



NSW DEPARTMENT OF INDUSTRY

Ten-year review of the Snowy water licence

Final report

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More information

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Abbreviations

Abbreviation	Expanded term
ANF	annual natural flows
AWOP	Annual water operating plan
DISV	Dry inflow sequence volume
licence	Snowy water licence
MDBA	Murray–Darling Basin Authority
Ministerial Corporation	Water Administration Ministerial Corporation
NEM	National Electricity Market
OEH	NSW Office of Heritage
RMIF	River Murray increased flows
SHC Act	<i>Snowy Hydro Corporatisation Act 1997</i>
SDL	sustainable diversion limits
SMRIF	Snowy Montane rivers increased flows
Snowy Mountains Scheme	Snowy Mountains Hydro-electric Scheme
SRIF	Snowy River increased flows
SSC	Snowy Scientific Committee
SWGOC	Snowy Water Government Officials Committee
SWIOID	Snowy Water Inquiry Outcomes Implementation Deed
WCLC	Water Consultation Liaison Committee

Overview

The Snowy Mountains Hydro-electric Scheme (Snowy Mountains Scheme) is one of the most complex integrated water and hydroelectric power schemes in the world. The Snowy Mountains Scheme is operated and maintained by Snowy Hydro Limited, a company owned by the Australian Government.

The Snowy water licence (the licence) defines Snowy Hydro Limited's rights and obligations in relation to water in the Snowy Mountains Scheme. The licence allows Snowy Hydro Limited to collect, divert, store, and release water by and from the works of the Snowy Mountains Scheme for the 75-year term of the licence. The licence also defines the rules for releases into the Murray and Murrumbidgee rivers and imposes environmental flow release obligations on Snowy Hydro Limited for the benefit of the Snowy River and other montane rivers (the rivers of the Snowy Mountains).

The licence is a NSW water licence issued and administered by the Water Administration Ministerial Corporation (Ministerial Corporation), which is a statutory body established under the *Water Management Act 2000* to represent the Crown and carry out various water management functions.

Under the *Snowy Hydro Corporatisation Act 1997* (SHC Act), the licence is subject to mandatory reviews, initially after five years and then at intervals of 10 years.

The review's terms of reference are established under the licence. In brief, the review focused on Snowy Hydro Limited's obligations under the licence, which fall into three broad categories:

- increased flow requirements (releases of water for the environment)
- water release requirements (predominately releases of water to the Murray and Murrumbidgee rivers where it is used for consumptive and environmental uses)
- administrative obligations (for example, compliance, annual operating plans, fees and charges).

It also considered Snowy Hydro Limited's and the Ministerial Corporation's performance in meeting the conditions of the licence.

The NSW Department of Industry administers the licence on behalf of the Water Administration Ministerial Corporation and managed the 10-year review. The department commenced the review on 28 June 2017, with interested stakeholders encouraged to lodge submissions.

Approach to the review

The department's approach to the review involved:

- acknowledging and responding to all issues raised in the submissions
- considering all Snowy Hydro Limited issues in good faith
- only acting on issues that fall within the review's terms of reference
- identifying a process to resolve complex issues rather than delay completing the formal review
- commissioning independent advice on performance where NSW Government agencies are party to implementation.

The report is structured to provide important context and meet the review's terms of reference.

Chapters 1 to 5 set the scene by describing the review's scope, the department's approach to undertaking the review, how the Snowy Mountains Scheme is managed, the relevant policy settings and the outcomes of previous reviews.

Chapter 6 discusses the issues raised in the submissions and includes 20 actions in response aimed at increasing transparency in how the Snowy Mountains Scheme is operated and managed, strengthening compliance and accountability and simplifying licence provisions. It also proposes further investigating changes to the licence to improve the delivery of environmental flows, maximise water efficiencies and clarify ambiguous licence provisions. Chapter 6 is structured in accordance with the three categories outlined in the terms of reference.

Chapter 7 discusses Snowy Hydro Limited's and the department's performance in meeting and overseeing compliance with the conditions of the licence. It presents the findings of an independent expert panel review and includes the NSW Government's response to its nine recommendations.

Chapter 8 presents a detailed implementation plan including information on the recommended work streams and project governance arrangements.

Issues with the licence

The department received 40 submissions from stakeholders including Snowy Hydro Limited; a range of community, environmental and agricultural groups; government agencies; and individuals from across south-east Australia. The main themes of the submissions are as follows:

- Snowy Hydro Limited considers the licence is fit for purpose, but wants to change some water release requirements
- Other stakeholders focused mainly on water release requirements or environmental management.
- Environmental management issues included concerns about the increased flows obligations under the licence and broader natural resource management actions of the NSW Government.
- The remainder of issues raised were generally concerned with the licence's administrative obligations, water allocation policies in the Murray River and Murrumbidgee River water supply systems and review project governance.

Actions

The review identifies administrative amendments to the licence and proposes further investigating options to better manage environmental flows and improve current water release rules. Actions arising from the review will improve licence oversight and coordination of environmental water management in the Snowy Mountains.

Administrative amendments to the licence

The 10 administrative amendments to the licence will improve transparency, remove redundant licence provisions and fix errors.

The most significant amendment is that Snowy Hydro Limited will be obliged to prepare a public version of the annual water operating plan (AWOP), which will provide more information on the forthcoming year's operations.

Improving transparency was a priority for stakeholders, and ensuring transparency in how water is shared, allocated and managed is also a key goal outlined in the *NSW Government water reform action plan*¹.

Publishing this version of the AWOP will increase transparency around the management of the Snowy Mountains Scheme and provide information that will help downstream water authorities and water users plan their water use for the upcoming year.

The department will also review the commercial AWOP to ensure it remains fit for purpose, and to make the reporting process more efficient.

Further investigation

The NSW Department of Industry has used the review to scope the more complex issues raised in the submissions and develop plans to resolve them. This allowed the review to be completed in 2018, while providing more time to fully consider changes to the rules.

The NSW Government will explore better ways to deliver environmental flows and optimise water use, review the effectiveness of amendments made to the licence in 2011 and remove licence ambiguities.

¹ The *NSW Government water reform action plan* can be viewed at [NSW Government's Water Reform Action Plan website](#).

Key actions include:

- the NSW Office of Environment and Heritage (OEH) partnering with the NSW Department of Industry, Snowy Hydro Limited and the Victorian and Commonwealth governments to finalise an investigation into releasing environmental water down the Snowy River from the Mowamba River
- the NSW Department of Industry partnering with Snowy Hydro Limited, the Murray–Darling Basin Authority, WaterNSW and the Victorian and Commonwealth governments to investigate ways to improve water accounting and water release rules. The aim will be to increase water-use efficiencies and improve river health and flood management outcomes.

We will deliver the full work plan by 2020.

Improved Snowy Mountains region water management

The NSW Department of Industry’s performance as the licence administrator was reviewed by an independent expert panel. The NSW Government’s response to the review will improve licence administration, strategic decision-making and the effectiveness of the Snowy Montane River Increased Flows program.

Key actions include:

- the NSW Department of Industry reviewing and updating its regulatory policies and procedures for overseeing licence compliance to meet best practice regulation
- re-establishing an interjurisdictional committee of senior officials to jointly oversee and coordinate water management in the Snowy Mountains and ensure the NSW, Commonwealth and Victorian governments continue to meet the agreed outcomes from the Snowy Water Inquiry.

These actions will complement NSW Government reforms to environmental water management that established the Snowy Advisory Committee, and will transfer management of Snowy River and Snowy Montane Rivers increased flows from the NSW Department of Industry to the OEH.

Implementation plan

The NSW Department of Industry will oversee the implementation of these measures with the support of Snowy Hydro Limited and other government agencies and committees with a direct interest in water regulated and released from the Snowy Mountains Scheme. Community interests will be represented through the Snowy Advisory Committee and consultation mechanisms already established in the southern Murray–Darling Basin.

The implementation plan contains five key elements that will run concurrently and be completed progressively by 2021, as listed in Table 1 below.

Relevant water agencies and Snowy Hydro Limited will collaborate to ensure their analytic modelling tools are capable of supporting the investigations. This will allow for detailed analyses of proposed variations to the licence, including the costs and benefits.

The department will continue engaging and consulting with stakeholders and the community through formal project groups and public exhibition of proposed variations to the licence. Public exhibition of the second round of licence variations in 2021 will be supported by public information sessions and there will be a further invitation for submissions.

Table 1. Summary of implementation plan

Measure	Summary of actions	Timing
Administrative licence amendments	The department will vary the Snowy water licence to increase transparency, simplify provisions, secure current practice and fix known errors.	2019
Snowy Mountains region water management	The department will review and update its regulatory policies and procedures specific to the licence and re-establish the Snowy Water Government Officials Committee.	2019
Environmental water delivery investigations	The department and key stakeholders will explore better ways to deliver Snowy River and Snowy Montane Rivers increased flows.	2020
Water release investigations	The department and key stakeholders will investigate inefficient water use, review the effectiveness of amendments made to the licence in 2011 and seek to remove licence ambiguities.	2020
Second round of licence amendments	The department will vary the Snowy water licence to implement the recommendations arising from the investigations into environmental water delivery and water release requirements.	2021

Contents

Abbreviations	i
Overview.....	ii
Approach to the review.....	ii
Issues with the licence.....	iii
Actions	iii
Administrative amendments to the licence	iii
Further investigation	iii
Improved Snowy Mountains region water management.....	iv
Implementation plan	iv
Contents	vi
1. About the review	1
1.1 Scope	1
1.2 Approach to undertaking the review	2
1.2.1 Legislative requirements	2
1.2.2 Current practice	2
1.2.3 Simplification.....	2
1.2.4 Timely completion.....	2
1.2.5 Stakeholder and expert knowledge	3
2. The Snowy Mountains Hydro-electric Scheme.....	4
2.1 Overview of the Snowy Mountains Scheme	4
2.1.1 The Snowy–Murray Development.....	6
2.1.2 The Snowy–Tumut Development.....	6
2.2 Downstream of the Snowy Mountains Scheme	7
3. Policy context.....	8
3.1 Snowy water management reforms.....	8
3.1.1 Snowy Water Inquiry.....	8
3.1.2 The Snowy Water Initiative	8
3.1.3 Snowy Scientific Committee.....	9
3.2 Current water management regulatory framework	9
3.2.1 <i>Snowy Hydro Corporatisation Act 1997</i>	9
3.2.2 The Snowy water licence	9
3.2.3 Annual Water Operating Plan	10
3.2.4 Water Consultation and Liaison Committee	10
3.2.5 Snowy Advisory Committee	10
3.3 Related policy frameworks.....	10
3.3.1 Murray–Darling Basin Agreement and Basin Plan	10

3.3.2	NSW Water Reform Action Plan	11
3.3.3	National Electricity Market.....	11
3.3.4	Snowy 2.0.....	11
3.3.5	Commonwealth Government purchase of Snowy Hydro Limited.....	12
4.	Snowy water management responsibilities.....	13
5.	Past reviews and variations of the licence.....	14
5.1	Mandatory five-year review	14
5.2	Post-Millennium drought review	14
6.	Analysis of issues with the licence	15
6.1	Summary of stakeholder issues	15
6.2	Administrative obligations	15
6.2.1	Purpose of the licence	15
6.2.2	Compliance and transparency	16
6.2.3	Snowy Hydro Limited's water rights	19
6.2.4	Annual water operating plans.....	20
6.2.5	Fees and charges	22
6.2.6	Reviews of Snowy Hydro Limited's obligations	22
6.3	Increased flows.....	22
6.3.1	Environmental objectives of increased flows.....	23
6.3.2	Outlet works at Jindabyne and Tantangara dams	23
6.3.3	Mowamba Borrowings Account.....	24
6.3.4	Delivery of Snowy River Increased Flows from Mowamba River.....	24
6.3.5	Delivery of Snowy River increased flows.....	25
6.3.6	Data sources for reporting increased flows targets.....	28
6.3.7	Riparian releases.....	28
6.3.8	Warm water pollution	29
6.3.9	Call out of River Murray Increased Flows.....	30
6.4	Water release requirements	33
6.4.1	Water sharing	33
6.4.2	Release requirements.....	36
6.4.3	Water accounts.....	45
6.4.4	Data provision and analytical models.....	47
7.	Review of performance	49
7.1	Independent expert panel review of performance.....	49
7.2	Snowy Hydro Limited and NSW Department of Industry performance	49
7.2.1	Approach to demonstrating compliance	49
7.2.2	Expert panel findings and recommendations for demonstrating compliance	50

7.3	Accounting for spills from Lake Jindabyne	52
7.3.1	Approach to accounting for spills and stakeholder issues	52
7.3.2	Expert panel findings and recommendations for the accounting for spills from Lake Jindabyne	53
7.4	Accounting of unregulated flows over Mowamba River and Cobbon Creek weirs	53
7.5	Compliance with Snowy Montane Rivers Increased Flows.....	54
7.5.1	Managing Snowy Montane Rivers Increased Flows and stakeholder issues.....	54
7.5.2	Summary of expert panel findings and recommendations for managing SMRIF	57
7.6	Overarching themes and expert panel recommendations	58
7.6.1	Responsibilities for decision-making and monitoring outcomes.....	58
7.6.2	Frequency of licence amendments	58
7.7	NSW Government response to the expert panel’s recommendations.....	59
7.7.1	Improvements to Snowy water licence administration	59
7.7.2	Accounting for Jindabyne spills.....	59
7.7.3	Management of the Snowy Montane Rivers Increased Flows program.....	60
8.	Implementation plan.....	62
8.1	Actions at a glance.....	62
8.2	Responsibilities.....	63
8.3	Stakeholder and community involvement.....	64
	APPENDIX 1: List of stakeholder submissions.....	65

1. About the review

Snowy Hydro Limited, as the operator of the Snowy Mountains Scheme, was issued with a package of agreements, licences and other regulatory instruments in preparation for corporatisation in 2002. One component of this package was the Snowy water licence, which was issued on 30 May 2002 under the SHC Act.

The licence defines Snowy Hydro Limited's water rights and obligations and aims to strike a balance between the competing demands for water for hydro-electricity generation, consumptive use and the environment. The licence allows Snowy Hydro Limited to collect, divert, store, and release water by and from the works of the Snowy Mountains Scheme for the 75-year term of the licence. The licence also defines the rules for releases into the Murray and Murrumbidgee rivers and imposes environmental flow release obligations on Snowy Hydro Limited for the benefit of the Snowy River and other montane rivers (the high-country rivers of the Snowy Mountains).

The licence is subject to mandatory reviews under the SHC Act, initially after five years and then at intervals of 10 years. The five-year review was carried out between 2007 and 2009. This is the first mandatory 10-year review.

The NSW Department of Industry administers the licence on behalf of the Ministerial Corporation and is managing the 10-year review. The department initiated the review on 28 June 2017, with invitations to stakeholders to lodge submissions.

1.1 Scope

The review's terms of reference are focused on Snowy Hydro Limited's obligations under the licence, which fall into three broad categories:

1. **increased flow requirements**—also known as environmental releases—including releases under the Snowy River Increased Flows (SRIF) and SMRIF programs (see clause 1.1 (34) and Schedule 3 of the licence)
2. **water release requirements**—predominantly releases to the western rivers—including accounting and data provision rules (see clause 1.1 (104) and Schedule 4 of the licence)
3. **administrative obligations**—including obligations relating to compliance reporting (section 4 of the licence), the licensee's rights in relation to water (clause 7 of the licence), the development of AWOPs (clause 8 of the licence), fees and charges (clause 9 of the licence), and the requirement to build and/or modify certain works (clause 6 of the licence and clauses 6, 19 and 20 of Schedule 3 of the licence).

The review also considered Snowy Hydro Limited's performance in meeting the conditions of the licence and whether there are any anomalies or practical issues that need to be addressed.

The review did not address:

- the overall volumes of environmental flow releases, and whether they are excessive or insufficient
- the transfer of responsibility for designing Snowy Mountains environmental flows from the NSW Department of Industry to OEHL
- issues relating to Snowy 2.0 and the possible expansion of the Snowy Mountains Scheme
- town water supply issues.

1.2 Approach to undertaking the review

The following principles guided the NSW Department of Industry's approach to the review:

- Comply with relevant legislation.
- Formalise current practice agreed by the NSW, Victorian and Commonwealth governments and Snowy Hydro Limited.
- Identify opportunities to clarify and simplify licence provisions.
- Ensure timely completion of the review.
- Draw on stakeholder and expert knowledge.

1.2.1 Legislative requirements

The relevant legislative requirements are set out in the SHC Act and the licence. The SHC Act prescribes the requirement for the Ministerial Corporation to review the obligations under the licence and the need to do so every 10 years after the first five-year review. It also prevents the licence being amended to reduce the volume of environmental releases for the Snowy montane rivers, outlines consultation requirements and provides for the NSW Government and Snowy Hydro Limited to agree on compensation arrangements for variations to the licence that have adverse financial impacts Snowy Hydro Limited.

The licence, in addition to what is covered in the SHC Act, requires the Ministerial Corporation to consider all issues raised by Snowy Hydro Limited in good faith throughout the course of the review.

To comply with legislative requirements, the department:

- confined the review's terms of reference to reviewing Snowy Hydro Limited obligations under the licence and its operational performance
- initiated the review on 28 June 2017, being 15 years after corporatisation
- invited stakeholders to lodge submissions by 13 October 2017²
- liaised directly with Snowy Hydro Limited to ensure its issues were understood and considered
- publicly exhibited draft findings of the review on 30 May 2018 and invited stakeholders to lodge submissions by 6 July 2018.

1.2.2 Current practice

The Water Consultation and Liaison Committee (WCLC) is established under the Snowy Water Inquiry Outcomes Implementation Deed³ (SWI OID) and is responsible for advising Snowy Hydro Limited on the preparation and implementation of each AWOP. More information on the WCLC is contained in section 3.2.3.

Since 2002, the WCLC has agreed to numerous accounting and operating arrangements that are not explicitly set out in the licence and captured them in the AWOP. The review provided an opportunity to secure these agreements in the licence, providing certainty for Snowy Hydro Limited and the WCLC and visibility for the public, who do not have access to the AWOP.

1.2.3 Simplification

The licence is complex and includes many one-off starting provisions that are now redundant. The department identified the redundant provisions and actively sought opportunities to simplify arrangements.

1.2.4 Timely completion

Completing the formal review in 2018 will provide certainty for Snowy Hydro Limited and stakeholders that rely on water released from the Snowy Mountains Scheme. However, the complex interactions between the various water release obligations set out in Schedule 4 means detailed analysis is required to understand the consequences of any proposed variations and ensure third parties are not inadvertently impacted.

² The first round submission period was originally scheduled to close on 28 August 2017. NSW Department of Industry extended the date to provide stakeholders more time to prepare their submissions following the public stakeholder briefings.

³ Refer to section 3.1.2 of the report for more information on the SWI OID.

There are numerous administrative improvements and enhancements to the management of increased flows that can be implemented now. Rather than delay these improvements until all issues are thoroughly investigated, the department has used the formal review to scope the more complex issues and identify a work plan to resolve them.

It is expected the full work plan will be delivered by 2020. More detail on implementing the work plan is provided at section 8.

1.2.5 Stakeholder and expert knowledge

The department sought public and stakeholder input by inviting public submissions at the start of the review and following the release of the draft report.

The first submission period ran over fifteen weeks between 28 June 2017 and 13 October 2017. There were 24 submissions lodged in response to the invitation, from a range of community, environmental and agricultural groups, government agencies and individuals. The second submission period ran over five-and-a-half weeks between 30 May 2018 and 6 July 2018. There were 16 submissions lodged in response to the draft report. A list of submitters is provided in Appendix 1.

In addition, the department called on the expertise of an inter-jurisdictional group to advise on the review. It also commissioned an expert panel to independently advise it on the performance of Snowy Hydro Limited and the Ministerial Corporation in meeting the conditions of the licence to date, and consulted directly with Snowy Hydro Limited.

Approximately 20% of issues raised in the submissions fell outside the review's strict terms of reference. The department has used the review process as an opportunity to respond to these key issues and clarify the NSW Government's current management approach in the *Ten-year review of the Snowy water licence—summary of submissions (2018)*.

The expert panel's performance review and summary of submissions report and can be accessed on the [NSW Department of Industry](#) website.

2. The Snowy Mountains Hydro-electric Scheme

2.1 Overview of the Snowy Mountains Scheme⁴

The Snowy Mountains Scheme is an integrated water and hydro-electric power utility operated and maintained by Snowy Hydro Limited.

The Snowy Mountains Scheme was designed to produce electrical energy, but one of the objectives was to provide an annual, reliable source of water for agriculture in NSW and Victoria. The Snowy Mountains Scheme collects and stores water, including water that would otherwise flow east down the Snowy River, diverts it through trans-mountains tunnels and power stations and then release it west of the Snowy Mountains into the River Murray and Murrumbidgee River where it can be used for town water supply, irrigation and environmental purposes.

The Snowy Mountains Scheme was designed to provide more than 1,000 gigalitres of water to each of the Murray and the Murrumbidgee valleys each year. This annual supply of reliable, high-quality water enabled the expansion of irrigation development in the inland areas. The Snowy Mountains Scheme was designed to be able to provide the annual supply through the most severe drought on record, which was then the period 1938–45.

To generate electricity Snowy Hydro Limited must release water from the Snowy Mountains Scheme, and to release water, Snowy Hydro Limited must generate electricity. In this way, water releases and electricity generation are inseparably linked.

Snowy Hydro Limited must operate the Snowy Mountains Scheme to first meet its water release obligations and then to maximise electricity market opportunities within the constraints imposed by the licence.

Snowy Hydro Limited must fund both the debt and operating costs of the Snowy Mountains Scheme through its participation in the highly competitive National Electricity Market (NEM). Those electricity revenues pay for the increasing costs of maintaining and operating the Snowy Mountains Scheme, including the costs associated with making environmental flows.

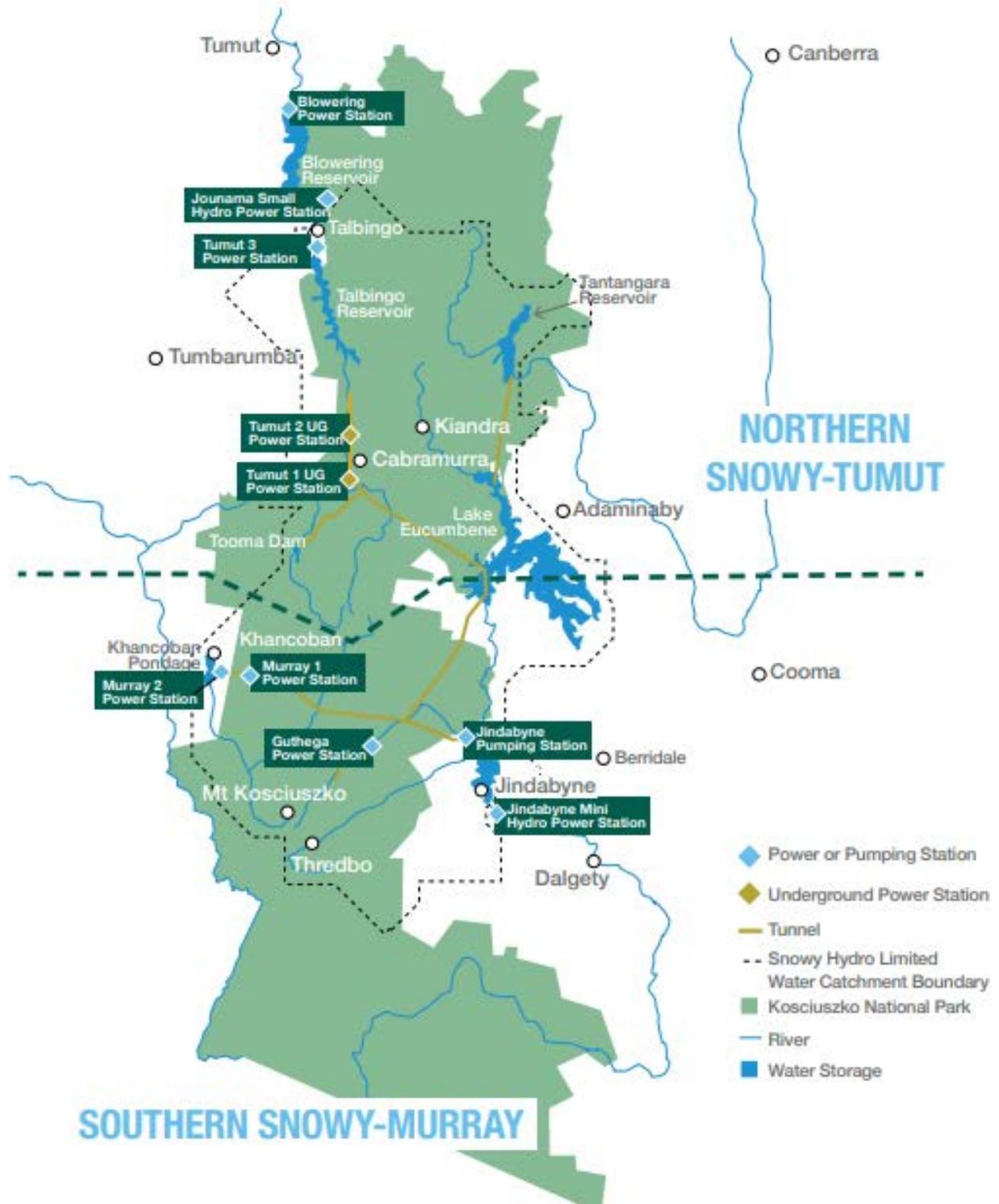
Approximately 99% of all flows in the Snowy Mountains is captured and diverted through a complex, integrated infrastructure that includes:

- nine power stations—Murray 1, Murray 2, Blowering, Guthega, Tumut 1 (located 366 metres below ground level), Tumut 2 (located 244 metres below ground level), Tumut 3, Jounama Small Hydro Power Station and Jindabyne Mini Hydro Power Station
- one pumping station at Jindabyne and a pump storage facility at Tumut 3 Power Station
- 16 major dams with a total storage capacity of 7,000 gigalitres, more than 12 times the volume of Sydney Harbour.
- 145 kilometres of interconnected tunnels and pipelines and 80 kilometres of aqueducts
- 33 hydro-electric turbines with a generating capacity of 4,100 megawatts.

The Snowy Mountains Scheme comprises two major developments: the Northern Snowy–Tumut Development and the Southern Snowy–Murray Development. The water in Lake Eucumbene, the Snowy Mountains Scheme's large, long-term storage, is split between the two developments based on where the water was collected. Figure 1 shows a map of the Snowy Mountains Scheme.

⁴ Snowy Hydro Limited contributed information to this section.

Figure 1. The Snowy Mountains Scheme⁵



⁵ Source: *Snowy Hydro Water Report for 2014–15*

2.1.1 The Snowy–Murray Development

The Snowy–Murray Development (Figure 2) consists of four power stations with 17 generating units and one pumping station. Water in the upper Snowy River is diverted at Guthega Dam through Guthega Power Station and back into Island Bend Dam. Inflows into the relatively small Guthega Pondage are seasonal and spills of the reservoir are common, particularly during the spring snowmelt period.

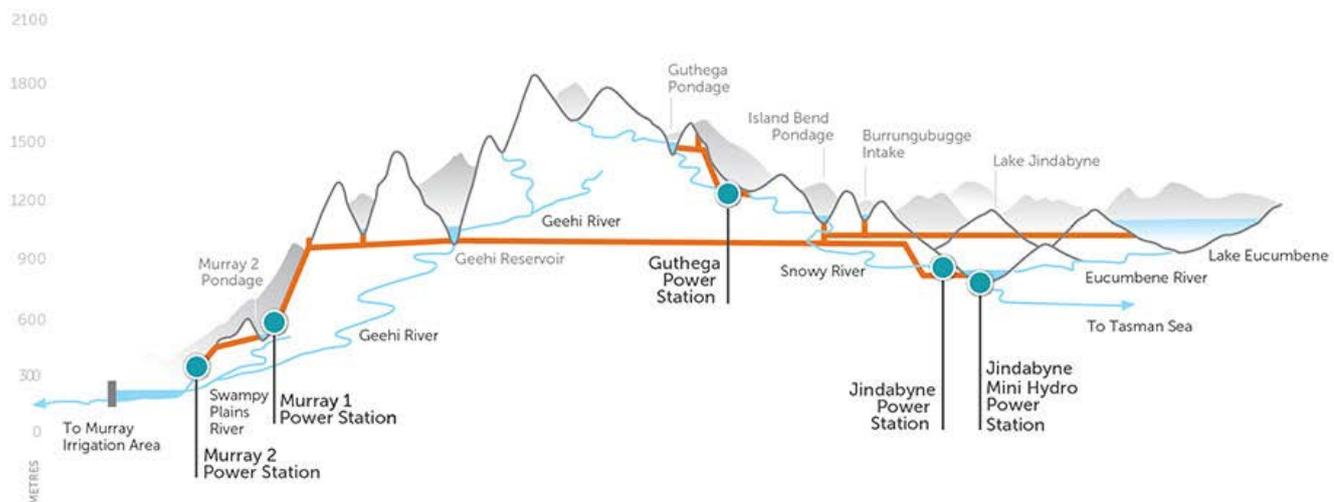
During times of high inflows, water flowing into Island Bend Pondage is diverted to Lake Eucumbene for storage and then transferred to the River Murray catchment at a later time. At times of low inflows, water from Island Bend Pondage is diverted to Geehi Reservoir through a trans-mountain tunnel, together with water transferred back from Lake Eucumbene.

The Jindabyne Pumping Station pumps water from Lake Jindabyne (normally at off-peak times such as nights and on weekends) into Geehi Reservoir. Water from Lake Jindabyne cannot be pumped back to Lake Eucumbene or to Island Bend Dam.

The Jindabyne Mini-hydro Power Station allows Snowy Hydro Limited to recover a small amount of electricity from some of the environmental releases made from Jindabyne Dam into the Snowy River.

From Geehi Reservoir, with additional water from the Geehi River and the water from Island Bend and Eucumbene, water passes through Murray 1 and Murray 2 power stations. Khancoban Dam regulates water released from Murray 2 Power Station down the Swampy Plains River, which is a tributary of the upper River Murray.

Figure 2. The Snowy–Murray Development⁶



2.1.2 The Snowy–Tumut Development

The Snowy–Tumut Development (Figure 3) consists of five power stations and 16 generating units. It collects the headwaters of the upper Murrumbidgee, Tooma and Eucumbene rivers. Those waters are diverted through trans–mountain tunnels to Tumut Pond Dam where they join the waters of the Tumut River and flow through Tumut 1 and Tumut 2 underground power stations and then into Talbingo Reservoir. Water stored in Talbingo Reservoir then passes through the Tumut 3 Power Station and into Jounama Pondage.

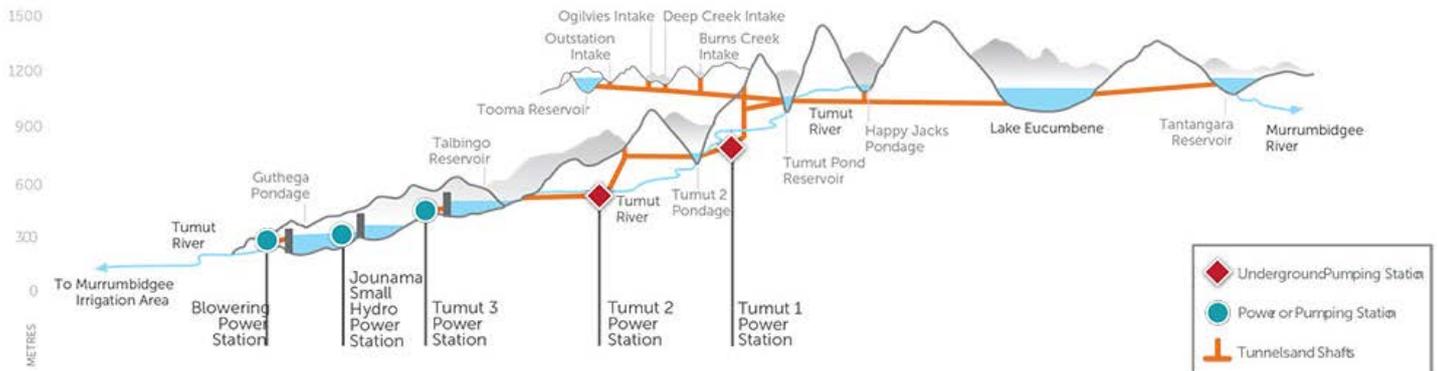
Three of the six generating units at Tumut 3 Power Station also have large pumps that can be used to pump water from Jounama Pondage back up into Talbingo Reservoir, thereby ‘recycling’ water. Water cannot be pumped any further uphill than Talbingo Reservoir.

Water is released from Jounama Dam into Blowering Reservoir either through the Jounama Small Hydro Power Station or through the radial release gates at Jounama Dam.

⁶ Source: [Snowy Hydro Limited](#) website

Blowering Power Station is located on Blowering Dam and is leased from WaterNSW. Blowering Power Station is a 'run of river' plant that operates as WaterNSW releases water from Blowering Dam into the Tumut River, which joins the Murrumbidgee River near Gundagai.

Figure 3. The Snowy–Tumut Development⁷



2.2 Downstream of the Snowy Mountains Scheme

Snowy Mountains Scheme releases, and the other River Murray and Murrumbidgee River catchment inflows, are re-regulated by Hume Dam on the River Murray and Blowering Dam on the Tumut River.

Water releases for consumptive and environmental uses along the River Murray are managed by the MDBA, principally through releases from Dartmouth and Hume Dams.

Water releases for consumptive and environmental uses along the Murrumbidgee River are managed by WaterNSW, principally through releases from Blowering and Burrinjuck Dams.

⁷ Source: [Snowy Hydro Limited website](#)

3. Policy context

3.1 Snowy water management reforms

The Snowy Mountains Scheme's current regulatory framework is the product of major energy market and water reforms implemented by the NSW, Victorian and Commonwealth governments in the 1990s. These reforms resulted in the corporatisation of the Snowy Mountains Hydro-Electric Authority and an inquiry into the environmental impacts of the Snowy Mountains Scheme. Driving these reforms was the desire to secure the commercial viability of the Snowy Mountains Scheme, while delivering environmental benefits to the Snowy River, Snowy montane rivers and River Murray⁸.

3.1.1 Snowy Water Inquiry

The Snowy Water Inquiry was commissioned in 1998 to investigate the 'environmental issues arising from the pattern of water flows in rivers and streams...caused by the operation of the Snowy Mountains Hydro-electric Scheme and report on options for dealing with the issues and the environmental, economic, agricultural and other impacts of those options'. In its final report in 1998, the inquiry identified a series of flow options to address its terms of reference. The inquiry also recommended that increased flows should not adversely affect water supplies to irrigators.

In 2000, the NSW, Victorian and Commonwealth governments agreed to implement the outcomes of the Snowy Water Inquiry in the *Heads of Agreement on the Outcomes of the Snowy Water Inquiry*.

The heads of agreement was subsequently given effect through the SWIOID entered into by the NSW, Victorian and Commonwealth governments in 2002. It is a legally binding agreement between the parties on the outcomes of the Snowy Water Inquiry.

The SWIOID captures agreements on the acquisition and management of increased flows, including the Joint Government Enterprise and funding. It also establishes and prescribes the functions of the WCLC and prescribes how the licence can be transferred and revoked.

3.1.2 The Snowy Water Initiative

The Snowy Water Initiative was established to deliver the water recovery commitments set out in the SWIOID. Initially, the NSW, Victorian and Commonwealth governments and Snowy Hydro Limited invested \$1.2 billion in water recovery infrastructure upgrades, water management and science to allow the recovered environmental water to be released as increased flows to the Snowy, Snowy montane and Murray rivers.

Targets for the increased flows programs included returning the following volumes of water each year:

- Snowy River: a) 212 gegalitres
b) if applicable, up to 294 gegalitres
- Murray River: 70 GL
- Snowy montane rivers: up to the equivalent of up to 150 gigawatt hours of forgone electricity generation, which equates to 117.8 gegalitres.

The partner governments agreed that the increased flows would be delivered in a four-stage process, with increasing volumes of water being released after each stage, and with the maximum amount being delivered within 10 years of corporatisation (28 July 2012).

Water for Rivers was the joint government enterprise established to develop water efficiency projects and other measures, including water licence purchases, to recover the water for the three increased flows programs. The Water for Rivers enterprise completed its task of securing the licensed water entitlements from the Murray, Murrumbidgee and Goulburn rivers in July 2012.

⁸ Source: Vanderzee, M. & Turner, G. (2002): *The Snowy Flows Again—Intergovernmental Cooperation on Water Reform*, 4th Water Law and Policy Conference, Sydney.

3.1.3 Snowy Scientific Committee

The Snowy Scientific Committee (SSC) was established by the NSW Government under the SHC Act as a body corporate. The SSC and its support were funded by the NSW Government and included both NSW and Victorian nominees.

The SSC was formally established in 2008⁹ and advised the NSW Government on environmental releases up until the 2012–13 water year. These recommendations were adopted, except for some minor changes for operational reasons and for some flow trials undertaken by the then NSW Office of Water. The SSC also produced two reports on the adequacy of environmental flows to the Snowy River in 2008 and in the upper Murrumbidgee River in 2010.

In 2013, the NSW Government reviewed the structure and function of the SSC to ensure the management of Snowy River environmental water remained fit for purpose and up to date. The review recommended a new Snowy Advisory Committee be established to advise on the pattern and timing of environmental releases for the Snowy River, governed by a more contemporary framework that could better respond to community and government needs. It was recommended that the new committee be expanded to provide a greater range of water expertise and necessary technical skills and include Aboriginal and community representation.

The Snowy Advisory Committee began operating in 2018 and will advise the Ministerial Corporation on the pattern of increased flows from the 2019–20 water year onwards.

3.2 Current water management regulatory framework

3.2.1 Snowy Hydro Corporatisation Act 1997

Three complementary Snowy Hydro Corporatisation Acts made by each of the NSW, Victorian and Commonwealth Governments in 1997 provide the legal foundation for the Snowy water management reforms discussed above in section 3.1.

NSW's SHC Act:

- provided for an inquiry examining the environmental impacts of the Snowy Mountains Scheme
- established Snowy Hydro Limited as a corporatised entity to operate and maintain the Snowy Mountains Scheme through a water licence
- established a scientific committee to advise on the pattern of environmental releases.

3.2.2 The Snowy water licence

Through corporatisation, the Snowy Mountains Scheme's water operations were brought under NSW's regulatory regime and the Snowy water licence became the principle instrument through which Snowy Hydro Limited's water operations are governed.

The licence is a NSW water licence issued and administered by the Ministerial Corporation. It reflects two key principles of corporatisation, being that the water regulated by the Snowy Mountains Scheme is not an asset of Snowy Hydro Limited and that it contains, for the most part, the prior water rights and obligations of the Snowy Mountain Hydro Electric Authority.

These rights and obligations aim to strike a balance between competing demands on water for hydro-electricity generation, the environment and consumptive use in the Murray–Darling Basin. Put simply, the licence specifies the minimum volume of water that must be released from the Snowy Mountains Scheme each year as 'required annual releases' and 'increased flows'. Nominally, these release obligations equate to 2,088 giganlitres per year shared between the Murray, Murrumbidgee and Snowy rivers.

The licence also contains numerous obligations on Snowy Hydro Limited giving effect to agreements made in response to the Snowy Water Inquiry and captured in the SWIOID, including:

⁹ Establishing the SSC was delayed due to a combination of factors including resourcing and operational arrangements and because little water was actually available for the environmental releases prior to 2008.

- volumes of increased flows over time
- the water accounting treatment and delivery obligations associated with increased flows
- environmental objectives for the management of increased flows
- the construction of works to support the delivery of increased flows
- increased flows monitoring requirements
- how compliance is assessed and force majeure provisions
- WCLC consultation in the preparation of the AWOP.

3.2.3 Annual Water Operating Plan

The licence obliges Snowy Hydro Limited to prepare and comply with an AWOP approved by the Ministerial Corporation on an annual basis.

The purpose of an AWOP is to provide the Ministerial Corporation and the WCLC with details as to how Snowy Hydro Limited proposes to operate the Snowy Mountains Scheme in the forthcoming water year, within the parameters set by the licence around increased flow requirements and water release requirements.

Under the licence, Snowy Hydro Limited must:

- prepare a first draft AWOP and provide it to WCLC for review
- consider WCLC's comments and provide a revised plan to the NSW Department of Industry (as the Ministerial Corporation).

3.2.4 Water Consultation and Liaison Committee

The WCLC is established under the SWIOID and is responsible for advising the Ministerial Corporation on administering the licence during the preparation and implementation of each AWOP.

Currently the WCLC comprises representatives from the NSW Department of Industry, the Victorian Department of Environment, Land, Water and Planning and the MDBA. The Commonwealth Government is not currently represented but is a member under the SWIOID.

3.2.5 Snowy Advisory Committee

The Snowy Advisory Committee is established by the NSW Government under the SHC Act and will provide the Ministerial Corporation advice on key issues and help progress the next stage of the long-term watering strategy of the Snowy River. Specifically, it will be responsible for providing community and expert input to the design of the timing and pattern of the release of environmental flows to the Snowy River and Snowy montane rivers. The Snowy Advisory Committee is made up of at least six members representing Aboriginal, local community and environmental interests, alongside NSW and Victorian government specialists.

3.3 Related policy frameworks

3.3.1 Murray–Darling Basin Agreement and Basin Plan

The water released west of the Snowy Mountains Scheme to the Murray and Murrumbidgee rivers increases water availability in the Murray–Darling Basin.

Releases secure the reliability of allocations against water licences issued by NSW, Victoria and South Australia in the Murray and Murrumbidgee systems for both consumptive and environmental purposes. In doing so they reduce the volume of water that would otherwise have been diverted from Murray–Darling Basin water sources to support this level of development.

For the River Murray, the rights of NSW and Victoria to releases from the Snowy–Murray Development are secured in the Murray–Darling Basin Agreement. Water made available under these rights support the obligation of these states to deliver South Australia's entitlement.

The Basin Plan became law in 2012 and has set limits on how much water can be diverted from the Murray–Darling Basin for consumptive use. The limits, known as sustainable diversion limits (SDLs) come into effect in 2019 and have set a recovery requirement across the basin of 2,750 gigalitres from a 2009 baseline.

Modelling of the Basin Plan water recovery target assumes the Snowy Mountains Scheme continues providing inflows to the Murray and Murrumbidgee systems.

The Basin Plan also includes provision to adjust the SDLs if a basin state can demonstrate environmental outcomes can be reached with less water. NSW and Victoria have jointly proposed to seek an SDL adjustment from changes made to the licence in 2011 that provide environmental managers more opportunities to access River Murray Increased Flows (RMIF) to target improved environmental outcomes.

3.3.2 NSW Water Reform Action Plan

In December 2017, the NSW Government released the Water Reform Action Plan in response to the *Independent investigation into NSW water management and compliance*, conducted by Ken Matthews, AO (the Matthews Report) and the Murray–Darling Basin Water Compliance Review.

The plan will deliver on the state’s responsibility to ensure an equitable and transparent approach to the management of water for current and future generations. The NSW Government’s water goals are to:

- introduce best practice for water management
- build a compliance and enforcement regime that ensures strong and certain regulation
- ensure transparency in how NSW shares, allocates and manages water
- build capability to support implementation of water reforms.

3.3.3 National Electricity Market¹⁰

Snowy Hydro Limited is the leading provider of peak, renewable electricity and innovative risk management financial hedge products to the NEM.

Through its hydro, gas and diesel generation assets, Snowy Hydro Limited generates the power that meets the everyday peak power demands of electricity retailers and end-use customers in the NEM.

Snowy Hydro Limited is a leading supplier of electricity price risk hedging contracts such as price caps and similar contracts to other NEM participants (retailers and other generators) who are seeking protection to limit the price risk they face in the NEM spot market. Snowy Hydro Limited’s ability to draw on large-scale generation at short notice means that it is able to offer such contracts, and generally hedge the risk it takes on under those contracts by generating electricity as required.

The NEM has been operating since 1998 and today supplies electricity to more than nine million Australian customers on an interconnected national grid that runs through Queensland, NSW, the Australian Capital Territory, South Australia, Victoria and Tasmania. Approximately \$7.7 billion of energy was traded through the NEM in 2014–15.

The Australian Energy Market Operator operates a wholesale spot market for trading electricity between generators and electricity retailers in the NEM. This means that all the electricity output from generators is pooled and then scheduled to meet electricity demand.

3.3.4 Snowy 2.0

Snowy 2.0 is a pumped hydro project that will increase the Snowy Mountains Scheme’s generation capacity by up to 2,000 megawatts and will provide about 350,000 megawatt hours of energy storage at full capacity.

Snowy Hydro Limited released its feasibility study into the Snowy Mountains Scheme’s expansion in December 2017, which concluded the Snowy 2.0 pumped hydro expansion project is both technically and financially feasible. The feasibility study concluded the expansion will not impact downstream water users or environmental flows because there will be no change to Snowy Hydro Limited’s licence.

This will be validated in a comprehensive and transparent planning and environmental approvals process, which involves preparing environmental impact statements for both the exploratory and construction phases of the project. The environmental impact statements will address the environmental, social and economic impacts of the project phases and be submitted to the NSW Department of Planning and Environment as part

¹⁰ Snowy Hydro Limited contributed information to this section.

of the approval process. Community members will have the opportunity to review each environmental impact statement and make submissions during the declared periods.

Final approval of the works rests with the Minister for Planning, who will consider the recommendations of Department of Planning and Environment. Snowy Hydro Limited cannot begin any construction works until it receives ministerial approval.

3.3.5 Commonwealth Government purchase of Snowy Hydro Limited

On 2 March 2018, the Commonwealth Government announced it had reached agreement with the NSW and Victorian governments to take full ownership of Snowy Hydro Limited.

Under the agreement, the Commonwealth Government has increased its shareholding from 13% to 100% by purchasing NSW's (59%) and Victoria's (29%) shareholdings.

Importantly, it was agreed there will be no change to current arrangements on water issues, including licence administration. As such, the sale has no bearing on the outcomes of the review.

4. Snowy water management responsibilities

In addition to Snowy Hydro Limited, numerous government organisations play key roles in the management of water regulated by the Snowy Mountains Scheme. Their roles are described in Table 2.

Table 2. Role of agencies and committees in the management of water regulated by the Snowy Mountains Scheme.

Agency/committee	Responsibilities
Water Administration Ministerial Corporation	<p>The Ministerial Corporation is a statutory body established under the <i>Water Management Act 2000</i> responsible for representing the Crown and carrying out various water management functions.</p> <p>Its role in Snowy water management is prescribed in the SHC Act and the licence itself. Its key functions include:</p> <ul style="list-style-type: none"> • administering the licence • approving the AWOP • notifying Snowy Hydro Limited of the volume of annual water recovery and increased flows release volumes • preparing a safety management plan in connection with the release of Snowy River flushing flows • calling out releases related to the previous year's Relaxation Volume, drought accounts and RMIF • consulting on various water accounting matters • developing analytical models and providing downstream storage and diversion volume data • verifying data provided by Snowy Hydro Limited. <p>It is also a member of the WCLC.</p> <p>In a practical sense, most of these functions are carried out by NSW Department of Industry, which has been delegated responsibility for the day-to-day operation and administration of the licence.</p>
NSW Department of Industry	In addition to acting as the Ministerial Corporation's delegate, NSW Department of Industry is also responsible for accounting for Snowy–Tumut Development inflows and releases and, currently, developing strategies for increased flows.
Victorian Department of Environment, Land, Water and Planning	Victorian Department of Environment, Land, Water and Planning is responsible for managing Victoria's catchments and waterways. It represents the Victoria on the WCLC and provides input to the increased flows strategies.
Murray–Darling Basin Authority	The MDBA is responsible for operating the River Murray system and the accounting for Snowy–Murray Development inflows and releases in accordance with the Murray–Darling Basin Agreement. It is also represented on the WCLC.
WaterNSW	WaterNSW operates the Murrumbidgee water system and leases Blowering Reservoir to Snowy Hydro Limited.
Office of Environment and Heritage	OEH delivers water for the environment on behalf of the NSW Government and will take over responsibility for developing the increased flows strategies from NSW Department of Industry in 2018.
Victorian Environmental Water Holder	The Victorian Environmental Water Holder is responsible for holding and managing Victoria's environmental water entitlements and advises on the development of the increased flows strategies.

5. Past reviews and variations of the licence

5.1 Mandatory five-year review

The Ministerial Corporation first reviewed the licence between 2007 and 2009, meeting the legal obligation to carry out a mandatory five-year review into the increased flows provisions described in Schedule 3.

The five-year review addressed issues raised in public submissions. Key outcomes included:

- developing a communication program to ensure that all stakeholders have easy access to all relevant information relating to the licence, including the various regulatory bodies involved in the management of the licence and the environmental flow regime
- amending the licence to require that Snowy Hydro Limited produce an annual report to show how it has complied with matters relating to environmental flows and western river releases relative to targeted volumes
- a recommendation to the SSC to investigate options for better achieving environmental objectives under the low flow conditions that may include the options for decommissioning of Mowamba Aqueduct.

The licence was subsequently varied in May 2010, and included variations recommended in the five-year review and variations agreed to by the NSW, Victorian and Commonwealth governments, the Murray–Darling Basin Commission and Snowy Hydro Limited during the course of administering and operating under the licence.

5.2 Post-Millennium drought review

In 2011, following a period of variable weather patterns including both extreme drought and above-average rainfall, the Ministerial Corporation, along with the Victorian and Commonwealth Governments, identified a need to amend certain conditions of the licence related to management of water that accumulates in Snowy Hydro Limited's storages following an extreme drought period. The licence was varied on October 2011 following a public consultation process. Amendments included:

1. removing the requirement to release, as soon as the inflows to the Snowy Mountains Scheme allow, any accumulated dry inflow sequence volume (DISV).
2. establishing a 'drought account' for each valley: 150 gegalitres for the Murrumbidgee Valley and 225 gegalitres for the Murray Valley. The water in these accounts can be used if inflows again reach critically low levels. The accounts are credited with water when a recovery occurs following a period when a DISV is triggered (and at other times at the discretion of the Ministerial Corporation)
3. granting an option each year to call out RMIF when above-target water reserves stored in the Snowy Mountains Scheme exceed 800 gegalitres
4. granting an option each year for Snowy Hydro Limited to release water in excess of the required annual release (also known as 'flexibility release or 'flex') and have the additional release treated as an early delivery of the next year's required annual release
5. including a 'wet sequence protection' provision that requires Snowy Hydro Limited to release more water if any flexibility release it made the previous year spilled from downstream storages and was not used to supply consumptive or environmental flow demands.

6. Analysis of issues with the licence

6.1 Summary of stakeholder issues

The NSW Department of Industry recorded close to 240 issues/statements from the submissions made to the review, covering more than 50 topics related to the management and operation of the Snowy Mountains Scheme. Roughly 80% of the topics fell within the review's terms of reference. The remaining issues were generally concerned with environmental management and water allocation policies in the western water supply systems.

Snowy Hydro Limited considers the licence is fit for purpose, but is seeking some changes to the water release requirements.

Some of the key themes raised by stakeholders and community members included:

- the opaque nature of Snowy Mountains Scheme operations and licence complexity
- efficient use of Snowy Mountains water resources, both within the Snowy Mountains Scheme and downstream water supply systems
- concerns the variations made in 2011 have been ineffective and that the licence now favours electricity production over water and environmental matters
- concerns around NSW's approach to implementing the outcomes of the Snowy Water Inquiry
- a lack of opportunities for community/stakeholder and scientific input to decision-making.

Numerous submissions commented on project management matters, including the need to ensure the recommendations do not impact third parties, undertake detailed analyses of proposals and continue to engage with stakeholders.

These issues are discussed further in this report under the three broad categories identified in the terms of reference. The department has also published a summary of submissions report that documents and responds to every identified issue.

6.2 Administrative obligations

The licence places numerous obligations on Snowy Hydro Limited and the Ministerial Corporation in carrying out and administering Snowy Hydro Limited's operations around:

- licence objectives/priorities (Clause 3 and Clause 5.1, Schedule 3)
- compliance reporting (Clause 4)
- Snowy Hydro Limited's water rights (Clause 7)
- the development of AWOPs (Clause 8)
- Snowy Hydro Limited fees and charges (clause 9)
- the requirement to build and/or modify certain works (clause 6 and clauses 6, 19 and 20 of Schedule 3)
- Ministerial Corporation's review of the licence (Clause 10).

The review's actions respond to issues raised around transparency, information sharing, consultation and redundant provisions. In summary, the actions seek to simplify provisions of the licence, increase transparency, compliance and accountability, and provide downstream water authorities and water users more information with which to plan their water use to maximise production.

6.2.1 Purpose of the licence

The purpose of the licence is prescribed in Clause 3. It confers rights to water on Snowy Hydro Limited and imposes obligations with respect to exercising those rights, including increased flows and water release requirements. It is quite literal in its focus, simply reflecting the nature of the licence as stipulated in the SHC Act.

Some stakeholders have raised concerns with the narrowness of the purpose, suggesting it impacts on the ability to achieve balanced outcomes when operations are not covered by the licence obligations.

Environmental interests have sought equal prominence for environmental objectives to ensure rivers receive the water they need at the times and volumes required to improve river health. It was also suggested the licence would benefit from articulating principles used to establish relative priorities for supply and energy production to help guide operations, particularly where interpretation of the licence is required.

Unlike water sharing plans and comparable water planning documents, management objectives are not established under the licence. It is not proposed to change this because the licence is more akin to a water entitlement than a planning document. The obligations on Snowy Hydro Limited give effect to strategies and outcomes agreed by governments through policy planning reforms such as the Snowy Water Inquiry and Snowy Mountains Scheme corporatisation. For example, the licence replicates the environmental objectives agreed and prescribed in the SWIOD for SRIF. It is not used to set the objectives.

Given the above, no changes are recommended to the licence's purpose. Policy and management objectives will continue to be considered within the broader framework governing management of the Snowy Mountains Scheme, with changes implemented through variations to obligations in the licence and other relevant instruments when governments agree.

6.2.2 Compliance and transparency

Two new clauses were inserted into the licence in 2010 in response to concerns raised in the five year review about inadequate reporting on licence compliance and a need for improved reporting.

Clause 4.3 requires Snowy Hydro Limited to report publicly on its compliance with the licence, with the contents of the report prescribed in clause 4.4.

The AWOP is also a critical reporting document, the purpose of which is to provide the WCLC details as to how Snowy Hydro Limited proposes to operate the Snowy Mountains Scheme in the forthcoming year. Clause 8 obliges Snowy Hydro Limited to prepare and comply with AWOPs and prescribes what they must contain and the consultation and approval processes Snowy Hydro Limited must follow in developing them.

Snowy Hydro Limited has prepared AWOPs each year as required by clause 8. Each AWOP has included all items set out in clause 8.3, and the timing of first and second drafts has been consistent with the requirements of the licence, or as otherwise varied by agreement with the WCLC.

Despite improvements in compliance reporting, numerous issues were raised with the transparency of Snowy Mountains Scheme water operations, accounting and release volumes. Transparency issues were raised in some form in 11 of the 24 submissions to the review, indicating it is a priority for stakeholders.

Issues raised around a lack of transparency can be summarised as:

- limited visibility on the volume of water held and/or allocated (credits and debits) to environmental accounts in the Snowy Mountains Scheme
- no access to information on water accounting agreements that affect environmental accounts (e.g. treatment of spills)
- access to daily flow data within the Snowy Mountains Scheme is restricted (e.g. Pats Patch gauge on Mowamba River)
- the main water operations document, the AWOP, is only available to a select few government agencies
- WCLC decisions are only captured in the AWOP.

It is asserted that not publishing this information prevents public scrutiny of Snowy Hydro Limited operations and government oversight and impedes the ability of downstream water users to plan their own water use.

It was also identified that compliance reports have not been prepared since the 2015–16 water year, meaning public reporting of compliance for 2016–17 remains outstanding. This has since been rectified.

The issues raised are generally not concerned with Snowy Hydro Limited's performance in meeting its compliance and AWOP obligations. Rather, the concerns relate to a lack of public information made available by Snowy Hydro Limited and the NSW Government. Stakeholders are interested in having access to more

forecast operational information, particularly on matters that directly affect the volume of water they are interested in seeing released from the Snowy Mountains Scheme.

The main reason transparency is an issue is generally considered to be due to the commercial nature of the information stakeholders are seeking to access and that the AWOP is all encompassing, but only available to a select few. The tension is between Snowy Hydro Limited’s commercial requirements and what many stakeholders consider to be the public’s right to information.

Other constraints include the regulatory burden and costs of presenting and maintaining information and a lack of evidence signalling it is highly valued by large numbers of the community.

A significant amount of information and data on Snowy Mountains Scheme water operations is already published on the internet by Snowy Hydro Limited and the NSW Department of Industry although most of this information is annual data from the preceding year produced as part of Snowy Hydro Limited’s compliance reporting. Table 3 provides a summary.

Table 3. Information published on Snowy Mountains Scheme water operations

Organisation	Preceding year	Current/real-time	Forecast/future
Snowy Hydro Limited	Annual release volumes Net DISV volume for year Annual flex releases Annual above-target water releases Total western river release Catchment inflows Annual, monthly and daily SRIF releases Annual Jindabyne and Mowamba base passing flow releases Annual, monthly and SMRIF releases End of year active storage volume Temperature of Jindabyne dam releases Temperature of Tintangara dam releases	Daily releases from Jindabyne Daily releases from Khancoban Daily releases from Tintangara Jindabyne storage level Eucumbene storage level Tintangara storage level Snow depths	SRIF daily release targets SMRIF daily release targets from Tintangara SMRIF annual release targets
NSW Department of Industry	Snowy water savings summary	Real-time flow data in Snowy, Upper Murray and Murrumbidgee basins (NSW government-owned gauges)	Annual strategy for SRIF & SMRIF (inclusive) Safety management plan for SRIF

Current/real-time data is limited to releases and storage levels for key dams and gauged data from outside the Snowy Mountains Scheme. Information about future operations is limited to the information contained in the SRIF and SMRIF programs annual strategies.

There is very little information in the public domain about forecast releases and the accounting of water destined for the western rivers, including RMIF. Water allocations against the SRIF and SMRIF programs are available in the delivery strategies, however simple water account balances, summarising the flow of water in and out of the major environmental accounts, do not exist. WCLC agreements on licence interpretations are also invisible to the public as they are captured only in the AWOP.

There is an opportunity to respond to this and improve public reporting of Snowy Mountains Scheme operations, while protecting Snowy Hydro Limited's commercial interests. Doing so will increase transparency and accountability, provide downstream water authorities earlier information to feed into water allocation determinations, and provide waters users more information to help plan water use to maximise production.

The scope of the increased reporting requirements will be recommended by NSW Department of Industry after consulting with Snowy Hydro Limited and the WCLC, before being released for public consultation in early 2019.

Table 4. Reporting actions

Action 1—Increased public reporting	Lead	By when
<p>A. The licence will be varied so that:</p> <ul style="list-style-type: none"> ○ Snowy Hydro Limited is obliged to prepare a public version of the AWOP summarising the forthcoming year's operations, but not disclosing information that may disadvantage it on a commercial basis ○ future WCLC agreements will be published in both the commercial and public versions of the AWOP. 	NSW Department of Industry	2019
<p>B. NSW Department of Industry will lead a WCLC review of the commercial AWOP to ensure it remains fit for purpose and does not impose unnecessary administrative burden on Snowy Hydro Limited.</p>	NSW Department of Industry	2019

An issue was also raised about penalties associated with non-compliance, namely that there were no realistic penalties in place to incentivise Snowy Hydro Limited to comply with the conditions of the licence.

Offence and court order provisions relating to the licence are contained in sections 34 and 35 of the SHC Act. In summary:

- Snowy Hydro Limited must comply with the terms, conditions and other provisions of the licence.
- If it fails to comply, Snowy Hydro Limited could face a maximum penalty of 1,000 penalty units (\$110,000) and a further 500 penalty units each day the offence continues.
- The maximum penalty may be increased to 10,000 penalty units (\$1,100,000) if Snowy Hydro Limited is found to have intentionally breached the licence, or was reckless.
- Penalties, including imprisonment, may also apply to Snowy Hydro Limited directors if they are found to have breached the licence.
- If convicted, the Land and Environment Court may order Snowy Hydro Limited to manage any impacts to the environment caused by the breach or to pay a public authority or person costs and expenses incurred as a consequence.

This review is not considering the SHC Act, so has not considered amendments to the offence and court order provisions prescribed for the licence. Snowy Hydro Limited's performance in meeting the conditions of the licence is considered further in section 7.

6.2.3 Snowy Hydro Limited's water rights

Clause 7 prescribes the water rights conferred on Snowy Hydro Limited under the licence.

In summary the licence:

- grants Snowy Hydro Limited a right to collect, divert, store and release all surface waters within the Snowy Mountains Scheme subject to the water rights of riparian landholders and private diverters located within the Snowy Mountains Scheme
- grants Snowy Hydro Limited a right to use that water to generate electricity
- obliges Snowy Hydro Limited to release all water, save for normal operating losses and consumption of works
- grants Snowy Hydro Limited a right to release this water as it sees fit, provided it complies with water release requirements, increased flows requirements and requirements of the AWOP
- prevents Snowy Hydro Limited from acting as a supplier of water, unless agreed by Ministerial Corporation
- obliges Snowy Hydro Limited to prioritise electricity generation to minimise internal spills of water held between developments in Lake Eucumbene, but not by releasing above-target water.

These rights are fundamental to the operation and viability of the Snowy Mountains Scheme and reflect what is conferred on Snowy Hydro Limited under the SHC Act, which in turn reflects agreements made through corporatisation and the outcomes of Snowy Water Inquiry. It is not proposed to vary these rights.

The water rights of riparian landholders and private diverters located within the Snowy Mountains Scheme are presented in Tables 1 to 7 of Schedule 5 and reflect the volumes as at 2002. While Snowy Hydro Limited has no management control over these rights (the water diverted under them is considered 'lost' from an operational sense), and clause 10.8 of the licence makes allowance for variations, it has identified the review provides an opportunity to update the tables to reflect current licensed volumes.

While it is possible to update Schedule 5 with updated licence data, the review also provides an opportunity to rationalise the licence and reduce duplication by varying it to take into account the existence and public availability of water sharing plans and licence data in NSW's Water Register.

Combined, the water sharing plans applying across the Snowy Mountains Scheme and the NSW Water Register contain up-to-date information on the rights presented in Schedule 5 and can be provided to Snowy Hydro Limited on request.

The water sharing plans establish the bulk access regime, basic landholder rights and water source share components for water access licence types—for example domestic and stock, local water utility and river access licences. The water sharing plans applying across the Snowy Mountains Scheme include:

- Snowy Genoa Unregulated and Alluvial Water Sources
- Murrumbidgee Unregulated and Alluvial Water Sources
- Murray Unregulated and Alluvial Water Sources.

The NSW Water Register¹¹ provides public access to information about water licences, approvals, water trading, water dealings, environmental water and other matters related to water entitlements in NSW.

The water sources located within the Snowy Mountains Scheme are presented in Table 6.

Table 5. Actions relating to riparian landholders and private diverters

Action 2—Water rights of riparian landholders and private diverters	Lead	By when
The licence will be varied to remove Schedule 5 and reference the publicly available information of rights to water that exist across the Snowy Mountains Scheme.	NSW Department of Industry	2019

¹¹ Source: [NSW Water Register](#) website

Table 6. Water sources located within the Snowy Mountains Scheme

Water Sharing Plan		
Snowy Genoa Unregulated & Alluvial Water Sources	Murrumbidgee Unregulated and Alluvial Water Sources	Murray Unregulated and Alluvial Water Sources
Lake Eucumbene	Tantangara	Tooma
Eucumbene River	Goodradigbee River	Swampy Plain
Gungarlin River	Upper Tumut	
Burungubugge River		
Upper Snowy River (Island Bend Reach)		
Upper Snowy River (Munyang Reach)		
Perisher Creek		
Upper Snowy River		
Cobbin Creek		
Thredbo River		
Mowamba River		
Wollondibby Creek		
Lake Jindabyne		

6.2.4 Annual water operating plans

Issues around transparency and public availability of AWOPs are discussed in section 6.2.2. Additional issues raised by stakeholders focussed on consultation around AWOP implementation and the inability for Ministerial Corporation or WCLC to force changes to draft AWOP's prepared by Snowy Hydro Limited. The WCLC has also agreed to variations to the contents of the AWOP.

6.2.4.1 Collaboration

Improved collaboration between Snowy Hydro Limited and downstream water authorities such as the MDBA and WaterNSW, has the potential to improve coordinated management of the different water supply systems.

To quote the MDBA, 'Advance notice of Snowy Hydro Limited release intentions is of significant benefit in managing the River Murray system. Knowledge of future Snowy Hydro Limited releases would allow improved planning of transfers from Dartmouth to Hume dams and in doing so potentially reduce subsequent spills. Minimum releases updates through the year could bring forward water allocation improvements for water users. An indication of likely delivery of RMIF would inform environmental planning'.

Collaboration has increased in recent years, benefiting river operations and environmental planning. Formalising these, or comparable, arrangements between relevant authorities would ensure these benefits are captured on an enduring basis.

Table 7. Actions relating to collaboration

Action 3—Collaboration on water operations	Lead	By when
Snowy Hydro Limited will agree to collaboration arrangements with the MDBA and WaterNSW to discuss implementation of AWOPs during a water season.	Snowy Hydro Limited	2019

6.2.4.2 Approvals

A large part of Clause 8 is concerned with the AWOP consultation and approvals process. It provides for numerous drafts and opportunities for Ministerial Corporation and WCLC to provide feedback and request changes. It also points to a formal dispute resolution process in the event the parties cannot agree on AWOP provisions related to meeting increased flow or water release requirements.

The AWOP process established in the licence is collaborative and provides for a fair process to resolve differences of opinion between Ministerial Corporation and Snowy Hydro Limited. This is important given the value of the water diverted by the Snowy Mountains Scheme to governments and Snowy Hydro Limited.

To date, Snowy Hydro Limited has not referred any disputes to an independent expert for determination, suggesting the consultation and approvals framework established in the licence is effective. Consequently, it is not proposed to vary it.

6.2.4.3 Content

Clause 8.3 of the licence prescribes what Snowy Hydro Limited must include in an AWOP. As stated previously, the WCLC has agreed two changes to clause 8.3 to ensure its contents contain relevant information.

In 2005, the WCLC acknowledged maximum releases are only relevant in a wet sequence and that data at that time will be better than at the end of summer/early autumn, when the AWOP is being prepared. WCLC subsequently agreed that ‘Quarterly Likely Maximum Releases’ need not be included in the AWOP on the proviso that if the WCLC members projected a wet sequence and requested that the Quarterly Likely Maximum Releases be calculated, Snowy Hydro Limited must provide those volumes as soon as practicable after any such request.

To capture these agreements, the licence will be varied:

- so that Snowy Hydro Limited may have regard to antecedent conditions when providing details on a quarterly basis of the likely range of forecast water releases
- to include a new provision that obliges Snowy Hydro Limited to provide WCLC, upon request from a member, updated projections of quarterly forecast releases if experiencing a wet sequence.

Following the 2002–03 water year the WCLC agreed that, rather than providing likely quarterly lower bounds, Snowy Hydro Limited would provide guaranteed quarterly lower bounds to which Snowy Hydro Limited committed, subject only to force majeure (‘Quarterly Guaranteed Minimum Releases’). As guaranteed volumes, they are more useful in helping downstream water agencies plan for the releases.

To codify this in the licence, it is also proposed to vary clause 8.3(2) so that Snowy Hydro Limited must have regard to guaranteed minimum releases.

Table 8. Actions relating to the contents of annual water operating plan

Action4—Contents of the AWOP	Lead	By when
<p>Clause 8.3(2) of the licence will be varied so that Snowy Hydro Limited may have regard to:</p> <ul style="list-style-type: none"> • antecedent conditions, when providing details on a quarterly basis of the likely range of forecast water releases • guaranteed releases. <p>A new provision will also be added to the licence that obliges Snowy Hydro Limited to provide WCLC, upon request from a member, updated projections of quarterly forecast releases in a timely manner if experiencing a wet sequence.</p>	NSW Department of Industry	2019

6.2.5 Fees and charges

Clause 9 of the licence obliges Snowy Hydro Limited to pay fees and charges to the Ministerial Corporation to cover its costs of administering and monitoring compliance with the licence. It also explicitly excludes any obligation for Snowy Hydro Limited to pay catchment or resource management related fees or any costs obliged on the Ministerial Corporation.

Several stakeholder submissions suggested Snowy Hydro Limited, or the Commonwealth Government as its sole shareholder, should be responsible for funding ongoing monitoring and environmental programs from its electricity generation revenue. This is consistent with the ‘impactor pays’ approach to allocating water planning costs. It was also suggested these costs be recovered from Murray and Murrumbidgee water licence holders based on the same principle.

Varying the licence to impose catchment or resource management related fees on Snowy Hydro Limited may be considered a compensable action under section 30 of the SHC Act payable by governments to Snowy Hydro Limited.

Given this, and the fact that historically funding for these programs has been provided from governments to benefit Snowy communities, it is not proposed to vary the licence to impose catchment or resource management related charges on Snowy Hydro Limited.

Further discussion around improving the coordination and governance around Snowy environmental management, including program funding, is provided in section 8 of the report.

6.2.6 Reviews of Snowy Hydro Limited’s obligations

Clause 10 places an obligation on the Ministerial Corporation to review Snowy Hydro Limited’s obligations under the licence at set time periods, initially five years after corporatisation (increased flows obligations only) and every 10 years thereafter. It also provides for Ministerial Corporation to vary the licence, subject to numerous conditions, depending on what section of the licence is proposed to be amended.

Concerns were raised about the length of time between reviews and its charter, claiming that having only one opportunity to input to the licence every 10 years is inadequate and that they are too narrow in focus. It was also proposed the licence would benefit from including a formal process to consider issues raised by WCLC. This was supported by the independent expert panel, which proposed reviewing the licence more frequently to capture and clarify agreed interpretations of provisions, remove redundant provisions (and errors, if any), harness any opportunities to simplify the licence and provide stakeholders with an opportunity to comment.

It is not proposed to vary the licence in response to these issues. However, the NSW Department of Industry will update its regulatory procedures to commit to working with Snowy Hydro Limited and the WCLC to monitor when licence amendments outside the formal reviews may be required to capture and clarify current practice, and simplify and streamline provisions (refer to Action 21).

This will complement the mandatory reviews, which are resource intensive and costly and can take a number of years to complete. A review period of 10 years ensures there is adequate time to operate under the provisions before having to review them and balances the benefits of a formal review with the costs of carrying one out.

A separate process is required to review issues that extend beyond the obligations in the licence, for example, relating to agreements set out in the SWIOD.

6.3 Increased flows

Snowy Hydro Limited’s obligations to release SRIF and SMRIF are contained in Schedule 3 of the licence. Obligations on RMIF are contained in both Schedule 3 and Schedule 4.

The obligations prescribed in the licence reflect what was agreed and captured in the SWIOD about the volume, allocation, accounting and delivery of environmental water recovered under the SWI, as well as agreements made on the call out of RMIF when the licence was varied in 2011.

Specifically, the licence places obligations on Snowy Hydro Limited around:

- the allocation and accounting under the SRIF and SMRIF programs (Clauses 1 to 4, 10, 16, 22 and 23 of Schedule 3)
- environmental objectives (Clauses 5 and 18 of Schedule 3)
- constructing works to facilitate delivery of SRIF and SMRIF (Clauses 6, 19 and 20 of Schedule 3)
- delivering SRIF and SMRIF (Clauses 8, 9, 11 to 17 and 24 to 27 of Schedule 3).
- calling out RMIF (Clause 10.4 of Schedule 4).

The review's actions respond to issues raised around redundant provisions, the delivery of SRIF and access to RMIF. In summary, the actions seek to simplify licence provisions and further investigate ways to increase operational flexibility for delivering increased flows. Issues around meeting SMRIF target volumes are considered as part of Snowy Hydro Limited's performance later in the report.

6.3.1 Environmental objectives of increased flows

The environmental objectives for the use of SRIF and SMRIF are contained in clauses 5 and 18 of Schedule 3 respectively and reflect the objectives agreed by governments in the SWIOID.

The five key objectives for the Snowy River include:

1. improving the temperature regime of river water
2. achieving channel maintenance and flushing flows within rivers
3. restoring connectivity within rivers for migratory species and for dispersion
4. improving triggers for fish spawning
5. improving the aesthetics of currently degraded riverine environments.

The objectives for the Snowy montane rivers include:

- protecting endangered/threatened species
- maintaining natural habitats
- maintaining wilderness and national parks values.

The SWIOID and licence also require the NSW, Victorian and Commonwealth governments to determine a set of objectives for each river that receives SMRIF deliveries. In developing a more comprehensive set of ecological objectives, the strategies for increased flows developed by the governments have focused on repairing flow related processes that support:

- habitats (that is, hydraulic diversity, substrate condition, channel morphology and thermal regime)
- resource availability (e.g. dissolved organic carbon) and productivity
- reproduction and recruitment
- biotic dispersal.

Some stakeholders have raised concerns that the objectives contained in the SWIOID, and therefore the licence, are outdated.

Although the focus of the increased flows strategies has evolved since the SWIOID was initiated, the environmental objectives prescribed in the licence are not constraining governments and Snowy Hydro Limited from achieving the desired outcomes. While consideration to update the SWIOID environmental objectives may be warranted based on recent experience in managing the increased flows programs, it is more appropriate to do so via an interjurisdictional review of the SWIOID than this review of the licence.

Further discussion around coordination and governance of Snowy environmental management, including implementation of the SWIOID, is provided in section 7.7.3.

6.3.2 Outlet works at Jindabyne and Tantangara dams

The licence includes provisions to construct outlets at Jindabyne and Tantangara dams capable of delivering the flow targets committed in the SWIOID. Specifically, Snowy Hydro Limited was obliged to construct an outlet at:

- Jindabyne Dam capable of releasing 5 gigalitres per day in addition to the capacity of the spillway gates (Clause 6, Schedule 3)

- Tantangara Dam capable of releasing 1.5 gigalitres per day (clause 20, Schedule 3).

Snowy Hydro Limited has met these obligations, so the relevant start-up provisions are redundant.

Table 9. Actions relating to construction of outlets

Action 5—Construction of outlets at Jindabyne and Tantangara dams	Lead	By when
The licence will be varied to remove all provisions related to the outlet construction works at Jindabyne and Tantangara dams.	NSW Department of Industry	2019

6.3.3 Mowamba Borrowings Account

In the years following corporatisation, the release of SRIF was restricted by physical limitations of Jindabyne Dam and the volume of environmental water recovered from the Murray–Darling Basin. In response, the NSW, Victorian and Commonwealth governments agreed to release up to a maximum of 38 gigalitres per year of SRIF down the Snowy River via the Mowamba River and Cobbon Creek, with the water borrowed from water held in the Snowy Mountains Scheme. This was to occur until new outlet was constructed at Jindabyne Dam.

The obligation to maintain a water account for Mowamba Borrowings is one of a number of start-up provisions established in the licence to give effect to this agreement. In total, 64.9 gigalitres of SRIF was borrowed and debited from the Mowamba Borrowings Account between 2002–03 and 2005–06.

The licence also gives effect to a repayment agreement specified in the SWIOD, which is to share all Snowy environmental allocation above 38 gigalitres per year evenly between SRIF and the Mowamba Borrow until the debt was repaid.

Repayments were slowly credited to the Mowamba Borrowings Account between 2002 and 2010, when an intergovernmental agreement was reached between the NSW, Victorian and Commonwealth governments to payout the outstanding debt.

Given the volume held in the Mowamba Borrowings Account has been reduced to zero and the SWIOD water recovery targets have been met, the Mowamba Borrowings Account provisions in the licence are now redundant and can be removed.

Table 10. Actions relating to Mowamba Borrowings

Action 6—Mowamba Borrowings	Lead	By when
The licence will be varied to remove all reference to the operation of the Mowamba Borrowings Account.	NSW Department of Industry	2019

6.3.4 Delivery of Snowy River Increased Flows from Mowamba River

Since the outlet works at Jindabyne Dam were completed and the Mowamba Aqueduct reinstated in January 2006, Snowy Hydro Limited has been required to deliver SRIF from Jindabyne Dam in accordance with clause 11, Schedule 3 of the licence.

Numerous submissions to the review have advocated for the licence to be varied to allow these flows to be delivered from a combination of releases from Jindabyne Dam and unregulated flows from the Mowamba River. Many went further to seek the permanent decommissioning of the Mowamba Creek Aqueduct and Mowamba Weir.

It is suggested this will improve ecological outcomes by reintroducing the Mowamba River as a natural headwater for the Snowy River and increasing natural variability in the environmental flow pattern.

The mandatory five year review into the increased flows provisions committed to investigating environmental flows to the Snowy under low-flow conditions. This included assessing the importance of inflows from the Mowamba River to the Snowy River and carrying out a cost-benefit analysis of options for improving

environmental flow management, including decommissioning the Mowamba Aqueduct and removal of the Mowamba Weir.

This work is yet to be completed, however the NSW, Victorian and Commonwealth governments have made progress on:

- developing flow objectives for the Mowamba and Snowy rivers
- better understanding the local hydrology
- understanding the role of unregulated tributaries in the functioning of main river channels
- analysing water quality data
- assessing the supply of dissolved organic carbon and invertebrate drift.

The NSW Department of Industry and Snowy Hydro Limited also carried out annual experimental releases from the Mowamba River Aqueduct over May and/or June between 2014 and 2017. During these periods the aqueduct was turned out and all inflows to the diversion weir passed downstream to the Mowamba River. Releases from Jindabyne Dam during the same period targeted very low flow rates.

Conceptually, providing SRIF from the Mowamba River tributary has some merits, however no variations to the licence are proposed at this time. More work is required to understand the operational, economic, social and cultural heritage implications of required flow and infrastructure changes, and whether the timing is right to adopt such a strategy from an ecological perspective.

Reforms Snowy environmental water management, discussed in section 7.7.3, provides a means to complete the investigation, which involves:

- collating and synthesising the various scientific investigations completed to date on the ecological merits of the altered flow regime
- developing and assessing management options for the Mowamba Weir and costs
- completing economic, social and cultural water assessments.

The NSW Government will consult with Snowy Hydro Limited, the Snowy Advisory Committee and the local community in finalising the investigation before developing a final recommendation for partner Snowy governments¹² to consider. It is expected to complete this work in 2019.

Table 11. Actions relating to Mowamba River investigations

Action 7—Mowamba River investigation	Lead	By when
<p>OEH, in partnership with the NSW Department of Industry, Snowy Hydro Limited, the Snowy Advisory Committee and Victorian and Commonwealth governments, will finalise the Mowamba River investigation. This will include:</p> <ul style="list-style-type: none"> • evaluating using the Mowamba River as a way 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. 	Office of Environment and Heritage	2020

6.3.5 Delivery of Snowy River increased flows

6.3.5.1 Increased delivery flexibility for Snowy River increased flows

Part 4 of Schedule 3 of the licence prescribes obligations on Snowy Hydro Limited and Ministerial Corporation around the notification and delivery of annual, monthly, daily SRIF volumes and flushing flows from Jindabyne Dam.

The Ministerial Corporation is required to notify Snowy Hydro Limited of the:

¹² Partner Snowy governments refers to the parties to the SWIOD, being the NSW, Victorian and Australian governments.

- annual SRIF volume, by 13 February
- target monthly SRIF volumes, by 13 February
- target daily SRIF volumes six days before the commencement of the next month
- flushing flows strategy, by 13 February.

Snowy Hydro Limited is required to deliver these volumes, within various operational tolerances.

Stakeholders raised concerns about the rigid nature of these arrangements, particularly the need to plan the flow pattern two and a half months before the start of Snowy Hydro Limited's water year and the limited ability to vary them during the year in response to seasonal conditions. The Victorian Government considers this rigidity increases the likelihood of flooding in the lower reaches of the Snowy River, when increased flow releases coincide with high natural flows originating from the downstream catchment. There are also environmental benefits of having the flexibility to 'piggyback' releases on to natural flow events below the dam.

Arguably, it is the requirement to set monthly and annual patterns that are most rigid because daily flows can be modified, so long as the total daily volumes exceed the notified monthly volume.

Allowing SRIF to be carried over from one year to the next is one way to increase annual flexibility. This is a common attribute of environmental entitlements in the Murray–Darling Basin and is widely used by environmental managers to optimise use of their available water and adapt to weather conditions as they arise.

While numerous submissions to the review called to introduce carryover provisions, its value for SRIF is less evident because of the significant impact Jindabyne Dam has on flows for the Snowy River immediately downstream. All annual allocation available for the Snowy River, regardless of the recent climate, has been used to support the current management focus of repairing flow-related processes. This raises the question of whether there will be surplus allocation to carry over.

Theoretically, increased flexibility around monthly releases may be more beneficial. However, any benefits would need to be weighed up against the operational implications. It is also worth noting that the obligation to specify and deliver monthly targets will need to be considered as part of the Mowamba River investigation given a flow regime relying on natural flows in the Mowamba River would make targeting monthly SRIF releases extremely difficult.

Flexible arrangements for delivering daily flows are more likely to help manage downstream flooding and enable environmental managers to piggyback on natural flow events. While delivering large volumes of SRIF from Jindabyne Dam is complex, and opportunities to increase flexibility may be limited, Snowy Hydro Limited and the Ministerial Corporation now have more than 10 years' experience in delivering SRIF from the Jindabyne Dam outlet works. Environmental managers have also gained valuable experience in managing large environmental water holdings in other large water supply systems where there is more delivery flexibility under a different river operating regimes.

In recognition of this, it is recommended the NSW Department of Industry leads an investigation into increasing delivery flexibility to achieve better environmental outcomes from SRIF, in partnership with OEH, Snowy Hydro Limited and the Victorian and Commonwealth governments.

How are flood risks from Snowy environmental flows managed?

The licence recognises the need to manage risks associated with delivering SRIF, such as flooding, and includes an obligation for Ministerial Corporation to prepare a safety management plan. A plan is prepared annually and attempts to identify and address anticipated risks to the public, third-party property and NSW Department of Industry and Snowy Hydro Limited employees from the flushing flows.

The objectives of the plan are to ensure these risks are appropriately minimised by complying with any statutory requirements, promoting public awareness of the variable river heights in the Snowy River from below Jindabyne Dam and promoting public awareness of potential hazards from the collection of river debris.

Currently, during a high-flow event, the NSW Department of Industry constantly monitors information by liaising with the Bureau of Meteorology and Snowy Hydro Limited, particularly when forecasts indicate that future rain is likely. Approximate river flows can be forecast by the Bureau of Meteorology up to several days in advance. If natural flows combined with Jindabyne Dam releases are likely to cause inconvenience to downstream communities, the Ministerial Corporation can direct Snowy Hydro Limited to modify or cease releases from the dam.

Effective relationships with all stakeholders who have an interest in ensuring the winter–spring high-flow events occur safely are essential and NSW will continue to work with Victorian agencies, and others, to manage their concerns.

6.3.5.2 Delivery of long-term average Snowy River increased flow volumes

Target levels of increased flows are contained at Clause 7 of the SWIOID. These targets are not replicated in the licence, in which Snowy Hydro Limited releases are limited only by the annual allocated volume of SRIF in any year (Clause 2).

Despite some stakeholders raising concerns about the licence restricting the delivery of target flows of up to 28% of annual natural flows (ANF), this is not the case. The licence obliges Snowy Hydro Limited to release all water recovered for the Snowy and Snowy montane rivers under the SWIOID and makes no reference to water recovery targets agreed by partner Snowy governments.

The conditions on delivering more than 21% ANF are contained in the SWIOID. Under clause 5 of Annexure 1:

- SRIF cannot be increased to more than 294 gigalitres per year (equivalent to 28% ANF).
- Snowy Hydro Limited must be compensated for forgone revenue associated with delivering more than 212 gigalitres per year (21% ANF).

The volume of SRIF exceeded the 21% ANF target in 2017–18 by 2,334 megalitres. This was the first time the Snowy River allocation had reached the target volume. However, ambiguities in the licence and SWIOID around whether or not compensation is payable to Snowy Hydro Limited to deliver more than 212 gigalitres in any year, or over the long-term, resulted in the excess 2,334 megalitres not being delivered down the Snowy River in 2017–18.

Restricting releases to 212 gigalitres in any year places the partner Snowy governments' targets of achieving 21% ANF at risk. This is because they have assumed the annual 212 gigalitre target is a long-term average, which requires more water to be delivered in some years ('overs') to offset the years where there is less water available ('unders').

This is reflected in clause 7.1 of the SWIOID, where the stage three target volume is an average annual flow of 212 gigalitres per year.

The NSW, Victorian and Commonwealth governments have not considered a scenario that requires them to compensate Snowy Hydro Limited to deliver 'overs', when targeting the 212 gigalitre average. The alternative of capping deliveries at 212 gigalitres per year would make it impossible to deliver the target volume over the long-term, unless annual allocations against the recovered environmental entitlements remain high and generate at least 212 gigalitres per year.

The NSW Department of Industry and Snowy Hydro Limited are eager to clarify the arrangements, as are numerous stakeholders who commented on the issue in submissions on the draft report. The review provides an opportunity to do so.

Table 12. Actions relating to the delivery of increased flow target volumes

Action 8—Delivery of Snowy River increased flows target volumes	Lead	By when
<p>NSW Department of Industry, in partnership with OEH, Snowy Hydro Limited, and the Victorian and Commonwealth governments will:</p> <ul style="list-style-type: none"> A. investigate more flexible delivery to achieve better environmental outcomes from the available SRIF B. work together to ensure governments can deliver an average annual flow of 212 gegalitres per year down the Snowy River cost-effectively in accordance with the intent of the SWIOID. 	NSW Department of Industry	2020

6.3.6 Data sources for reporting increased flows targets

In 2011, the WCLC noted and agreed that:

- for the purposes of reporting against daily SRIF flow targets, Snowy Hydro Limited uses operational data available on the SCADA system or via field measurements. This is the data used on the day to physically manage the delivery of that day's target
- for monthly and annual targets, Snowy Hydro Limited uses hydrographically corrected data and is consistent with the monthly water accounts as a whole.

These arrangements will be captured in the licence for releases of SRIF from Jindabyne Dam and releases of SMRIF from Tantangara Dam.

Table 13. Actions relating to data sources for reporting increased flows targets

Action 9—Data sources for reporting increased flows targets	Lead	By when
<p>Clauses 12.2 and 25.2 of Schedule 3 of the licence will be varied to clarify that Snowy Hydro Limited may use the following data to demonstrate compliance with daily, monthly and annual flow targets from Jindabyne and Tantangara dams:</p> <ul style="list-style-type: none"> • operational data to report compliance against daily targets • hydrographically corrected data to report compliance with monthly and annual targets. 	NSW Department of Industry	2019

6.3.7 Riparian releases

The licence was intended to codify Snowy Hydro Limited's water release obligations on and from the corporatisation date. However, it does not refer to two of the three riparian releases made from the Snowy Mountains Scheme, being from Mowamba Weir and Eucumbene Dam.

Snowy Hydro Limited has committed to continue these riparian releases even though it is not strictly required under the licence. These releases are described as follows:

1. Mowamba Weir—riparian releases of approximately 1.4 megalitres per day, equivalent to 0.5 gegalitres per annum, released continuously from the Mowamba Weir and accounted as Jindabyne base passing flow.
2. Eucumbene Dam—riparian releases of up to 2.4 megalitres per day, released continuously from Eucumbene Dam to maintain visible flow in the Eucumbene River at Nimmo, about seven kilometres downstream of the dam.

These arrangements will be codified in the licence to improve visibility and provide certainty.

Table 14. Actions relating to riparian releases

Action 10—Riparian releases	Lead	By when
<p>The licence will be varied to capture the agreement for Snowy Hydro Limited to continue making a riparian release of:</p> <ul style="list-style-type: none"> Approximately 1.4 megalitres per day (0.5 gigalitres per year) from the Mowamba Weir, as part of nine gigalitres per year Snowy River base passing flow requirement. Up to 2.4 megalitres per day from Eucumbene Dam, to maintain a visible flow in the Eucumbene River at Nimmo. 	NSW Department of Industry	2019

6.3.8 Warm water pollution

Obligations to construct outlets at Jindabyne and Tantangara dams capable of releasing water above the thermocline are included in the SWIOLD and replicated in clauses 6 and 20 of Schedule 3 of the licence. These obligations were inserted to manage cold water pollution in the Snowy and Murrumbidgee rivers, which can have significant adverse impacts upon aquatic organisms and aquatic ecological processes and is a key determinant of river health¹³.

Further efforts to mitigate the cold water pollution risk from increased flows was made through the five year review, which resulted in obligations on Snowy Hydro Limited to ensure it operates both variable level offtakes to selectively release water from near the surface horizon of the reservoirs.

Some stakeholders have raised concerns that mandating the requirement to release from the surface horizon of the reservoirs at all times risks causing warm water pollution in the cooler (winter) months, when temperatures in the upper levels of the dams are higher than downstream tributaries.

Winter temperature elevation caused by releases from large dams is considered a component of the cold water pollution issue facing river operators in south east Australia, where 'discharges from large dams are typically colder than natural for approximately half the year and warmer than natural for the other half of the year'.

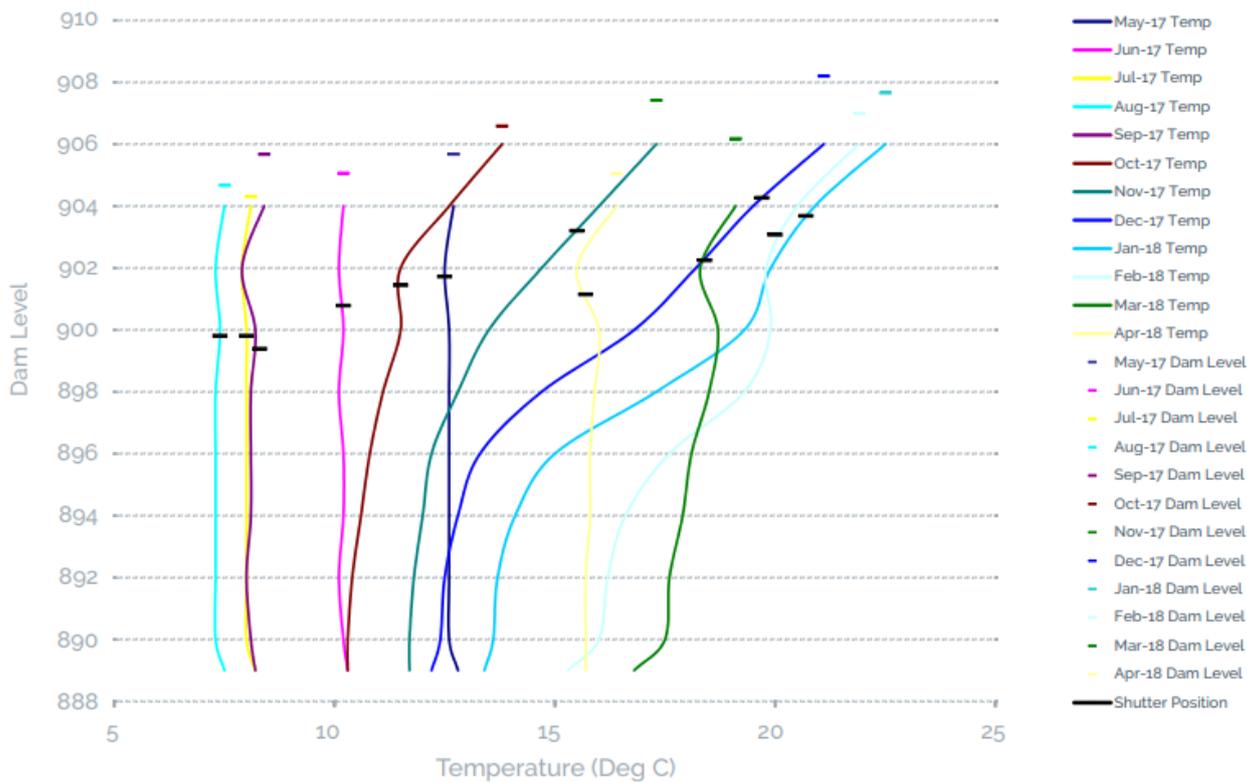
The NSW Government has endorsed the principle of requiring dam operators to match the temperature of releases from individual dams as closely as possible to the natural temperature regime, having regard to the associated costs and benefits. According to NSW's *Guidelines for managing cold water releases from high priority dams* matching the temperature regime on a monthly basis may be workable for some large dams and a reasonable compromise between ecological outcomes and operational complexity.

However, the guidelines also state that the approach of managing releases to better mimic the background temperature regime should be limited to the spring/summer/autumn period. Selective withdrawal is not a practical option in winter because the dams are isothermic during this period (that is, uniform in temperature from top to bottom).

This phenomenon is illustrated in Figure 4, below, which shows that in 2017 Jindabyne Reservoir experienced uniform water temperatures in May, June, July, August and September. This demonstrates that the temperature of SRIF delivered during these cooler months would have been similar regardless of the level Snowy Hydro Limited extracted the water from in the reservoir.

For the Snowy River, it has been suggested delivering SRIF via a combination of releases from Jindabyne Dam and Mowamba River could help address warm water pollution concerns by mixing warm reservoir water with cooler tributary water. It is therefore sensible that the Mowamba River Investigation consider the benefits a new flow regime would have on temperature outcomes in the Snowy River below Lake Jindabyne.

¹³ Source: *NSW Cold Water Pollution Strategy: Guidelines for managing cold water releases from high priority dams*, (2011) State of NSW through the Department of Primary Industries.

Figure 4. Jindabyne Dam intake water temperatures and levels in 2017/18¹⁴

6.3.9 Call out of River Murray Increased Flows

The availability and delivery obligations established in the licence for RMIF are relatively straightforward when compared to SRIF. However, many submissions raised concerns with the entitlement's existing arrangements, which are contained across a number of different instruments and plans including the SWIOD, the licence, Murray–Darling Basin Agreement, the *Strategy for River Murray Increased Flows* and River Murray water licences.

The availability and apportionment of recovered environmental water to the River Murray is set out in the SWIOD and is applied annually to allocate water to SRIF and RMIF. Under the SWIOD (Clause 16.1), NSW must apportion water recovered under the environmental entitlements between SRIF and RMIF on a 2:1 basis, until the RMIF annual allocation reaches 70 gegalitres. From then on, all water is allocated to SRIF.

In the licence, arrangements for RMIF are specified in clause 4.1(6) of Schedule 3 and clause 10.4 of Schedule 4. Together, they:

- result in RMIF being allocated to and accounted in 'above-target water' in the Snowy–Murray Development
- grant Ministerial Corporation a right to call out RMIF in addition to required annual releases when the volume of net above-target water in the Snowy Mountains Scheme exceeds 800 gegalitres.

Similarly to SRIF, savings accruing to RMIF are transferred to above-target water in the Snowy–Murray Development. This occurs primarily because this water is no longer needed to meet required annual release volumes, so is not considered in meeting target storage levels. More discussion on the target storage principle and allocation of Snowy Mountains Scheme resources between below-target and above-target water is provided in section 6.4.1.

The crucial difference between SRIF and RMIF is that water allocated to SRIF is encumbered by delivery obligations under Schedule 3 of the licence and not available to Snowy Hydro Limited to use at its discretion.

¹⁴ Source: Water Compliance Report 2017 – 2018 Water Year (2018) Snowy Hydro Limited (http://www.snowyhydro.com.au/wp-content/uploads/2018/10/SH1266_Water-Report-FY17-18_v2.pdf)

In contrast, above-target water identified as RMIF by the MDBA may be released by Snowy Hydro Limited at its discretion, some or all of which may be recognised as RMIF by the MDBA in consultation with NSW and Victorian environmental managers. This is described in more detail in the following sections.

How is RMIF credited to environmental water holder accounts in the Murray?

There are three ways RMIF can be credited to environmental accounts in the Murray:

1. Environmental managers place an order and call it out.

This can occur if the order is placed by 5 October and the volume of net above-target water reserved in the Snowy Mountains Scheme is greater than 800 gigalitres.

2. Environmental managers can request a release of above-target water be accounted as RMIF.

This usually occurs in May, once the volume of above-target water released by Snowy Hydro Limited is known.

3. Environmental managers are forced to accept a release of above-target water as RMIF.

This occurs when all above-target water stored in the Snowy Mountains Scheme is RMIF. Again, the RMIF water accounts are credited in May, once the volume of above-target water released by Snowy Hydro Limited is known.

6.3.9.1 Snowy Hydro Limited's right to release River Murray Increased Flows

When releasing above-target water, Snowy Hydro Limited does not differentiate RMIF from its other above-target water reserves. This differentiation is made by the MDBA in accordance with the Murray–Darling Basin Agreement, which provides that RMIF must have first priority from above-target water releases. In other words, environmental managers have the option to accept previously released above-target water as RMIF if they would like to use it in the River Murray. If they choose not to, RMIF stored as above-target water is not reduced and remains stored in the Snowy Mountains Scheme and downstream resource managers make best use of the released above-target water, for example by allocating to licence holders.

The only time environmental managers must accept above-target water releases as delivery of RMIF is when the total volume of above-target water in the Snowy–Murray Development equals the volume of RMIF (that is, when the volume allocated to RMIF is the only above-target water stored in the Snowy Mountains Scheme). Under these circumstances, MDBA rules require that the above-target water be accounted as RMIF. This is commonly referred to as a 'forced release of RMIF'. Forced releases of RMIF may occur at sub-optimal times for Murray environmental managers.

These arrangements were the negotiated outcome at corporatisation and were put in place to manage the impacts of recovering water for the Snowy Mountain and Snowy montane rivers. They seek to achieve both environmental and electricity generation outcomes from RMIF, consistent with the overarching objective of the Snowy Mountains Scheme.

Snowy Hydro Limited releases of RMIF in 2017–18

Snowy Hydro Limited released 1107 gigalitres to the River Murray in 2017/18, of which 493 gigalitres was a discretionary release of above-target water.

Of this release, environmental managers were forced to accept 262 gigalitres as RMIF and chose to accept an additional 50 gigalitres for future drought contingency measures. Environmental managers began using RMIF in May 2018 and continue to use it in the 2018/19 water season.

6.3.9.2 Ministerial Corporation's right to call out River Murray Increased Flows

A variation to the licence in 2011 increased flexibility for environmental managers to improve environmental outcomes from RMIF. The variation established a call-out right for Ministerial Corporation that, when exercised, obliges Snowy Hydro Limited to release this volume of RMIF to the Murray from its above-target water reserves, in addition to required annual releases.

This call-out right only applies when the volume of net above-target water stored in the Snowy Mountains Scheme exceeds 800 gigalitres. For this purpose, the licence defines net above-target water as the volume of

above-target water in the Snowy Mountains Scheme minus the volume of water stored in the River Murray and Murrumbidgee drought accounts.

This trigger volume was agreed to ensure a buffer of above-target water for Snowy Hydro Limited's commercial operations.

Numerous stakeholders have raised concerns that the additional flexibility provided by the call-out right does not go far enough, claiming access to taxpayer-funded water recovery should be independent of Snowy Hydro Limited's electricity generation needs. Of particular concern is that RMIF may not be available to manage a sequence of dry years, when it is most needed. It is asserted RMIF could be better used to maximise environmental benefits by providing environmental managers sole discretion over its use and delinking it from the volume of above-target water in the Snowy Mountains Scheme. Agricultural interests contend this would have the added benefit of reducing the water recovery pressures facing irrigation-dependent communities in the Murray–Darling Basin.

The obvious impact of increasing flexibility for environmental managers by removing RMIF from Snowy Hydro Limited's discretion would be to reduce Snowy Hydro Limited's flexibility to generate electricity. The call-out right was not granted in isolation and was negotiated between partner Snowy governments and Snowy Hydro Limited and formed part of a package of variations that sought electricity generation, environmental and water security outcomes.

Further, Snowy Hydro Limited has also raised concerns that the definition of net above-target water does not consider all water accounts that Snowy Hydro Limited has no discretion over, including:

- SRIF
- Ministerial Corporation call-outs linked to the previous year's relaxation volumes
- water held in the Snowy–Tumut Development in the Pre-release Compensation Account for the purposes of the Blowering Airspace Deed.

Snowy Hydro Limited asserts that a failure to consider these volumes in the definition undermines the purpose of the trigger to provide an adequate operational buffer of above-target water reserves. Of particular concern is that a call out of RMIF could significantly compromise Snowy Hydro Limited's ability to use above-target water in the Snowy–Murray Development.

Including these above-target water accounts in the definition of net above-target water would improve outcomes for Snowy Hydro Limited. Conversely, it would reduce the volume of net above-target water stored in the Snowy Mountains Scheme at any one time and restrict access to RMIF more often and for longer periods. This would pare back the flexibility gained in 2011 for environmental managers and risk reducing its contribution to the MDBA's assessment of the sustainable diversion limit adjustment mechanism. The latter threat could result in more water recovery under the Basin Plan.

The issues raised are primarily concerned about what might happen in the future. While the submissions provided little evidence the arrangements have resulted in unforeseen or perverse outcomes to date, the issues are significant and warrant further consideration and investigation into whether:

- the variations made to the licence in 2011 have met the intent of the agreement between governments and Snowy Hydro Limited
- certain climate and/or operating scenarios place the assumed outcomes at risk (for example, an extended dry sequence)
- alternative arrangements would provide a more balanced outcome.

Table 15. Actions relating to increased flows

Action 11—Call out of River Murray increased flows	Lead	By when
NSW Department of Industry, in partnership with Snowy Hydro Limited, the Victorian and Commonwealth governments and MDBA, will further investigate the trigger for accessing River Murray Increased Flows.	NSW Department of Industry	2020

6.4 Water release requirements

Snowy Hydro Limited's obligations to release water from the Snowy–Murray and Snowy–Tumut developments are contained in Schedule 4 of the licence. Schedule 4 includes a series of rules intending to benefit both electricity generation and downstream water interests under a variety of different circumstances, while protecting stored water in the Snowy Mountains Scheme. It defines how releases are accounted on an annual basis, with particular reference to very wet or very dry climatic conditions, transfers between developments, or accounting between years or within a single year.

Specifically, Schedule 4 places obligations around:

- the sharing, allocation and transfer of water within and between the Snowy–Murray and Snowy–Tumut developments (clauses 2 to 4 and 9)
- how water releases should be accounted (clause 5)
- the volumes and timing of water required to be released (clauses 6 to 8 and 10 to 13)
- sharing data with Ministerial Corporation and NSW Government (clause 14)
- developing analytical models for downstream water supply systems (clause 15)
- maintaining water accounts (clause 16).

The actions outlined in this section respond to issues around water resource efficiencies; requests to review the operation of the variations made in 2011; identified errors and ambiguities in the licence; and requests to undertake detailed assessments of any proposed changes. In summary, agreements between partner Snowy governments and Snowy Hydro Limited will be secured in the licence, known errors will be fixed and the NSW Department of Industry will partner with relevant agencies to complete numerous investigations to maximise operational efficiencies and clarify licence rules. These investigations will be supported by Snowy Hydro Limited, MDBA and WaterNSW collaborating to improve analytic modelling capability to enable assessment of options.

6.4.1 Water sharing

6.4.1.1 Snowy–Murray and Snowy–Tumut developments

Clauses 2, 3 and 4 of Schedule 4 define how inflows to the Snowy Mountains Scheme are shared between the Snowy–Murray and Snowy–Tumut developments. Clauses 2 and 3 prescribe the water available to each development, while clause 4 specifies what downstream catchments the water is committed to.

The sharing of the Snowy Mountains Scheme's water resources was first legislated in 1959 in an agreement between the Commonwealth, NSW and Victorian governments on the construction, operation and management of the Snowy Mountains Scheme. This agreement allocated approximately 75% of water regulated by the Snowy Mountains Scheme to NSW and 25% to Victoria by:

- granting the River Murray Commission (now the MDBA) the right to control water released from the works of the Snowy–Murray Development via the River Murray (which is shared equally between NSW and Victoria)
- granting NSW the right to control water released from the works of the Snowy–Tumut Development via the Murrumbidgee River
- committing diversions from the Tooma River (in the upper Murray), Upper Murrumbidgee River and Eucumbene River to the Tumut River
- committing diversions from Lake Jindabyne and the Snowy River to the Murray River.

Corporatisation of the Snowy Mountains Scheme subsequently secured the following rights in the licence:

- **The River Murray** is entitled to receive all water from the Snowy River catchment (except for the Eucumbene River), together with water from Geehi River and Bogong Creek.
- **The Murrumbidgee River** is entitled to receive all water from the Tooma River, the Upper Murrumbidgee River and the Eucumbene River, together with water from the Tumut River.

In addition, up to 2,019 gigalitres of water available for the River Murray can be stored in Lake Eucumbene, which is the only storage in the Snowy Mountains Scheme shared by the two developments.

An issue was raised about the growing differences in the nature of these rights due to changing inflow and use patterns of each development. Given these rights are fundamental to the design and operation of the Snowy Mountains Scheme, it is not proposed to specifically investigate this issue in this review.

Nevertheless, it will be necessary to consider changes to the nature of these entitlements when assessing any proposal to vary Snowy Hydro Limited's release requirements.

6.4.1.2 Below-target and above-target water

The inflows to each development are further characterised as either below-target water¹⁵ or above-target water, depending on whether the volume available in storage at any time is below or above a target storage volume. Below-target water is water set aside to deliver the annual release requirement specified in Schedule 4 of the licence. Above-target water is available for Snowy Hydro Limited to release at its discretion, with some exceptions.

Target volumes were established for each development during the Snowy Mountains Scheme's design. They reflect how much water is needed in storage to ensure the Snowy Mountains Scheme can release an agreed annual volume during a repeat of the design drought without running out of water. The design drought incorporates the period of inflows between 1936 and 1946.

The agreed annual volume is defined as the required annual release, and equals a nominal volume for each development of:

- Snowy–Murray Development: 1,062 gigalitres per year
- Snowy–Tumut Development: 1,026 gigalitres per year.

On average, these nominal volumes were designed to contribute around 85% of total releases from the Snowy Mountains Scheme.

As illustrated in Table 16 target volumes apply for each month, taking into account seasonal variation in inflows and release of the required annual release. They are secured in clause 8 of Schedule 4 of the licence.

Inflows to the Snowy Mountains Scheme are accounted as below-target water when storages are below the target volumes. When storages are above the target volumes, inflows are accounted as above-target water. Importantly, inflows are not reallocated from above-target water to below-target water if storages fall back below-target volumes in the future. Inflows generated from Snowy Hydro Limited's cloud seeding operations are also accounted as above-target water. This is discussed further in section 6.4.1.3.

Water can be transferred between below-target and above-target water under certain circumstances specified in the licence. Below-target water is re-classed as above-target water when:

- annual allocations are made against SRIF and RMIF
- water is transferred to the drought accounts
- a relaxation volume is calculated
- a pre-release volume is calculated for the previous year.

Above-target water is re-classed as below-target water when:

- water in excess of the required annual release is required to meet minimum release volumes between 1 December and 30 April (within-year release requirements)
- Ministerial Corporation seeks to call out a portion of the previous year's relaxation volume, or water from the drought accounts
- a wet sequence protection volume is calculated.

The relaxation volume, within-year release requirements, wet sequence protection volume and drought accounts are discussed in more detail in section 6.4.2.

¹⁵ Note: below-target water is not explicitly defined in the Licence but is commonly referred to in the management of the Snowy Mountains Scheme.

Table 16. Target storage volumes

Month	Snowy–Murray Development target storage volumes (gigalitres)	Snowy–Tumut Development target storage volumes (gigalitres)
January	1510	1660
February	1520	1670
March	1460	1610
April	1410	1530
May	1340	1460
June	1290	1410
July	1240	1350
August	1170	1300
September	1190	1490
October	1240	1580
November	1400	1590
December	1450	1580

Similar to the catchment-based sharing of inflows, the target storage approach and allocation of inflows to below- and above-target water are fundamental to the operation of the Snowy Mountains Scheme. Concerns have been raised that the licence lacks clarity around the accounting of above-target water, specifically transfers between above-target water and below-target water and from cloud seeding operations. The consequence is that various parties have had different interpretations of above-target water availability.

The review provides an opportunity to clarify accounting arrangements.

6.4.1.3 Accounting for inflows generated from cloud seeding

Snowy Hydro Limited formally commenced an operational cloud seeding program in the Snowy Mountains Scheme catchment in 2013. Cloud seeding trials held between 2004 and 2012 found that cloud seeding increased precipitation by an average of 14% during suitable conditions.¹⁶

Cloud seeding involves introducing a seeding agent into suitable clouds during the cooler months (May to September) to create ice crystals that grow big enough to fall as snow. The enhanced snowfall leads to increased runoff and inflows to the Snowy Mountains Scheme.

Cloud seeding activities are authorised by *the Snowy Mountains Cloud Seeding Act 2004*. The calculation and accounting of additional inflows is currently managed through the AWOP by agreement with the WCLC.

At the end of the cloud seeding season Snowy Hydro Limited calculates the volume of additional inflows for each development in accordance with a peer-reviewed method, and transfers this volume to its above-target water reserves. The decisions to account the additional inflows as above-target water, regardless of below-target storage levels, recognises the additional inflow created by Snowy Hydro Limited's cloud seeding program, in accordance with the program's original intent.

¹⁶ <https://www.snowyhydro.com.au/our-energy/cloud-seeding/cloud-seeding-history/>

The calculation depends on the number of cloud seeding events that take place during the year. The calculation method adopts statistical research findings which show that each cloud seeding event creates additional precipitation that delivers quantifiable increases of inflow across the catchments of Island Bend (including Guthega), Geehi, Tooma and Tumut Pond reservoirs. All of these catchments are within the cloud seeding target area.

To date, between 6 and 16 gigalitres per year of additional inflows have been accounted as above-target water since the 2015/16 water year. Snowy Hydro Limited intends to re-evaluate the calculation method every five years to allow for refinement of the statistical methods and improvements from having additional data. The NSW Department of Industry and partner stakeholders will consider the outcomes of Snowy Hydro Limited's first review, scheduled for 2020, as part of the next phase of the review, with the aim of securing ongoing water accounting arrangements in the licence.

Table 17. Actions relating to inflows

Action 12—Accounting for inflows from cloud seeding	Lead	By when
<p>NSW Department of Industry, in partnership with Snowy Hydro Limited, the MDBA, WaterNSW and the Victorian and Commonwealth governments will agree on cloud seeding water accounting arrangements for inclusion in the licence.</p> <p>The formal arrangements will be informed by Snowy Hydro Limited's re-evaluation of the existing data and methods scheduled for 2020.</p>	NSW Department of Industry	2020

6.4.2 Release requirements

Clauses 6 to 13 of the licence govern the minimum annual release requirements of Snowy Hydro Limited to the Murray and Murrumbidgee rivers. These requirements consist of the required annual releases for each development and the Murrumbidgee riparian release.

In practice, the required annual releases vary from the nominal volumes every year. Elements that influence the calculated volume include:

- the volume and timing of inflows to the Snowy Mountains Scheme
- storage volumes/water availability in Hume and Blowering reservoirs
- timing of actual releases
- allocations against SRIF and RMIF
- decisions of Ministerial Corporation, including call outs.

6.4.2.1 Dry inflow sequence volume

While the target storage volumes are designed to ensure reliable required annual releases over a major drought, the licence does contain a demand management mechanism aimed at securing ongoing releases from the Snowy Mountains Scheme when inflows are drier than the design inflow sequence.

This mechanism reduces the demand on each development by reducing the required annual releases when the cumulative volume of inflows falls below the design inflow sequence for an extended period. The DISV is the volume by which the required annual releases are reduced.

The DISV is calculated monthly using a predictive formula that determines whether the current inflow sequence, going back to when below-target water reserves were last at target storage and looking forward to the end of the water year, is adequate to meet the nominal volume for that development. If not, a DISV is calculated equal to the volume necessary to ensure the Snowy Mountains Scheme can supply a reduced required annual releases under forecast minimum inflows until the end of the water year.

The DISV is calculated at the beginning of every month, therefore the required annual releases are adjusted monthly when there is a DISV. However, the DISV does not change in the last two months of each water year. Improvements in inflows during this period are reflected in the following year's required annual releases calculation.

Relying on minimum inflows to calculate the DISV means that when the inflow sequence is tracking below the design inflow sequence, the DISV tends to begin the water year higher, before slowly recovering as actual inflows exceed minimums and are factored into the calculation. As a consequence, when there is a persistent DISV, the required annual release tends to increase over the year.

Significant inflow deficiencies were experienced in the Snowy Mountains Scheme during the Millennium drought, over which time DISV's were calculated between 2006–07 and 2016–17 on the Snowy–Murray Development and between 2006–07 and 2009–10 on the Snowy–Tumut Development.

Stakeholders did not raise any issues with the DISV provision or dry inflow sequence formula. Amendments were made through the five year review to improve the operation of the DISV and the Snowy Mountains Scheme continued to release water during the Millennium drought. This indicates it has generally been effective in meeting its objective of balancing release requirements over extended dry sequences.

However, in considering previous AWOPs, the WCLC did identify the accounting treatment of inflows in the DISV formula (Clause 8.1, Schedule 4) is different to its treatment in the 'water available' calculation (clauses 2.1 and 3.1, Schedule 4). The definition of water available to the Snowy–Murray and Snowy–Tumut developments is given as 'water regulated by the Snowy Mountains Scheme', while the DISV refers to inflows only.

In 2012, WCLC considered adopting 'regulated inflows' for the calculation of the DISV on the understanding that doing so will not impact accounted below-target and above-target water stores. This treatment was partially agreed by WCLC and has been adopted in recent AWOPs. The review provides an opportunity to resolve this ambiguity.

Stakeholders have also sought that the review consider how the DISV interacts with other provisions in the licence, namely the pre-release and relaxation provisions, to ensure it remains fit for purpose.

Further, the review provides an opportunity to consider whether the DISV provision that was effective in managing water through the Millennium drought, will continue to be effective under a changing climate (noting a DISV persisted on the Snowy–Murray Development a few years after the Millennium drought ended), and whether there are any opportunities to improve the arrangements.

Table 18. Actions relating to the dry inflow sequence volume

Action 13—The dry inflow sequence volume	Lead	By when
NSW Department of Industry, in partnership with Snowy Hydro Limited, MDBA, WaterNSW and the Victorian and Commonwealth governments, will: <ul style="list-style-type: none"> A. seek agreement on the definition of inflows for calculating the DISV B. further investigate the: <ul style="list-style-type: none"> • interaction of DISV with other elements of the required annual release • effectiveness of the DISV in managing release requirements in a changing climate. 	NSW Department of Industry	2020

6.4.2.2 Relaxation volume

The licence contains provision to reduce the required annual release when downstream water availability is high and releases from the Snowy Mountains Scheme are not needed to support increased water allocations in the Murray or Murrumbidgee river systems. The volume by which the required annual release is reduced is defined as the relaxation volume and is determined according to a fixed formula that takes into account downstream water supply system demands and operating requirements, and current and forecast water availability.

The relaxation mechanism is in place to maximise water efficiency by not forcing releases from the Snowy Mountains Scheme when neither Snowy Hydro Limited nor downstream water interests are seeking them. When triggered, the required annual release is reduced by the calculated relaxation volume and an equivalent volume of water transferred from below-target water to above-target water. The relaxation volume cannot reduce the nominal required annual release below 800 gigalitres, that is, a maximum of 262 for the Snowy–Murray Development and 226 gigalitres for the Snowy–Tumut Development.

The licence also provides Ministerial Corporation the opportunity to call out up to 100 gigalitres of the relaxation volume in the following year (Clause 10.1, Schedule 4) if actual releases in the previous year were less than 900 gigalitres and relaxation volumes exceeded 162 gigalitres for the Snowy–Murray Development and 126 gigalitres for the Snowy–Tumut Development.

Stakeholders have raised a number of concerns with the mechanism, including:

- the presence of a drafting error in the calculation of the Snowy–Tumut relaxation volume
- the complexity of the related call out provisions
- the provision not operating as intended
- unintentional reduction of the required annual release due to interaction with DISV and pre-release provisions
- a lack of flexibility for downstream water supplies.

It is clear from the submissions that stakeholders believe the current approach to determining relaxation volumes is not achieving outcomes sought by Snowy Hydro Limited or downstream water users and that stakeholders consider further investigation of the mechanism a priority for the review. Further discussion is provided in the following sections.

Drafting error in Snowy–Tumut calculation

The formula used to calculate the Snowy–Tumut relaxation volume at Clause 7, Schedule 4 allows for up to 262 gigalitres, matching the volume that can be calculated for the Snowy–Murray Development. As discussed earlier, the intent of the relaxation provision is that it does not reduce the required annual release below 800 gigalitres. To achieve this on the Snowy–Tumut Development, the relaxation volume calculation should be capped at 226 gigalitres.

Complexity of related call-out provision

Clause 10.1, Schedule 4 is complex and fails to take into account pre-releases in determining the volume of the previous years' actual release volumes. In 2013, the WCLC agreed to simplify the drafting of this clause and reflect the changes required to consider the addition of pre-release provisions. All AWOPs since this date have included the following agreement:

For the Snowy–Murray Development, if the maximum relaxation volume in a water year was greater than 162 gigalitres, a volume of water that could be called out not later than 31 August in the following water year is the greater of:

- (1) zero
- (2) maximum relaxation volume—162 gigalitres—discretionary above-target water release

Where discretionary above-target water releases represents above-target water releases made entirely at Snowy Hydro Limited's discretion and is defined as above-target water release excluding above-target water components in the required annual release formula as well as drought release and call out of RMIF.

For the Snowy–Tumut Development the same conditions apply, but using 126 gigalitres as the volume.

The relaxation volume is not operating as intended

Since corporatisation, there has been very little relaxation volume calculated, and when it has, it has been late in the year. This has been the case even in the wetter years that followed the Millennium drought.

Stakeholders have singled out issues with the use of modelled baseline conditions (development and operating conditions at corporatisation) to estimate diversions in the River Murray water supply systems as well as the use of fixed numbers to estimate system operating requirements and forecast inflows (some of which have errors). Changes to water allocation policies and water use behaviour since 2002 and changes to minimum inflows and transmission and evaporation, means it may no longer be appropriate to rely on these fixed requirements as they do not accurately represent current conditions.

To resolve this, stakeholders have sought that the review consider revising the relaxation provisions to no longer rely on modelling baseline conditions and to enable the calculation to adapt to changes to downstream fixed-system operating requirements and inflow forecasts. Other considerations include the need to consider the impact carryover has on the determination of downstream water availability and the benefits provided by not relaxing the required annual release, for example on maintaining storage levels at higher volumes.

Interaction of relaxation, DISV and flex provisions

It is possible for the required annual release to be reduced by a DISV due to both a long-term deficiency in inflows to the Snowy Mountains Scheme and a relaxation volume due to short-term recovery in the downstream water supply system. There are concerns that this could lead to an excessive, unintended reduction in required annual release. Similarly, there are concerns that allowing relaxation and pre-releases in the same year could also lead to less water committed to the Murray and Murrumbidgee systems, albeit in future years.

Flexibility for downstream water supplies

A commonly held view of Murray and Murrumbidgee water interests is that the relaxation provisions are not effective at delivering flexibility to downstream water supply systems between years and thus provide little benefit to downstream water users—particularly in future years when water availability may be low.

Stakeholders are interested in the review investigating options that increase call out flexibility, in terms of volume and timing, to maximise the value of below-target water to downstream systems and help smooth variations in water allocation determinations. Options identified include allowing:

- relaxation volumes to be called out in future years (that is, two or three years after relaxation)
- downstream water authorities to call out all relaxation volumes when conditions turn dry
- relaxation volumes to be used to offset DISV.

Table 19. Actions relating to relaxation provisions

Action 14—Relaxation	Lead	By when
A. The licence will be varied to: <ul style="list-style-type: none"> • correct the drafting errors in the Snowy–Tumut calculation • reflect the WCLC drafting of Clause 10.1, Schedule 4 and definition of ‘discretionary above-target water release’. 	NSW Department of Industry	2019
B. NSW Department of Industry, in partnership with Snowy Hydro Limited, MDBA, WaterNSW and the Victorian and Commonwealth governments, will investigate options to improve the effectiveness of the relaxation mechanism.	NSW Department of Industry	2020

6.4.2.3 Flexibility and pre-releases

Clause 13 of Schedule 4 provides:

- the Ministerial Corporation and Snowy Hydro Limited the ability to agree to reduced releases of below-target water in any year (Clauses 13.2 and 13.3, Schedule 4)
- Snowy Hydro Limited the ability to pre-release a portion of the following year’s required annual release (Clause 13.4)
- for wet sequence protection for a portion of pre-releases (Clause 13.5).

Reduction in required annual release

The facility to agree to reductions in required annual release was included in the first issue of the licence and has been exercised on numerous occasions on the Snowy–Tumut Development on a without-prejudice basis. As discussed earlier in the context of the relaxation provisions, stakeholders have sought flexibility around moving required annual release volumes between years. Conceptually, this provision could be utilised to achieve a similar outcome, provided conditions can be agreed with Snowy Hydro Limited.

Pre-releases of required annual release

Variations to Clause 13 were made in 2011 to provide Snowy Hydro Limited the right to release at least 200 gigalitres of flex in any year, regardless of the previous year's final DISV. This allows Snowy Hydro Limited to pre-release the following year's required annual release when water availability is greater and downstream spills more likely, compared with what could occur before 2011, and is why the increased flexibility was accompanied by the downstream wet sequence protection (discussed in section 6.4.2.3).

Snowy Hydro Limited is content that the provisions are effective, except for the definition of unused spills used to calculate the downstream wet sequence protection volume (refer section 6.4.2.3) and two known errors addressed below. However, some stakeholders have expressed additional concerns that the provisions may have altered operations to the detriment of downstream water availability.

The licence contains two errors in relation to the flex and pre-release provisions, being the definition of agreed annual release and the calculation of the recovery amount.

The agreed annual release is applied when Ministerial Corporation and Snowy Hydro Limited agree to reduce the required annual release. An administrative error has resulted in the definition of agreed annual release incorrectly referencing clause 13.1 instead of 13.2. The licence will be varied to fix this mistake.

The recovery amount is the volume by which the DISV reduces in a given year and is used to calculate the pre-release volume and to credit the drought and DISV reserve accounts. The WCLC identified an error in the definition of the recovery amount at Clause 1.1(56), where it mistakenly calculates the DISV recovery over the preceding month, instead of the year to date. In 2013, the WCLC agreed to amend the drafting of the definition so that:

'Recovery Amount means, for each Development with respect to each Month in a Water Year, the volume (if any) by which the Dry Inflow Sequence Volume for that Development calculated as at the commencement of that Month under clause 8 of Schedule Four is less than the volume of the Dry Inflow Sequence Volume for that Development calculated as at the commencement of March in the previous Water Year under clause 8 of Schedule Four.'

The licence will be varied to reflect this agreement.

Numerous submissions also called on the review to analyse how the flex provisions have operated since being reformed in 2011. There are concerns that flex may not be adequately incorporated into other provisions of the licence, may be responsible for increasing the volume downstream spills and may increase the likelihood of the Snowy Mountains Scheme failing under ongoing dry conditions. The review provides an opportunity to investigate the flex provisions to understand whether it has had any unforeseen impacts and identify any opportunities to improve the existing arrangements.

Table 20. Actions relating to flexibility and pre-releases

Action 15—Flexibility and pre-releases	Lead	By when
A. The licence will be varied to: <ul style="list-style-type: none"> correct the drafting error in the definition of the ‘agreed annual release’ reflect the WCLC drafting of the definition of ‘recovery amount’. 	NSW Department of Industry	2019
B. The NSW Department of Industry, in partnership with Snowy Hydro Limited, MDBA, WaterNSW and the Victorian and Commonwealth governments, will review the operation of the flexibility and pre-release provisions, including their interaction with other required annual release provisions, and to considering opportunities to improve existing arrangements.	NSW Department of Industry	2020

6.4.2.4 Timing of releases

The licence only places two restrictions on Snowy Hydro Limited regarding timing of releases, being the minimum requirement to deliver the required annual release during the water year (Clause 12, Schedule 4) and the limit on releases from Jounama Dam (Clause 12.4, Schedule 4). These ensure a nominal volume of water is released annually to the Murray and Murrumbidgee water supply systems and that regulated releases from Jounama Dam do not exacerbate flooding of the Tumut River.

The licence does not limit how much of the required annual release Snowy Hydro Limited can deliver early in the season, when the risk of spill of downstream storages is at its greatest. Snowy Hydro Limited can make early releases of the required annual release within a water year and between water years through flex pre-releases.

Rather than imposing restrictions on Snowy Hydro Limited to manage the risk of early releases spilling from downstream storages, the licence includes two spill compensation mechanisms that act as a disincentive for Snowy Hydro Limited to make early releases during wet periods. They achieve this by requiring Snowy Hydro Limited to release its above-target water reserves to compensate downstream water supply system for releases that cannot be re-regulated downstream and ultimately spill. This is intended to balance water supply certainty for water users with operational flexibility to generate electricity.

Compensation for spills of early releases from the required annual release is governed by:

- the within-year release requirement provision (Clause 11, Schedule 4), in the case of early season releases
- downstream wet sequence protection (Clauses 13.5 and 13.6, Schedule 4), in the case of pre-releases of the required annual release in the previous year.

Within-year release requirements provide a minimum volume of releases from the Snowy Mountains Scheme between 1 December and 30 April when early season releases from the required annual release have spilled from the downstream water supply system. The volume is limited to a maximum of 200 gigalitres on the Snowy–Murray Development and 241 gigalitres on the Snowy–Tumut Development.

In addition, changes to the flexibility and pre-release provisions in 2011 introduced spill protection for water pre-released from the Snowy Mountains Scheme. Downstream wet sequence protection volume provisions require Snowy Hydro Limited to release above-target water if it makes pre-releases and it spills in the following water year. The volume ‘protected’ is the difference between what Snowy Hydro Limited could have released under historic required annual release provisions and 200 gigalitres. This former pre-release right, commonly referred to as ‘DISV Flex’, allowed Snowy Hydro Limited to deliver a volume of next year’s required annual release up to the DISV on 1 March.

No pre-release is protected if the volume of DISV Flex exceeds 200 gigalitres. In other words, downstream wet sequence protection can be restricted or negated altogether by the presence of a large DISV.

What is DISV Flex?

Prior to the 2011 licence variations, the required annual release was reduced by the 1 March DISV and increased by a volume equal to the 1 March DISV of the previous year (defined as 'carry overs').

In 2007, the WCLC agreed to variations to the required annual release formulae to recognise pre-releases up to the 1 March DISV volume¹⁷, which essentially allowed Snowy Hydro Limited to pay next year's carry over volume early. This early release, now termed DISV Flex, was not afforded spill protection.

Adequacy of spill protections

Numerous stakeholders have sought a review of the downstream wet sequence protection to ensure it is meeting its intent and is adequately compensating downstream water users in response to any consequential changes to Snowy Hydro Limited's release patterns. Stakeholders pointed to recent examples where capacity existed within the Snowy Mountains Scheme to store water when Blowering and Hume reservoirs were close to full or pre-releasing, but releases were made anyway at a cost to downstream water availability and above-target water reserves in the Snowy Mountains Scheme. It has also been suggested the review go further and investigate the consequences of not protecting spills of DISV Flex.

The adequacy of the within-year release requirements to compensate early releases of required annual release has also been questioned, namely that:

- the periods specified in the licence may not match the risk of spill profiles of downstream storages
- there is ambiguity around whether pre-releases affect the within-year release requirement.

Determination of unused spill

Key to both the within-year release requirements and wet sequence protection provisions is the calculation of unused spill, which is linked to physical spills and/or flood pre-releases¹⁸ from Hume and Blowering dams.

Snowy Hydro Limited has expressed a desire to reform the spill compensation arrangements, citing deficiencies it believes exist in the calculation of unused spill. In summary, Snowy Hydro Limited considers any compensation for early release from the required annual release should:

- only be provided to the extent the volume of early release contributes to the spill downstream, that is, any unused spill should be proportional to other inflows contributing to the spill
- take into account Snowy Hydro Limited's minimum release obligations.

In considering these proposals previously, the WCLC has also noted that the volume of unused spills should be limited to accountable releases from the Snowy Mountains Scheme (that is, regulated releases) and that changes to downstream water user behaviour, as a consequence of water policy reforms, could affect the ability of the downstream water storages to regulate early releases from the Snowy Mountains Scheme when compared to baseline conditions, being at corporatisation in 2002.

Further, the WCLC has identified and discussed inconsistencies in how unused spills are calculated for the Snowy–Tumut and Snowy–Murray developments due to the pre-release compensation arrangements that exist in the Blowering Air Space Deed. The compensation clauses in the deed operate in a way that potentially reduces the volume of unused spills calculated under the licence, thereby reducing the volume of releases regulated by the Murrumbidgee River system.

There may also be opportunities to investigate the usefulness of the spill compensation mechanisms where, similar to the call out of the previous year's relaxation volume, they may not generate compensation when they are most needed downstream (that is, during a dry period).

¹⁷ This agreement was inserted into the licence in variations that came into force in May 2010.

¹⁸ 'Pre-releases' are commonly used to describe early releases of water from a reservoir to manage risks of flooding. It does not appear in the definition of unused spill in the Licence because the term is adopted in the Blowering Airspace Deed to meet a different purpose.

Flood mitigation

The provision in place to manage Tumut River flooding restricts Snowy Hydro Limited from releasing water from Jounama Dam when Blowering Dam is spilling and downstream flows in the Tumut River exceed the operating channel capacity (Clause 12.4, Schedule 4). During these periods Snowy Hydro Limited cannot release a daily volume that exceeds the volume that would have passed through the Tumut River at Jounama Dam had the Snowy Mountains Scheme not been constructed.

To manage the impact this restriction has on Snowy Mountains Scheme operations and allow for emergency electricity generation, Snowy Hydro Limited has entered into an agreement with the Ministerial Corporation to manage the likelihood of the provision being triggered. Under the agreement, known as the Blowering Air Space Deed, Snowy Hydro Limited may notify an airspace volume in Blowering Reservoir of up to 190 gegalitres that the Ministerial Corporation (WaterNSW) must target in its operations. To offset the water lost from the reservoir as a consequence, Snowy Hydro Limited maintains a separate above-target water account in the Snowy–Tumut Development that is used to compensate the Murrumbidgee system at a later date.

Snowy Hydro Limited has identified an operational constraint within the *Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2016* that impacts WaterNSW’s ability to target the notified air space volumes and thus increases the volume of required annual release spilled from Blowering Reservoir and the likelihood of major flooding. It claims the operating channel capacities of 9 gegalitres per day at Oddy’s Bridge and 9.3 gegalitres per day at Tumut are too low and recent experience has shown it may be possible to operate to higher rates.

Other submissions raised flood mitigation and the Snowy Mountain Scheme’s capacity to help manage flood risks as an issue worth investigating through the review. In addition to the constraints below Blowering Dam, it was also highlighted there is no limit on releases from the Snowy–Murray Development to the upper River Murray while Hume Dam is spilling. Concerns were raised that Snowy Hydro Limited has in the past continued to release water to the upper Murray River when pre-releases were being made from Hume Reservoir and capacity existed in Lake Eucumbene to retain water in the Snowy Mountains Scheme.

Table 21. Actions relating to the timing of releases

Action 16—Timing of releases	Lead	By when
NSW Department of Industry, in partnership with Snowy Hydro Limited, MDBA, WaterNSW and the Victorian and Commonwealth governments, will: <ul style="list-style-type: none"> A. review the effectiveness of spill compensation and flood mitigation arrangements B. investigate options to improve licence rules around the timing of releases to increase water use efficiency and flood management outcomes. 	NSW Department of Industry	2020

6.4.2.5 Accounting for inter-valley water transfers

Inter-valley water transfers are described in Clause 9.2, Schedule 4 of the licence as releases of:

- water available to the Snowy–Murray Development to either or both the Tumut River catchment and the Murrumbidgee River catchment

or

- water available to the Snowy–Tumut Development to the River Murray catchment upstream of Hume Dam.

The required annual release formulae include references to increases or decreases due to inter-valley water transfers from either development. However, there is no recognition of bulk transfers between developments in Clauses 2.1 and 3.1, Schedule 4, which specify the water available to the Snowy–Murray Development and Snowy–Tumut Developments respectively.

In 2009, the WCLC agreed that an inter-valley water transfer should be complemented by a transfer in water availability for each development and has been operating in accordance with this arrangement since 2009–10.

It is proposed to codify this arrangement in the licence by amending the formulae to calculate development water availability at clauses 2.1 and 3.1 to include reference to the volume of annual inter-valley water transfers.

Table 22. Actions relating to inter-valley transfers

Action 17—Accounting for inter-valley transfers	Lead	By when
Clauses 2.1 and 3.1, Schedule 4 of the licence will be varied to ensure the method used to calculate the water available to each development reflects any inter-valley water transfers.	NSW Department of Industry	2019

6.4.2.6 Releases from Tantangara Dam

The licence was varied in 2010 to place a minimum release obligation from Tantangara Dam (Clause 12A, Schedule 4). Specifically, the requirement obliges Snowy Hydro Limited to release the lesser of 83 megalitres per day, or natural inflows, to maintain the flow of the Murrumbidgee River at Mittagong Crossing at 32 megalitres per day. These releases are made from below-target water reserves.

A submission questioned whether the intent of the variation was to ensure higher volumes of SMRIF could be released to deliver water held under ACTEW AGL's high-security Murrumbidgee licence or increase the reliability of supplies for ACT's water licences held in the upper Murrumbidgee.

As stated in the five year report, this variation was provided to secure a reliable water supply for Cooma. Further, releases of base passing flows are made in addition to releases of SMRIF. This is reiterated in numerous clauses throughout the licence.

However, the WCLC did agree that any Tantangara releases above the normal riparian release arrangements required to maintain Cooma township water supply would be accounted as SMRIF releases. While this decision has not influenced the design of the SMRIF strategy, as some stakeholders have questioned, it has risked SMRIF being diverted downstream. Numerous stakeholders raised concerns around the protection of SMRIF and SRIF downstream of the Snowy Mountains Scheme and will be considered separately to the review.

6.4.2.7 Early season commitment of Snowy Mountains Scheme releases

Several submissions identified an opportunity for Snowy Mountains Schemes water reserves to contribute to early season water availability in the River Murray and Murrumbidgee River systems. Changes to available water determination inputs, such as minimum inflow assumptions, and more frequent dry periods are resulting in low water availability at the beginning of the water year. Relying on future inflows to increase water allocations over the year introduces significant uncertainty for irrigators and environmental managers, making it difficult plan the forthcoming year's water use. Notably, persistent DISVs are contributing to this issue because the required annual releases used to be a reliable source of inflows that could be relied on at the start of the water year.

One method used to manage this issue in recent years is commonly referred to as 'above-target water borrow' or 'Snowy advance'. While the arrangements have differed over the years, such borrows are essentially a commercial agreement between water service providers and Snowy Hydro Limited and approved by Ministerial Corporation, whereby:

- Snowy Hydro Limited agrees to release a volume of above-target water in return for a fee and often more flexible releases arrangements.
- The borrowed water is allocated through state water sharing plans to the water service provider, who assigns it to affiliated customers.
- Snowy Hydro Limited is paid back through a reduced requirement to release below-target water (that is, a reduction in required annual release, which leads to a transfer of below-target to above-target water) when downstream water availability improves.

- The water service providers that received the advance are required to make good the required annual release reduction to avoid third-party impacts, for example by ‘writing off’ or forfeiting water allocation.

Beneficiaries of previous Snowy advances have advocated for the review to consider developing similar market-based approaches to help water users manage low water availability years. Supporters believe they provide a win-win for water and electricity generation interests—downstream water users benefit from early season water at reasonable prices, and Snowy Hydro Limited benefits from financial payment and increased flexibility.

However, not all stakeholders support these advances. They cite concerns that the benefits are not available to all water users, they risk impacting third-parties, the arrangements are not governed by the licence or relevant water sharing plans and the required approval process is resource intensive for regulatory agencies.

An alternative option has also been proposed by the MDBA. Instead of borrowing above-target water, it has proposed the required annual release be supplemented by a fixed volume when there is a DISV early in the season, which would provide for increased water allocations downstream. This supplement could be underwritten by above-target water held in the Snowy Mountains Scheme and called on if the DISV fails to recover during the year. The appropriate supplement volume would need to be determined through modelling and consultation with affected parties.

Further work is required to understand the costs, benefits and risks associated with various borrow/advance options, however it is clear pursuing this work is a priority for water users.

Table 23. Actions relating to early season commitments

Action 18—Early season commitment of release volumes	Lead	By when
NSW Department of Industry, in partnership with Snowy Hydro Limited, the MDBA, WaterNSW and the Victorian and Commonwealth governments, will investigate options to secure commitment of releases from the Snowy Mountains Scheme to support increased early season water allocations for Murray or Murrumbidgee water users.	NSW Department of Industry	2020

6.4.3 Water accounts

Clause 16, Schedule 4 establishes water accounts relevant to the Western Release Requirements and places obligations on Snowy Hydro Limited to maintain them. They include the:

- River Murray and Murrumbidgee River Drought accounts
- Snowy–Murray Development DISV Reserve and Snowy–Tumut Development DISV Reserve.

Snowy Hydro Limited is also required to maintain environmental accounts in accordance with Schedule 3, being:

- SRIF
- SMRIF
- Snowy–Murray Development¹⁹
- Mowamba Borrowings Account.

The MDBA is responsible for maintaining an account for RMIF in the Snowy Mountains Scheme²⁰ in accordance with provisions in the *Murray–Darling Basin Agreement*.

¹⁹ The Snowy–Murray Development account specifies the volume of River Murray annual allocation that Snowy Hydro Limited transfers to above-target water in the Snowy–Murray Development (Clause 1.2, Schedule 3).

²⁰ The MDBA is obliged to maintain Initial River Murray Increased Flows Account and the River Murray Increased Flows in Authority Storages Account to track allocation, releases and use of RMIF in the Snowy Mountains Scheme and River Murray system.

6.4.3.1 Operation of the drought and DISV reserve accounts

Drought accounts

The drought accounts were established as part of a package of variations made to the licence in 2011. They respond to the agreement between Murray–Darling Basin States and the Commonwealth Government that critical human water needs are the highest priority water use and that conveyance water will receive first priority from the water available²¹. This agreement was reached during the Millennium drought when water supplies for critical human, stock, intensive industry and permanent plantings were at risk, and a range of contingency measures were required to ensure ongoing supply of water.

Establishing reserves in the Snowy Mountains Scheme was a more efficient way to meet this commitment than in the downstream storages. This is because the drought accounts:

- take advantage of periods when sudden recoveries in the Snowy Mountains Scheme would have forced repayment of accumulated DISV when downstream water availability had improved and the extra releases were not required
- store the mandatory reserves in the highest reservoirs, exposing them to less evaporation and ensuring they service the entire River Murray and Murrumbidgee systems
- do not take up valuable storage space in downstream reservoirs.

The drought accounts are established in Clause 16.1 of Schedule 4 and are credited with water when a DISV has accumulated in previous years, and there is a subsequent improvement in inflows to the Snowy Mountains Scheme that would allow the DISV to be repaid. This is defined in the licence as the ‘recovery amount’.

The accounts can hold up to 225 gigalitres in the Snowy–Murray Development and up to 150 gigalitres in the Snowy–Tumut Development and can be called out as additional releases from the Snowy Mountains Scheme when needed to support the delivery of critical human water needs. They do not store the water allocations for critical human water needs entitlements. Rather, they hold water in reserve to ensure there is enough water to run the river (that is, meet conveyance requirements) in the following year and thereby enable water required for critical human needs to be delivered. This benefits all water licence holders, not just those with critical needs.

Both accounts are full as at December 2018. Improvements in inflows in the years following the Millennium drought resulted in the Murrumbidgee and Murray drought accounts being credited 150 gigalitres and 215 gigalitres respectively. The Murray drought account was topped up with the final 10 gigalitres in 2016–17. No water has been called or forced out.

Some stakeholders believe this review provides a good opportunity to investigate whether the drought accounts are meeting their intent and to what extent they have impacted available water determinations. Concerns were raised around the impact crediting the drought accounts can have on the required annual release in any year compared to the benefits they might provide water users who had been subject to reduced water availability in the previous years through accumulation of a DISV. It is proposed to carry out this investigation.

DISV reserve accounts

Stakeholders were also interested in better understanding the function of the DISV reserve accounts and how they interact with the drought accounts.

The DISV reserve accounts are also credited when there is a recovery of DISV that had accumulated in previous years, but only when the drought accounts are full. The difference is that water stored in the DISV reserve accounts is not transferred to above-target water. Instead, it remains as below-target water and supports next year’s required annual release when conditions are dry and there is risk of a DISV and a reduced required annual release. It does this by reserving below-target in storage in the year of recovery and using it to offset the next year’s DISV.

The alternative is to release the water in the year of recovery at a cost to early season required annual release volumes in the following year.

²¹ This agreement is secured in Section 86A of the *Water Act 2007* (Commonwealth).

An investigation of the drought accounts also provides an opportunity to consider the effectiveness of the DISV reserve accounts and whether or not they are providing downstream water users the outcomes they are seeking.

Table 24. Actions relating to drought and DISV reserve accounts

Action 19—Drought and DISV reserve accounts	Lead	By when
NSW Department of Industry, in partnership with Snowy Hydro Limited, MDBA, WaterNSW and the Victorian and Commonwealth governments, will investigate the effectiveness of the drought and DISV reserve accounts and consider options for improving how they support downstream water user requirements.	NSW Department of Industry	2020

6.4.3.2 Sharing of net evaporation

The licence is silent on how net evaporation should be shared, which leaves it open to interpretation and makes it hard for stakeholders to find out how evaporation is accounted for. In practice net evaporation is shared at the bulk level between the Snowy–Murray and Snowy–Tumut developments and between below-target and above-target water in proportion to the volume of water held in these accounts. It is calculated monthly.

Some stakeholders have raised concerns about the current approach to sharing evaporation between below-target and above-target water. In addition, none of the water accounts established under the licence are debited net evaporation. As a consequence, it is only allocated to below-target water stored for required annual release and above-target water stored for Snowy Hydro Limited’s discretionary use. The impact of evaporation on these water reserves increases as the volume held in the accounts accumulates, particularly as more water is carried over between water years.

Snowy Hydro Limited believes the RMIF and Drought accounts should be debited net evaporation because the extra water stored in the Snowy Mountains Scheme as a consequence physically evaporates. They assert this is an oversight of the licence, not a deliberate act. Other stakeholders believe not subjecting these accounts to net evaporation was intentional, being a negotiated outcome.

Either way, the review provides an opportunity to investigate the potential impacts these arrangements are having on Snowy Hydro Limited and downstream water users and whether they should be varied to achieve more equitable outcomes.

Table 25. Actions relating to sharing of net evaporation

Action 20—Sharing of net evaporation	Lead	By when
NSW Department of Industry, in partnership with Snowy Hydro Limited, MDBA, WaterNSW and the Victorian and Commonwealth governments, will further investigate and resolve how net evaporation should be shared between bulk water accounts, including between below and above target water.	NSW Department of Industry	2020

6.4.4 Data provision and analytical models

The data provision and analytical model provisions at clauses 14 and 15 of Schedule 4 essentially establish obligations on both Snowy Hydro Limited and Ministerial Corporation to ensure the successful operation of the licence. Except for issues with estimating of baseline conditions (refer to section 6.4.2.2), stakeholders did not raise any significant issues with the adequacy of existing provisions.

However, it was highlighted that there is nothing in the licence compelling Snowy Hydro Limited or the NSW, Victorian and Commonwealth governments to provide data or modelling analysis to support future variations to the licence or investment in future efficiencies.

Using analytical tools to support decision-making is essential to making informed decisions and is consistent with how water management reforms are implemented elsewhere in Australia. It is also consistent with the expectations of stakeholders, who made it clear in the submissions that variations proposed through the 10 year review be supported by technical analysis.

It is not proposed to vary the licence to compel Snowy Hydro Limited to provide long-term data or develop an analytical model because doing so would not support the operation of the licence and risks creating an unnecessary administrative burden on Snowy Hydro Limited. However, the relevant water agencies and Snowy Hydro Limited will collaborate to improve modelling capability to support the investigations recommended from this review and any future reviews that propose to consider meaningful variations to the licence.

Not only is improved modelling capability in the best interests of both Snowy Hydro Limited and NSW, Victorian and Commonwealth governments, it is necessary to meet community expectations around decision-making.

7. Review of performance

The NSW Government is committed to an equitable and transparent approach to the management of our water for current and future generations. A key goal is to build a compliance and enforcement regime that ensures strong and certain regulation.²²

The review's terms of reference included a requirement to consider Snowy Hydro Limited's performance in meeting the conditions of the licence. To improve compliance effectiveness, The NSW Department of Industry commissioned an expert panel to independently carry out the performance review. It was decided to engage independent experts in recognition of the department's role in both administering the licence and overseeing the increased flows programs. More detail on the independent review of performance is provided in section 7.1.

Snowy Hydro Limited is confident it has complied with its obligations and used its submission to present its position, a summary of which is provided below in section 7.2. While compliance was not a major focus of the submissions, some stakeholders did raise issues with the management of increased flows, namely the management approach taken to account for spills of SRIF and meet SMRIF target volumes. These are summarised in sections 7.3, 7.4 and 7.5.

The panel's findings and recommendations are contained in the *Report of the Expert Panel for 10 Year Review of the Snowy Water Licence (2018)*, which can be accessed on the [NSW Department of Industry](#) website. The panel has made nine recommendations, which the NSW Government has accepted.

7.1 Independent expert panel review of performance

Alluvium Consulting was commissioned to convene and manage the expert panel, which was made up of David Winfield, Garry Smith and Ross Carter. Collectively the panel contained significant expertise in water and environmental management and regulation.

It was tasked with independently reviewing Snowy Hydro Limited's performance to date, based on Snowy Hydro Limited's assessment, the issues raised in the submissions, a collection of AWOPs and an audit of the systems and processes in place to determine and demonstrate compliance. It also considered the department's performance as the licensor.

Specifically, the scope of the project included reviewing:

- Snowy Hydro Limited's assessment of compliance with its licence obligations
- the appropriateness of the management approach taken to account for spills of SRIF and meet SMRIF targets
- the systems, procedures and frameworks in place to ensure Snowy Hydro Limited and the NSW Department of Industry can demonstrate Snowy Hydro Limited's compliance with the licence.

7.2 Snowy Hydro Limited and NSW Department of Industry performance

7.2.1 Approach to demonstrating compliance

Snowy Hydro Limited's submission to the 10-year review sought to demonstrate its performance in meeting the conditions of the licence. A copy of the submission can be accessed on the [NSW Department of Industry](#) website. In summary, Snowy Hydro Limited is confident it has complied with all its obligations as follows.

²² NSW Government's Water Reform Action Plan (industry.nsw.gov.au/water-reform/metering-framework)

It has complied with its administrative obligations by:

- making compliance reports publically available since 2010, outlining its performance against each of its obligations and a summary of its release requirements based on the relevant AWOP
- operating in accordance with the rights granted to it under clause 7 of the licence
- preparing AWOPs each year in accordance with the content, timing and consultation requirements
- procuring an independent audit of its annual compliance based on ISO19011.

It has complied with its increased flows obligations by:

- working constructively with the Ministerial Corporation to implement, manage and monitor all increased flow requirements.
- constructing an outlet at Jindabyne Dam that can, and has, enabled flow rates of up to 5 gigalitres per day to the Snowy River below the dam
- endeavouring to remain within the operational tolerances of the specified annual, monthly and daily targets from Jindabyne and Tantangara dams and successfully delivering flushing flows from Jindabyne Dam when directed by Ministerial Corporation
- collaborating with the Ministerial Corporation to identify suitable release points and deliver SMRIF to all five catchments listed in the licence in a way that sought to maximise the prescribed environmental objectives
- delivering SMRIF at a time and volume required by the licence and Ministerial Corporation, noting the impracticalities of achieving the exact targets envisaged under the SWIOD.

It has complied with its water release obligations by:

- operating in accordance with the water available to each development and preservation of catchment-based inflows obligations
- ensuring actual release volumes meet the required annual release
- providing the required data to the Ministerial Corporation and collecting and verifying data in accordance with the required standards
- maintaining the required water accounts and detailing them in the AWOP.

The NSW Department of Industry has been delegated Ministerial Corporation's responsibilities for the day-to-day operation and administration of the licence and, until 2019, planning for delivery of increased flows. The specific functions are explained in Table 1.

Broadly, the department has used the AWOP process, prescribed in clause 8 of the licence, and development of the increased flows strategies²³ to oversee and ensure compliance with the licence.

7.2.2 Expert panel findings and recommendations for demonstrating compliance

The expert panel focused on six key areas of compliance to positively assess Snowy Hydro Limited's submission and determine that it has the systems, procedures and frameworks in place to ensure it can demonstrate compliance with the licence. The panel's assessment is contained in sections 4 and 5.1 of its report and is summarised in Table 26 below.

The expert panel made no recommendations for Snowy Hydro Limited.

²³ Strategies for SRIF and SMRIF can be accessed from the NSW Department of Industry website – (industry.nsw.gov.au/water/basins-catchments/snowy-river/initiative)

Table 26. Summary of the expert panel's findings for Snowy Hydro Limited

Assessment Framework (Key areas of compliance)	Expert panel finding
Identification and understanding of compliance points and requirements	Snowy Hydro Limited has a clear understanding of the requirements of the licence and its compliance obligations.
Data acquisition approach and application of industry standards	Snowy Hydro Limited's data acquisition systems and processes are based on accepted industry standards and controlled under an accredited quality management system.
Data management systems and quality assurance approach, and use of industry standards	Snowy Hydro Limited's data management systems and quality assurance processes are consistent with relevant industry standards and subject to independent verification annually.
Due diligence, risk management, audit and verification	Snowy Hydro Limited operates a range of risk management systems and processes based on international standards for risk management.
Reporting and transparency	Snowy Hydro Limited publishes its compliance management activities in a number of different forms, which presents water licence compliance information to both internal and external parties.
Governance	Snowy Hydro Limited has in place governance processes that are designed to provide effective oversight to compliance, and emphasise its importance.

The expert panel adopted a different framework for assessing the NSW Department of Industry's ability to effectively oversee compliance with the licence. The key elements of the framework were derived from literature and designed according to the unique nature of the Snowy Mountains Scheme's regulatory framework.

The expert panel's assessment is contained in section 5 of its report and is summarised in Table 27 below. It made three recommendations based on its findings.

Table 27. Summary of the expert panel's findings for the NSW Department of Industry

Assessment Framework (Key concepts and regulatory practice)	Expert panel finding
Responsive regulation Responses to problems are tailored and informed by a range of people, including those well placed to fix the problem.	The department is applying responsive regulation principles in its administration of the licence. However, there is little evidence of policy or procedural guidance on how consideration of formal sanctions or decisions should be made in the unique context of the licence.
Risk-based regulation Information, intelligence and data are used to identify the risks to the objectives of the regulator and determine the significance of the risk.	The licence provides an inherently robust compliance environment. This is complemented by the scrutiny and measurement undertaken by water managers and users downstream of the Snowy Mountains Scheme. However, the compliance environment did not demonstrate the application of risk-based regulation.
Regulatory craft The role of regulators incorporates the administration of processes, procedures, approaches and policies to give practical effect to law.	The department could increase rigour and transparency for decision-making involving interpretation. Professional scepticism is an important aspect of a regulator's role and utilising appropriate regulatory tools to test potential areas of risk is the usual approach to exercising this scepticism.

Assessment Framework (Key concepts and regulatory practice)	Expert panel finding
<p>Expertise</p> <p>The regulator is seen to have valid expertise and independence, and engages responsively with diverse groups/views.</p>	<p>The department has a long history of involvement in the management of the Snowy Mountains Scheme and built substantial corporate knowledge across a range of officers. However, the areas of the department responsible for administering the licence had not been immune to the extensive changes and loss of corporate capacity in recent years.</p>
<p>Stewardship</p> <p>The regulator demonstrates integrity and ethics, is consistent over time and meets commitments. It demonstrates fair decision-making processes, is receptive to diverse public concern and demonstrates commitment to continuous improvement.</p>	<p>Submissions to the licence review indicate a level of distrust and opaqueness in the administration of the licence. Community trust and confidence is likely to be improved by implementing and demonstrating regulatory best practice.</p>
<p>Transparency</p> <p>The regulator demonstrates accessibility and responsiveness, provides accurate and useful information, devotes resources to communicating information and assists the capacity of the community to engage with information.</p>	<p>Information about the licence, the SRIF and SMRIF are not easily accessed and drawn together to provide a coherent narrative. This is exacerbated by an overly cautious approach to publishing information with relevant decisions (and their reasons) and interpretation.</p> <p>While reasonable decision-making processes were evident, it is unlikely stakeholders have an understanding of these processes, much less confidence in them being fair, rigorous and tested.</p>

The expert panel's recommendations for the NSW Department of Industry respond to challenges associated with the technical complexity of the licence, an overly conservative approach to confidentiality and a lack of communication. It identified improvements to licence administration that will build community confidence by applying regulatory best practice.

The expert panel has recommended the Ministerial Corporation:

- R3.1** Develop a suite of regulatory policies, within the overarching Departmental Policy Framework, specific to the oversight of the Snowy water licence and regulation of Snowy Hydro Limited.
- R3.2** Improve the governance of the AWOP process (including the role of the WCLC), and of the interpretive decisions that are recorded in it, to increase transparency and confidence in its rigour.
- R3.3** Adopt an 'if not, why not' publication position on all policies, decisions, information and processes to the extent that it does not compromise the commercial operations of Snowy Hydro Limited.

7.3 Accounting for spills from Lake Jindabyne

7.3.1 Approach to accounting for spills and stakeholder issues

In March 2012, Snowy Hydro Limited determined that 16 gigalitres spilled from Lake Jindabyne in excess of the specified daily SRIF release targets. Ministerial Corporation, with the support of Snowy Hydro Limited and WCLC, agreed these spills were the consequence of Snowy Hydro Limited holding Lake Jindabyne higher than it would have if it was not targeting releases from the dam in accordance with the SRIF program strategy.

The accepted rationale was that Snowy Hydro Limited could have delivered the annual target volume of 163 gigalitres by releasing a constant daily flow rate if the 1 May storage level was 903.1 meters without inflows.

Starting the year at this storage level would have had a 25% chance of achieving the required flushing flow, but would have been successful in preventing spills.

To achieve a greater chance of delivering the flushing flow event, Snowy Hydro Limited was required to target a higher storage level throughout the year, which prevented it from avoiding the spill. Thus, it was agreed the accounted spills of 16 gigalitres would not have occurred if Snowy Hydro Limited had not been required to prepare the storage for the flushing flow release.

In total, eight gigalitres was accounted as a borrow against SRIF in future years in accordance with Clause 16.1, Schedule 3 of the licence. This equalled the balance of the SRIF account at the time of spill.

It was agreed the SRIF borrow amount would be repaid at a rate of two gigalitres per year over four years, commencing 2015–16. The volume is being repaid to below-target water reserves.

A number of stakeholders dispute the decision to account the spills as SRIF, claiming they occurred due to a natural event and reflect the realities of water operations. They have sought that the eight gigalitres be paid back to the SRIF account.

7.3.2 Expert panel findings and recommendations for the accounting for spills from Lake Jindabyne

The expert panel found the management approach taken to account for the March 2012 Lake Jindabyne spills was appropriate. However, it also found the language used in the relevant licence provisions (clause 16.1, Schedule 3) is complex and could be confusing to some readers.

The expert panel has included one recommendation aimed at improving clarity on how spills are accounted in the licence.

The expert panel has recommended:

- R2.1** the Ministerial Corporation consider redrafting Clause 16.1 of Schedule 3 to improve the clarity of the provisions, and to incorporate any relevant learnings around the identification and allocation of risks arising from delivery of SRIF flushing flows. In addition, it is recommended the Department consider developing a plain English explanation of the intent of the Licence, for communication with community stakeholders.

More detail on the expert panel's findings and recommendation is provided in section 6.1 of its report.

7.4 Accounting of unregulated flows over Mowamba River and Cobbon Creek weirs

As stated earlier in the report, base passing flows are made in addition to releases of increased flows. This is reiterated in numerous clauses throughout the licence, as well as the SWIOID. Base passing flow is defined in both instruments as:

- **with respect to the Snowy River**, the volume of nine gigalitres per water year from Jindabyne Dam plus the non-regulated flow past the relevant works on the Mowamba River and Cobbon Creek prior to the corporatisation date
- **in the case of the Upper Murrumbidgee River**, the long-term average volume of two gigalitres per water year from Tantangara Dam
- **with respect to works on the Snowy montane rivers**, the unregulated flow of the relevant river past the particular work prior to any modification to that work required under the licence.

As acknowledged in the SWIOID (Clause 7.3), base passing flows contributed to the derivation of increased flows volumes under the Snowy Water Inquiry. Water recovery targets, when presented as percentage flow equivalents (for example 21% average natural flow of the Snowy River), comprise a volume of base passing flows, some of which are unregulated, in addition to regulated releases.

Concerns have been raised that the unregulated flow contribution over Mowamba River and Cobbon Creek weirs is being accounted as a regulated release of SRIF instead of base passing flows, consequently reducing the volume of water delivered down the Snowy River. It is asserted the impact could be as much as 2% of average natural flows over the long-term.

The NSW Department of Industry did not refer this issue to the expert panel. With the exception of spills from Lake Jindabyne (under certain circumstances), the delivery of SRIF is accounted as water released by Snowy Hydro Limited to meet the daily, monthly and annual targets specified by the Ministerial Corporation. This is in addition to regulated base passing flow releases of nine gigalitres per year from Jindabyne Dam²⁴ and unregulated flows, which are unaccounted for. Further, when delivering SRIF from Mowamba Weir, for example in recent experimental releases from the Mowamba Aqueduct, only releases up to the capacity of the aqueduct, excluding the existing base passing flow release, were accounted as SRIF.

7.5 Compliance with Snowy Montane Rivers Increased Flows

7.5.1 Managing Snowy Montane Rivers Increased Flows and stakeholder issues

Some stakeholders expressed concerns that the management approach developed by Snowy Hydro Limited and Ministerial Corporation for the SMRIF program is not meeting the SWIOID targets specified in the licence.

Specifically, there are concerns that:

- the modifications to Snowy Hydro Limited's works cannot deliver the river reach or overall target flow volumes, pointing to a shortfall of 36.5 gigalitres in 2017–18—the first year when full allocations were available
- SMRIF cannot be delivered from Guthega or Island Bend Dams, thus failing to restore flow to the entire upper Snowy River
- A disproportionate amount of SMRIF is being delivered to the upper Murrumbidgee River at the expense of the upper Snowy River.

The SMRIF program implements environmental flow regimes for the Snowy montane rivers in line with Part 5, Schedule 3 of the licence. Accordingly, the SMRIF program supports increased flows in the Murrumbidgee River, Goodradigbee River, Geehi River and upper Snowy River.

The program is governed by agreed annual target volumes for each river reach, a set of overarching environmental objectives and a requirement to determine specific objectives for each target river. It is supported by obligations on Snowy Hydro Limited to:

- modify works on these rivers to increase the amount of unregulated flow
- construct an outlet at Tantangara Dam to allow regulated flows of up to 1.5 gigalitres per day down the Murrumbidgee
- operate the works to deliver a defined volume of increased flows.

SMRIF program targets

The SMRIF program targets are prescribed at Table 1, Schedule 3 of the licence. It replicates the agreed targets prescribed in the SWIOID for five catchments (or river reaches) within the Snowy Mountains Scheme.

Similar to the SRIF program, targets were set progressively over 10 years from the corporatisation in tandem with increases in water recovery. However, unlike the SRIF program, the targets are represented as forgone electricity generation, with the maximum target being 150 gigawatt hours per year. Final SMRIF program targets are presented in Table 8.

Modifications to works

Snowy Hydro Limited is responsible for modifying any works to pass the required SMRIF after seeking the advice of the WCLC. However, with the exception of Tantangara Dam, there is no obligation within the licence to carry out major structural changes to any infrastructure.

²⁴ Base passing flows from Jindabyne Dam include a regulated release of 8.5 gigalitres per year from Jindabyne Dam and a riparian release of 0.5 gigalitres per year from Mowamba Weir.

In each instance, Snowy Hydro Limited assessed the inflows and engineering of each of the works within each catchment and recommended to the WCLC how and where modifications should be made²⁵.

The works identified as suitable release locations for SMRIF are presented in Table 28. These locations have been chosen to maximise the degree to which SMRIF will be delivered to meet the environmental objectives.

Each weir has been modified to either allow all water to pass downstream (that is, 'transparent' releases) or, in the case of the Goodradigbee River, allow a proportion of the daily inflows to be released (that is, 'translucent' releases). It is anticipated that the hydrological characteristics downstream of the weir under the modified flow regimes will reflect the hydrology of a Snowy montane river/stream.²⁶

The weirs were selected as release locations rather than dams as they provide alternative ecological benefits not capable of being delivered via large dams and are simpler to implement.²⁷

As discussed earlier in the report, Snowy Hydro Limited has also met the obligations in the licence to construct the outlet at Tantangara Dam capable of delivering 1.5 gigalitres per day. These works enable Snowy Hydro Limited to meet daily, monthly and annual volumes targeted under the SMRIF program, instead of relying on inflows.

Table 28. Summary of the Snowy montane river increased flows program

River reach/catchment	Target forgone electricity generation (GWh)	GWh conversion factor	Increased flow target (GL)	Modified works	Average annual yield
Murrumbidgee River	52.4	1.94	27.0	Tantangara Dam Outlet	27.0
Goodradigbee River	23.3	1.94	12.0	Goodradigbee River Weir	12
Geehi River	36.6	1.85	19.8	Middle Creek Weir Strzelecki Creek Weir	22.7
Snowy River – Gungarlin	20.6	0.71	29.0	Tolbar Creek Weir Diggers Creek Weir	18.9
Snowy River – Perisher/Rams Flat	17.1	0.57	30	Falls Creek Weir	3.4
Total	150	-	117.8	-	84.0

Volume of increased flows

The volume of SMRIF to be made available is prescribed in clause 22, Schedule 3 of the licence. The volume available annually depends on how much water is allocated to SRIF and where it will be released.

The licence provides for a maximum volume equivalent to 150 gigawatt hours of forgone electricity generation across the five river reaches. How much electricity Snowy Hydro Limited is obliged to forgo each year is proportional to the volume of water available to SRIF. For example, when 212 gigalitres is allocated to SRIF Snowy Hydro Limited may be obliged to forgo up to 150 gigawatt hours of electricity generation in delivering SMRIF. If 106 gigalitres is allocated to SRIF (that is, 50% of its maximum), then Snowy Hydro Limited may only be obliged to forgo up to 75 gigawatt hours of electricity generation.

²⁵ Source: *Snowy Water Licence Review*, Snowy Hydro Limited Submission, 13 October 2017.

^{26,22} Source: Williams, S. (2017), *Release strategy for the Snowy Montane Rivers Increased Flows, 2017–18*. *Snowy Response Monitoring and Modelling Program*, NSW DPI Water, Sydney.

A set of factors has been agreed between partner Snowy governments and Snowy Hydro Limited to convert forgone electricity generation to water volumes based on long-term average generation and release records. These conversion factors are secured in the licence at Table 1, Schedule 3 and are shown in Table 8 below. Different conversion factors apply at different locations based on the impact SMRIF releases would have on electricity generation. Higher factors mean greater impacts and result in lower water volumes. Generally, higher factors occur when a release cannot be re-regulated by the Snowy Mountains Scheme downstream.

Accounting for Snowy Montane Rivers Increased Flow deliveries

As explained earlier, SMRIF releases from the weirs reflect catchment inflows to the weir pool because it is not practical to prescribe a daily flow target.

Accordingly, the SMRIF program sets a long term annual yield for the weirs rather than defined flow targets. This means the annual volume will average the nominated target over the long term, but will vary annually depending on the weather, reflecting the hydrology of the inflows. In wetter years the flow will exceed the long term target and in drier years the annual volume will be less than the target.

This means that weir releases are made and accounted for based on long-term historical or modelled data on a largely 'set-and-forget' basis. For example, where a weir is configured to target a passing flow of nine gigalitres, regardless of what volume actually passes that structure as a result of annual climatic fluctuations.

In contrast, releases from Tantangara Dam must be accurately targeted and released with any shortfalls or excesses to be made good in the following year. This allows Tantangara Dam to be used to manage any annual variations of SMRIF weir deliveries.

Variation of Snowy Montane Rivers Increased Flows program²⁸

To date, the allocation of water to the SMRIF program has varied each year. This variation has occurred due to a gradual increase in water entitlements, climate variability, operational issues at existing infrastructure, and optimising use of the available environmental water.

Until 2017–18, insufficient water has been available to meet the annual targets specified in the SWIOID, and there is also some uncertainty that the annual targets can be met with a full 150 gigawatt hour allocation. Achieving exact targets is difficult due to the nature of the works and what they can realistically deliver. Therefore, a conservative and staged approach has been implemented to ensure sustained long-term ecological improvements at each montane location.

Snowy Hydro Limited and the NSW Department of Industry have optimised the use of increased flows by varying annual allocations to the upper Murrumbidgee River and staging the commissioning of each release location in the weirs program. The resultant average annual yield of the SMRIF program is presented at Table 8.

Snowy montane rivers—weirs

Two variations to the SWIOID annual targets are currently being implemented in the Snowy montane rivers weirs.

Firstly, in the upper Snowy River catchment lower annual targets are being implemented. This lower target reflects issues associated with the overall available water, and a staged implementation within Perisher Range.

Secondly, in the Geehi River Catchment, a slightly higher annual target is being implemented. For the third year, an additional volume of 5.2 gigalitres per year is being released to the Geehi River via a tributary release on Strzelecki Creek. The annual SMRIF volume is expected to provide improved ecological outcomes for the Geehi River given the additional connectivity to higher altitude headwaters.

²⁸ Source: Williams, S. (2017), *Release strategy for the Snowy Montane Rivers Increased Flows*, 2017–18. *Snowy Response Monitoring and Modelling Program*, NSW DPI Water, Sydney.

Snowy montane rivers—dams

The ability to actively manage environmental releases from Tantangara Dam to the upper Murrumbidgee River provides the flexibility to accommodate changes in total annual allocation to SMRIF.

In 2017–18, a greater allocation was provided to the upper Murrumbidgee River to allow a better mimicking of the local hydrology across most of the year and greater physical reworking of the river benthos and in-channel habitats during winter and spring. In 2018-19, a much lower total of 5.7 GL has been allocated to the upper Murrumbidgee River. This is necessary because releases from the montane weirs cannot be controlled, and the total 2018-19 allocation to SMRIF is lower than in 2017/18.

7.5.2 Summary of expert panel findings and recommendations for managing SMRIF

The expert panel focused on three key areas of the licence in assessing the NSW Department of Industry's and Snowy Hydro Limited's approach to implementing the SMRIF program. The panel's assessment is contained in section 6.2. of its report and is summarised in Table 29 below.

Table 29. Summary of the expert panel's findings on the management of the SMRIF program

Assessment Framework (Key areas of the licence)	Expert panel finding
Objectives, performance measures and strategy	The lack of a definitive record of strategic planning decisions being made by partner Snowy governments raises ambiguities in terms of whether decision-making, trade-offs and strategic direction is being made by the parties intended and at the decision-making level intended.
Proposals for modifications of works	<p>Snowy Hydro Limited brought forward proposals for SMRIF works that were reportedly developed with NSW Department of Industry staff. However, detailed technical review and testing by the department and partner Snowy governments (through WCLC), could have provided confidence that these proposals met the intent encompassed in the SWIOID and the licence, in terms of environment and energy generation trade-offs, together with the trade-off between the Upper Murrumbidgee and other montane rivers.</p> <p>Snowy Hydro Limited's delivery of the SMRIF was in compliance with the AWOP, agreed by WCLC and approved in an annual formal notification by Ministerial Corporation.</p>
SMRIF and Table One, Schedule 3	<p>The (proportional) matching to the prevailing climate of the long-term average annual yield approach represents good practice in environmental flows. It is consistent with some clauses of the licence, but in tension with other terminology.</p> <p>Each SMRIF works modification decision is validly supported, while alternative decisions could also have been valid—that is, judgement was required. The key vulnerability is the absence of public documentation beyond the annual strategies.</p> <p>There is clearly a tension in the provisions of the SWIOID and licence within respect to the role of Table One, and in the understanding of the department as licensor and Snowy Hydro Limited as licensee. Secondly, the failure to amend Table One to reflect the agreed approach and any improved knowledge did not support transparency and communication to stakeholders—and indeed has contributed to confusion.</p>

The expert panel made three recommendations based on its findings:

- R2.2** The partner Snowy governments initiate a decision process at the appropriate level to update and confirm SMRIF objectives, performance measures and strategy. Once confirmed, these should be made easily accessible on a single online platform, together with compliance reports and performance measures monitoring.

R2.3 The NSW Department of Industry initiate independent technical review of the adopted SMRIF modifications and alternative options, and assess costs, benefits and optimisation against the identified objectives, performance measures and strategy. Consistent with good practice for environmental flows and water planning, the department could undertake monitoring, evaluation and reporting against the identified performance measures, in order to inform such reviews and assessment.

R2.4 The NSW Department of Industry review and amend the Snowy water licence in a timely fashion where (a) the provisions are found to be onerous, inefficient or ineffective in supporting the intent (as per the SHC Act and the SWIOLD), and/or (b) revision of specific environmental objectives is supported by scientific investigation.

7.6 Overarching themes and expert panel recommendations

The expert panel also presented findings and recommendations in relation to responsibilities for environmental water management decisions, monitoring and review, and the frequency of licence amendments.

7.6.1 Responsibilities for decision-making and monitoring outcomes

The expert panel noted it is good practice to monitor the effectiveness of the partner Snowy governments' investment in environmental outcomes for the Snowy, Snowy Montane and Murray rivers. It recognised there has been considerable activity in monitoring the ecological outcomes. However, the increased flows strategies do not include monitoring the results, nor has the panel been successful in identifying reports evaluating ecological outcomes.

It pointed to its earlier findings about the importance of fair and robust decision-making processes that build in consultation, communication and expert advice, and incorporate reviews that are informed by a risk-based approach to testing and monitoring. The expert panel noted that professional scepticism is important, as is clear and regular communication of what has been done, what lessons have been learned, and what might be improved in future.

The expert panel also identified that management responsibilities for the Snowy montane and Snowy rivers increased flows risk falling between the cracks if the functions of the NSW Department of Industry and Office of Environment and Heritage are not clearly identified and funded.

The expert panel has recommended:

R4.1 The NSW Department of Industry embed a professional scepticism approach to testing options and decisions. This can also be embedded in the recommended risk-based rolling monitoring and reporting program.

The department and OEH clearly identify agency roles and responsibilities for bringing expertise to bear in testing proposals, accounts and outcomes of the SRIF and SMRIF.

Responsibilities and funding for the transfer of environmental management functions to OEH need to include an appropriate, cost-effective program for monitoring, evaluation, reporting and review of the environmental outcomes of the SRIF and SMRIF, reflecting the significance of investment in these outcomes.

7.6.2 Frequency of licence amendments

The expert panel noted that the WCLC, the NSW Department of Industry and Snowy Hydro Limited have agreed and approved and included in the AWOP various interpretations of ambiguous or discretionary clauses, water accounting treatments and the SMRIF program. It considers waiting 10 years to amend the licence to capture these agreements increases the chance that regulatory practice will diverge from the licence provisions and risks losing transparency and regulatory clarity. It also considered there is a risk that an incremental cumulative set of decisions could have unintended consequences when applied as a whole.

The expert panel has recommended:

R4.2 The NSW Department of Industry considers amending the licence at least every five years, to capture and clarify agreed interpretations of provisions, remove redundant provisions (and errors if any), harness any opportunities to simplify the licence and provide stakeholders with an opportunity to comment. Statutory review of the licence could remain 10-yearly.

7.7 NSW Government response to the expert panel's recommendations

The NSW Government has accepted all nine recommendations and is committed to working with Snowy Hydro Limited and partner Snowy governments to improve administrative oversight of the licence and delivery of the increased flows programs.

7.7.1 Improvements to Snowy water licence administration

The NSW Government is committed to strengthening water management compliance and ensuring transparency in how we share, allocate and manage water in NSW. We acknowledge that, as the regulator, we are obliged to act in the public interest and in doing so maintain an attitude of professional scepticism in our decision-making.

The NSW Department of Industry will review and expand on its internal regulatory policies and procedures for overseeing compliance with the licence, including:

- identifying and capturing ways to apply the regulatory tools available to it
- improving WCLC administration, operations and governance by providing secretariat support on behalf of the partner Snowy governments and helping develop standard operating procedures for decision-making
- publishing interpretive decisions of the WCLC (refer to section 6.2.2)
- developing and publishing plain English interpretations of the intent of licence provisions
- identifying and capturing practical ways to ensure we exercise and document professional scepticism
- identifying when to seek licence amendments outside the formal reviews to capture and clarify current practice, and simplify and streamline provisions.

The department will also embed best practice regulatory values and behaviours in these policies and procedures and adopt an 'if not, why not' publication position for communicating decisions.

The policies and procedures will guide the department's approach to managing non-compliance and decision-making and ensure it is well placed to effectively identify, monitor and manage risks alongside Snowy Hydro Limited and partner Snowy governments.

Table 30. Actions relating to demonstrating compliance

Action 21—Demonstrating compliance	Lead	By when
NSW Department of Industry will seek to apply regulatory best practice to the administration of the Snowy water licence by reviewing and updating regulatory policies and procedures consistent with the advice of the expert panel.	NSW Department of Industry	2019

7.7.2 Accounting for Jindabyne spills

The NSW Government welcomes the expert panel's finding that our approach to accounting for the March 2012 Lake Jindabyne spill was appropriate, but accepts the various spill related provisions in the licence are complex.

In recognition of this complexity, the NSW Department of Industry will investigate updating the various spill provisions to increase clarity and ensure the intent of the current arrangements is well understood.

Table 31. Actions relating to accounting for Lake Jindabyne spills

Action 22—Accounting for Lake Jindabyne spills	Lead	By when
The NSW Department of Industry, in partnership with Snowy Hydro Limited, OEH and the Victorian and Commonwealth governments, will seek to simplify Lake Jindabyne spills provisions.	NSW Department of Industry	2020

7.7.3 Management of the Snowy Montane Rivers Increased Flows program

7.7.3.1 High level decision-making

The NSW Government is committed to the outcomes of the Snowy Water Initiative and to building community confidence in the way the Snowy montane and Snowy rivers are managed. With the significant water recovery task complete, we are reforming environmental water management arrangements to ensure the recovered water is used to its greatest effect.

Firstly, we are transferring responsibility for increased flows from the NSW Department of Industry to the OEH. OEH prepares annual watering plans and annual outcomes reports on the use of water for the environment for river valleys across NSW. It is also developing plans to provide longer-term goals for environmental water management. OEH will apply this management framework to Snowy environmental water, including SMRIF, and be guided by the intergovernmental agreements agreed under the SWIOID.

OEH will be supported in its new role by the Snowy Advisory Committee, which is providing community and expert input on the volumes and locations of SMRIF releases and the timing and pattern of SRIF releases to the Snowy River. The Snowy Advisory Committee will operate under a contemporary management framework that will ensure it can respond to community and government needs.

These reforms will bring environmental water management in the Snowy Mountains into line with other rivers in NSW.

We will also re-establish the Snowy Water Government Officials Committee (SWGOC) to provide strategic advice and direction for water management in the Snowy River and Snowy Mountains, facilitate integration of activities between stakeholders, and set work priorities. The SWGOC will provide a forum to seek advice and gain endorsement of OEH's approach to planning for and delivering SMRIF and SRIF in the context of the SWIOID and other inter-jurisdictional water policy considerations.

More broadly, the SWGOC will:

- approve and/or review advice and recommendations concerning implementation of actions arising from the 10-year review of the Snowy water licence
- oversee the SWIOID
- provide strategic advice and recommendations to the respective government ministers concerning key water management issues in the Snowy Mountains
- facilitate coordination of water management and complementary management activities in the Snowy River basin
- oversee communication of agreed management decisions.

Table 32. Actions relating to Snowy Water Government Officials Committee

Action 23—Snowy Water Government Officials Committee	Lead	By when
NSW Department of Industry will re-establish the Snowy Water Government Officials Committee to jointly oversee and coordinate water management in the Snowy Mountains and ensure the NSW, Victorian and Commonwealth governments continue to meet agreed outcomes from the Snowy Water Inquiry.	NSW Department of Industry	2019

7.7.3.2 Technical review of Snowy montane rivers works

We agree the current SMRIF program will need to be reviewed against OEH's longer term goals. OEH will incorporate this review into its new role, supported by the Snowy Advisory Committee and guided by SWGOC and the WCLC. OEH has suitably qualified and experienced staff to plan and deliver environmental flows for optimum outcome and is suitably independent, having not been involved in previous SMRIF planning decisions. We will consider the need to commission further independent technical advice when the time comes, taking into account resource availability and funding priorities.

7.7.3.3 Snowy water licence review and update

We agree varying the Snowy water licence to reflect agreed approaches and incorporate improved knowledge is one way of ensuring SMRIF program transparency. As discussed in section 6.2.6, the licence can be varied at any time with the agreement of Snowy Hydro Limited, meaning there is flexibility to amend the licence to reflect and test current practice when a need is identified.

The NSW Department of Industry will reflect this approach in the internal regulatory procedures it develops under Action 21, and work closely with OEH and Snowy Hydro Limited to identify when a review is required.

7.7.3.4 Decision-making and monitoring

We agree with the panel's advice that effective decision-making includes fair and robust processes that build in consultation, communication and expert advice, and is informed by a risk-based approach to testing and monitoring.

OEH manages environmental water this way, so is well placed to deliver Snowy Montane rivers and Snowy River increased flows programs consistent with the expert panel's advice. It will seek input from the Snowy Advisory Committee and have access to technical expertise within the NSW Department of Industry and, where possible, Snowy Hydro Limited. Further, OEH will be responsible for improving environmental outcomes with the available environmental water and will assess, monitor and review management options against this broad objective.

OEH will also support the planning and delivery of SMRIF and SRIF through scientific monitoring and evaluation. OEH adopts a scientific approach to managing water for the environment, and its environmental watering targets and events include monitoring to assess the effectiveness of environmental flows. The level of monitoring and evaluation undertaken for the Snowy environmental flows will match the activities it carries out in other NSW catchments, and will have regard to the information needs of the Snowy Advisory Committee and investment in environmental water recovery for the Snowy and Snowy Montane rivers.

More details on the activities OEH undertake to support water for the environment can be accessed from the OEH website (environment.nsw.gov.au).

We will also work with partner Snowy governments through the SWGOC to coordinate cross-border monitoring and evaluation activities in the Snowy River.

Finally, we also agree it is important to clearly identify and agree on agency roles and responsibilities for SRIF and SMRIF. This is why we are securing these agreements in a memorandum of understanding between the NSW Department of Industry and OEH. The memorandum of understanding will cover functions assigned to the Ministerial Corporation and Minister for Regional Water under the licence and SWI/OID, and include current policy directions of the NSW Government in relation to environmental water management.

8. Implementation plan

8.1 Actions at a glance

The 10-year review includes 23 actions that will vary the licence, investigate better ways to deliver environmental flows and complementary management rules between the Snowy Mountains Scheme and downstream water supply systems and improve oversight and coordination of water management in the Snowy Mountains.

Key elements of the plan are summarised in Table 33.

Table 33. Key elements of the implementation plan

Measure	Summary of actions	Timing
Administrative licence amendments	<p>NSW Department of Industry will vary the Snowy water licence to increase transparency, simplify provisions, secure current practice and fix known errors. Specifically, the licence will be varied to:</p> <ul style="list-style-type: none"> oblige Snowy Hydro Limited to prepare a public AWOP that includes agreements of the WCLC remove Schedule 5 and instead reference publicly available information of water rights within the Snowy Mountains Scheme confirm Snowy Hydro Limited does not have to provide quarterly maximum release forecasts in the AWOP unless experiencing a wet sequence or it is requested by WCLC confirm Snowy Hydro Limited must include quarterly guaranteed minimum releases in the AWOP rather than lower bounds remove all provisions relating to the outlet construction works at Jindabyne and Tantangara dams and the operation of the Mowamba Borrowings Account clarify Snowy Hydro Limited may use operational data to report compliance against daily increased flow targets and hydrographically corrected data to report compliance with monthly and annual targets capture riparian flow releases of approximately 1.4 megalitres per day from Mowamba River and up to 2.4 megalitres per day from Eucumbene Dam correct drafting errors in the calculation of the Snowy–Tumut relaxation volume and definition of the ‘agreed annual release’ reflect WCLC drafting of clause 10.1, Schedule 4 and the definitions of ‘discretionary above-target water release’ and ‘recovery amount’ ensure the calculation of water available to each development reflects inter-valley water transfers. 	2019
Environmental water delivery investigations	<p>NSW Department of Industry and key stakeholders will explore better ways to deliver Snowy increased flows by:</p> <ul style="list-style-type: none"> finalising the Mowamba River investigation exploring opportunities to increase delivery flexibility ensuring governments can deliver an average annual flow of 212 gigalitres per year down the Snowy River cost-effectively investigating the trigger for accessing RMIF. 	2020
Water release investigations	<p>NSW Department of Industry and key stakeholders will clarify the definition of inflows for calculating the DISV and investigate:</p> <ul style="list-style-type: none"> the calculation methods for determining how to account for cloud seeding the interaction of DISV with other elements of the required annual release and its effectiveness in managing release requirements in a changing climate 	2020

Measure	Summary of actions	Timing
	<ul style="list-style-type: none"> improvements to the effectiveness of the relaxation mechanism the effectiveness of the flexibility and pre-release provisions the effectiveness of spill compensation and flood mitigation arrangements options to improve timing of releases to increase water use efficiency and flood management outcomes options to secure early season release commitments to support early season water allocations the effectiveness of the drought and DISV reserve accounts how net evaporation should be shared between bulk water accounts. 	
Second round of licence amendments	The Snowy water licence will be varied to implement the recommendations arising from the investigations into environmental water delivery and water release requirements.	2021
Snowy water management	NSW Department of Industry will: <ul style="list-style-type: none"> review and update its regulatory policies and procedures specific to the administration of the Snowy water licence consistent with best practice re-establish the SWGOC to jointly oversee and coordinate water management in the Snowy Mountains 	2019

8.2 Responsibilities

The NSW Department of Industry will implement the plan with the support of Snowy Hydro Limited and government agencies and committees with a direct interest in water regulated and released from the Snowy Mountains Scheme. Community interests will be represented through the Snowy Advisory Committee and already established consultation mechanisms in the southern Murray–Darling Basin.

Project governance arrangements are illustrated in Figure 5, and Table 34 provides an outline of the roles and responsibilities of the various agencies and corporations that will be involved in the implementation plan.

Figure 5. Project governance for the Snowy water licence review implementation plan

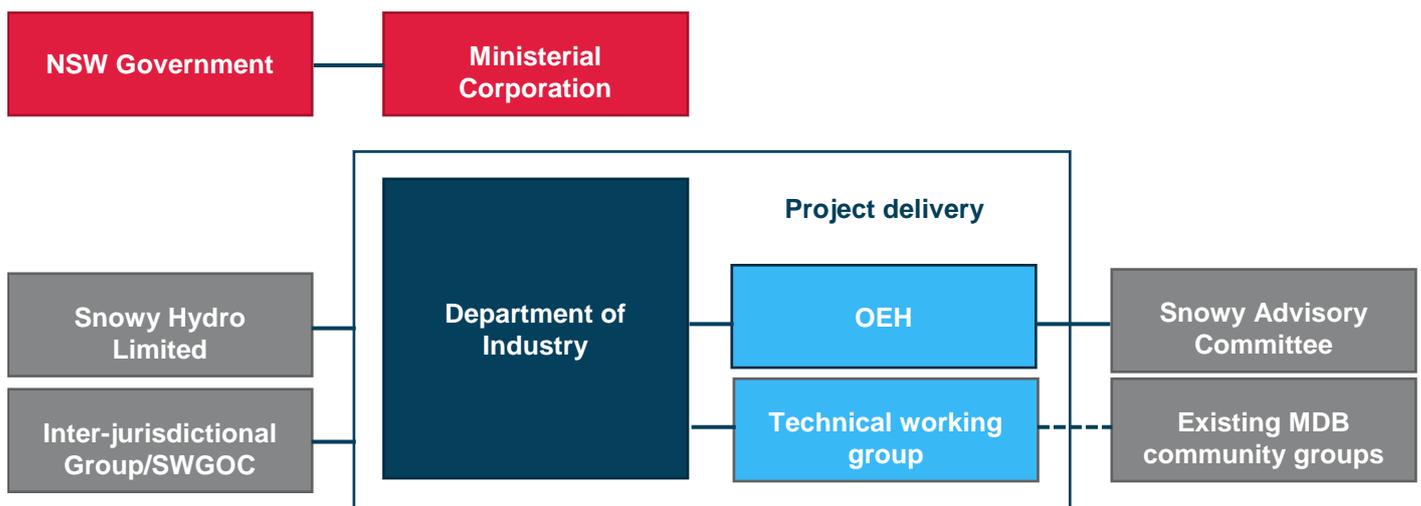


Table 34. Roles and responsibilities for the Snowy water licence review implementation plan

Who	Responsibility	Approvals	Project delivery	Technical input	Project advice
Minister for Regional Water	As Ministerial Corporation, responsible for reviewing the Snowy water licence, approving key outputs and gaining endorsement of the NSW Government.	✓			
NSW Department of Industry	Manage and deliver the plan, including project groups.	✓	✓	✓	✓
Office of Environment and Heritage	Partner with the NSW Department of Industry to deliver some of the review's environmental flow actions.		✓	✓	✓
Snowy Hydro Limited	As the licensee, provide advice and technical input to investigations and proposed licence variations. Also represented on Technical Working Group.			✓	✓
WaterNSW	Provide technical input to investigations and proposed licence variations. Represented on Technical Working Group			✓	✓
MDBA	Provide advice and technical input to investigations and proposed licence variations. Represented on Technical Working Group and Inter-jurisdictional Group.			✓	✓
Victorian Department of Environment, Land, Water and Planning	Provide advice and technical input to investigations and proposed licence variations. Represented on Technical Working Group and Inter-jurisdictional Group and SWGOC.			✓	✓
Commonwealth Department of Agriculture and Water Resources.	Provide advice and technical input to investigations and proposed licence variations. Represented on Technical Working Group and Inter-jurisdictional Group and SWGOC.			✓	✓
South Australian Department for Environment and Water	Provide advice on investigations and proposed licence variations. Represented on Inter-jurisdictional Group.				✓

As discussed in section 6.4.4, the relevant water agencies and Snowy Hydro Limited will collaborate to ensure their analytic modelling tools are capable of supporting the investigations. This will allow the various agencies, corporations and committees to undertake and engage stakeholders on detailed analyses of proposed variations to the licence, including the costs and benefits.

8.3 Stakeholder and community involvement

The NSW Department of Industry will continue engaging and consulting with stakeholders and the community through the formal project groups identified in section 8.2 and through public exhibition of proposed variations to the licence. Public exhibition of the second round of licence variations will be supported by stakeholder briefings and a further invitation for submissions.

APPENDIX 1: List of stakeholder submissions

Table 35. Submissions

Submitter	Round 1: 28 June 2017 to 13 October 2017	Round 2: 30 May 2018 to 6 July 2018
A G Andrich	✓	
Australian Dairy Industry Council	✓	
B R Dunn	✓	
C Gibson		✓
C Ingram	✓	
Coleambally Irrigation Co-operative Limited	✓	✓
Commonwealth Department of Agriculture and Water Resources	✓	
C Rogerson		✓
Dalgety Chamber of Commerce	✓	
Dalgety District and Community Association	✓	✓
E Guarracino & R Valler	✓	
Environment Victoria	✓	✓
Gippsland Environment Group	✓	✓
I E Pottage	✓	
K Tull		✓
M Talbot	✓	
Murray Irrigation Limited	✓	
Murray–Darling Basin Authority	✓	
Murray Valley Private Diversers (Inc)		✓
National Farmers' Federation	✓	
National Parks Association of NSW	✓	
New South Wales Irrigators' Council	✓	✓
Ricegrowers' Association of Australia	✓	
R Swain		✓

Submitter	Round 1: 28 June 2017 to 13 October 2017	Round 2: 30 May 2018 to 6 July 2018
Snowy Hydro Limited	✓	✓
Snowy River Alliance	✓	✓
V Wallace	✓	✓
Victorian Government	✓	✓
VR Fish		✓
WaterNSW	✓	✓
TOTAL	24	16