SUBMISSION NO. 55

snowyhydro Limited
renewable energy

Secretary: .....

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HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON
AGRICULTURE, FISHERIES
AND FORESTRY

30 August 2002

The Secretariat
Standing Committee on Agriculture, Fisheries and Forestry
Parliament of Australia

Dear Sir,

Subject: Inquiry into future water supplies for Australia's rural industries and communities

The purpose of this submission is to draw the Standing Committee's attention to the benefits that cloud seeding in the Snowy Mountains could offer to the river health/resource availability of the River Murray.

Two studies have concluded that the clouds passing over the Snowy Mountains during winter are suitable for increasing snowfall by seeding and indications are that in excess of 100 gigalitres per year on average could be added to the River Murray system. The attached paper gives a brief outline of the issues involved and the work undertaken to date. Cloud seeding is a modern water management technique that has proven successful in Tasmania, and is a routine winter occurrence in over 100 catchments within the United States of America.

Records over the past 50 years show that there has been a steady reduction in the amount of snowfall on the main range of the Snowy Mountains. This may reflect a long-term trend as a result of global warming, or be a local short-term aberration. Whichever, the decline is factual and may have implications for endangered alpine species. Cloud seeding during winter periods could assist in redressing this trend.

The possibility of more water for the River Murray is an issue of national significance. Cloud seeding is a sustainable process, as there are a number of regional and national beneficiaries and there are no apparent downsides. The New South Wales ski resort operators and the Murray-Darling Basin Commission are also supportive of such an initiative. As a comparison, cloud seeding could provide additional environmental releases to the River Murray within two years, at an order of magnitude lower cost than the Commonwealth government's funding of $75 million over ten year for an additional 70 gigalitres per annum.

All of the alpine catchments of the Snowy Mountains are within the Kosciuszko National Park and subject to a plan of management aimed at maintaining habitat and recreational values. Snowy Hydro maintains a close interest in these management practices because of the potential to influence the water quality stored in the Scheme's reservoirs. Studies in similar areas overseas where cloud seeding has been undertaken for up to 50 years has not demonstrated any significant adverse environmental effects.

While Snowy Hydro appreciates the potential that cloud seeding offers in the way of increased generation, it also considers that there are environmental, regional and State beneficiaries that dictate that this issue should be considered in the broader national interest. Snowy Hydro would be willing to provide the principal funding and coordination for this national initiative and would be pleased to work with other interested parties.

Yours faithfully

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Executive Officer, Water

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A proposal to create additional water by cloud seeding in the Snowy Mountains

1 Summary

The cloud systems passing over the Snowy Mountains during winter can be induced to produce significant additional snowfall by seeding. This additional snowfall has a number of environmental and financial benefits to a diverse range of beneficiaries, including the alpine ecology, River Murray salinity and security, greenhouse gas emissions, the ski industry and the Australian economy. There are no known adverse environmental impacts of cloud seeding and objections tend to be ideologically rather than factually based.

Cloud seeding is a modern water management tool that has proven successful in increasing water resources within Tasmania, and in over one hundred catchments in the United States alone. It offers an opportunity to increase flows in the River Murray at an order of magnitude, lower cost and considerably quicker, than any alternative.

2 Why does Cloud Seeding Work

Snow occurs naturally over the Snowy Mountains by a process known as ice nucleation, whereby minute ice particles in the clouds initiate the growth of snow flakes by the amalgamation of water and vapour droplets. Very cold clouds (with sufficient moisture) have an abundance of ice particles and snow naturally.

Warmer clouds, however, can contain sufficient water, but have a scarcity of ice particles and as a result do not snow and usually evaporate downwind of the mountains or pass out to sea without raining. These clouds are suitable for seeding with substances that take the place of the ice particles. Such substances include dry ice, silver iodide, or bacteria naturally occurring on grass and in soil. The suitability of these nucleating agents depends on the air, cloud and ground temperatures and the topography. Silver iodide would be the nucleating agent of choice in the Snowy Mountains.

3 How is Cloud Seeding Undertaken

Silver iodide can be dispensed into clouds from aircraft or, in those cases where clouds passing over mountains are subject to orographic uplift, from ground generators. The ground generators (see section 6.2) are located along the windward side of the mountain range so that the plumes of silver iodide are uplifted into the cloud systems. Many of the American programs maximise effectiveness of seeding by using both aircraft and ground generators and each method has specific application. Dispensing seeding agent from aircraft has the benefit of ensuring the agent reaches the clouds, but the amount of cloud that can be seeded is much less than from ground based generators.

Ground generators would be the primary dispensing method for a seeding program in the Snowy Mountains.

Seeding is initiated remotely when conditions are suitable.
The suitability of clouds for seeding is assessed from radar and weather balloon information. A number of physical and chemical methods can be used to confirm the

effectiveness of seeding programs, and statistical methods of measuring increased precipitation and runoff have generally been accepted.

4 History of Cloud Seeding

4.1 Australia

Cloud seeding experiments commenced in Australia in 1947, shortly after the discovery in America that pellets of dry ice could induce precipitation from clouds. The CSIRO conducted experiments in the Snowy Mountains from 1955-59, however the indicated increase of 11% was inconclusive because of inadequacies in the design of the experiment.

A study by SIROMATH in 1986 and field investigations undertaken in the Snowy Mountains on behalf of the Snowy Mountains Council during the winters of 1988 and 1989, confirm that there are sufficient opportunities with suitable clouds to significantly increase the water resources of the Snowy Mountains region. These studies were targeting winter cloud systems where precipitation would occur only as snow.

A draft EIS to undertake a six-year program to confirm the viability of cloud seeding in the Snowy Mountains was prepared following the 1988-9 field studies. The program would essentially be a passive ground-based operation with minimal presence within the National Park. The study did not proceed principally because of concerns by environmental groups of the impact on a wilderness area within the Kosciuszko National Park and concern from ski resort operators that the increased precipitation could fall as rain rather than as snow. There was a secondary concern by agricultural interests that downwind landowners could be deprived of rainfall.

The program has now been revised to: (a) excise the wilderness area from the program; (b) have a seeding regime that can be interrupted by the ski industry if the freezing level is too high above ground level at specific resort locations. Numerous studies have confirmed that precipitation downwind of seeded areas either increases or remains unchanged.

The estimated increase in runoff from a fully operational program is estimated to be well over 100 gigalitres per year based on a 6% increase. Some of this would flow directly into the River Murray as the snow melted, most would be regulated for release to the River Murray during drier months.

Twenty years of cloud seeding in Tasmania has confirmed (by the CSIRO), that rainfall can be increased by 15-20% in seeded months.

4.2 America

Cloud seeding projects have been undertaken successfully in America for almost 50 years. Currently there are over 100 catchments being seeded to increase winter snow pack. The increased runoff as a result of these programs varies from 5% to 15%.

5 What are the Checks and Balances on Cloud Seeding

Scheme reservoirs have historically been less that half full for half of the time and have surplus capacity to regulate additional inflow. Seeding programs have cessation rules to limit the likelihood of flooding by limiting seeding when the amount of snow pack and/or reservoir storage reach predefined levels.

6 What are the Environmental Impacts

6.1 Physical

While cloud seeding increases the reliability of the snow cover during the season, it only extends the snow season by about 3-4 days. There is a wide range in natural variability of snow depth and season duration from year to year. Typically, an expected 10% increase in snow cover would increase peak season snow depth by about 15 centimetres, while not significantly altering the snow line.

6.2 Visual

The ground generators are trailer-mounted so they can be positioned prior to and removed following winter. These would be located adjacent to existing access tracks and below ridges to minimise visibility. The trailers are camouflaged steel containers having a gas burner located three metres above the ground. Propane gas from an adjacent 2000 litre container vaporises a mixture of silver iodide and acetone. The combustion and resultant plume is invisible.

6.3 Ecological

Silver iodide from seeding is relatively inert and cannot be detect above background levels of silver in the soil. Extensive studies in the US have not shown any significant detrimental impacts of silver iodide on the environment. More stable snow conditions would not adversely impact on habitat or result in increased erosion during the snow melt and are expected to counteract the expected loss of habitat resulting from global warming.

7 Who would benefit from Cloud Seeding

7.1 Environmental Benefits

- River Murray ecology, increased flow and reduced salinity
- Alpine ecology, insurance against diminishing habitat caused by global warming
- Reduced greenhouse gas emissions

7.2 Commercial Benefits

- River Murray communities, more reliable flow and reduced salinity
- River Murray irrigators, reduced threat of lower allocations
- Snowy Hydro Limited, increased generation
- Ski industry, more reliable snow cover