box 5: Implementation Coordination (Senior Officials Function)***

##### **Proposed enhancement**

The Panel proposes establishment of a more formalised intergovernmental coordination function to support implementation and whole-of-system operation.

##### **Design approach**

The Panel recommends this function is delivered through a senior officials committee or similar intergovernmental forum, supported by existing service delivery agencies (for example, the MDBA, which already performs coordination and delivery functions).

##### **Key elements**

- coordination of planning and delivery across jurisdictions
- oversight of implementation sequencing and system integration
- use of existing service delivery agents where appropriate
- support for consistent, whole-of-system operation.

#### ***Box 6: Advisory and Participatory Inputs***

##### **Proposed enhancement**

The Panel proposes strengthening advisory and participatory inputs to ensure that decision-making is informed by experts, community perspectives and First Nations knowledge. This would support more consistent integration of these inputs across planning, decision-making and review processes.

##### **Design approach**

The Panel recommends this build on existing advisory arrangements, including bodies such as the Snowy Advisory Committee, while expanding their scope and participation to reflect the broader system context. Advisory mechanisms would operate within a clearer governance structure, with defined pathways for input into decision-making and system review.

##### **Key elements**

- structured input from experts, communities and First Nations stakeholders
- integration of advisory input into planning, decision-making and review processes
- expanded participation where appropriate (e.g. possible inclusion of the Commonwealth Environmental Water Holder and broader jurisdictional representation)
- evolution of existing advisory bodies toward a broader, system-level remit, reflecting basin-scale considerations rather than a sole focus on the Snowy River
- clear articulation of the role of advisory inputs within the wider governance framework.

### **Box 5: Strengthened governance expectations for Snowy Hydro Limited**

#### **Proposed enhancement**

The Panel proposes strengthening the governance expectations applying to Snowy Hydro to better align corporate decision-making with system-level objectives, including environmental and water outcomes.

#### **Design approach**

The Panel recommends this be implemented through a revised Statement of Expectations issued by Shareholder Ministers, consistent with existing government business enterprise frameworks. These instruments could be used to more clearly embed system objectives, including environmental outcomes and First Nations engagement, within corporate governance, performance and oversight arrangements.

In addition, the Australian Government should consider whether current shareholder and governance arrangements adequately reflect water policy interests, noting the interaction between energy, water and environmental outcomes and give consideration to the Minister responsible for Water becoming a shareholder.

#### **Key elements**

- explicit inclusion of environmental, water and public benefit objectives within Statements of Expectations
- consideration of performance-linked mechanisms, such as incorporating environmental outcomes (e.g. river health and environmental flow delivery) into internal performance frameworks and executive incentives
- alignment of corporate governance and reporting with system-level performance expectations
- board composition to include skills and experience relevant to environmental management and water systems.

### *Operational delivery*

Operational delivery continues through existing entities including Snowy Hydro, but is significantly strengthened through more active and adaptive management of environmental water.

These arrangements introduce a more dynamic model of operation, where trade-offs between environmental outcomes and energy generation are exposed and managed in real time, rather than being determined solely through static rules or planning requirements that are undertaken so far in advance of the operation. Introducing an Environmental Water Manager would support this (**Box 8**).

This represents a shift from a largely rules-based delivery model to one that incorporates active management and real time decision-making.

### **Box 6: Environmental water management function**

#### **Proposed enhancement**

The Panel proposes establishing a strengthened environmental water management function as a key operational reform. This introduces dedicated expertise and capability to actively manage environmental water delivery and maximise ecological outcomes within agreed system constraints.

#### **Design approach**

The Panel recommends this function could build on existing environmental water management capability across jurisdictions, rather than requiring a new stand-alone institution. For example, it could be delivered through:

- an expanded role for the Commonwealth Environmental Water Holder
- a coordinated function across state environmental water managers (e.g. NSW and Victoria)
- or a joint arrangement combining Australian Government and state expertise for the Snowy– Upper Murrumbidgee system

In each case, the function would operate with a clear mandate for real-time, adaptive decision-making, working alongside Snowy Hydro and within defined governance and escalation pathways.

#### **Key elements**

- active, real-time management of environmental water delivery
- ability to adapt releases in response to changing conditions and environmental opportunities
- operation within defined parameters agreed through governance arrangements
- interaction with scheme operators, with escalation pathways where agreement cannot be reached.

### **Monitoring, reporting and review**

Transparency on system performance and support for adaptive management through:

- performance monitored against defined objectives and indicators
- regular public reporting providing transparency on decisions and outcomes
- independent audit and evaluation assess system performance
- periodic reviews enabling adjustment of objectives, settings and practices over time.

This framework (**Box 9**) distinguishes between short-term performance reporting and long-term evaluation of system outcomes. Together, these functions provide a continuous feedback loop between performance and decision-making.

### **Box 7: Monitoring, reporting and review framework**

#### **Proposed enhancement**

The Panel proposes a strengthened framework for monitoring, reporting and review that distinguishes between short-term performance reporting and long-term evaluation of system outcomes. This ensures that progress against objectives is clearly assessed and that the effectiveness of the framework can be reviewed over time.

#### **Design approach**

The Panel recommends this framework build on existing monitoring and evaluation capability, rather than creating new institutions. For example:

- annual performance monitoring and reporting would draw on existing data, modelling and reporting processes
- independent evaluation of environmental outcomes should draw on bodies such as the NSW Natural Resources Commission (NRC)
- periodic system review should be undertaken by the Productivity Commission, consistent with its role in reviewing intergovernmental frameworks.
- These components would operate as a structured cycle linking performance information to decision-making and system improvement.

#### **Key elements**

Performance reporting (short-term, annual)

- reporting against defined objectives and performance indicators
- publication of system performance and outcomes, including ecological condition and water delivery
- transparency on how decisions and delivery contribute to system objectives.
- System evaluation (long-term, multi-year)
- assessment of progress against outcome-based objectives (e.g. river health, key indicator species condition)
- independent audit of system performance over time (every 5 years)
- periodic major review (every 10 years by the Productivity Commission) to assess whether the framework is achieving its intended outcomes and whether settings should be adjusted.

#### **Integration**

- monitoring and evaluation findings are used to inform planning, decision-making, program delivery and governance adjustments over time.

### ***Compliance and enforcement (system assurance)***

Compliance and enforcement arrangements ensure that obligations are met and system requirements are adhered to:

- roles and obligations are clearly defined and enforceable
- compliance is monitored and assessed against agreed requirements
- breaches are addressed through proportionate and transparent responses
- accountability is supported through independent oversight and reporting.

### **Box 8: Compliance and enforcement framework**

#### **Proposed enhancement**

The Panel proposes strengthening compliance and enforcement arrangements to ensure that agreed operational settings, release parameters and obligations are delivered in practice. This provides assurance that the system is operating as intended and its relationship to delivering outcomes is understood.

#### **Design approach**

The Panel recommends this could be delivered through existing regulatory frameworks and agencies, rather than creating new enforcement bodies. For example, compliance monitoring and enforcement could be undertaken by regulators such as the Natural Resources Access Regulator (NRAR), which already performs similar functions in relation to water management.

These arrangements focus on the short-term operational timeframe, operating alongside (but distinct from) longer-term monitoring and review processes.

#### **Key elements**

- compliance with defined operational 'envelopes', including release rules, licence conditions and operational settings
- ongoing monitoring of delivery against agreed requirements (within-year / near real-time where required)
- independent compliance assessment and enforcement, including investigation and response to non-compliance
- clear escalation pathways, including referral to dispute resolution mechanisms where required
- transparent reporting of compliance outcomes, supporting accountability and confidence
- delivery and governance adjustments over time.

## **An integrated governance system**

The governance framework is designed to operate as an integrated system linking objectives, decision-making, delivery, performance assessment and compliance. These linkages provide a 'closed loop' governance system.

At its core, the framework establishes a clear line of sight between:

- objectives and performance expectations, set through the new Deed
- decision-making processes, including the structured assessment of trade-offs
- operational delivery, including more active and adaptive management of environmental water
- performance monitoring and evaluation, assessing whether outcomes are being achieved over time
- compliance and enforcement, ensuring that agreed operational settings are implemented in practice.

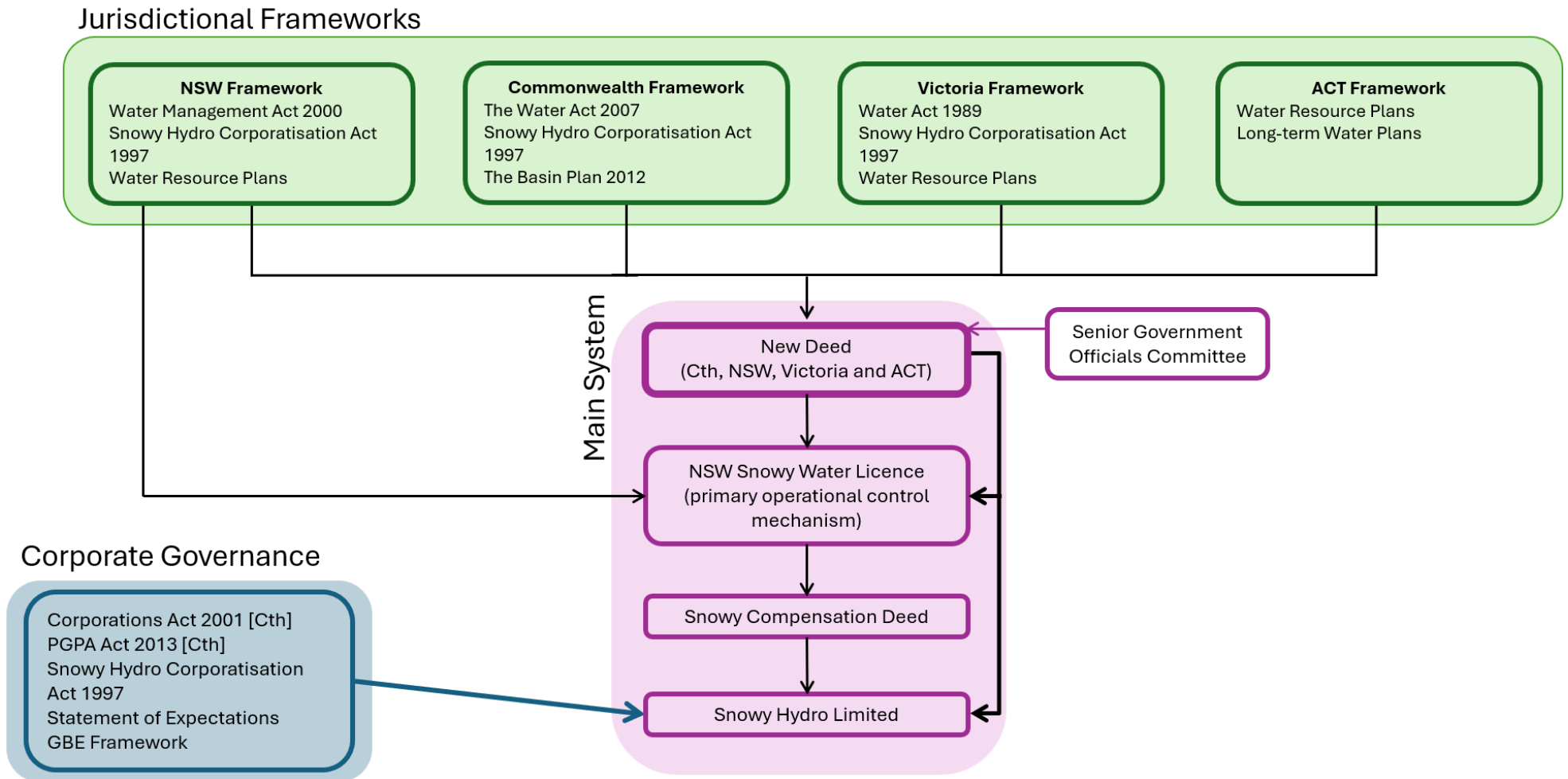
These components operate across different timeframes but are closely connected. Short-term processes ensure that decisions are implemented and operational requirements are met, including real-time management of environmental water and compliance with defined operating parameters.

Over the longer term, monitoring, evaluation and periodic review provide a basis for assessing whether the framework is achieving its intended ecological, water and system outcomes and for making adjustments where required.

The framework also integrates multiple sources of input and oversight. Governments retain responsibility for setting objectives and policy, while structured decision-making processes ensure that trade-offs are assessed transparently. Advisory inputs inform decision-making at key points. Independent functions, including dispute resolution, audit and system review provide assurance and credibility.

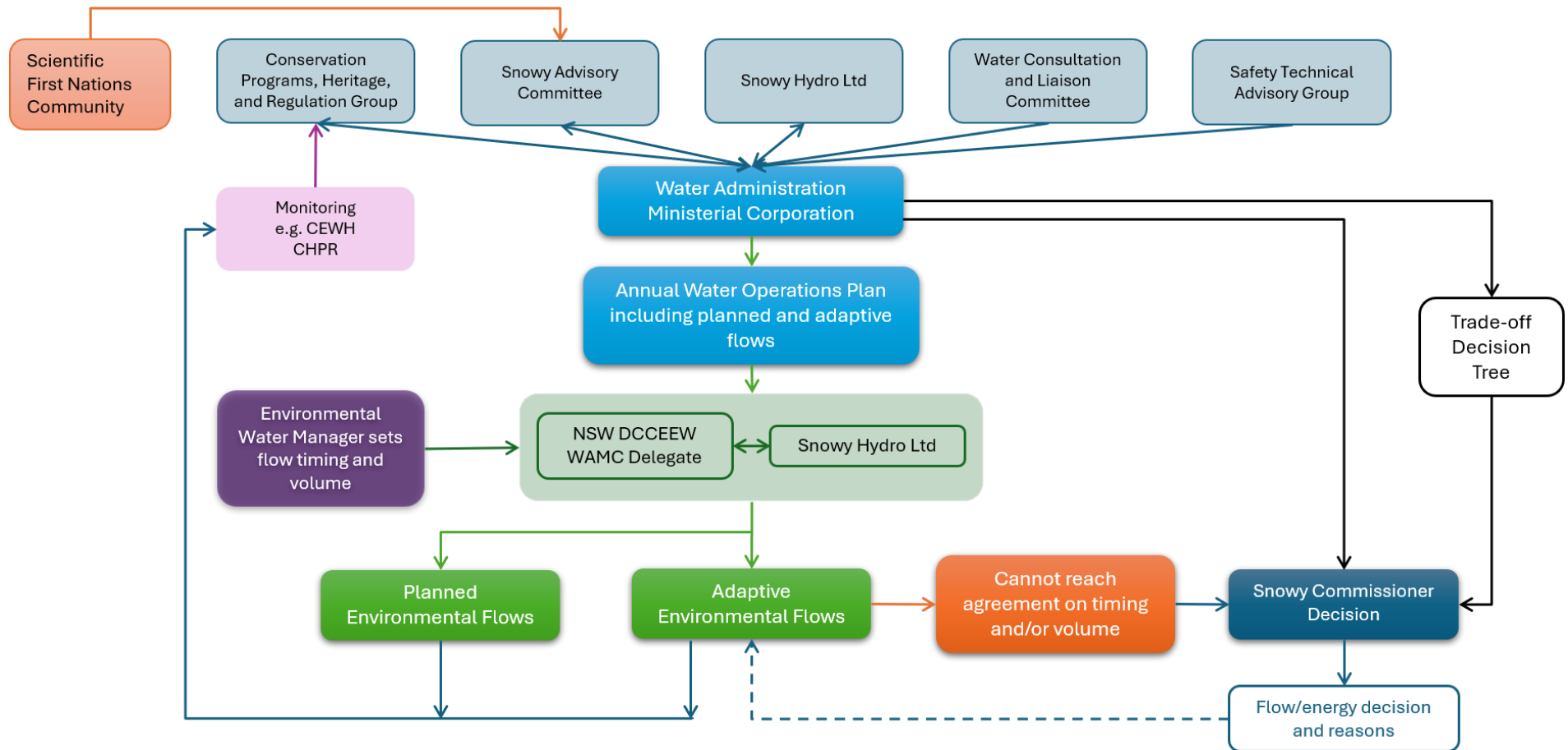
Operational delivery remains with existing entities, including Snowy Hydro, but is supported by strengthened governance expectations and more adaptive management functions that build on existing arrangements. This integrated approach is intended to improve transparency, strengthen accountability and support continuous improvement over time. As shown in **Figure 13**, the framework centres on a new Deed that establishes system objectives and governance roles, supported by structured decision-making processes, more adaptive operational delivery and strengthened assurance mechanisms.

Figure 13: Proposed Governance and Legal Framework - For Draft Purposes Only\*



\*This diagram is provided for draft purposes only and remains subject to further review and amendment prior to finalisation.

Figure 14: Environmental Flow Management – For Draft Purposes Only\*



\*This diagram is provided for draft purposes only and remains subject to further review and amendment prior to finalisation.

## Recommendations

### **Recommendation 9 – Governance and decision-making framework**

NSW, in consultation with the Australian Government, establish a decision-making framework that:

- a. provides transparent and consistent processes for assessing trade-offs between environmental outcomes, water availability and energy system considerations
- b. establishes an independent dispute resolution mechanism as a statutory appointment of an independent Snowy Water Commissioner under *the Water Management Act 2000* (NSW). The appointment is subject to consultation with Victoria, the ACT and the Australian Government.
- c. defines escalation pathways and decision-making timeframes
- d. requires documentation and public reporting of decisions and trade-offs.

### **Recommendation 10 – New Deed and system objectives**

Governments replace the Snowy Water Inquiry Outcomes Implementation Deed with a new Deed that:

- a. establishes clear, system-level objectives across environmental, water, energy, cultural and community outcomes
- b. includes all relevant jurisdictions, with the ACT joining as a full participant following agreement on the contribution of the ACT to the arrangement
- c. defines roles, responsibilities and decision-making arrangements across governments
- d. provides the foundation for coordinated planning, funding, implementation and monitoring
- e. establishes 5-yearly audits and 10-yearly reviews.

The new Deed should be clearly structured and accessible, supported by appropriate explanatory material, and include:

- a. measurable ecological performance indicators for the Upper Murrumbidgee and, in time, the Snowy and other Snowy Montane rivers
- b. responsibility for transparent public reporting on performance, monitoring outcomes and compliance (including in line with Recommendation 14 on compliance and enforcement).

### **Recommendation 11 – Intergovernmental coordination (Senior Officials)**

Governments establish a senior officials level committee with authority and accountability to support implementation and whole-of-system operation.

This function must:

- a. provide whole-of-system oversight of implementation, sequencing and coordination
- b. ensure alignment across water, environment, energy, First Nations and community objectives
- c. Approve an annual plan, for example, from the MDBA, which coordinates as necessary, activities under the Deed
- d. support effective collaboration across jurisdictions
- e. include and respond to the advice of First Nations, the community and scientific input.

### **Recommendation 12 – Advisory and participatory inputs**

Governments strengthen advisory and participatory arrangements to support decision-making across the system.

This includes:

- a. NSW expanding advisory arrangements (such as the Snowy Advisory Committee) to include additional ACT, First Nations and community representation
- b. ensuring input into planning, decision-making and review processes is consistent and coordinated
- c. including the Commonwealth Environmental Water Holder in relevant advisory and coordination forums
- d. supporting transparency and community confidence through clear engagement processes and public reporting.

#### **Recommendation 13 – Monitoring, reporting and review**

Governments establish an integrated monitoring, reporting and review framework which brings together monitoring undertaken by relevant entities (including the Commonwealth Environmental Water Holder) that:

- a. assesses performance against agreed objectives and indicators
- b. provides independent, transparent reporting on system outcomes
- c. supports adaptive management through feedback into decision-making
- d. includes regular independent audit (e.g. 5-yearly) and 10-yearly Deed review
- e. provides coordination across jurisdictions.

#### **Recommendation 14 – Compliance and enforcement**

Governments establish a strengthened compliance and enforcement framework that:

- a. supports delivery of system-level objectives
- b. separates compliance and enforcement functions from policy decision-making and operational and delivery to ensure independent oversight and clear accountability
- c. applies proportionate enforcement mechanisms
- d. provides transparent and regular (e.g. annual) public reporting on compliance
- e. integrates with monitoring and review processes to support continuous improvement.

#### **Recommendation 23 – Alignment of Corporate Governance (Snowy Hydro)**

The Australian Government should strengthen alignment between Snowy Hydro's corporate governance and system-level objectives.

This includes:

- a. revising Statements of Expectations to reflect environmental, water and public benefit outcomes
- b. incorporating specific performance measures linked to river environmental flow and system outcomes in Snowy Hydro's Balanced Scorecard framework to inform performance assessment for bonuses for senior staff
- c. ensuring board capability is balanced across priority sectors and functions, including water, environment, public policy (in addition to energy, risk, strategy, finance and other relevant skills)
- d. appointing the Australian Government Minister responsible for water as a shareholder minister.

## 6. System integration and enabling elements

The elements in this chapter are integral to achieving the system objectives and ensuring the effectiveness of the environmental flow arrangements outlined in **Chapter 4** and the governance framework outlined in **Chapter 5**.

They reflect the broader system context within which environmental water is delivered, including the participation of First Nations and communities, integration across water, energy and land management systems and the coordination of planning and operations at a whole-of-system scale.

This includes the interaction between environmental water delivery and the NEM, the role of catchment condition and complementary land and water management actions, and the need for adaptive operational arrangements and risk-sharing mechanisms.

These elements form the enabling conditions for effective system performance, ensuring that environmental flow arrangements and governance frameworks are supported by the broader institutional, environmental and socio-economic settings required to deliver intended outcomes over time.

### *Stakeholder perspectives on system integration and enabling elements*

Stakeholder feedback consistently emphasised that achieving improved ecological outcomes requires more than changes to environmental water delivery. Across consultation, there was strong support for a more integrated, whole-of-system approach that aligns governance, environmental flows, catchment condition and community and First Nations involvement.

#### **First Nations participation and custodianship**

Stakeholders, particularly through the First Nations Advisory Group, identified the absence of formal roles for First Nations in governance and management as a key limitation of current arrangements. There was strong support for a shift from consultation-based engagement toward structured and enduring custodial roles, including greater involvement in planning, decision-making, delivery and monitoring. This includes recognition of cultural water and the integration of cultural knowledge and indicators into system management.

*“We seek active involvement in the management of the Snowy River. We should not be ‘consulted’ as bystanders; we should be integrated into the Emergency Management and Water Governance frameworks of Far East Gippsland.” - Submission 16, Scott Eades*

*“First Nations participation requires particular and explicit recognition of authority...must be embedded as decision-makers within water governance arrangements, rather than consulted after decisions are effectively settled.” - Submission 129, Australian River Restoration Centre*

## **Community involvement and transparency**

Submissions highlighted a need for more meaningful and consistent community participation in planning and decision-making processes. Stakeholders emphasised that local knowledge and stewardship play an important role in improving river health, and that existing engagement processes are often fragmented or limited to consultation rather than ongoing involvement. Improved transparency in decision-making and clearer communication of trade-offs and outcomes were also identified as priorities for building trust and confidence.

*“Communities connected to the river deserve a meaningful role in its governance. This includes the ACT, which relies on the river for drinking water, as well as First Nations peoples, whose knowledge and stewardship should be recognised and embedded within decision-making structures.” – Submission 27, Anonymous*

*“Communities affected by the river should have a meaningful role in decisions.” – Submission 28, Anonymous*

## **Whole-of-system planning and coordination**

Across governments and stakeholders, there was broad recognition that current arrangements operate in a fragmented manner, with responsibilities distributed across jurisdictions, agencies and programs. Stakeholders emphasised the need for clearer coordination mechanisms, shared objectives and integrated planning processes that operate at a system scale. This includes aligning environmental water delivery with catchment management, land use planning and broader water resource management.

*“I encourage the review to carefully balance environmental improvements in the Upper Murrumbidgee with the protection of downstream water users in NSW.” – Submissions 20, Rodfos Farming and 21, I Quarisa*

*“Governance arrangements are exclusionary and lack transparency and accountability...the Deed does not include clear obligations to protect biodiversity or prevent local extinctions” – Submission 54, Jimmy Hooper*

## **Catchment management and complementary actions**

Stakeholders consistently noted that environmental water alone is insufficient to deliver ecological recovery where catchment condition is degraded. While there is strong capability and existing investment in catchment management, these efforts were described as fragmented, short-term and not consistently aligned with environmental water delivery. There was strong support for more coordinated, long-term and place-based approaches that integrate on-ground works with flow management.

*“The state of the river is just devastating. It is absolutely choking on sand. The sand slugging is extreme.” – Submission 2, Anonymous*

*“Lack of flood flows combined with accelerated erosion from land clearing and over grazing, leading to extensive streambank and gully erosion, has filled many refuge pools reducing drought refuges and restricting movement.” – Submission 11, Fin Martin*

## Revised compensation framework

Stakeholders broadly supported more adaptive and flexible environmental water management, including the ability to respond to climatic variability and emerging ecological information. However, a consistent concern across submissions and intergovernmental discussions was that current arrangements require new impacts to Snowy Hydro to be offset, reinforcing expectations of protection from change and limiting the scope for adjustment. As identified through the RCG, this acts as a practical barrier to adaptation. Stakeholders emphasised the need for clearer and more predictable approaches to allocating risk, including moving away from discretionary, case-by-case compensation under the current Snowy Compensation Deed towards defined, transparent and rule-based arrangements that enable more confident decision-making, improve system flexibility and support improved environmental outcomes over time.

*“While the Deed can be amended by agreement of the Deed Parties, any corresponding change to the Licence triggers compensation payable by NSW to SHL, unless SHL agrees to changes. The costs incurred and compensation payable are in practice determined by the Licensee (SHL) under the current framework and are difficult to independently verify. There is no prescribed approach to calculating the costs. This creates a structural disincentive to pursue changes to the Deed or Licence that would improve outcomes, even where these align with the original intent or are otherwise agreed by all governments.” – Review Consultation Group Discussion Summary*

## 6.1 First Nations Participation

This section responds to the voices of First Nations that have engaged in this review with recommendations on how their water interests can be progressed within the proposed reforms.

The Review received advice from the FNAG (FNAG Custodianship Papers), perspectives from Snowy River First Nations and through public submissions on the Panel’s Issues Consultation paper.<sup>72 73 74</sup> Together, they provide a thoughtful, First Nation-led articulation of how First Nations understand their obligations to water, Country and future generations. The suite sets out clear aspirations, perspectives and preferred directions for governments, grounded in long-term custodianship and lived experience.

These documents are framed as direction setting guidance on the values, governance characteristics and cultural responsibilities that First Nations consider essential for durable and legitimate water management. The Panel has considered this guidance on how First Nations water interests, including cultural water, can be progressed within the scope of this Review and aligned with contemporary governance and policy frameworks.

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<sup>72</sup> First Nations Advisory Group (April 2026), ‘From Advisory to Custodianship – Cultural Recommendations to the Independent Review Panel’.

<sup>73</sup> Knight, P, (2026), ‘Snowy River Cultural Values and Community Expectations,’ *Community Perspectives Arising from the SWIOD Review*. <https://www.dcceew.gov.au/sites/default/files/documents/snowy-river-cultural-values-community-expectations.pdf>

<sup>74</sup> Australian Government DCCEEW (2026), Issues Consultation: Independent Review of the Snowy Water Inquiry Outcomes Implementation Deed, Summary of Public Consultation. [www.dcceew.gov.au/sites/default/files/documents/issues-consultation-independent-review-snowy-water-inquiry-summary-report.pdf](http://www.dcceew.gov.au/sites/default/files/documents/issues-consultation-independent-review-snowy-water-inquiry-summary-report.pdf).

## First Nations participation and cultural outcomes

First Nations people have enduring cultural, spiritual and economic relationships with water and Country across the Snowy and Upper Murrumbidgee systems. These relationships include obligations to care for Country and maintain cultural practices. Current arrangements do not adequately reflect these roles or enable meaningful participation in system planning and delivery.

Strengthening First Nations participation is critical to achieving long-term environmental, cultural and community outcomes.

## First Nations water interests

First Nations water interests extend beyond consumptive use to include cultural, environmental, spiritual and economic values associated with water and Country. These interests are not consistently recognised within existing system arrangements.

The Panel has not identified any First Nations-held water entitlements in the Upper Murrumbidgee or Snowy River systems. This contrasts with emerging approaches in other parts of the Murray–Darling Basin, where First Nations groups have acquired, held or managed water entitlements for cultural purposes.

In the Regulated Murrumbidgee system, the Murrumbidgee Cultural Access Licence has enabled First Nations-led watering of culturally important wetlands and floodplain environments. The absence of equivalent arrangements in the Upper Murrumbidgee and Snowy systems limits the practical ability of First Nations to determine how water is used to meet cultural objectives, fulfil responsibilities to Country and realise broader economic opportunities.

To support system outcomes:

- recognise First Nations water interests within system objectives, planning and delivery
- enable structured participation in decisions affecting water management and river health
- support the inclusion of cultural values in monitoring and evaluation frameworks.

## Government policies and strategies

The policy environment surrounding the Deed has evolved significantly since 2002. Australian and State governments have established a range of policies and commitments to strengthen First Nations participation in water and environmental management.

At the national level, the Closing the Gap agreement and the draft National Water Agreement establish expectations for shared decision-making, stronger community-controlled roles and recognition of First Nations' rights and interests in land and water. These reforms establish a clear expectation that First Nations people are involved in decisions that affect their Country.

Jurisdictional frameworks signal a shift toward greater involvement of First Nations in decision-making and management of water resources:

- [Victoria's Water is Life](#) roadmap provides a practical model for implementation, including pathways for Traditional Owners to hold and manage water, lead seasonal watering decisions and participate in governance through funded arrangements.

- In New South Wales [the Aboriginal Water Strategy](#) and [Regional Water Strategies](#) focus on increasing Aboriginal access and ownership of water, embedding cultural knowledge, and strengthening participation in planning and governance.
- In the ACT [the Water Strategy 2025–2045](#) recognises cultural values, supports Aboriginal Waterway Assessments and cultural flows and commits to stronger partnerships with Traditional Custodians.

Within the Snowy and Upper Murrumbidgee systems the application of these policies has remained limited. Participation is largely consultation-based and does not provide First Nations with a defined or ongoing role in governance, planning or operational decision-making.

The FNAG emphasised the need to move beyond consultation toward a model of custodianship, in which First Nations people are recognised as enduring partners in the stewardship of rivers and landscapes.

The Panel considers that formalising custodianship within future governance arrangements is particularly relevant to the Snowy and Upper Murrumbidgee systems because implementation of the Deed requires decisions that affect multiple outcomes, including with those of cultural importance. First Nations Custodianship on matters of cultural importance requires appropriate governance structures that operate as part of, and not alongside, the broader governance arrangements outlined in **Chapter 5**.

The following section outlines the key features of a three-tiered Custodianship framework, adapted from the FNAG Custodianship Papers, and its relevance to future water governance arrangements in the Upper Murrumbidgee and Snowy river systems.

### *Application of the Custodianship framework*

The Custodianship framework as detailed in the FNAG Custodianship Papers comprises three forms of participation, differentiated depending on the cultural significance and interests of all stakeholders: sole decision-making on matters of cultural authority; joint-decision making with Governments; and advisory.

In the context of the governance arrangements recommended in **Chapter 5**, the Panel considers that the Custodianship framework could be applied as follows:

1. **First Nations Authority** – A peak body for First Nations in the Upper Murrumbidgee and Snowy rivers that deliberate and make decisions on matters of cultural importance. This Authority could develop strategic guidance to support First Nations in their respective Cultural Flow planning, coordinate operational planning for Cultural Flows, provide representation to governments on issues raised during the Review (for example river access, legal recognition of rivers) and promote knowledge sharing and capacity building.
2. **Senior Officials Committee** – The Committee, comprising officials from relevant government agencies, is the decision-making authority on implementation of the Deed (refer to **Chapter 5**). The First Nations Authority may make representations to the Committee on matters relevant to Cultural authority.
3. **Advisory groups** – First Nations to have greater participation in advisory groups with broader stakeholder involvement, such as the Snowy Advisory Committee that is responsible for

program/project implementation, monitoring and review processes. This may include implementation of environmental flows or complementary catchment management activities.

The proposed custodianship framework does not replace broader stakeholder involvement. Rather, it envisages advisory mechanisms that continue to provide opportunities for community, environmental, industry and local government participation. Together, these elements seek to establish formal governance arrangements that better recognise First Nations custodial responsibilities while supporting collaborative planning, implementation and accountability across the Upper Murrumbidgee and Snowy river systems.

### *Implications for system governance*

The transition to a custodianship model highlights a key gap between current arrangements and stated policy commitments. While governments have articulated objectives relating to First Nations participation, these are not yet reflected in the operation of the Snowy and Upper Murrumbidgee systems.

Addressing this gap will require coordinated action across jurisdictions and a clear commitment to embedding custodianship within governance, planning and delivery.

To support this:

- align system governance arrangements with relevant Australian and state government policy commitments, including Closing the Gap priorities
- apply the Custodian Framework (or equivalent approaches) to establish formal and ongoing roles for First Nations in governance
- transition from consultation-based engagement to structured participation and shared decision-making
- ensure consistent implementation across jurisdictions.

## **Cultural Water**

### *Understanding cultural water*

Advice provided by First Nations describes cultural water as water used to fulfil cultural responsibilities, support cultural practice, enable access to Country and sustain cultural continuity. The technical and policy material provided for this Review and the advice from First Nations note that recognising cultural water alone is insufficient. Cultural water must be progressed as a distinct category, with authority resting with First Nations to determine its use and with risks managed through structured governance, supported planning and capacity building.

### *Indicative pathway for progressing cultural water*

The Panel supports the recognition and progression of cultural water and accepts the core principles articulated in the Snowy River Report and FNAG Custodianship Papers.

While specific mechanisms will vary across jurisdictions, a typical pathway involves:

- governments and First Nations identify pathways that provide legal authority to hold and manage water interests (e.g. licences, allocations, program-based water recovery)
- First Nations determine objectives, timing, location and use of cultural water, including where they complement environmental outcomes and/or encompass economic, social or livelihood outcomes
- the First Nations Authority may have a role in providing strategic guidance, coordination and long-term capacity building/knowledge sharing. A Cultural Flow Strategy (or similar) for the Upper Murrumbidgee and Snowy rivers may help guide Nations' access to, and cultural use of water licences
- operational arrangements are established to coordinate delivery alongside environmental and other water uses
- outcomes are monitored and adapted over time based on cultural and ecological indicators where relevant.

## Supporting broader aspirations

First Nations advice to the Review also identified broader aspirations for the recognition of rights, authority and responsibilities in relation to water and Country. These aspirations are informed by Closing the Gap commitments, Treaty processes in Victoria, emerging approaches in other Australian jurisdictions and international examples of rights-based recognition for rivers and living landscapes.

While some of these matters are beyond the scope of the Review, the Panel considers that the proposed custodianship framework can provide an important foundation for progressing these aspirations. A recognised First Nations Authority could provide the forum through which Nations can engage with governments on longer-term reforms, including river rights, land and water access, cultural water ownership, Treaty-related matters and future authority over water resources.

While these matters are beyond the scope of the Review, acknowledging them accurately reflects the advice received from First Nations through the Review process. The revised Deed therefore should not be seen as the endpoint for First Nations water interests. Rather, it could establish practical arrangements that recognise custodianship now, while supporting Nations and governments to pursue broader reforms through the appropriate legal and policy pathways.

### Recommendations

#### **Recommendation 16 – First Nations custodianship framework**

Governments proactively work with all Nations of the Upper Murrumbidgee and Snowy River systems to establish a First Nations custodianship framework, described in Chapter 6.1, that provides a structured pathway towards shared governance and decision-making on matters affecting cultural values, and to progress broader aspirations that may include river rights, cultural water ownership and access to river Country.

Governments are to invest appropriately to support the implementation of this recommendation.

#### **Recommendation 17 – Water entitlements for First Nations**

Governments proactively work with and support First Nations along the Upper Murrumbidgee and Snowy rivers, including through targeted and sustained investments to enable access to water entitlements that may be progressed through a Nation-led program that:

- a. identifies the mechanism for legal authority to hold and manage water interests
- b. supports First Nations defining objectives, timing, location and use of cultural water
- c. develops strategic guidance, coordination and long-term capacity building/knowledge sharing prepared by the First Nations Authority
- d. establishes operational arrangements for coordinating cultural water delivery alongside environmental and other water uses
- e. establishes monitoring and reporting against cultural objectives.

## 6.2 Community Stewardship

### Role of community

#### **Box 9: Case Study: The Snowy River Campaign – Advocacy Driving Reform**

The Snowy River campaign demonstrates the power of sustained community advocacy in driving environmental reform.

Advocacy by local communities led to the 1998 Snowy Water Inquiry and the 2000 intergovernmental agreement to return environmental flows, increasing releases from around 1% to up to 22% of natural flows. The subsequent 2002 Deed was one of Australia's first legally binding environmental flow commitments.

Although the Deed requires review, the experience highlights the ongoing role of community advocacy in shaping, maintaining accountability and supporting long-term reform.

Local communities play a foundational role in the stewardship and management of river and catchment systems. Landholders, community groups, Traditional Owners and volunteers are often directly responsible for the delivery of on-ground works that underpin ecological outcomes. These activities include riparian restoration, erosion control, revegetation, weed management, habitat protection and the maintenance of river corridors. In systems such as the Upper Murrumbidgee and Snowy rivers, where land tenure is mixed and large areas are privately managed, community-led action is essential to achieving landscape-scale outcomes.

Community involvement also contributes to knowledge generation, monitoring and adaptive management. Local participants bring detailed, place-based understanding of river systems which complements scientific data and supports more responsive and effective management decisions. Communities also play a coordination role, working across property boundaries and connecting landholders, government agencies and other stakeholders to deliver integrated, reach-scale interventions.

### Current capability and initiatives

There is a high level of community capability and engagement across the Upper Murrumbidgee and Snowy systems. Established networks, including Landcare groups, regional partnerships and community-led initiatives, underpin much of the on-ground delivery of river and catchment management. These networks build on decades of investment in community-based natural resource management and provide established governance structures, technical capability and

strong local participation, reflecting the broader value of Landcare and community-based approaches in delivering environmental, social and economic outcomes.<sup>75</sup>

Initiatives such as the [Upper Murrumbidgee Demonstration Reach](#) and [Rivers of Carbon](#) illustrate the effectiveness of coordinated place-based approaches that combine scientific methods with local knowledge and community participation. These initiatives are delivering tangible outcomes, including improved riparian condition, reduced sediment inputs and enhanced habitat connectivity while also increasing awareness of river health issues. They also demonstrate the value of collaboration with multiple stakeholders working together to address shared challenges and deliver integrated interventions.

## Constraints and implications

Community-led efforts are often constrained by systemic challenges:

- funding is typically short-term or program-based, limiting continuity and long-term planning
- reliance on volunteer effort can constrain scalability and sustained delivery, particularly for more complex or ongoing interventions
- fragmentation across programs, funding sources and jurisdictions reduces effectiveness, particularly for catchment-scale issues requiring coordinated action.

These constraints highlight the need for more coordinated, long-term and system aligned support for community involvement including stronger integration with governance and funding arrangements.

### Recommendations

#### **Recommendation 20 – Supporting First Nations custodianship and community stewardship in catchment management activities**

Governments embed First Nations and community in catchment management activities through enduring stewardship roles.

This includes:

- a. expanding participation in catchment management from the outset, including planning, delivery and monitoring, moving beyond consultation toward shared decision-making
- b. investing in ranger programs, on-Country stewardship and workforce development to support long-term capability
- c. supporting the integration of cultural and local knowledge and indicators of river health in catchment activities and monitoring.

<sup>75</sup> Henry, A et al. (2016), *The Value of Landcare to the Australian Community*, Landcare NSW.

## 6.3 Whole of System Planning

This section sets out the Panel's proposed direction for establishing a more integrated, whole-of-system approach to planning environmental water releases from the Snowy Scheme. The Panel finds that, while there are well-established and structured planning arrangements for environmental water, these do not operate within an integrated system-wide framework and are not sufficiently aligned with broader planning processes across water use, land use, infrastructure and regional development.

As outlined in the Background chapter of this Review, water for environmental, cultural and energy outcomes cannot be planned or managed in isolation from the wider system of competing and growing demands for the same resource. While this Review focuses on these outcomes, these objectives need to sit within a broader planning context that includes critical human water needs, population growth, industry and agriculture. This chapter elaborates on how the Panel considers that should occur.

The Panel notes that there are already well-established governance, advisory and planning arrangements governing environmental water releases from the Snowy Scheme. These include the WAMC as decision-maker, supported by advisory bodies such as the SAC, the WCLC and the Safety Technical Advisory Group, as well as structured annual planning processes linked to the Snowy Water Licence and Annual Water Operations Plan.

These arrangements provide a mature and structured foundation for environmental water planning and delivery. Although the Panel's findings in this chapter do not identify an absence of governance, they note a lack of integration across a whole-of-system planning framework.

### Fragmentation of planning frameworks and absence of a regional approach

The planning environment for the Snowy and Upper Murrumbidgee systems involves multiple overlapping frameworks operating across Australian, state and territory jurisdictions. These include national water policy settings (such as the Basin Plan, the National Water Initiative (NWI) and the draft National Water Agreement), state water sharing arrangements, ACT planning frameworks and broader land use and development processes.

While environmental water planning arrangements are well established, they are not consistently integrated with related planning domains including land use, infrastructure investment and regional development. As a result, water demand associated with urban growth is often addressed incrementally rather than through a coordinated, long-term strategy.

This fragmentation creates a risk that water allocation decisions are made without full visibility of cumulative system impacts. Under existing national water policy settings, including the NWI, critical human water needs and urban water supply are prioritised in times of scarcity.<sup>76</sup> In the absence of

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<sup>76</sup> 'Intergovernmental Agreement on a National Water Initiative (2004), <https://www.dcceew.gov.au/sites/default/files/sitecollectiondocuments/water/Intergovernmental-Agreement-on-a-national-water-initiative.pdf>.

an integrated, forward-looking planning framework, new or growing urban water demands are likely to be met through reallocation of available water resources.

This creates a structural risk that environmental outcomes may be progressively eroded, even where formal objectives or flow targets remain unchanged.

These challenges highlight the need for a more integrated, whole-of-system planning approach that aligns water, land use and infrastructure decisions and enables long-term system impacts to be assessed and managed collectively.

## Established environmental water governance and planning arrangements

The current established environmental water governance and planning arrangements are described in detail in **Chapter 3**. These arrangements provide the current institutional and regulatory framework for environmental water delivery including decision-making roles, planning processes and advisory structures.

As discussed in **Chapter 5**, while these arrangements provide a foundation for delivery, they do not fully support the integrated, adaptive and system-wide approach required to achieve the proposed objectives.

## Growing pressures and competing demands

Stakeholders consistently highlighted the scale and uncertainty of future demand pressures driven by population growth, regional development and climate change. These pressures are expected to intensify over time increasing competition for available water resources across the system.

Submissions pointed particularly to growing urban demand associated with the ACT and surrounding region, as well as emerging industries such as hydrogen and critical minerals, as drivers of increased and uncertain future water demand. This reinforces the need for scenario-based and adaptive planning approaches.

Critical human water needs take precedence in times of scarcity. As demand pressures grow, this priority has increasing practical implications for how water is allocated across competing uses, particularly in the absence of coordinated, long-term planning.

Under existing national water policy settings, including the NWI, risks associated with reductions in water availability are allocated between entitlement holders and governments depending on their cause. In practice, these settings mean that growing or new demands are likely to be met through reallocation of available water resources.

Without coordinated, system-wide planning, decision-making is likely to remain incremental and case-by-case with limited visibility of cumulative impacts. This creates a structural risk that pressures associated with population growth, development and climate change are not managed transparently or strategically.

Stronger cross-border coordination, particularly between the ACT and NSW, will be increasingly important in managing shared infrastructure, urban demand and regional growth. Incorporating

these considerations into planning frameworks would support a more coherent, whole-of-system approach.

## The limits of jurisdictional planning arrangements

The Panel acknowledges that environmental water planning should retain its clear environmental focus. However, in practice, water planning cannot be separated from competing system demands including critical human water needs.

While environmental water planning is supported by established governance and annual processes, these operate largely independently of broader system planning. This fragmentation persists across jurisdictions and policy domains and cultural water is not formally recognised under current arrangements.

As water availability declines under a changing climate, trade-offs between environmental, cultural, consumptive and energy outcomes are likely to become more frequent and contested. The key gap lies at the interface between environmental water planning and broader system planning, including land use, infrastructure and energy.

Without more integrated planning and coordinated decision-making, there is an increased risk that environmental and cultural outcomes are progressively deprioritised over time.

## The importance of a forward-looking, system-wide perspective and process

The Review does not seek to resolve these trade-offs nor prescribe detailed planning outcomes for the system as a whole; rather, it highlights the importance of explicitly acknowledging them. Decisions taken in relation to one objective, whether urban water supply, industrial development or infrastructure investment, will inevitably have consequential impacts for others. Where such decisions are made in isolation, cumulative effects can be significant, including ongoing adverse consequences for environmental condition and First Nations cultural values.

Effective planning must move beyond short-term or partially coordinated considerations. It must account for both a 'planned future', based on known growth trajectories and policy settings, and an 'unplanned future' shaped by climate variability, uncertainty and changing demands over five, ten and more years.

Without this perspective, system outcomes remain vulnerable to incremental, uncoordinated decisions.

## The missing shared vision

While elements of a shared vision exist across policy and planning frameworks, there is no consistently articulated and operationalised vision for what these landscapes and systems should look like over time. Without alignment between objectives, planning frameworks and decision-making processes and investment can be poorly targeted.

A shared vision is essential to guide trade-offs, align decision-makers and provide clarity on how environmental, cultural, social and economic outcomes are expected to interact within the system.

## Consequences of inaction

Stronger collaboration, particularly between the ACT and NSW, will be essential to ensure that critical human water needs are clearly identified, jointly planned and sustainably met over future review cycles, alongside strengthened environmental and cultural water planning.

Failure to adopt a whole-of-system approach risks perpetuating existing imbalances. In particular, it may allow continued disproportionate influence over allocation decisions, undermine environmental recovery efforts and contribute to ongoing decline in environmental values and cultural outcomes across affected river systems. It may also lead to suboptimal or poorly targeted investment decisions, as infrastructure and service planning are not aligned with system-wide needs and long-term demand pressures, and decisions are made in a crisis.

## Principles for whole-of-system planning

Delivery of a reformed whole-of-system planning should be underpinned by the principles of:

- **Integration**, ensuring that planning is coordinated across sectors, jurisdictions and timeframes, and that interdependencies between water, land use, environment, infrastructure and community outcomes are explicitly recognised and managed.
- **Transparency**, ensuring that decision-making processes, assumptions and trade-offs are clear, explicit and accessible.
- **Flexibility and responsiveness**, enabling adaptive management in the face of climate variability, uncertainty and changing demands.
- **A robust trade-off framework**, explicitly recognising and managing competing objectives across environmental, social, cultural and economic outcomes.

Together, these principles provide the foundation for planning that can better align water for energy, environment and culture with the broader system in which it operates, and support more resilient and equitable outcomes over the long-term.

## The principles in action

To be effective, the principles outlined above must be implemented through existing planning instruments, governance forums and operational processes. In the Upper Murrumbidgee and Snowy Montane systems this creates an opportunity to better align and use established arrangements, building on existing instruments within the strengthened governance framework outlined in **Chapter 5**.

These arrangements would operate within the strengthened system-level governance framework which provides the coordination, decision-making authority and accountability required to support integrated planning across jurisdictions and sectors.

Greater **integration** can be achieved through more deliberate coordination across existing statutory plans and institutional frameworks, including the NSW Water Sharing Plan for the Murrumbidgee Regulated River Water Source, ACT water planning frameworks and Basin Plan mechanisms administered by the Murray–Darling Basin Authority (MDBA). Integration with Snowy Scheme operations can be supported through the Snowy Water Licence and associated intergovernmental

arrangements between the Australian, NSW, Victorian and ACT governments, supported by existing advisory and coordination processes.

A key priority is ensuring these instruments operate from a shared evidence base, with consistent planning assumptions, timeframes and objectives. This includes strengthening how strategic objectives are translated into operational rules, including environmental flow settings under water sharing plans and Snowy Scheme release decisions.

**Transparency** can be strengthened by building on existing reporting and consultation processes. Reporting by the MDBA, the Commonwealth Environmental Water Holder (CEWH) and state agencies such as NSW DCCEEW provides an established foundation. There is scope to more clearly articulate how key decisions are made, particularly where trade-offs are involved, including decisions relating to environmental flows, water allocation and Snowy Scheme operations. Publishing modelling assumptions, scenario analysis and option comparisons through existing processes would further strengthen transparency and confidence.

**Flexibility and responsiveness** can be enhanced through more systematic application of adaptive management within existing frameworks. This includes more consistent use of planned review processes, defined operational triggers and environmental watering arrangements, as well as applying existing modelling platforms used by the MDBA and state agencies to scenario-based planning under a range of future conditions.

**Trade-offs** must be explicitly defined, assessed and managed through structured and transparent decision-making processes. While existing frameworks under the Basin Plan, water sharing plans and environmental watering arrangements require consideration of environmental, social and economic outcomes, these processes can be strengthened through more consistent and structured approaches across agencies. Clearer articulation of objective hierarchies, such as identifying priority environmental thresholds, essential human water needs and areas where flexibility exists, should be incorporated into plan reviews and operational guidance. This would provide clarity on how competing demands, including consumptive use, hydropower generation and environmental outcomes, are to be balanced during periods of water scarcity and in renewable energy droughts.

Collectively, these elements demonstrate how a more integrated, transparent and adaptive planning approach can be achieved through stronger alignment and use of existing arrangements within a strengthened, system-wide governance framework.

## What success looks like

A more effective whole-of-system planning framework would be characterised by:

- alignment between environmental water planning and broader land use, infrastructure and urban water planning processes
- a shared, cross-jurisdictional understanding of long-term system objectives and the trade-offs required to achieve them
- improved ability to assess and manage cumulative impacts of growth, development and climate change across the system
- clearer and transparency decision-making, including explicit articulation of how allocation decisions are made, particularly during periods of scarcity

- increased capacity to adapt environmental water delivery within-year in response to hydrological conditions and ecological cues
- stronger coordination across jurisdictions and sectors, including between water, environment and energy systems, enabling more consistent and forward-looking decision-making.

## Defining ‘adaptive’ management: tangible measures

Adaptive management in this context refers to the ability to adjust the timing, volume and pattern of environmental water delivery in response to changing system conditions, rather than relying on fixed rules or annual allocations.

In practice, this can be enabled through a range of tangible mechanisms within existing frameworks. These include defining clear operational triggers, such as inflow conditions, ecological indicators or system stress events that allow water delivery to be varied within and between years. Existing planning instruments, including water sharing plans, environmental watering arrangements and Snowy Scheme operating frameworks provide the basis for implementing these adjustments without requiring new processes.

Adaptive management also relies on consistent use of scenario-based modelling to test system performance under different hydrological and climate conditions and to inform decisions about release timing, volumes and trade-offs.

Operationally, this requires closer coordination between environmental water managers, system operators and relevant agencies, supported by clear decision-making processes and oversight under the governance framework outlined in **Chapter 5**.

The detailed design and implementation of adaptive management arrangements, including operational settings, performance measurement and decision-making processes are addressed in **Chapters 4 and 5**.

**Chapter 4** sets out the evidence base and modelling that underpin adaptive approaches to environmental water delivery, including the role of scenario analysis and system response under varying hydrological conditions.

**Chapter 5** establishes the governance framework required to support adaptive management in practice, including structured decision-making, performance monitoring, and the explicit management of trade-offs between environmental, energy and other system objectives.

Within this context, adaptive management in the Snowy and Upper Murrumbidgee systems involves the ability to adjust the timing, volume and pattern of environmental water delivery in response to changing conditions, supported by clear operational triggers and coordination between environmental water managers and system operators.

In practice, this involves:

- adjusting environmental releases within and between years in response to inflow conditions and ecological needs
- aligning environmental objectives with Snowy Scheme operations

- applying defined triggers and operational flexibility within agreed bounds.

## Recommendations

### **Recommendation 15 – ACT and NSW Regional Growth Strategy**

The ACT and NSW governments jointly develop a regional growth strategy to manage water resources in a way that meets Canberra and surrounding NSW region water needs including during dry and drought periods.

This strategy must:

- a. explicitly account for trade-offs between different water uses and be adaptive, enabling responses to changing climatic, environmental and operational conditions
- b. provide sufficient certainty for long-term planning outside of scheduled review points
- c. deliver on the environmentally sustainable level of take
- d. engage the NSW Cross Border Commissioner.

## 6.4 Linkages to operations in the National Electricity

### Market

Snowy Hydro is an active participant in the NEM and subject to the National Electricity Rules with regulatory oversight by the Australian Energy Regulator (AER) and operated by the Australian Energy Market Operator (AEMO). It also participates in financial markets associated with the NEM and subject to general competition regulation by the ACCC. It is important that the linkages to these markets and the need for Snowy Hydro to comply are taken into account in the development of detailed operational processes.

AEMO operates forward planning systems including the medium-term ‘projected assessment of system adequacy’ which covers the next two years and is important in informing market participants of expected market conditions over that period and in forecasting reliability. AEMO also undertakes a short-term ‘projected assessment of system adequacy’ providing more detailed and updated information for the next two weeks and a pre-dispatch system projecting market conditions and prices over the next 24 hours. The proposed operating processes introduce more flexibility into Snowy Hydro’s operations and potentially add to the issues they need to take into account when providing information to these processes. The annual water plan will be a part of this and may need updating occasionally during the year.

In operating the market AEMO will identify issues from time to time and issue market notices, notify lack of reserve levels and identify periods of supply scarcity. AEMO can take action to intervene in the market when necessary, including through directions to participants. The operating arrangements should accommodate those NEM provisions.

The availability of the rich information and forward planning in the NEM will be very useful in determining whether an environmental water release may be deferred or not.

## 6.5 Catchment health and complementary water-land management

Catchment condition is a critical determinant of river health outcomes in both the Upper Murrumbidgee and Snowy systems. Large parts of these catchments are in degraded condition, including sediment accumulation, bank instability, loss of riparian vegetation and habitat degradation, which limit the effectiveness of environmental water delivery.

Improving environmental outcomes therefore depends not only on increasing flows but on complementary catchment-scale actions. As outlined in **Chapter 4** environmental water alone cannot restore ecological function where underlying catchment processes remain degraded. Targeted on-ground interventions, including riparian restoration, erosion control and habitat improvement are required to enable environmental water to achieve intended outcomes.

A range of programs already contribute to catchment management across jurisdictions, including activities delivered by ACT and NSW agencies, Local Land Services, Catchment Management Authorities and community-based organisations. These initiatives demonstrate capability and local knowledge but are not consistently aligned with environmental water delivery or system-wide priorities.

A more coordinated and sustained approach is required to align environmental water delivery with catchment management actions. This includes strengthening cross-jurisdictional coordination, improving coordination, aligning investment and supporting First Nations and community stewardship. The recommendations in this report provide a framework for better integrating these elements into a coherent, whole-of-system approach.

### Current catchment management arrangements

#### *Upper Murrumbidgee*

Catchment and river restoration initiatives in the Upper Murrumbidgee are being delivered by a range of agencies and organisations across the ACT and NSW, reflecting the cross-jurisdictional nature of the system. These activities involve collaboration between governments, community groups, research organisations and landholders.

The ACT Environment, Planning and Sustainable Development Directorate plays a central coordination role through the ACT and Region Catchment Management Coordination Group. This group supports alignment of catchment activities across jurisdictions and stakeholders and has developed the [ACT and Regional Catchment Strategy 2016-2046](#), with annual reporting on progress.<sup>77</sup> In NSW, Local Land Services contributes through on-ground restoration activities and landholder support.

Non-government organisations also play a significant role. Initiatives such as the [Upper Murrumbidgee Demonstration Reach](#) and programs delivered by the [Australian River Restoration Centre](#) demonstrate collaborative, place-based approaches to river restoration.

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<sup>77</sup> The latest 2024-25 report can be found here: [ACT and Region Catchment Management Coordination Group Annual Report 2024-25](#).

These programs demonstrate strong capability and local knowledge, but greater alignment, longer-term investment and improved coordination are needed to support catchment-scale outcomes. Existing programs demonstrate substantial capability, goodwill and local knowledge but sustained investment and stronger collaboration mechanisms are required to enable these efforts to be scaled and delivered more effectively.

The Australian Government funded [Restoring the Upper Murrumbidgee River Program](#) supports on-ground restoration, science, monitoring and community engagement across NSW and the ACT. With funding through to June 2029 this program provides a foundation for future investment.

Further information on Upper Murrumbidgee catchment activities is available in the Australian Government document [DCCEEW's Improving the health of the Upper Murrumbidgee: Context and Background](#).

## **Snowy River**

Catchment management in the Snowy River is delivered across jurisdictions. In Victoria management is delivered primarily through the [East Gippsland Catchment Management Authority \(CMA\)](#). East Gippsland CMA is established under the *Catchment and Land Protection Act 1994* and *Water Act 1989*. The CMA coordinates planning, investment and on-ground delivery of integrated land, water and biodiversity management.

In NSW catchment management activities are primarily undertaken by NSW Local Land Services which is established under the *Local Land Services Act 2013*. Local Land Services plays a key role in catchment management by coordinating regional programs that support sustainable land use, improve water and soil health and protect biodiversity in line with state priorities and local community needs.

Non-government organisations also contribute significantly to the Snowy River catchment. Community-led initiatives such as the [Snowy River Interstate Landcare Committee](#) and the [Upper Snowy Landcare Network](#) demonstrate collaborative, place-based approaches to improving river health, supporting sustainable land management and delivering on-ground restoration outcomes across the catchment.

## **Strengthening catchment management outcomes**

Addressing these challenges requires a more coordinated, sustained and system-wide approach to catchment management aligned with environmental water delivery.

A central priority is the establishment of a coordinated, cross-jurisdictional catchment program for the Upper Murrumbidgee, Snowy and associated montane systems. This program should build on existing initiatives while improving alignment, continuity and scale, recognising that ecological outcomes depend on both flow regimes and catchment condition. It should be jointly funded by governments, and where appropriate, Snowy Hydro, and be designed to operate over the long-term rather than through short-term or program-specific funding cycles.

The program should adopt a place-based approach enabling actions to be tailored to local conditions while contributing to system-wide objectives. Priority activities include riparian restoration and protection, erosion and sediment control, habitat improvement and protection of

key refuge areas. Strengthening community stewardship will be critical, including through support for locally led delivery for outcomes-based projects.

A strengthened role for First Nations in catchment management is essential. This includes enabling structured, long-term involvement in planning, delivery, monitoring and evaluation and supporting on-Country stewardship. Establishing or expanding First Nations ranger programs in the Upper Murrumbidgee would provide a practical mechanism to deliver integrated land and water management, drawing on both cultural knowledge and contemporary science. These programs support long-term capability, intergenerational knowledge transfer and the incorporation of cultural indicators alongside biophysical measures.

Monitoring, evaluation and learning should be embedded as a core component of this approach. Catchment and environmental water management should operate within a structured adaptive management cycle, where actions are informed by evidence, outcomes are tracked over time, and management approaches are adjusted in response to changing conditions and new knowledge. Monitoring should focus on outcomes rather than activity, integrate land and water management and support both local decision-making and system-wide learning.

This approach is intended to complement, not replace, the governance and adaptive management frameworks outlined in **Chapters 4 and 5** and provides a clear pathway for translating investment into more consistent and durable ecological and cultural outcomes across the system.

## Recommendations

### **Recommendation 18 – Integration of environmental water delivery and catchment management actions**

Governments ensure that environmental water delivery and targeted catchment management actions are integrated through a coordinated, whole-of-system approach. This may include:

- a. delivering environmental releases with complementary on-ground interventions (such as riparian restoration, erosion control and habitat improvement) to deliver ecological outcomes
- b. strengthening integration between land and water management across planning, delivery and monitoring processes.

### **Recommendation 19 – Whole-of-system catchment investment coordination and alignment**

Governments improve coordination and alignment across jurisdictions, agencies and programs to enable a more integrated, whole-of-system approach for catchments, under the oversight of the senior officials committee and coordinated by, for example, the MDBA. This may include:

- a. establishing a coordinated, cross-jurisdictional approach to catchment investment that builds on existing arrangements and progressively strengthens delivery
- b. providing sustained, long-term funding to support continuity of on-ground works, enable scaling of successful initiatives, and build regional capability
- c. ensuring monitoring, evaluation and learning is embedded within a structured adaptive management framework to support continuous improvement in catchment and environmental flow outcomes.

## 6.6 Revised compensation arrangements

Under the current framework changes to the Snowy Water Licence may trigger compensation, payable by NSW to Snowy Hydro, under the Snowy Compensation Deed. Compensation under this arrangement, in the form of financial liability, creates a barrier to change which limits the system's ability to adapt.

The Panel proposes reducing the influence of the compensation trigger that currently exists under the Snowy Compensation Deed by establishing a rule-based framework that supports adaptive system operation. This approach avoids reliance on case-by-case negotiation, providing a consistent basis for valuing system trade-offs over time.

This framework enables changes to be made in response to new information, changing conditions and agreed system objectives, without creating automatic financial consequences.

This shifts the focus from negotiating compensation between NSW and Snowy Hydro to managing system performance, supporting adaptive management and improving outcomes over time.

### *Adaptive operation and risk management framework*

The framework operates through four simple rules:

**1. Agreed changes (no compensation)**

Changes agreed by governments through reform, periodic review, or adaptive management do not trigger compensation to Snowy Hydro.

**2. Normal operation (within the envelope)**

Snowy Hydro operates within an agreed operating envelope delivering outcomes without compensation. This includes adjusting operations over time in response to updated science, monitoring and system conditions.

**3. Outside the envelope (defined consequences)**

Financial consequences apply only where outcomes fall outside the agreed envelope:

- Government-directed actions → payment
- Operational non-performance → penalty.

**4. Transparent valuation**

Any compensation payable is determined using a clear, formula-based approach that is publicly available, ensuring transparency, consistency and predictability.

### *Operating envelope and valuation of system variation*

The operating envelope defines the expected range of system operation within which Snowy Hydro delivers agreed outcomes without financial adjustment. It provides a structured basis for managing variation, enabling adaptive operation while maintaining clear rules and accountability.

The operating envelope is designed to evolve allowing system objectives and operating conditions to be updated through periodic review and in response to monitoring, science and changing conditions.

The envelope should be defined using measurable parameters, including flow delivery characteristics, operational flexibility and system performance indicators. These parameters should be informed by science, modelling and agreed objectives and be updated through periodic review.

Where outcomes fall outside the envelope a consistent and transparent approach is required to determine financial consequences.

Professor Gordon Leslie's submission (Submission 85) highlighted that the effects of water use can be estimated using forward-looking measures of the opportunity cost of foregone electricity generation, reflecting the value of water in the energy system at a given point in time.

Approaches of this kind provide a practical basis for valuing system variation in a way that is:

- consistent over time
- transparent and rule-based
- responsive to changing market and system conditions.

This allows financial consequences to be applied in a predictable manner, supporting adaptive management while avoiding case-by-case negotiation.

For example, valuation approaches may estimate the expected change in electricity generation associated with water releases, combined with forecast energy prices, to approximate the economic effect.

Further detail on the design and implementation of the operating envelope, valuation methodology, trigger mechanisms and institutional roles is provided in **Appendix C**. These elements will require further development by governments as part of implementation of the reformed framework, taking into account system objectives, market conditions and governance arrangements.

### *Decision framework for adaptive operation*

The final report will include a recommended decision framework for adaptive operation that will support adaptive management by distinguishing between normal variation, agreed changes and material deviations.

### *Implications*

The decision framework:

- removes barriers to reform and updates licence settings
- supports adaptive management and continuous improvement
- replaces ad hoc compensation under the Snowy Compensation Deed with clear, rules-based outcomes
- aligns incentives toward delivery of system-level outcomes
- provides transparent and predictable management of trade-offs.

Implementation of the framework requires:

- definition of an operating envelope
- clear trigger and escalation rules
- a transparent valuation methodology

- defined institutional roles and responsibilities.

These elements should be developed during implementation and reviewed periodically to support adaptive system management.

## Recommendations

### **Recommendation 24 – Establish a Rule-based Compensation Framework**

Governments establish a rule-based compensation framework that limits compensation to clearly defined circumstances and supports adaptive system management. Under this framework:

- a. no compensation applies to changes agreed through periodic reviews, audits or updates to objectives and operating arrangements
- b. compensation applies only where outcomes fall outside a defined operating envelope, with impacts assessed against agreed criteria
- c. the amount of any compensation is determined using a transparent, publicly available method or formula.

The framework is to also include:

- a. clear triggers and rules for when compensation applies
- b. compliance enforcement, including financial penalties for non-performance against agreed obligations.

## 6.7 Conclusion

The elements set out in this chapter are not standalone reforms but are essential enabling conditions for the effective operation of the proposed framework. The Panel has consistently identified that limitations in current arrangements arise not only from the design of environmental flow settings, but from fragmentation across planning, governance, risk allocation and system coordination. Addressing these constraints requires a shift to a genuinely whole-of-system approach, where water, energy, environmental and community considerations are managed in an integrated and transparent way. Without these enabling elements in place, the recommendations of this Review would be difficult to implement and unlikely to deliver enduring outcomes. Together, they provide the practical foundation required to support adaptive management, informed trade-offs and improved system performance over time.

# 7. Funding and Investment Framework

Delivering the reforms recommended by the Panel requires a coordinated, whole-of-system approach to funding and investment.

The proposed reforms extend beyond environmental water delivery to include catchment management, First Nations and community programs and the governance functions needed to support coordination and implementation, accountability and adaptive management. These elements are interdependent and require sustained, long-term investment.

In many cases, current funding arrangements, characterised by short-term programs, fragmented investment and reliance on discretionary government funding, are not aligned with the timeframes required for ecological recovery and system improvement. A new funding and investment framework is required to provide certainty and durability, supported by clear roles for governments and Snowy Hydro and mechanisms that enable transparent allocation and long-term investment in system outcomes.

## 7.1 What requires funding

Improved outcomes depend on integrated investment across four key areas:

- environmental water delivery and science: flow management, operations, modelling, ecological monitoring, reporting and the scientific functions required to design, assess and adapt flow regimes over time
- catchment management and complementary measures: restoration, erosion control, habitat improvement and stewardship programs
- First Nations and community programs: cultural water initiatives, participation and capacity building
- governance and system functions: independent decision-making (including dispute resolution and trade-off assessment), compliance, monitoring, reporting and periodic review.

## 7.2 Current funding context

Recent Australian Government investment in the Upper Murrumbidgee has supported catchment works, monitoring and cross-jurisdictional collaboration. This funding, which expires in 2029, is program-based rather than embedded in an enduring framework.

While Snowy Hydro has evolved from a publicly funded national infrastructure project to a commercial entity operating within a broader system of public value, funding arrangements that recognise both its use of public water resources and its contribution to system-wide outcomes need to be recognised.

More broadly, current funding arrangements for water management, monitoring and review are fragmented and subject to budget cycles, limiting long-term planning and continuity of delivery. These challenges are compounded by the cross-border nature of the system where funding, program design and delivery responsibilities are distributed across multiple jurisdictions without a consistent mechanism for coordination or alignment, resulting in little or no integration or consideration of the system as a whole.

As identified in the SAG report, this has resulted in:

- short-term funding cycles that do not align with the long-term timeframes required for ecological restoration, risking the loss of benefits once funding ceases
- a lack of durable, cross-jurisdictional commitment, with existing funding mechanisms unable to sustain system-wide outcomes over time.<sup>78</sup>

## 7.3 Stakeholder perspectives

Stakeholder input consistently highlights that effective implementation depends on secure, long-term funding arrangements. Key themes include:

- strong support for investment in catchment and complementary measures, alongside flows
- concerns that short-term funding cycles undermine achieving environmental outcomes
- expectation that costs should be shared across governments and system beneficiaries
- broad support for Snowy Hydro contributing to environmental and community outcomes, reflecting its use of public water resources
- calls for dedicated funding for First Nations and community programs
- need for coordination of activities across and within jurisdictions.

## 7.4 Funding challenges

The Panel agrees that the shortcomings identified by stakeholders need to be taken into account in developing funding arrangements.

While sustained funding is required over a long timeframe, the intensity of investment is expected to change over time. Higher upfront investment in catchment repair and system restoration would likely be followed by reduced but ongoing funding for maintenance, monitoring and adaptive management as system condition improves.

## 7.5 Principles for funding design

The funding framework should:

- provide long-term certainty and continuity of funding
- align funding with system outcomes, impacts and responsibilities
- support shared but proportionate contributions across governments

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<sup>78</sup> Stakeholder Advisory Group (May 2026), Restoring the Upper Murrumbidgee, Improving Flows, Balancing Interests - Initial Report from the Stakeholder Advisory Group to the Independent Review Panel: 20.

- establish an appropriate contribution from Snowy Hydro
- ensure funding allocation is transparent, well-governed and independently informed and directed to priority actions that deliver the greatest contribution to agreed prioritised system outcomes. Priorities should be based on scientific evidence and transparent criteria. Input should also be sought from community stakeholders and First Nations
- support adaptive management by enabling funding to respond to new information and evolving system priorities
- recognise both public benefit and user-pays principles, while operating within established water entitlement frameworks
- support First Nations participation, community involvement and long-term stewardship
- support delivery of effective operational arrangements measured against environmental, cultural and social outcomes rather than input-based or volumetric targets
- ensure participation in the new Deed framework has agreed financial and / capped in-kind contributions.
- be coordinated across jurisdictions.

In practice, this may result in funding being distributed unevenly across jurisdictions, reflecting differences in catchment condition, opportunity for improvement and the actions required to achieve system-wide objectives.

Funding responsibilities should therefore reflect a combination of system benefits, impacts and shared stewardship responsibilities.

## 7.6 Recommended funding approach

A hybrid funding model is proposed, combining government contributions, a defined contributory role for Snowy Hydro and enduring funding arrangements.

The effectiveness of this funding model will depend on how funds are raised and how priorities are determined. Community and First Nations should inform investment priorities alongside scientific evidence, monitoring and evaluation information, to ensure funding decisions are evidence-based, transparent and locally informed. Future funding approaches need to consider cost, equity, ecological effectiveness and financial risk.

The Panel considers that a beneficiary-pays approach provides the most appropriate basis for funding design, recognising that multiple parties derive value from the system and share an interest in improved outcomes.

### Indicative allocation of funding responsibilities

- Governments: funding governance functions, coordination and co-investment in public good outcomes
- Snowy Hydro: financial contributions reflecting its role in system operations, outcomes and impact.

These arrangements support clarity of roles and improve transparency in how funding is applied across the system. They would operate under intergovernmental oversight, with governance arrangements to ensure accountability and alignment with agreed objectives.

## Funding architecture

Funding arrangements should support both long-term investment and ongoing system delivery.

### *Governance*

Funding arrangements should operate under the new Deed governance framework with appropriate oversight by senior officials to ensure transparency, accountability and alignment with system objectives.

Funds management may be implemented through one or more funding mechanisms or accounts to optimise program delivery.

Funding decisions and allocation of resources would remain the responsibility of governments under the new Deed arrangements, supported by senior officials, with independent oversight provided through the governance framework.

### *Types of funding to be supported*

Funding arrangements should support two interdependent categories of activity—ongoing and long-term. Effective outcomes rely on ongoing system management supported by sustained investment in system condition and resilience.

#### **Ongoing system functions (operational funding)**

These include the core activities required to operate and manage the system on an ongoing basis, such as governance and coordination, environmental water planning and delivery, system operations and modelling, monitoring and reporting and compliance and assurance. These functions require stable, predictable funding to ensure continuity and accountability.

#### **Long-term investment and system improvement**

These include activities that improve system condition and outcomes over time, such as catchment restoration and complementary measures, environmental outcomes beyond flow delivery, First Nations and community programs, scientific capability and adaptive management. These require flexible, longer-term investment directed to priority outcomes and adjusted as system needs evolve.

## Government contributions

The Australian, NSW, Victoria and ACT governments should:

- jointly fund core governance functions and coordination
- proportionately invest in catchment, environmental and community programs.

This reflects shared stewardship of water resources and shared system benefits.

Contributions from jurisdictions should reflect their role within the system and may take different forms, including financial contributions, provision of water or entitlements and targeted investment in catchment and system functions. Contributions are forward-looking and based on current and future system roles rather than historical funding arrangements.

### **Example: Funding additional flows**

Within a shared funding framework jurisdictional contributions may be structured in different forms, including direct financial contributions or targeted investments aligned to system priorities.

For example, the ACT's participation in an intergovernmental funding arrangement could include responsibility for supporting additional environmental flows in the Murrumbidgee River. This would reflect the ACT's position within the catchment and provide a direct contribution to downstream system outcomes.

Such arrangements are consistent with an outcome-based approach to funding allocation in which contributions are aligned to system needs and benefits rather than applied uniformly across jurisdictions.

## **Snowy Hydro contribution and water-use pricing**

Snowy Hydro should contribute to environmental costs associated with its operations. Contributions from Snowy Hydro are expected to be implemented through a combination of licence obligations, new Deed settings and, where required, supporting regulatory or contractual mechanisms rather than through direct statutory prescription.

This model distinguishes between two distinct types of contribution:

### ***1. Annual water-use and system contribution (Snowy Hydro base contribution)***

Snowy Hydro should make an annual payment, reflecting:

- its access to and use of water resources
- the costs of system-level functions required to manage those resources.

These contributions are not intended to represent payment for ownership of water resources (Snowy Hydro does not own the water), but rather to support the management, monitoring and improvement of system outcomes.

These funds should be directed into a jointly governed intergovernmental funding mechanism or account, enabling coordinated contributions from governments and Snowy Hydro and supporting the delivery of shared system functions:

- system management and coordination
- compliance and regulatory oversight
- monitoring, modelling and water management activities.

The level of this contribution should be independently determined, including through application of pricing principles by the NSW Independent Pricing and Regulatory Tribunal (IPART) or an equivalent body, to ensure transparency, consistency and objectivity in the calculation.

## *2. Variable system contribution*

This contribution varies to reflect the scale and nature of system effects associated with Scheme operations, including their interaction with environmental water delivery and broader system performance. These funds should be directed to an enduring fund and applied to:

- funding complementary measures and catchment works
- supporting environmental water outcomes, including where additional water or offset actions are required to achieve agreed system objectives.

These arrangements would operate at a system level and are not intended to attribute impacts to specific downstream users or activities. Existing water entitlement frameworks are not altered by these funding arrangements.

### *Incentive-based design*

This structure does not assign responsibility for environmental impacts to a single party. Rather, it recognises that system outcomes are shaped by multiple factors and that contributions can appropriately vary to reflect the role, benefits and system effects associated with different participants.

The variable contribution should also be designed to provide a clear incentive for improved system performance over time.

In particular:

- the level of contribution would be expected to reduce over time as system performance improves and legacy impacts are addressed, including reduction where improved performance is demonstrated against agreed system outcomes
- adjustments should be informed by independent monitoring, audits and periodic reviews of system outcomes
- the framework should ensure that improved operational performance and reduced impacts are reflected in lower ongoing financial liability.

### *Overall approach*

Together, these mechanisms:

- introduce clear, transparent and independently determined financial contributions
- ensure that Snowy Hydro contributes both to system management costs and the mitigation of its impacts
- establish a framework that supports long-term system outcomes, accountability and continuous improvement.

The detailed design of both mechanisms requires further legal, regulatory and economic analysis, including consideration of Snowy Water Licence settings and shareholder arrangements.

## **Enduring funding arrangements**

To support long-term stability and system-wide investment funding should be administered through an enduring fund, established as a central component of the governance framework.

The establishment and operation of funding arrangements may be supported through intergovernmental agreement or administrative mechanisms, with legislative change only required where existing powers are insufficient.

The purpose of the fund is to:

- pool contributions from governments and Snowy Hydro
- enable coordinated, cross-jurisdictional investment
- ensure funding is directed toward agreed system-level outcomes over appropriate ecological timeframes.

## 7.7 Transitional funding arrangements

Transition to the new funding and investment framework should reflect legal, financial and operational constraints, as well as the time required to establish new governance, funding and planning arrangements across jurisdictions.

This transition is based on a proportional and outcome-based approach to funding, rather than equal contributions across jurisdictions.

### *Maintaining momentum through existing Australian Government investment*

The Panel recognises the importance of maintaining continuity of on-ground works, scientific investment and monitoring activities during the transition period.

To support this, the Australian Government's Restoring the Upper Murrumbidgee River Program should be extended for a further five years, providing:

- continued investment in catchment restoration and complementary measures
- sustained support for scientific research, monitoring and evaluation
- an ongoing platform for cross-jurisdictional collaboration.

This extension would ensure that progress in enhancing condition in the Upper Murrumbidgee River is not disrupted while new governance and joint funding mechanism are established.

### *Phased introduction of joint government funding*

During the initial transition period responsibility for funding should shift from predominantly Australian Government-led investment to a shared funding model, with proportionately increasing contributions from NSW, Victoria and the ACT. As the Deed is implemented, inclusive of new environmental and cultural outcomes being met, contributions are expected to reduce as system performance improves and legacy constraints are resolved.

This should involve:

- development of agreed system priorities and investment frameworks across jurisdictions
- alignment of funding cycles and contributions
- progressive introduction of joint contributions from the Australian, NSW, Victorian and ACT governments consistent with the principles set out in this chapter.

Contributions from jurisdictions are not expected to be equal and should reflect differences in system benefits, impacts, existing investments and responsibilities across the catchment. For example, Victoria's responsibilities are for the Snowy River, not the Upper Murrumbidgee, and the East Gippsland CMA has done an effective job improving river outcomes through their past investments.

This approach recognises that jurisdictions may require time to establish coordinated funding arrangements and budget processes, while ensuring a clear pathway to shared ownership and stewardship of the system.

### *Front-loaded Snowy Hydro contribution with declining liability*

This approach reflects the need for higher initial investment to address legacy system impacts and constraints, followed by reduced contributions as system condition improves.

The transition framework should also incorporate a front-loaded contribution from Snowy Hydro, reflecting:

- the current level of system impacts
- the need to fund early investment in system repair, offsets and complementary measures.

Under this approach:

- initial contributions, including the beneficiary-pays component (variable system contribution), would be set at a higher level during the early phase of the framework
- these funds would support priority actions to address legacy impacts, downstream effects and system constraints
- contributions would be expected to reduce where Snowy Hydro demonstrates improved performance against agreed system outcomes.

Reductions in financial liability should be:

- linked to measurable improvements in environmental and system outcomes
- informed by independent monitoring, evaluation and reporting
- supported by the periodic audits and reviews recommended under the governance framework.

This creates a clear incentive structure, encouraging Snowy Hydro to align operations with system objectives while ensuring that early investment is sufficient to support meaningful system improvement.

### *Leveraging existing Snowy Hydro community investment programs*

The Panel also recognises that Snowy Hydro currently delivers a range of community grants, sponsorship and regional support programs in areas associated with its operations.

As part of the transition to the new funding framework, there is an opportunity for governments to better coordinate existing investment programs and align them with system priorities, including in the Upper Murrumbidgee. This would help ensure that local communities within the system benefit more consistently from existing investment mechanisms.

Improved coordination and alignment would:

- provide early, visible community benefits during the transition period
- support local stewardship, participation and capacity building
- complement broader funding arrangements by delivering targeted, place-based investment aligned with system priorities.

Snowy Hydro's programs could, over time, be considered as part of this broader approach, including closer alignment with local community priorities and system-level outcomes.

There should be clear alignment between these programs and the broader funding framework, including the prioritisation processes, governance arrangements and system-level outcomes.

### *Sequencing and coordination*

The transition should be carefully sequenced to ensure that:

- the enduring fund mechanism is operational prior to full implementation of new funding flows
- funding, planning and monitoring functions are aligned at a system level
- that funding decisions are made within established governance and accountability frameworks rather than transitional arrangements.

This sequencing will enable funding decisions to be made within a coherent governance and accountability framework, rather than through fragmented or transitional arrangements.

### *Outcome of transition*

These transitional arrangements provide a pathway from the current system, characterised by fragmented, short-term and compensation-based funding, to a model defined by:

- coordinated, long-term and cross-jurisdictional investment
- transparent and principles-based contributions, including from Snowy Hydro
- contributions structured on a proportional basis reflecting system roles, impacts and benefits
- clear alignment between funding, governance and system-level outcomes.

This staged approach ensures that reform is both implementable and aligned with long-term system objectives.

### **Proposed funding transition**

The Panel proposes a staged transition to a new funding and investment framework that reflects the establishment of governance arrangements, the introduction of joint funding, and the progression toward a stable, long-term model. The transition pathway is indicative and may require adjustment in response to operational, institutional and funding constraints as arrangements are implemented.

This transition is designed to:

- maintain continuity of investment during the establishment phase
- progressively introduce shared funding responsibility across governments

- align contributions with system-level outcomes and impacts over time, including through a declining impact-based contribution from Snowy Hydro.

Importantly, governments should give preference to an all-jurisdictions funding arrangement, involving the Australian, NSW, Victorian and the ACT governments. Funding commitments should be formalised through intergovernmental agreement and associated instruments, with clear obligations.

This approach would:

- support coordinated, system-wide investment across connected river systems
- ensure that both the Upper Murrumbidgee and the Snowy River systems benefit from a consistent funding framework
- strengthen shared stewardship and accountability across jurisdictional boundaries, consistent with the governance framework outlined in **Chapter 5**.

An all-jurisdictional model provides the strongest basis for delivering integrated environmental, cultural and community outcomes at a system scale.

**Table 4: Stages of Proposed Transition**

Stage	Timing	Key characteristics	Government role	Snowy Hydro Limited role
<b>1. Stabilisation</b>	Years 0–2	Australian Government-led funding while governance and funding mechanisms are established	Australian Government provides the majority of funding to maintain system functions and continuity of investment	Provides base contribution and a higher, front-loaded impact payment to support early system repair and offsets
<b>2. Transition</b>	Years 2–5	Joint funding commences; responsibility progressively shared	NSW, Victoria and ACT begin contributing; Australian Government contribution tapers as shared funding increases	Impact-based contribution declines progressively as system performance improves; base contribution remains stable
<b>3. Mature model</b>	Years 5+	Stable, coordinated funding model aligned to system-level priorities	Governments contribute on a shared basis reflecting joint stewardship	Contribution stabilises at a base level only, with impact payments reduced or no longer required

## 7.8 Panel conclusions on funding

Overall, the proposed framework establishes a coordinated, system-wide approach to funding, aligned with governance and system outcomes. It supports shared but differentiated contributions, strengthens accountability and provides a flexible platform for long-term, adaptive investment.

## Recommendations

### **Recommendation 21 – Shared government funding**

The Australian, NSW, Victorian and ACT governments establish a shared funding model, including coordinated contributions to support system-level functions, planning and investment across the catchments.

These contributions are to reflect system roles and responsibilities and may take different forms, including financial contributions, provision of water or entitlements, and targeted investment in catchment and system functions. Governments should establish enduring funding arrangements to:

- a. support coordinated, cross-jurisdictional investment
- b. allocate funding based on agreed system-level priorities.

Funding is to be allocated based on:

- a. scientific evidence and monitoring
- b. agreed system-level priorities
- c. input from community and First Nations.

The arrangement is to be transitional and staged, including interim measures to extend the Australian Government investments to ensure continuity (including the Restoring the Upper Murrumbidgee River Program and drought response).

### **Recommendation 22 – Snowy Hydro funding**

Consistent with the beneficiary-pays principle, Snowy Hydro make an ongoing financial contribution to support environmental and system outcomes under the renewed Deed arrangement.

This contribution:

- a. reflects its role in operating and influencing outcomes across the system
- b. contribute to the costs of environmental, catchment and system functions, coordinated by governments
- c. provide certainty over time
- d. include a base contribution and where appropriate, an additional contribution linked to system-level effects of operations.

The level and structure of these contributions are to be determined through an independent pricing or regulatory process (such as IPART), to ensure transparency, consistency and objectivity.

## 8. Implementation Roadmap

This chapter outlines a staged implementation pathway for transitioning from current arrangements to a coordinated, adaptive system for managing the Snowy Scheme. It sets out the sequencing of key decisions, institutional changes and operational reforms required to give effect to the Panel's recommendations.

The approach recognises the need to maintain system stability while enabling early action, and reflects the legal, technical and intergovernmental constraints that shape how reform can be delivered in practice. The roadmap provides a structured basis for governments to progress reform in a phased manner while ensuring full implementation over time.

### 8.1 Implementation at a glance

Implementation of the Panel's recommendations will proceed in three phases:

- **Phase 1 (0–2 years):** Establish the new Deed, governance arrangements and funding architecture, while maintaining continuity of existing programs and initiating early actions, including increasing the release of water from Tantangara Dam to an average annual target of 23% (68 GL equivalent) of average annual inflow.
- **Phase 2 (2–5 years):** Embed reforms through Snowy Water Licence amendments, operational funding arrangements, and implementation of the planning framework.
- **Phase 3 (5+ years):** Consolidate and operate a mature, adaptive system.

Action within the first 12 months is critical to initiate intergovernmental processes, stabilise funding, agree on a new environmental flow program delivered through both planned and adaptive environmental water (**Chapter 4**), commence Flow-MER monitoring, and begin technical design work. Implementation should be guided by a consistent set of principles (**see Box 12**) to support coordinated intergovernmental decision-making.

The implementation pathway distinguishes between policy agreement, legal effect and operational delivery, recognising that these elements progress at different speeds but must remain aligned over time.

### **Box 10: Implementation Principles**

#### **1. Immediate commencement is required**

Implementation should proceed as a deliberate transition to a more effective and sustainable system.

#### **2. Build on existing frameworks**

Reforms should use and adapt existing institutions, legislation and agreements wherever possible, avoiding unnecessary complexity or duplication.

#### **3. Sequence reform to manage risk**

Implementation should be staged, with early actions establishing core elements and more complex changes introduced progressively. Snowy 2.0 is a major project which brings additional capability that is critical to the NEM and important in the delivery of the Panel's recommendations. The sequencing of reform should be coordinated with the completion and commissioning of this project.

#### **4. Maintain system stability during transition**

Changes must ensure continuity of water delivery, environmental outcomes and energy system performance.

#### **5. Align actions with jurisdictional responsibilities**

Actions should be undertaken at the appropriate level, enabling early progress without requiring all elements to be agreed simultaneously.

#### **6. Enable adaptive implementation**

Implementation should adjust over time in response to improved information, system performance and changing conditions.

## **8.2 Implementation phases**

Implementation proceeds through three staged but overlapping phases. While broadly sequential, elements may progress in parallel where supported by existing legal and institutional frameworks. In particular:

- Phase 1 focuses on in-principle agreement and early actions
- Phase 2 establishes binding arrangements and enforcement mechanisms
- Phase 3 supports ongoing system operation and refinement.

### ***Phase 1: Establishment (0–2 years)***

Phase 1 focuses on establishing the institutional, legal and funding foundations for reform while ensuring continuity of existing programs and initiating priority actions. Key outcomes of Phase 1 are at **Table 5**.

Importantly, Phase 1 includes both foundational institutional changes and early delivery actions (including increasing the release of water from Tantangara Dam to an average annual target of 23% (68 GL equivalent) of average annual inflow), ensuring that environmental improvements (including Flow MER) can commence without waiting for full implementation of the framework.

**Table 5: Summary of Actions in Phase 1**

Outcome	Key Actions
<b>Outcome 1: Establish a New Deed</b>	<ol style="list-style-type: none"> <li>1. Agree to replace the existing Deed with a new Deed between the Australian, NSW, Victorian and ACT governments – <b>Chapter 5</b></li> <li>2. Endorse system-level objectives to guide decision-making – <i>Chapter 5</i></li> <li>3. Establish governance arrangements (<b>Chapter 5</b>) including: <ul style="list-style-type: none"> <li>• decision-making processes</li> <li>• independent oversight</li> <li>• intergovernmental committee service delivery partner and</li> <li>• advisory groups.</li> </ul> </li> <li>4. Agree on a new environmental flow program delivered through both planned and adaptive environmental water - <b>Chapter 4.</b></li> <li>5. Establish processes for independent decision-making on trade-offs - <b>Chapter 5</b></li> <li>6. Design the enduring funding framework, including contribution arrangements - <b>Chapter 7</b></li> <li>7. Increase First Nations participation, including early resourcing to support engagement, advisory input and involvement in planning, monitoring and decision-making - <b>Chapter 6</b></li> <li>8. Australian Government develops a new Statement of Expectations for Snowy Hydro.</li> </ol>
<b>Outcome 2: Continuity and enhancement</b>	<ol style="list-style-type: none"> <li>9. Stabilise and continue existing funding, ensuring no disruption to catchment management, monitoring or First Nations initiatives including for: <ul style="list-style-type: none"> <li>○ the Drought Operating Framework</li> <li>○ the ‘Restoring the Health of the Upper Murrumbidgee Program’</li> </ul> </li> <li>10. Provide immediate transitional funding to support actions in ‘Outcome 1’ (above) ahead of the new agreement</li> <li>11. Fund and commence deliver of the Flow MER in the Upper Murrumbidgee</li> <li>12. Commission priority technical and feasibility work ensuring this does not delay or compromise the commencement of Option 5, including: <ul style="list-style-type: none"> <li>• Tantangara Dam outlet</li> <li>• automation and operational constraints</li> <li>• hydrological and ecological assessments</li> <li>• development of environmental water requirements for the Snowy River.</li> </ul> <p><i>Early monitoring and technical work will inform the initial development of the whole-of-system planning framework which will be progressively formalised in Phase 2.</i></p> </li> </ol>
<b>Outcome 3: Realignment of the Snowy Licence</b>	<ol style="list-style-type: none"> <li>13. Amend Snowy Water Licence, including updated flow regimes, adaptive management provisions and enhanced reporting requirements.</li> </ol>

### *Phase 2: Transition (2–5 years)*

Phase 2 focuses on translating the agreed framework into operational and compliance arrangements. By the end of this phase governance, funding, planning and regulatory systems should be functioning cohesively. Key outcomes of Phase 2 are at **Table 6**.

During this phase, policy settings agreed through the new Deed and other arrangements are translated into legally enforceable obligations through amendments to the Snowy Water Licence.

**Table 6: Summary of Actions in Phase 2**

<b>Outcome</b>	<b>Key Actions</b>
<b>Outcome 1: Embed the new Deed framework and governance arrangements</b>	<ol style="list-style-type: none"> <li>1. Finalise and implement the new Deed embedding agreed objectives, governance structures and funding commitments - <b>Chapter 5.</b></li> <li>2. Operationalise governance and decision-making arrangements, including structured advisory input and independent oversight - <b>Chapter 5.</b></li> <li>3. Fully implement the whole-of-system planning framework, including coordinated planning, advisory processes and decision support systems.</li> </ol>
<b>Outcome 2: Operationalise funding, monitoring and adaptive management</b>	<ol style="list-style-type: none"> <li>4. Establish and implement the enduring funding framework, transitioning from transitional funding arrangements in Phase 1 to full contributions from governments and Snowy Hydro- <b>Chapter 7.</b></li> <li>5. Implement integrated monitoring, evaluation and reporting systems aligned to system objectives and performance indicators</li> <li>6. Embed adaptive management processes, enabling periodic adjustment of flow regimes based on monitoring outcomes, climatic variability and system performance.</li> <li>7. Progress targeted legislative and regulatory changes where required to support governance, compliance and funding functions.</li> </ol>
<b>Outcome 3: Implement and operationalise the reformed Snowy Water Licence</b>	<ol style="list-style-type: none"> <li>8. Amend and give effect to the redesigned Snowy Water Licence, including revised flow regimes, planning framework linkages and adaptive management provisions</li> <li>9. Operationalise environmental water delivery through the planning framework and licence settings, enabling flexible and system-responsive implementation over time.</li> </ol>

### *Phase 3: Consolidation (5+ years)*

Phase 3 focuses on long-term system operation and continuous improvement. The emphasis is on maintaining system performance, refining settings over time and ensuring the framework remains effective, accountable and responsive to changing conditions. Key outcomes of Phase 3 are at **Table 7.**

Through these processes the system evolves over time in response to changing environmental conditions, improved information and operational experience, ensuring it continues to deliver balanced, transparent and effective outcomes.

**Table 7: Summary of Actions in Phase 3**

<b>Outcome</b>	<b>Key Actions</b>
<b>Outcome 1: Embedded Deed and governance framework</b>	<ol style="list-style-type: none"> <li>1. Full operation of the new Deed with governance, planning and decision-making processes embedded across jurisdictions</li> <li>2. Continued operation of coordinated planning and advisory arrangements, supporting transparent and evidence-based decision-making.</li> </ol>

<p><b>Outcome 2: Stable funding, monitoring and adaptive management</b></p>	<ol style="list-style-type: none"> <li>3. Stabilisation of the funding framework, reflecting long-term cost allocation principles and system responsibilities</li> <li>4. Ongoing operation of integrated monitoring, evaluation and reporting systems aligned with system objectives</li> <li>5. Continued application of adaptive management, with decisions informed by monitoring outcomes, scientific knowledge and operational experience</li> <li>6. Regular audit and review processes, including: <ul style="list-style-type: none"> <li>o periodic independent audit (every five years)</li> <li>o longer-term system review (every ten years).</li> </ul> </li> </ol>
<p><b>Outcome 3: Ongoing optimisation of the Snowy Water Licence and system settings</b></p>	<ol style="list-style-type: none"> <li>7. Continued refinement of the Snowy Water Licence, including flow regimes and adaptive management provisions in line with system performance and emerging evidence</li> <li>8. Progressive optimisation of system settings, including planning frameworks, operational rules and investment priorities.</li> </ol>

## 8.4 Role of the NSW Snowy Water Licence

The Snowy Water Licence will remain the primary legal and operational instrument through which environmental flow obligations, system rules and compliance requirements are implemented.

The new Deed establishes the policy framework, which is subsequently given legal effect through staged amendments to the Licence.

In practice, key elements of the Panel’s recommendations, including flow regimes, adaptive management provisions, reporting obligations and aspects of the planning framework, will be reflected in Licence conditions and associated operating rules.

Amendments should be progressed through existing statutory processes in NSW. However, further detailed design work will be required following agreement by governments to determine the precise scope and content of amendments, including how the recommended framework is translated into legally enforceable provisions.

## 8.5 Legal and institutional changes

The Panel does not propose wholesale legislative reform. Any changes should be targeted and proportionate supporting the operation of the framework without creating new institutional complexity.

Implementation relies on coordinated use of several instruments:

- New Deed: establishes objectives, governance and funding
- Snowy Water Licence: implements enforceable system rules
- Legislation: supports compliance, enforcement and alignment, including the *Water Act 2007* (Cth) and the *Water Management Act 2000* (NSW)
- Statement of Expectations: sets the Government’s expectations of Snowy Hydro.

They perform distinct but complementary roles within the implementation framework, as summarised at **Table 8**. Further detailed investigation will be required to support implementation, including the design of each instrument and how the intergovernmental agreement will interact with existing legislative frameworks.

**Table 8: Summary of Legal and Institutional Changes**

<b>Instrument</b>	<b>Key changes</b>	<b>Purpose in implementation framework</b>
<b>New Deed</b>	Replace the existing Deed with a new agreement incorporating: updated system objectives ( <b>Chapter 5</b> ), governance framework, funding arrangements ( <b>Chapter 7</b> ), and participation of all jurisdictions (including ACT).	Establishes the overarching policy framework, including system objectives, governance arrangements, roles and responsibilities, and funding principles.
<b>Snowy Water Licence (NSW)</b>	Amend to incorporate: updated AWOP requirements for planned and adaptive environmental flow regimes, adaptive environmental flow management provisions, reporting requirements, trade-off decision processes and relevant governance settings.	Primary legal and operational instrument for implementation; translates policy settings into enforceable obligations and system rules.
<b>NSW Water Management Act 2000</b>	Targeted amendments may be required to: strengthen compliance and enforcement powers, support monitoring and reporting requirements, and clarify regulatory roles (e.g. NRAR, NRC).	Enables effective compliance, enforcement and regulatory oversight of the Licence and associated obligations.
<b>Commonwealth Water Act 2007</b>	Minor or targeted amendments if required to: ensure alignment with Basin Plan arrangements and support integration with national water policy frameworks.	Ensures consistency with national water reform frameworks and avoids conflict between system-level arrangements and Basin obligations.
<b>Snowy Hydro Corporatisation Acts</b>	Limited clarification to ensure that: Snowy Hydro's financial contributions (base and impact-based) and environmental obligations are consistent with its statutory mandate and shareholder framework.	Provides legal certainty that Snowy Hydro's obligations under the new framework are compatible with its corporate and governance structure.
<b>Funding mechanisms (Trust and Special Account)</b>	Establish an enduring Trust and operational account through intergovernmental agreement and/or administrative mechanisms, with contributions from governments and Snowy Hydro.	Enables coordinated, long-term funding, transparent allocation of resources, and delivery of system-wide environmental, cultural and community outcomes.
<b>Statement of Expectations</b>	Update the Statement of Expectations to reflect environmental, water and public benefit outcomes.	Ensures Snowy Hydro's priorities are aligned with broader environmental, water and public benefit expectations

## 8.6 Summary of roles and responsibilities

Effective implementation of the Panel's recommendations requires clear allocation of roles across governments, regulators, delivery entities and advisory bodies. These roles reflect the need to balance policy oversight, operational delivery, independent regulation and advisory input.

The framework is designed to build on existing institutional responsibilities, while strengthening coordination, transparency and accountability. Governments retain responsibility for setting

system-level objectives and overseeing performance, while operational delivery remains with Snowy Hydro under the Snowy Water Licence. Regulatory and compliance functions are retained within NSW.

New or enhanced functions include independent system oversight and more structured advisory input, including from experts, scientific bodies, community stakeholders and First Nations representatives. These functions are intended to support more transparent and evidence-based decision-making, particularly in relation to managing trade-offs between environmental, water security and energy system objectives.

Roles also evolve over time. In Phase 1, the focus is on establishing governance arrangements and clarifying responsibilities. In Phase 2, these roles become operational, with institutions actively supporting planning, funding and adaptive management processes. By Phase 3, responsibilities are embedded within a mature system of ongoing stewardship, review and continuous improvement.

The table below summarises the key functions within the framework and the entities responsible for delivering them.

**Table 9: Summary of Key Functions and Recommended Responsibility**

<b>Function</b>	<b>Responsibility</b>	<b>Key entities</b>
<b>Objective setting and system stewardship</b>	Establish system-level objectives and oversee system performance	Australian, NSW, Victorian, ACT governments
<b>Governance and decision-making</b>	Set policy direction, assess trade-offs, resolve disputes	Governments, supported by independent oversight (e.g. Snowy Water Commissioner)
<b>Independent Oversight</b>	Act as final decision-maker on trade-offs where resolution cannot be achieved through established governance arrangements.	Snowy Water Commissioner (new function)
<b>Advisory input</b>	Provide scientific, community and First Nations advice to inform decisions	Scientific agencies, individuals with relevant scientific expertise, community stakeholders, First Nations representatives
<b>Operational delivery</b>	Operate the scheme and implement water management decisions	Snowy Hydro
<b>Licence administration</b>	Administer and enforce the Snowy Water Licence	NSW Government
<b>Water manager</b>	Coordinate activities	MDBA (or equivalent)
<b>Monitoring and compliance</b>	Monitor system performance and enforce compliance	NSW Government, NRAR (or equivalent) or CEWH
<b>System review</b>	Major independent system review (~10 years)	Productivity Commission
<b>Regulation and compliance</b>	Day-to-day monitoring, enforcement of licence conditions	NSW Government, NRAR
<b>Independent audit</b>	Periodic audit of system performance and compliance (~5 years)	NRC (or equivalent), and equivalent in Victoria
<b>Implementation support</b>	Deliver programs, planning processes and complementary measures	State and territory agencies
<b>System stewardship and adaptive management</b>	Ensure system evolves through review, feedback and adjustment	Governments, supported by all entities above

## 8.7 Implementation considerations

The Panel was cautioned by the SAG against abrupt reform, they support a phased, staged and scalable implementation pathway, recognising infrastructure lead times and system complexity.<sup>79</sup>

First Nations perspectives presented in the FNAG report align with this staged approach, acknowledging that current infrastructure limitations at Tantangara Dam prevent implementation of the highest ambition ecological flow regimes. At the same time, they emphasise that meaningful progress should continue during the interim period while planning, approvals and construction of necessary upgrades are underway.<sup>80</sup>

Implementation pathways should:

- avoid further harm during transition periods
- allow time for learning and adaptation
- ensure cultural and ecological recovery are pursued together, not sequentially
- minimise impacts on energy reliability, security and price.

Strategic planning, feasibility studies and interim adaptive measures are recommended by the Panel as a means of avoiding irreversible loss while longer-term reforms are progressed.

Implementation of a flow regime that would support ecosystem recovery is feasible but requires deliberate planning, staged delivery and targeted infrastructure investment.

### *Snowy 2.0*

The Panel recognises the role of Snowy 2.0 in supporting more flexible operation of the scheme and hence being able to modestly increase environmental water releases while minimising any impacts on the NEM.

Snowy 2.0 is a significant and complex engineering project. The sequencing of reform actions need to be cognisant of these activities progressing in parallel and ensure they are coordinated and that implementation of the increased release of water from Tantangara Dam to an average annual target of 23% (68 GL equivalent) or a greater percentage of average annual inflow, is further adapted and refined after Snowy 2.0 is in service.

### *Infrastructure upgrades*

Infrastructure upgrades at Tantangara Dam are a necessary enabler of system-scale ecological recovery through larger channel clearing flows, while adaptive operational frameworks reduce risks and allow environmental outcomes to be maximised without compromising water security or energy reliability. A staged and scalable implementation pathway, supported by early planning for major capital works, provides a prudent and flexible approach to delivering the environmental objectives.

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<sup>79</sup> Stakeholder Advisory Group (May 2026), Restoring the Upper Murrumbidgee, Improving Flows, Balancing Interests - Initial Report from the Stakeholder Advisory Group to the Independent Review Panel: 22.

<sup>80</sup> First Nations Advisory Group (April 2026), From Advisory to Custodianship – Cultural Recommendations to the Independent Review Panel.

Indicative cost estimates of between \$100 million and \$300 million have been cited for upgrading the Tantangara Dam outlet by Snowy Hydro.<sup>81</sup> The Panel has not seen evidence confirming these estimates and understands that detailed technical investigations have not been undertaken. It is critical that investigations be undertaken to determine if there are alternative infrastructure options capable of achieving similar flow outcomes at lower cost or risk.

Similarly, the Panel has not been provided with cost estimates for decommissioning Mowamba Weir. Notwithstanding this, improvements in the effectiveness of environmental water delivery, across environmental, community and First Nations outcomes, are likely to depend on progressing these types of infrastructure interventions.

Undertaking preparatory design and feasibility work does not commit governments to construction. Rather, it ensures that decisions about the scale and ambition of environmental flows are informed by robust technical, financial and operational information. Delaying this work increases the risk that opportunities for ecological recovery are missed, particularly given projected drying climate conditions and the likelihood of increasing system stress over time.

## 8.8 Conclusion

This staged approach enables governments to initiate environmental improvements early, while allowing for immediate commencement of many recommendations and ensuring more complex legal, funding and infrastructure decisions are supported by sufficient technical, financial and operational information.

Collectively, elements of this roadmap provide a practical and sequenced pathway for implementation, ensuring that steps to reform commence immediately, proceed in a coordinated manner and deliver the full intended outcomes over time.

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<sup>81</sup> Snowy Hydro submission to Issues Consultation Report (2026). <https://consult.dcceew.gov.au/swioid-independent-review/new-survey/view/127>

# Glossary

## Acronyms

AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ANF	average natural flows
AWOP	Annual Water Operations Plan
CBA	Cost-benefit analysis
CEWH	Commonwealth Environmental Water Holder
CPHR	Conservation Programs, Heritage and Regulation
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Australian Government or NSW Government specified)
EGCMA	East Gippsland Catchment Management Authority
EWRs	Environmental Water Requirements
FIRM	Framework for Integrated River Models
FNAG	First Nations Advisory Group
GL	giga litre
GWh	giga-watt hour
ISP	Integrated System Plan (AEMO)
IPART	Independent Pricing and Regulatory Tribunal (NSW)
MDBA	Murray-Darling Basin Authority
MER	monitoring, evaluation and reporting framework
ML	mega litre
MW	mega watt
MWh	mega-watt hour
NEM	National Electricity Market
NRAR	Natural Resources Access Regulator
NRC	Natural Resources Commission (NSW)
NWI	National Water Initiative
OECD	Organisation for Economic Co-operation and Development
RAR	Required Annual Release
RCG	intergovernmental Review Consultation Group

SAC	Snowy Advisory Committee
SAG	Stakeholder Advisory Group
SMRIF	Snowy Montane Rivers Increased Flows
SRA	Snowy River Alliance
STAG	Safety Technical Advisory Group
SWGOC	Snowy Water Government Officials Committee
SWIOD	Snowy Water Inquiry Outcomes Implementation (the Deed)
WAMC	Water Administration Ministerial Corporation (NSW)
WCLC	Water Consultation and Liaison Committee
WRP	Water Resource Plan

# Appendices

## Appendix A: SWIOID IRP Engagement Register

This table includes engagements from the Panel to date, not including sessions with consultants procured to support the Review.

Stakeholder/s	Panel meeting date
Snowy Hydro Limited, Chief Operating Officer Rodger Whitby and Maia Schweizer	30 September 2025
Centre for Water Economics, Environment and Policy, Australian National University, Dr Paul Wyrwoll	30 September 2025
Australian Rivers Restoration Centre, Dr Siwan Lovett	30 September 2025
Deed Review First Nations Advisory Group Facilitator, Paul Knight	30 September 2025
Murray-Darling Basin Authority	1 October 2025
New South Wales Irrigators Council, Tom O'Malley	1 October 2025
Snowy Monaro Regional Council and Queanbeyan-Palerang Regional Council	1 October 2025
New South Wales Department of Climate Change, Energy, the Environment and Water	1 October 2025
Victorian Department of Energy, the Environment and Climate Action	1 October 2025
National Electricity Market Review Secretariat – Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW)	1 October 2025
Australian Energy Regulator	1 October 2025
Australian Capital Territory (ACT) Government, City and Environment Directorate	16 October 2025
University of Canberra, Professor Fiona Dyer	23 October 2025
Snowy Advisory Committee, Emeritus Professor John Rodger	23 October 2025
Australian National University researcher, Anna McGuire (on a jointly published paper with Professor Jaimie Pittock).	23 October 2025
ACT and Region Catchment Management and Coordination Group	23 October 2025
Deed Review Stakeholder Advisory Group	11 November 2025
Snowy Hydro Limited, Chief Executive Officer, Dennis Barnes	13 November 2025
Deed Review intergovernmental Review Consultation Group	3 December 2025
Deed Review First Nations Advisory Group	11 December 2025
Commonwealth Environmental Water Holder, Dr Simon Banks	11 December 2025
Commonwealth DCCEEW National Water Policy, International and Engagement Branch, on the new National Water Agreement	21 January 2026
Australian National University, Professor Jamie Pittock	21 January 2026
ACT and Region Catchment Management and Coordination Group Chair, Dr Maxine Cooper and Rinzin Lhamo	21 January 2026
Snowy Hydro Limited, Water Manager, James Pirozzi (Cooma, New South Wales)	22 January 2026
Victorian East Gippsland Catchment Management Authority	4 February 2026
Snowy River Public Community Forum (Marlo, Victoria)	4 February 2026

<b>Stakeholder/s</b>	<b>Panel meeting date</b>
Snowy River Public Community Forum (Dalgety, New South Wales)	5 February 2026
Deed Review intergovernmental Review Consultation Group	26 February 2026
Deed Review Commonwealth Review Steering Committee	2 March 2026
Inspector General of Water Compliance, the Hon Troy Grant	4 March 2026
Murray-Darling Basin Authority, Chief Executive Andrew McConville	6 March 2026
Deed Review intergovernmental Review Consultation Group	17 March 2026
NSW Natural Resources Commission, Executive Director Bryce Wilde	18 March 2026
NSW Natural Resources Access Regulator, Chief Regulatory Officer Grant Barnes	18 March 2026
NSW Local Land Services, CEO Kate Lorimer-Ward	8 April 2026
Snowy Hydro Limited, Chief Commercial Officer, Gordon Wymer and Chief Operating Officer, Maia Schwizer	15 April 2026
Deed Review intergovernmental Review Consultation Group	22 April 2026
Deed Review First Nations Advisory Group Facilitator, Paul Knight	21 April 2026
Deed Review First Nations Advisory Group	23 April 2026
Deed Review intergovernmental Review Consultation Group	12 May 2026
Deed Review intergovernmental Review Consultation Group	28 May 2026
NSW DCCEEW – Conservation Programs, Heritage and Regulation	2 June 2026
NSW DCCEEW – Water Group and Snowy Hydro Limited, Water Manager, James Pirozzi	2 June 2026
Commonwealth Environmental Water Holder	2 June 2026
Murray-Darling Basin Authority, Chief Executive Andrew McConville	3 June 2026
Snowy Hydro Limited, Chief Executive Officer, Dennis Barnes and Chief Operating Officer, Maia Schwizer	10 June 2026
Australian Capital Territory (ACT) Government, City and Environment Directorate	10 June 2026
National Electricity Market Review Panel Member, Philip Hirschhorn	12 June 2026
Australian Energy Market Operator (AEMO), Executive General Manager System Design, Nicola Falcon	12 June 2026
NSW Department of Climate Change, Energy, the Environment and Water	17 June 2026
Victorian Department of Energy, Environment and Climate Action	17 June 2026
Deed Review Stakeholder Advisory Group	23 June 2026
Deed Review Steering Committee	24 June 2026

*NSW engagement with the Panel was represented by the RCG members and support officer/s from DCCEEW Conservation Programs, Heritage and Regulation and DCCEEW Water Group*

## Appendix B: Assessment of governance arrangements against contemporary benchmarks

This appendix provides the detailed analytical foundation for the governance conclusions and recommendations set out in **Chapter 5**. It presents a structured assessment of the Snowy Water Inquiry Outcomes Implementation Deed against three relevant and authoritative benchmarks:

- the OECD Principles on Water Governance
- Australia’s national water reform framework, including the National Water Initiative and the direction of an emerging National Water Agreement
- the principles and expectations reflected in the Murray–Darling Basin Plan.

The tables in this appendix are not included for completeness alone. They represent the evidence base underpinning the Panel’s judgement that the governance limitations associated with the current Deed are structural and systemic, rather than the result of implementation or administration. Each table identifies areas of alignment and misalignment, assesses the scale of governance gaps, and outlines the implications of those gaps for effective, accountable and adaptive management of Snowy water resources.

The analyses in this appendix informed the development of the proposed governance framework and recommendations in **Chapter 5**. Readers seeking a detailed understanding of how current arrangements compare with contemporary governance standards are encouraged to refer to these tables.

## Appendix B, Part 1 – Gap analysis against Basin Plan principles

### *Framing observations*

The Murray–Darling Basin Plan provides the Australian Government’s statutory framework for basin-scale water management and reflects contemporary expectations regarding sustainability, adaptive management, transparency and accountability. Although the Deed predates the Basin Plan, the Deed significantly influences inflows to the Murray–Darling Basin and therefore operates alongside the Basin Plan. As such, the extent to which the Deed aligns with the principles and expectations of the Basin Plan is a relevant consideration in assessing whether existing governance arrangements remain fit for purpose.

The assessment identifies areas of alignment as well as gaps where the Deed does not reflect the governance approach embodied in the Basin Plan and considers the implications of those gaps for effective basin-wide water management.

However, it is noted that the geographic scope of the Deed extends across areas that sit both within and outside the Murray–Darling Basin, and that this gap analysis is both a test against good practice and the Deed’s impact on the relevant part of the Basin.

The following table outlines how the rating scores across Appendix B have been considered by the Panel.

<b>Rating</b>	<b>Definition</b>
<b>Fundamental</b>	Core element of the framework is absent or directly inconsistent with Basin Plan / NWI principles.
<b>Major</b>	Substantial misalignment affecting outcomes, system performance, or governance integrity.
<b>Moderate</b>	Partial alignment with clear weaknesses or gaps in implementation, clarity, or robustness.
<b>Minor</b>	Generally aligned, but with limited gaps in clarity, consistency, or completeness.
<b>Compliant / Aligned (optional)</b>	Fully or largely consistent with Basin Plan/NWI expectations.

<b>Principle</b>	<b>Basin Plan expectation</b>	<b>Position under the Snowy Water Inquiry Outcomes Implementation Deed</b>	<b>Gap and implications of the gap</b>
<b>Basin-scale, integrated water management</b>	Water resources are planned and managed at the scale of the hydrological basin, recognising connectivity between systems and cumulative downstream impacts.	Governance under the Deed is structured around the signatory jurisdictions and operation of the Snowy Scheme, rather than basin-scale integration. The ACT has no formal governance role despite being directly affected by Upper Murrumbidgee flows.	<b>Major</b> Fragmented decision-making limits integrated management and risks undermining downstream Basin Plan objectives.
<b>Environmentally sustainable level of take (ESLT)</b>	Water use and management operate within sustainable limits that protect key environmental assets and ecosystem functions.	The Deed specifies fixed volumetric environmental releases based on historical assumptions. It does not explicitly reference ESLT concepts or Basin Plan sustainability objectives.	<b>Moderate</b> The Deed provides limited assurance that releases remain environmentally sufficient under changing climatic and operational conditions, potentially constraining Basin Plan effectiveness.
<b>Clear environmental objectives and outcomes</b>	Environmental water is directed to achieve defined ecological objectives, supported by monitoring and evaluation.	Environmental flows under the Deed are largely expressed as volumes, with limited articulation of ecological objectives or performance measures at the Deed level.	<b>Moderate</b> Outcome-based accountability is weak, reducing the ability to demonstrate contribution to Basin Plan environmental outcomes.
<b>Adaptive management and responsiveness to change</b>	Basin-scale water management responds to new information, climatic variability and long-term change.	The Deed does not embed adaptive management principles or structured review triggers. Changes rely on ad-hoc intergovernmental agreement.	<b>Major</b> Governance is static and slow to respond, increasing the risk of maladaptive outcomes as climate pressures intensify.
<b>Transparency and accountability</b>	Decisions on water management and trade-offs are transparent and accountable to the public.	Key decisions and trade-offs under the Deed occur through intergovernmental and operational processes with limited public visibility.	<b>Moderate</b> Limited transparency weakens public confidence and reduces assurance that Snowy operations align with Basin Plan intent.
<b>Separation of roles and functions</b>	Policy-setting, operational management and regulation are clearly separated to avoid conflicts of interest.	Snowy Hydro Limited retains discretion over operational decisions affecting environmental flows while also pursuing energy generation objectives.	<b>Major</b> Structural role overlap creates conflicts of interest and weakens confidence in

<b>Principle</b>	<b>Basin Plan expectation</b>	<b>Position under the Snowy Water Inquiry Outcomes Implementation Deed</b>	<b>Gap and implications of the gap</b>
			environmental water decisions in a Basin Plan context.
<b>Stakeholder and community engagement</b>	Communities are informed and engaged in water management decisions affecting Basin outcomes.	The Deed contains no formal provisions for stakeholder or community engagement. Engagement occurs through external, discretionary processes.	<b>Moderate</b> Absence of embedded engagement mechanisms reduces social licence and community confidence in Basin-related outcomes.
<b>Recognition of First Nations values and uses</b>	First Nations cultural values, knowledge and uses of water are recognised and supported within water management frameworks.	The Deed contains no recognition of First Nations interests or role in governance, planning or review.	<b>Fundamental</b> The Deed is misaligned with Basin Plan expectations and contemporary standards, creating legitimacy, equity and trust failures.
<b>Monitoring, evaluation and review</b>	Ongoing monitoring and periodic review support learning and continuous improvement.	The Deed does not mandate a regular review cycle and was not substantively reviewed for more than 20 years after commencement.	<b>Major</b> Lack of institutionalised review limits learning, delays response to emerging risks, and increases long-term governance failure.
<b>Explicit management of trade-offs</b>	Trade-offs between environmental, social and economic outcomes are explicitly assessed and justified.	Trade-offs between environmental flows, energy generation and downstream reliability are implicit and managed operationally.	<b>Major</b> Opaque trade-off management increases contestation and constrains balanced, basin-wide decision-making.

## Appendix B, Part 2 – Gap analysis against NWI principles

### *Framing observations*

The National Water Initiative establishes a nationally consistent framework for water governance based on:

- clear roles and responsibilities
- basin-scale planning
- explicit environmental outcomes
- transparency and accountability
- adaptive management under variability and climate change.

The SWIOID, while innovative for its time, reflects a pre-NWI governance paradigm and has not evolved in step with nationally agreed reforms.

This analysis focuses on material alignment and misalignment, not technical compliance, recognising that the Deed predates the NWI but the Panel is reviewing the Deed in a context where national consistency with NWI principles is a minimum benchmark.

Principle	NWI expectation	Deed position	Gap & Implication
<b>Clear assignment of roles, risks and responsibilities</b> <i>NWI Clauses 6, 23, 52</i>	Governments clearly articulate who is responsible for water planning, allocation, regulation, operation and enforcement.  Risks associated with variability and change are explicitly identified and allocated.	Roles are partially defined but fragmented: Policy intent in the Deed Operational discretion with Snowy Hydro Regulation via NSW instruments No clear assignment of responsibility for ecological outcomes, as distinct from volumetric delivery Trade off risk (environment vs energy vs downstream users) is implicit, not allocated.	<b>Major</b> The SWIOID does not meet the NWI standard for transparent role clarity or risk allocation. Accountability is diffuse. Disputes are structural rather than procedural.
<b>Basin scale, integrated water planning</b> <i>NWI Clauses 25–34</i>	Water is managed at the appropriate hydrological scale.  Cross-jurisdictional impacts are addressed through inclusive governance arrangements.	Governance is structured around jurisdictional signatories, it does not account for the Upper Murrumbidgee basin. ACT is excluded despite being hydrologically and socially affected. No basin-scale decision-making body exists.	<b>Major</b> The SWIOID does not reflect basin-scale planning principles embedded in the NWI. Ongoing legitimacy and coordination failures.

Principle	NWI expectation	Deed position	Gap & Implication
			Structural misalignment between impacts and authority.
<b>Explicit provision for environmental and public benefit outcomes</b> <i>NWI Clauses 23, 35–40</i>	Environmental water outcomes must be: explicitly stated, planned, monitored and adapted over time. Environmental water is treated as a core entitlement, not residual.	Environmental flows are expressed largely as fixed volumetric targets. Limited articulation of ecological objectives beyond flow volumes. No requirement for outcome-based ecological assessment.	<b>Moderate to major</b> The SWIOID makes provision for environmental water but not in the manner envisaged by the NWI. Environmental performance cannot be robustly demonstrated. Adaptive improvement is constrained.
<b>Adaptation to variability and climate change</b> <i>NWI Clauses 4, 25, 47</i>	Planning frameworks must explicitly account for: climatic variability, long-term change and uncertainty. Adaptive mechanisms must be embedded, not ad hoc.	No explicit climate adaptation framework. Fixed assumptions about hydrology and operating conditions. Reviews occur only by political agreement, not by design.	<b>Major</b> The SWIOID is not climate-resilient by NWI standards. Governance becomes progressively less fit-for-purpose. Increased likelihood of crisis-driven intervention.
<b>Separation of policy, regulation and service delivery</b> <i>NWI Clauses 6, 52</i>	Clear institutional separation between: policy-setting, regulation and compliance and operational delivery.	Snowy Hydro is: both the operational manager and the primary party managing timing trade-offs affecting environmental outcomes. No independent arbiter for conflicts.	<b>Major</b> The SWIOID falls short of NWI institutional separation principles. Structural conflict of interest. Reduced confidence in environmental flow decisions.
<b>Transparency, data and water accounting</b> <i>NWI Clauses 71–87</i>	Timely, accessible and comparable water data. Transparent reporting of allocation decisions and outcomes.	Reporting largely compliance-focused. Limited public visibility of decision rationales, trade-offs, ecological outcomes. Accessibility varies across instruments and jurisdictions.	<b>Major</b> The SWIOID does not meet contemporary NWI transparency expectations. Reduced accountability. Diminished public trust.
<b>Monitoring, audit and review</b> <i>NWI Clauses 7, 10, 90–92</i>	Regular monitoring and independent review of arrangements. Evidence-based adjustment over time.	No mandatory review cycle in the Deed. First review initiated more than 20 years after commencement.	<b>Major</b> The SWIOID is inconsistent with the NWI's commitment to ongoing evaluation. Governance stagnation.

<b>Principle</b>	<b>NWI expectation</b>	<b>Deed position</b>	<b>Gap &amp; Implication</b>
		Learning relies on external processes (licence review, ad-hoc inquiries).	Delayed response to emerging risks.
<b>Indigenous interests and engagement</b> <i>NWI Clause 52</i>	Recognition of Indigenous peoples' rights, interests, cultural values, economic aspirations related to water. Engagement embedded in governance, not discretionary.	No mention of First Nations. No role in governance, planning or review.	<b>Fundamental.</b> This is one of the most pronounced areas of non-alignment. Failure to meet nationally agreed reform commitments. Elevated legal, social and reputational risk.
<b>Managing trade-offs transparently</b> <i>NWI Preamble; Clauses 6, 23</i>	Governments explicitly manage and justify trade-offs between economic, environmental and social outcomes.	Trade-offs are implicit and often opaque. Resolution occurs through negotiation or operational discretion rather than structured decision-making.	<b>Major</b> Persistent conflict. Diminished confidence in decisions that affect multiple interests.

## Appendix B, Part 3 – Gap analysis against OECD Principles on Water Governance

### *Framing observations*

The OECD Principles (2015) articulate 12 “must-do” principles across effectiveness, efficiency and trust and engagement.

In OECD terms, the SWIOID remains a first-generation water governance instrument:

- Strong on intergovernmental certainty and legal enforceability.
- Weak on inclusivity, adaptability, transparency, basin-scale management and learning.

Principle	OECD expectation	Deed position	Gap & Implication
<b>Principle 1: Clearly allocate and distinguish roles and responsibilities</b>	Roles for water policy, regulation, operational management and enforcement should be clearly defined and separated, with coordination mechanisms across responsible authorities.	Roles are distributed across the Deed, the Snowy Water Licence, NSW regulatory agencies and Snowy Hydro Limited, but are not clearly separated. Snowy Hydro Limited retains substantial discretion over operational decisions that materially affect environmental outcomes, including the timing of environmental releases.	<b>Moderate</b> Roles between policy (Deed), regulation (Licence), and operations (Snowy Hydro) are defined, but poorly integrated. No clear articulation of who is responsible for ecological outcomes, versus merely delivering volumes. No role for the ACT or First Nations despite material interests. The Deed does not clearly distinguish between policy direction, operational decision-making and trade-off management. This creates structural conflicts of interest, weakens accountability for environmental outcomes, and complicates dispute resolution where environmental and energy objectives diverge.
<b>Principle 2: Manage water at the appropriate scale</b>	Governance arrangements align with hydrological boundaries, with coordination across jurisdictions.	Governance is organised around the Deed parties (Commonwealth, NSW and Victoria). The ACT has no formal role despite being directly affected by Upper Murrumbidgee flows.	<b>Major</b> Governance is structured around jurisdictional boundaries, not the Upper Murrumbidgee catchment. The ACT is excluded from formal governance despite being directly impacted. No basin-level authority or joint decision-making mechanism exists. Exclusion of the ACT undermines legitimacy and constrains integrated catchment-scale management.

<b>Principle</b>	<b>OECD expectation</b>	<b>Deed position</b>	<b>Gap &amp; Implication</b>
<b>Principle 3: Encourage policy coherence across sectors (water–energy–climate)</b>	Water, environment, energy and climate policies are aligned to avoid conflicting objectives.	The Deed predates key national water, climate and energy reforms. Interactions between environmental flows, energy security and climate adaptation are not systematically addressed.	<b>Moderate to major</b> The Deed predates the Basin Plan, climate adaptation frameworks, net-zero energy policy. No mechanisms exist to systematically reconcile trade-offs between environmental water and energy security; instead, conflicts are managed case-by-case. Decisions involve unstructured trade-offs that risk inconsistency with broader national objectives.
<b>Principle 4: Adapt institutional capacity to the complexity of challenges</b>	Governance capacity is proportionate and responsive to changing water challenges.	Institutional arrangements assume relatively static conditions and are not periodically tested for fitness for purpose.	<b>Major</b> The Deed assumes fixed institutional capacity and hydrological conditions. No adaptive governance structures or resourcing mechanisms are embedded. Review and learning depend on external processes (licence reviews, ad hoc inquiries) rather than the Deed itself. Governance capacity may degrade over time. This limits effectiveness and increases reliance on external or crisis-driven intervention.
<b>Principle 5: Produce, update and share water-related data</b>	Timely, consistent and policy-relevant data supports decision-making and accountability.	Information is produced mainly through licence compliance and operational reporting. The Deed does not require integrated reporting on outcomes or decision rationales.	<b>Moderate</b> Data production exists through licence reporting and AWOPs. However, the Deed does not require outcome-based ecological monitoring and does not mandate public reporting of ecological effectiveness. Information is compliance-focused, not decision support focused. Transparency is limited. This constrains adaptive management and informed engagement by communities and First Nations.
<b>Principle 6: Mobilise water finance efficiently and transparently</b>	Governance arrangements clarify financial responsibilities and support efficient allocation of resources.	The Deed specifies water volumes but does not address long-term financing of environmental outcomes or adaptive management.	<b>Moderate</b> The Deed allocates water but is largely silent on long-term financing of river recovery and cost-sharing arrangements for adaptive measures.

Principle	OECD expectation	Deed position	Gap & Implication
			Economic risks are implicitly borne by Snowy Hydro and downstream users without transparent allocation rules. Financial responsibilities and risk allocation are unclear. This may constrain reform and discourage investment in improved outcomes.
<b>Principle 7: Ensure regulatory frameworks are effectively implemented</b>	Regulatory frameworks deliver agreed outcomes in the public interest and are enforceable.	Enforcement occurs primarily through NSW licensing regimes rather than through the Deed itself. Performance consequences are limited.	<b>Moderate</b> Strong regulatory enforcement exists via the NSW licence. However, the strategic instrument (the Deed) itself lacks compliance mechanisms and performance standards and consequence frameworks for failure to meet ecological objectives. Strategic objectives may not translate into outcomes. Performance failures may persist without timely correction.
<b>Principle 8: Promote innovative and adaptive governance practices</b>	Governance systems support learning, innovation and adaptation over time.	The Deed relies on fixed volumetric targets and does not embed adaptive management arrangements.	<b>Major</b> No formal adaptive management, experimentation or learning loops are embedded. Innovation has occurred later through licence protocols, not Deed reform. Governance is slow to respond to changing conditions, increasing the risk of maladaptive outcomes.
<b>Principle 9: Mainstream integrity and transparency</b>	Transparency and integrity underpin decision-making and public confidence.	Decisions are largely made through intergovernmental and operational processes with limited public visibility.	<b>Major</b> Decision-making occurs largely through intergovernmental negotiation, not transparent public processes. No public accountability framework for trade-offs between environment, energy and consumptive use exists in the Deed. Limited transparency weakens trust and heightens the risk of stakeholder contestation.
<b>Principle 10: Stakeholder engagement</b>	Stakeholders, including Indigenous peoples, are meaningfully engaged in governance.	The Deed contains no provisions for stakeholder or First Nations participation. Engagement occurs only through discretionary processes.	<b>Major</b> The Deed contains no stakeholder engagement requirements. First Nations are absent. Community involvement occurs only through discretionary reviews and consultations, not as a governance right.

Principle	OECD expectation	Deed position	Gap & Implication
			Governance lacks contemporary legitimacy and does not reflect enduring cultural and social interests.
<b>Principle 11:</b> <b>Manage trade-offs across users and generations</b>	Governance frameworks explicitly identify and manage trade-offs.	Trade-offs between environmental flows, energy generation and downstream users are implicit and managed operationally.	<b>Major</b> Trade-offs are implicit but generally unmanaged due to the rigid “set-and-forget” volumetric targets. No structured framework exists within the Deed to balance environmental outcomes, downstream reliability and energy security. Modern structured-decision-making is external to the Deed. Trade-offs are opaque. This increases conflict and limits balanced, long-term decision-making.
<b>Principle 12:</b> <b>Monitoring, evaluation and learning</b>	Regular monitoring and review supports learning and adaptation.	The Deed does not mandate periodic review and was not reviewed for more than 20 years.	<b>Major</b> The Deed lacks periodic review requirements, performance indicators, and adaptive amendment pathways. Learning has depended on external political triggers, not governance design. Governance stagnation occurs. Emerging risks may remain unaddressed until crisis intervention is required.

## Appendix B, Part 4 – Future-proofing Deed reform against a potential National Water Agreement transition

Australia’s intergovernmental water governance framework is undergoing a deliberate transition from the 2004 NWI to a renewed National Water Agreement (NWA). This transition reflects a shared recognition by all governments that, while the NWI provided a strong foundation for water reform, contemporary challenges now require more adaptive, inclusive and trust-based governance arrangements.

The emerging NWA strengthens and modernises national expectations in key areas, including:

- climate-resilient water management
- meaningful First Nations participation in water governance
- clearer accountability for environmental outcomes
- transparency to rebuild public trust in water decision-making.

Within this national context, the Panel considers it both timely and necessary that long-standing intergovernmental arrangements such as the Deed be assessed and re-designed for consistency with the NWA.

The Panel’s analysis demonstrates that, in its current form, the Deed is no longer aligned with nationally agreed water-governance principles, including those embedded in both the NWI and the emerging NWA. This misalignment has become increasingly pronounced as national policy has evolved.

Importantly, this divergence is structural rather than administrative. It cannot be resolved through minor amendments or improved cooperation but requires substantive reform of the underlying governance framework.

The Panel considers that reform of the SWIOID should be understood not as a departure from national water policy, but as a necessary step in giving effect to it.

A replacement intergovernmental arrangement for the Snowy–Upper Murrumbidgee system would:

- align Snowy governance with the principles, expectations and language of the NWA
- restore coherence between Snowy governance and other nationally significant water regimes
- ensure that the Snowy Scheme, as a nationally important water and energy asset, is governed to standards consistent with contemporary practice.

In this regard, Deed reform should be viewed as part of the NWA transition, rather than a bespoke or exceptional process.

In conceptual terms, the governance redesign recommended by the Panel gives practical effect to the direction of the NWA by:

- embedding climate resilience, through adaptive management and scheduled review cycles

- strengthening First Nations water governance, moving from consultation to structured participation
- clarifying roles and accountabilities, particularly where environmental objectives intersect with energy operations
- improving transparency and trust, through explicit documentation of trade-offs and independent audit
- aligning governance with hydrology, through the inclusion of the ACT
- Independent monitoring, audit and regular review, all publicly reported.

These elements are not additions to national water reform; they are expressions of it, tailored to the specific context of the Snowy Scheme.

The Panel considers that retaining the Deed in its current form would create an increasing governance anomaly as the NWA is implemented across jurisdictions.

Specifically, failure to reform would risk:

- entrenching arrangements that are inconsistent with nationally agreed principles
- undermining confidence in the application of the NWA to large, complex systems
- perpetuating governance gaps relating to climate change, transparency and First Nations inclusion
- increasing the likelihood of future, more disruptive intervention driven by crisis rather than design.

In this context, non-reform carries greater long-term risk than reform.

## Appendix B, Part 5 – Panel conclusions: governance reform is necessary

Taken together, **Tables 1, 2 and 3** demonstrate that the governance limitations of the Deed are systemic and structural, rather than isolated or technical.

Across international best practice (OECD Principles on Water Governance), nationally agreed reform commitments (National Water Initiative and emerging National Water Agreement), and statutory basin-scale expectations under the Basin Plan, the Deed is consistently characterised by misalignment with contemporary governance standards.

The most significant gaps relate to:

- catchment or system-scale governance
- clarity and separation of roles
- adaptive management
- transparency of trade-offs
- scheduled review and learning
- formal recognition of First Nations interests.

While the Deed has delivered important volumetric outcomes, particularly in its early years, its static and jurisdiction-centred design limits its capacity to respond to climate change, increasing system complexity and heightened expectations of legitimacy and accountability. Collectively, the analyses indicate that incremental adjustment is unlikely to address these gaps and that structural reform is required to realign Snowy governance with modern Australian and international water-management frameworks.

The Panel concludes that reform of the Snowy Water Inquiry Outcomes Implementation Deed is both justified and necessary in the context of Australia's transition to a new National Water Agreement.

A replacement intergovernmental arrangement, designed to reflect NWI/NWA principles, the Basin Plan principles and OECD best practice, would reintegrate Snowy governance into the national water reform framework and optimise its management in a period of climatic, social and energy-system change.

Viewed through this lens, Deed reform is not an outlier, but a critical component of maintaining national consistency, legitimacy and confidence in Australia's water governance.

## Appendix C: Compensation and system risk framework design steps

Implementation of the compensation and system risk framework requires the coordinated design of the operating envelope, trigger mechanisms, valuation methodology and institutional roles. These elements should be established as part of the broader governance and operational framework. The framework shifts from a compensation-based model under the current Snowy Compensation Deed to a structured risk-sharing approach, where predefined rules govern how system variation is managed.

### *Establish the operating envelope*

A defined operating envelope should be established to set the bounds of normal system operation within which Snowy Hydro Limited delivers agreed environmental, water and energy outcomes without financial adjustment.

The envelope should:

- articulate outcome-based ranges for environmental water delivery, including timing, variability and reliability
- define acceptable operational flexibility for energy generation and water management
- include tolerance thresholds distinguishing normal variation from material deviation
- identify and define limited exception conditions, including extreme hydrological and energy system events.

The envelope should support adaptive management and replace reliance on fixed, volume-based rules.

### *Define trigger and escalation mechanisms*

A structured trigger framework should be established to determine when system performance falls outside the operating envelope.

Triggers should distinguish between:

- government-directed actions outside the envelope
- operational non-performance within the envelope.

Further, the triggers should provide:

- objective criteria for assessing whether outcomes are within or outside defined limits
- tiered thresholds distinguishing minor variation from material deviation
- clear attribution of cause (e.g. government direction or operational non-performance)

This enables consistent, rules-based escalation, avoiding case-by-case negotiation.

## *Develop the valuation methodology*

A pre-defined valuation methodology should be established to apply where actions or outcomes fall outside the operating envelope.

The methodology should:

- reflect the forward-looking marginal opportunity cost of foregone electricity generation associated with water use
- operate through a transparent, formula-based approach, applied consistently across all events
- be capable of responding to changing hydrological and energy demand.

The methodology should provide, at a minimum, for:

- **Forecast-based valuation**  
Payments or penalties should be determined using the expected market value of electricity associated with the relevant water, including:
  - expected generation volumes
  - forecast electricity prices
  - system efficiency and storage impacts.
- **Opportunity cost of timing**  
The methodology should account for the value of deferring or accelerating water use, recognising that water stored has an option value for future generation.
- **Defined calculation parameters**  
Inputs to the formula (e.g. pricing references, modelling assumptions, time horizons) should be specified in advance to ensure consistency and reduce discretion at the point of application. To the extent possible, the parameters should be independently sourced, including from AEMO or the ASX, or verifiable data including reservoir levels.
- **Symmetric application**  
The same valuation framework should apply:
  - where governments request actions outside the envelope (resulting in payment), and
  - where Snowy Hydro fails to meet agreed obligations (resulting in penalty).
- **Independent oversight and periodic review**  
The methodology should be set and periodically reviewed by an independent body (such as an economic regulator) to:
  - maintain alignment with market conditions
  - ensure credibility and transparency over time.

This approach replaces ad hoc compensation with a rules-based mechanism, where financial outcomes are determined by a known formula rather than negotiated case-by-case.

### *Define institutional roles*

Responsibilities for applying the framework should be clearly allocated to ensure independence and accountability.

This should include:

- governments defining the operating envelope and policy parameters
- an independent decision-making function determining whether triggers are met should there be a dispute
- an economic regulator responsible for establishing or reviewing valuation methods
- Snowy Hydro operating within the envelope and subject to outcomes
- independent audit and assurance of performance and application.

Separation of roles is essential to avoid conflicts between operational, commercial and public interest functions.

### *Establish financial flows and reinvestment mechanisms*

Arrangements should be established to manage payments and penalties arising from the framework.

This should include:

- mechanisms for calculating and processing financial flows
- establishment of a dedicated fund or account (see Funding **Chapter 7**)
- defined principles for reinvestment in environmental outcomes and system improvements.

This ensures that financial outcomes support system objectives over time.

### *Transition from current compensation arrangements*

Implementation of the new framework should include removal or replacement of existing compensation provisions (Snowy Compensation Deed) linked to licence amendment, ensuring that establishment of the revised governance and operating framework is not contingent on compensation. Transition to the new framework should be undertaken as part of the broader reform package and not incur compensation from NSW while transitioning.

This should include:

- removal or replacement of existing compensation provisions (under the Snowy Compensation Deed) linked to licence change
- time-limited transitional arrangements to support adjustment where required
- alignment of compensation settings with the new operating and governance framework.

The transition should enable reform without perpetuating legacy constraints.

## *Monitoring and review*

The framework should be subject to ongoing monitoring and periodic review, aligned with broader governance processes.

This should include:

- assessment of system performance against the operating envelope
- periodic review of valuation methods
- refinement of thresholds and triggers over time.

This supports continuous improvement and adaptive system management.