The Snowy River Alliance has sought advice on the impacts of Snowy 2.0 EIS from a number of ecologists and scientists and has grave concerns about the environmental impacts of the Snowy 2.0 project on the ecosystems of the Snowy River and other waterways.
The EIS falls short on transparency of the environmental impacts and options to prevent or manage these.

There are considerable risks to native fish populations and ecosystems.
While the Alliance has sought to improve the health of the Snowy River through increased environmental flows and restoring a natural headwater, the impacts of Snowy 2.0 would lay waste to these gains.

The studies commissioned indicate that there is a high residual risk of fish passing through the system as a consequence of Snowy 2.0.

The greatest risks are the transfer of Redfin Perch and associated EHN virus and the transfer of Climbing Galaxias (a native fish species, but poses a threat to Stocky Galaxias).

The transfer of Redfin Perch into Tantangara would put the Macquarie Perch in the Upper Murrumbidgee at risk. The effects of the virus on Snowy River or montane fish is unknown. Macquarie Perch are EPBC listed species.

The transfer of Climbing Galaxias to Tantangara would put the only known population of Stocky Galaxias at risk.
Stocky Galaxias only occur in 3-4km of Tantangara Creek upstream of Tantangara Reservoir and are currently being listed (however, because the listing is 'pending' they don't have to be considered).

While there is a proposal to put a barrier in Tantangara Creek to protect Stocky Galaxias, no details are provided. There is no indication that proposed species recovery activities would be similarly protected.

Mitigation measures (for the transfer of fish) have been deemed to be too costly and have too great an associated environmental impact which means they are not to be implemented. However, no details of the mitigation measures that were considered have been provided. This points to a lack of transparency and is unacceptable.

The Alliance is apprehensive about several aspects of the proposal for Snowy 2.0 scheme which would transfer water between Talbingo and Tantangara reservoirs, with concerns spanning both threatened and invasive fish issues.

The Tumut River Catchment and the upper Murrumbidgee River Catchment have a number of listed threatened fishes both under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) *and the NSW Fisheries Management Act 1994* (FM). Both Macquarie perch (*Macquaria australasica*) and Trout cod (*Maccullochella macquariensis*) are listed as endangered under the EPBC Act and the FM Act, and Murray

Crayfish (*Euastacus armatus*) and Stocky galaxias (*Galaxias tantangara*) are listed as Vulnerable and Critically Endangered (respectively) under the FM act. Stocky galaxias has also recently been listed under the Finalised Priority Assessment Lists for the EPBC, with an assessment due to be completed by October 2020).

As a NSW endemic, it is likely that the EPBC assessment will result in the same status as in NSW.

Macquarie perch is now highly fragmented with only a handful of large self-sustaining populations remaining, with the upper Murrumbidgee population considered a relative stronghold of the species. Kosciuszko National Park contains the only population of the Stocky galaxias; now restricted to a single 3 km stream segment of the headwaters of Tantangara creek. Hence, the entire global population of Stocky galaxias and significant populations of Macquarie perch and Murray crayfish could be impacted by the construction and operation of Snowy 2.0.

The construction of a large tunnel and the transfer of water between Talbingo and Tantangara will cause a number of habitat and ecosystem level impacts that may have detrimental effects.

Primary concerns relate to loss of habitat and direct impacts of the disposal of tunnel spoil in Talbingo Reservoir. The large quantity of tunnel and dredge spoil is likely to directly impact Murray crayfish habitat in the reservoir, as disposal of spoil by edge-pushing will significantly later shallow littoral habitats and consequently aquatic submerged and emergent vegetation which is known to be important habitat for crayfish. The disposal of spoil in Talbingo will also result in prolonged changes to water quality through increased turbidity which is also likely to affect macrophytes in the reservoir.

Although the Snowy 2.0 Main Works EIS proposes to relocate Murray crayfish away from the disturbance area in the reservoir, the fate or success of such relocations is essentially unknown.

Transfer of Redfin perch via water transfers between Talbingo and Tantangara reservoirs. Redfin perch is known to be present in Talbingo Reservoir but is absent from Tantangara Reservoir, and the pumping of water via Snowy 2.0 from Talbingo to Tantangara is likely to transfer this species. Redfin perch is known to have impacts on small bodied fish and crayfish, particularly via predation, and so is likely to significantly impact conservation efforts for Stocky galaxias (limiting potential options for establishing additional populations upstream of Tantangara Reservoir). This is also likely to impact platypus. If established in Tantangara, it is also highly likely that Redfin perch would spread downstream into the upper Murrumbidgee should Tantangara spill over the dam wall, or through anglers using them as live bait.

Transfer of EHN virus between the two reservoirs, and transfers of the virus downstream of Tantangara. Although the Snowy 2.0 Main Works EIS notes that EHN virus (EHNV) has not been recorded from Talbingo Reservoir, based on “limited testing undertaken for this project” according to the Snowy 2.0 Main Works EIS), this virus is documented as being

undetectable in some testing (e.g. trout hatcheries) only to reappear in subsequent years. There is no detail in the Snowy 2.0 Main Works EIS of how many fish from Talbingo were tested for EHNV, what the sampling strategy was used is not stated, or how many seasons/years were samples collected. The virus is previously known from the Tumut River catchment (Blowering Reservoir) and may reappear. If the virus appears in Talbingo during construction of Snowy 2.0 (i.e. the next decade) and is transferred to Tantangara the spread of the virus from Tantangara downstream to the upper Murrumbidgee River is almost certain as both Rainbow trout and redfin perch are known hosts to the virus. The upper Murrumbidgee River downstream of Tantangara contains a significant population of the EPBC-listed Macquarie perch, which is documented to experience widespread and rapid mortality when exposed to EHNV.

The potential for introduction of the EHN virus through construction activities and personnel. The Snowy 2.0 Main Works EIS identifies that a 'Weed, Pest and Pathogen Management Plan' will be prepared and implemented to minimise and manage the spread of weeds, pest fish and pathogens, but there is no detail on what biosecurity measures are proposed, or whether they are in place now. EHNV is a very robust and resistant virus and could be spread on vehicles and equipment which have been previously used outside the Murrumbidgee catchment upstream of Tantangara.

Potential EHNV impacts on stocky galaxias (Mountain galaxias previously reported to be susceptible). EHNV has previously been shown to be carried by Mountain galaxias (*Galaxias olidus*) from which Stocky galaxias has been recently identified and split as a separate species. While some congeneric Australian species have been shown to have differential susceptibility to EHNV (e.g. Macquarie species) the taxonomy of the *Macquaria* genus is contested with some Macquaria species recently considered to be part of *Percalates*, and others not even considered to be is the same family (Percichthyidae). Consequently, the differing susceptibility to EHNV by supposed congenerics should not be any cause for optimism. While it is not known if Stocky galaxias is susceptible to EHNV, it is possible given its very close taxonomic affinity to Mountain galaxias, and testing of Stocky galaxias for EHNV susceptibility should be a priority.

Transfer of Climbing galaxias via water transfers between Talbingo and Tantangara reservoirs. As noted above for Redin perch, Climbing galaxias (*Galaxias brevipinnis*) is present in the Yarrangobilly River and likely Talbingo Reservoir. This species is native to the coastal drainages of eastern Australia but was transferred into the Murray-Darling basin via the original Snowy scheme.

The Alliance understands this species was not tested during the laboratory trials of survival of fish to pumping via Snowy 2.0 but must assume that it is also a moderate to high risk of transfer from Talbingo to Tantangara. Climbing galaxias is suspected as having detrimental impacts on other fish species when translocated and the species is listed as a threat to Stocky galaxias by the NSW Fisheries Scientific Committee.

The Snowy 2.0 Main Works EIS proposes that a mitigation measure is to construct a barrier to prevent Climbing galaxias invading the sole remaining habitat for Stocky galaxias, but gives no detail on what the design specifications for the barrier are; whether such a barrier

has been previously constructed, or if so, whether the barrier was successful and over what time period such assessment of success has occurred.

Loss of habitat for future conservation measures to recover the critically endangered Stocky galaxias. The Stocky galaxias is currently confined to a single 3 km stream segment of Tantangara Creek. The species is consequently at extreme risk from events such as wildfire or other localised impacts resulting in habitat loss. To mitigate such localised threats, it is necessary to establish additional populations of the species in streams other tan Tantangara Creek. However, if Climbing galaxias becomes established in Tantangara Reservoir and invades upstream tributaries, then there will be little availability of potential new sites to establish additional populations of Stocky galaxias. While the construction of the proposed barrier to Climbing galaxias invasion may protect the existing population of Stocky galaxias, the lack of other streams free of alien species (both trout and climbing galaxias) will severely compromise Stocky galaxias conservation efforts.

Transfer of other alien fish species such as Goldfish (*Carassius auratus*) and Eastern gambusia (*Gambusia holdbrooki*). As described above for Redfin perch and Climbing galaxias, the transfer of water between Talbingo and Tantangara provides a mechanism for the establishment of other alien species (and any associated pathogens and parasites) currently present in Talbingo but absent from Tantangara. The total absence of primary fish transfer mitigation measures at Talbingo (e.g. fish screens or equivalent) means that mitigation is totally reliant on secondary measure once alien fish species from Talbingo become established in Tantangara.

The potential for future transfers of other alien fish or crayfish species. As noted above, the total absence of primary fish transfer mitigation measures at Talbingo (e.g. fish screens or equivalent) means that any future changes in the fish community in Talbingo must be dealt with in the receiving waters of Tantangara using measures not designed or necessarily applicable for such future changes. For example, the Oriental weatherloach (*Misgurnus anguillicaudatus*) is currently not established in either Talbingo or Tantangara, but its illegal use as baitfish by anglers makes it likely that it will establish in the more populated catchment of the Tumut River in the future. This species is a hindgut respirer that allows it to survive in low oxygen environments and potentially move overland to colonise new environments. The current secondary mitigation screening in the Tantangara Reservoir outlet may not be effective at preventing subsequent downstream spread of this species into the Upper Murrumbidgee River below Tantangara.

The insufficient scrutiny in the Snowy 2.0 Main Works EIS of future changes of fish ecology or status.

The lack of primary fish transfer mitigation measures at Talbingo means that other future significant changes in the fish community at Talbingo or Tantangara will have to be retrospectively dealt with (if possible). An example may be the establishment of a self-sustaining population of Trout cod.

The Snowy 2.0 Main Works EIS largely dismisses the need for mitigation of Snowy 2.0 impacts on this EPBC-listed species on the basis that is maintained by stocking.

Another example is if EHNV establishes in Talbingo with the subsequent establishment of this virus much more likely with a Snowy 2.0 mediated establishment of Redfin perch in Tantangara.

The Alliance is concerned that the proposed Snowy 2.0 is likely to significantly impact the three focal threatened fish species, which have already declined significantly. These likely significant impacts (as defined under the EPBC Matters of National Environmental Significance (EPBC Act Policy Statement 1.1 Significant Impact Guidelines May 2006)) include:

- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- interfere with the recovery of the species.

While the impacts of any single threat may be able to be partially mitigated when considered in isolation, the cumulative effect of multiple impacts must be considered as part of the assessment process. For example, while the presence of the EHN virus has not been detected in Talbingo Reservoir, this virus is known to be undetectable at times, but then reappears in a location. The moderate to high risk of transferring Redfin perch from Talbingo to Tantangara, and the subsequent establishment of this species means that the likelihood of the virus establishing at some stage in the future is much higher than if Redfin were not present in Tantangara. If the virus establishes in Tantangara, then there is no mitigation able to prevent its spread into downstream populations of the endangered Macquarie perch in the Murrumbidgee River. Hence, the potential impacts of transfer of Redfin and subsequent establishment of EHNV may not become readily apparent until many years after the Snowy 2.0 project has been constructed.

A critical deficiency with the Snowy 2.0 Main Works EIS relates to the absence of the primary research reports commissioned by Snowy 2.0. Without these reports it is not possible to scrutinise the scope and cost of mitigation options reportedly examined (e.g. fish screening options); the potential for live fish transfer and survival; the design and suitability of the barrier to mitigate impacts from Climbing galaxias; and the design and sample size of EHN virus investigations. “

The offsets required for this project should be much more than the NSW Biodiversity Act offset formula minimum proposed by Snowy Hydro 2.0 (M.3) since public lands will be used and water and damage will be done to a national heritage area.

The proposal not to screen off the Talbingo portal to prevent spread of pest fish and disease up the tunnel to Tantangera is not adequately explained and needs to be reconsidered, with grave concern that the lower portal is not being screened as the virus could spread from Tantangara down the Snowy Riverand upper Murrumbidgee River.

Missing from the proposed offsets are further restoration of Snowy 1.0 sites and improving environmental flows in the Snowy River and other impacted rivers.

The NSW Government would need to establish a trust fund to manage the offset monies in perpetuity (including compulsory annual additional contributions from Snowy Hydro profits) for essential applied catchment research including condition and trend in condition monitoring of species, habitats and ecosystems, for and long-term restoration management and for responding to the needs of the environment in a climate change world.

There is a need to reinstate detailed hydrological monitoring in the Kosciuszko National Park to track water yield, water quality and water flow regimes for mountain catchments. The data could also be used as a surrogate for tracking the effects of climate change and to assess the benefits of restoration measures.

The EIS proposes a number of changes to the project that will result in bigger environmental impacts than previously understood, in particular:

a) Less reliance on barge transport and thus upgrading of access roads, including 6 km of new road to Lob's Hole;
b) Placement of tunnel spoil at limited sites that infill the edges of the two reservoirs (rather than submersing it in the dead zones) as well as on land at Lob's Hole;
c) No screening off of the Talbingo portal to prevent spread of pest fish and disease described without detail as due to: a) cost, b) uncertain effectiveness, and c) turbidity during construction (instead, three screens are proposed at Tantangara to limit further spread up and downstream);
d) Some groundwater depletion.
e) Clearing of up to 1,680 ha with possible risk to water quality if not correctly managed.
The 10 kilometre by 120 metre proposed powerline easement is to be covered in a yet to be released separate TransGrid EIS. Again, impact on the catchment is critical and should be considered for the whole project, and not broken up into a number of separate Environmental Impact Statements, which is unsatisfactory.

The value of the Snowy River was recognised by the Fisheries Management Act giving its catchments the status of EEC, to be protected.
The transfer of pests will severely damage the fragile areas of the Kosciusko National Park and alter the ecology of the park and associated waterways forever. This proposal does not support the values of the park and does not protect the catchments of the Snowy River.

The Snowy River Alliance has campaigned for many years to restore the Snowy River to health with environment flows legislated 21 – 28%.

The threat of transfer of Red Fin and viris would have devastating long term effects on the ecology of the Snowy River and other waterways.

Of concern also is the possible diminished availability of water for the legislated environmental water releases.

While the Snowy River Alliance fully supports renewable energy projects, other more efficient pumped hydro sites have been identified in NSW which do not have the catastrophic environmental impacts of Snowy 2.0.

The Snowy 2.0 EIS is unacceptable to the Snowy River Alliance in its current form.
The Alliance requests that other pumped hydro sites be considered ahead of this Snowy 2.0 project, and one EIS be developed to cover the whole project, with independent scientific assessment sought and made publicly available before progressing any further.

Yours faithfully

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