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# snowyhydro

## NEWS

## Weather & climate: critical to our business

### In this edition:

- *The power of visualisation - a virtual power station*
- *Awards recognise Snowy's community contribution*
- *Snowy River Flushing Flows 2015*
- *Upper Murray River Works Program Update*
- *Looking after the foreshores of the Snowy Scheme*

ISSUE 30

# Understanding weather and climate is critical to our business



**CEO, Paul Broad, explains how understanding weather and climate is critical to our business and what upcoming climate predictions are to be expected for the region...**

At Snowy Hydro, we have a group of very clever climate scientists who use their knowledge and experience to predict, forecast and digest weather and climate patterns to help us identify and adapt to the environmental factors that will face our business and the broader Snowy Mountains region.

The weather, and precipitation in particular, is critical to our business operations. We're one of the largest electricity generators by capacity in Australia and most of that generation capacity is powered by the mighty Snowy.

To succeed as a business we will always rely on the reliable, fast start capacity of the Snowy Scheme to

quickly deliver electricity to the National Electricity Market. But to do so, we need to harness the water in the dams and waterways across the Snowy Scheme.

As a result, at Snowy Hydro we're pretty knowledgeable about the weather and climate history of the Snowy Mountains region and our scientists draw on data gathered locally and nationally to consider how future weather patterns might look. You can read Snowy Hydro Atmospheric Scientist, Dr Johanna Speirs', article on page 10 outlining some recent collaborations with national and international climate scientists.



## *The current challenge for the region and for Snowy Hydro is that we are experiencing an El Nino phase...*

What's exciting is that we can utilise one of the region's tourist attractions - the Yarrangobilly Caves - to provide us with a wealth of historic data drawn from the temperature and snow cover at Cabramurra over the last 1000 years and project future trends. We're all sensitive to weather trends - particularly rainfall and the annual snowpack.

The current challenge for the region and for Snowy Hydro is that we are experiencing an El Nino phase which delivers cooler water and stable atmospheric conditions in the El Nino Southern Oscillation which results in dryer conditions. This is as opposed to La Nina which delivers warmer water, more evaporation and overall wetter conditions.

As a business that relies on consistent inflows of water to sustain our ability to deliver water inland to irrigators and generate electricity, El Nino is a challenging climatic condition. The good news is that we have steadily built up our water reserves since the devastating drought a few years back.

While you wouldn't wish the drought on our business or farmers in the region, the drought did encourage innovation in the face of adversity. Snowy Hydro learned a lot about our water storages and the movement of water across the Scheme and those learnings have made us much more efficient and, as a consequence, more resilient to future adverse weather and climate patterns.

In other news, following the expansion and diversification of the company last year (we acquired retail energy company Lumo Energy in Melbourne and gas-fired power station Colongra on the New South Wales Central Coast), Snowy Hydro has been working to integrate those businesses into our retail and generation operations. It's been a time of change and growth for our Snowy Hydro staff.

To check in with our employees, we recently

conducted an engagement survey at Snowy Hydro. We had an outstanding response rate of 88 per cent of employees across the Snowy business. While we're still waiting for the final results to be delivered, the overall result shows we are slightly behind our industry average and about ten points behind the Australian and New Zealand average.

This result shows we have a lot of work to do. It's also an opportunity for us to really understand what is driving engagement at Snowy Hydro and what we can improve on.

One of the most pleasing aspects of the survey is the results show our staff are highly engaged in safety. This is our highest priority at Snowy Hydro and it is pleasing that our staff feel that way too. We want to ensure that each and every one of our staff members goes home at the end of each day in the same or better shape than when they came in.

The majority of our staff also understand that change is necessary for Snowy Hydro to grow and remain successful in the future. I'm always pleased to engage with our staff across the business. The level of knowledge about our industry and our business is reassuring and makes me confident that we are well placed to meet the challenges facing the energy industry head-on.



# The power of visualisation



Are our electricity generators just a mass of moving metal? No, they are part of a range of complex assets we are the custodians of. **Manager of Asset Technology, Ben Hammann**, explains how Snowy Hydro has been trailing innovative techniques to visualise information...

Have you ever had trouble explaining a concept to someone? Even simple things can be difficult to explain and the challenge grows even greater when you are discussing the complex nature of the assets that make up the Snowy Mountains Scheme. Many of our assets are located across the Snowy region, in difficult to access power stations. The reliability of those assets is key to Snowy Hydro's ability to send electricity to the National Electricity Market (NEM) at a moment's notice.

Being able to visualise something is one of the keys to capturing and sharing knowledge across our business. The capture of that knowledge improves the quality and productivity of our work.

But what if the event you are trying to visualise has not happened yet? Imagine being able to give someone a virtual tour of equipment to assess competence, respond to an event or even plan a future event.

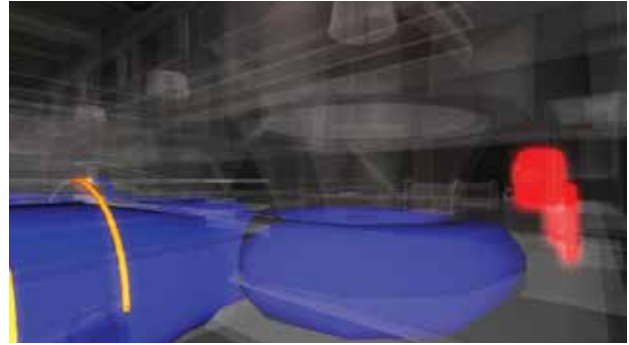
Snowy Hydro has been working with Optrix, a leading technology company, to pilot helpful ways of visualising asset information. We have created a virtual Tumut 3 power station - the actual power station is located in Talbingo. In the virtual power station we are not limited to the rules of reality. The virtual environment can be connected to real time information streaming from that asset.



The virtual Tumut 3 Power Station



*Capturing knowledge about the startup sequence of the generator at Tumut 3 Power Station*



Meanwhile in the real world, large amounts of data streams back from the field automation systems and is made available for control, maintenance and planning. This can be accessed on a complex array of displays and trend charts at the Snowy Mountains Control Centre in Cooma.

That data can now be accessed on smartphones and devices by our employees on site giving them a wealth of information to help them carry out maintenance work. This is a summary of the key pieces of data shown in an intuitive way. It helps them make good and timely decisions about the piece of equipment they're working on.

Extending on that concept, Augmented Vision Technology is the ability to supplement what you're actually seeing with a virtual display of information. This technology is being implemented on one of the units at Tumut 3 power station. This will display information that is not otherwise available while standing in front of the asset. Data that helps to link multiple processes together can also be brought together on the augmented reality display.

All of these innovations help improve decision making, the quality of our work and the productivity of our maintenance programs. By maintaining our assets to a high standard with such technology innovations, we can visualise a strong future for the mighty Snowy Scheme.



*Augmented reality is supplementing what you can actually see with an overlay of virtual information. Using a camera in the smart device pointing at an augmented reality marker (the square), real time data can be displayed using a specialised app. The real time data is streaming from automation systems associated with the asset.*

*The data can be accessed on smartphones by our employees on site giving them a wealth of information to help them carry out maintenance work...*







# Awards recognise Community Contribution



**Snowy Hydro has once again been recognised as an ABA100 Winner for Community Contribution in the Australian Business Awards 2015. Manager, Community Relations, Heath Woolley, talks about the win...**

This is the fifth time Snowy Hydro has received the Australian Business Award's Community Contribution award, demonstrating the value of the organisation's Community Partnerships Program.

Since the first blast was fired during construction of the Snowy Mountains Scheme in 1949, Snowy Hydro has been a major employer in the region and a valued part of the local community.

The Community Partnerships Program targets investment where it will have a positive impact and generate long-term benefits for the communities of the Snowy Mountains region. The program includes support for the Snowy Hydro SouthCare Rescue Helicopter, Cooma Universities Centre, Young Driver Training as well as local festivals and events.

"Snowy Hydro is an important part of the communities we live, work and operate in. Whether it's as a major employer, the operator of 16 power stations in some of Australia's most beautiful countryside, a provider of electricity and gas to our one million customer accounts or as the supporter of organisations and charities that make a difference to society, we take our role very seriously," Snowy Hydro CEO Paul Broad said.

"Our focus is on supporting and investing in our local communities where our staff live and work. We support activities that have a wide reach, are accessible and benefit the people of the Snowy Mountains region. We don't just provide donations, we build healthy partnerships with the community."

Ms Tara Johnston, Program Director, says, "For a decade, The Australian Business Awards have conducted knowledge building programs which focus on organisations that prioritise innovation and technology as they continue to drive local and international markets.

"The ABA100 Winners have demonstrated innovative, enterprising and technologically advanced business initiatives and products that support an obvious transformation coinciding with the ever-changing, highly competitive business environment. High-performing, intelligent organisations that continuously and effectively improve their processes and products are set to survive the long term challenges faced by all Australian businesses," Ms Johnston added.

For more on these awards and the 2015 ABA100 Winners go to: [australianbusinessawards.com.au](http://australianbusinessawards.com.au)

*"We don't just provide donations, we build healthy partnerships with the community."*

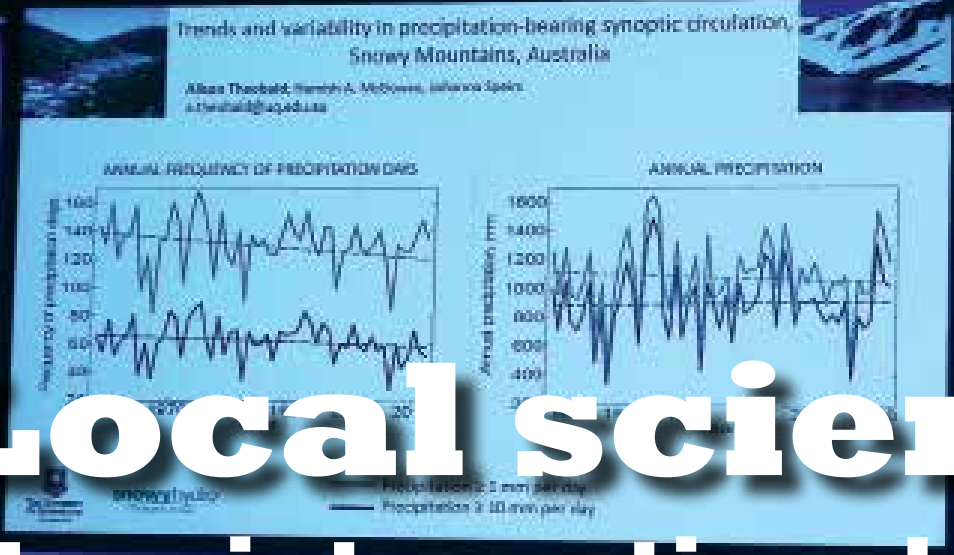




Cooma Universities Centre



Snowy Ride



# Local science at an international level



Recently Snowy Hydro's **Atmospheric Scientist, Dr Johanna Speirs**, attended the Australian Meteorological and Oceanographic Society Annual Conference in Brisbane, read on for more....

Understanding more about weather and climate in the region helps Snowy Hydro make the best possible decisions in managing the Scheme's water resources. That's why we have a team of scientists who advise us on weather, climate and inflows.

We also collaborate with other experts in the field - both national and international - to improve our knowledge of this complex area. Recently I helped organise the Australian Meteorological and Oceanographic Society Annual Conference which attracted more than 350 national and international scientists from diverse fields.

Expert scientists shared their knowledge in a number of areas including renewable energy weather, forecasting extreme weather events, climate variability (eg: El Nino) and climate change projections for rainfall and runoff in South East Australia.

Snowy Hydro's research partners at the University of Queensland shared their work on the variability and trends in weather systems that deliver precipitation to the Snowy Mountains. Perhaps not surprisingly, their work is showing that precipitation-bearing weather systems have become less frequent during the cool season over the last sixty years.

Meanwhile, warm season weather systems are showing indications of becoming more frequent and are delivering more precipitation.

Our research with the University of Queensland and University of Western Australia is part of a larger project aiming to understand more about the influence of weather patterns, climate variability and climate change on water and runoff in the Scheme, also utilising paleoclimate (long-term) records from the Yarrangobilly Caves.

With careful analysis of a stalagmite sample from the caves, researchers are able to reconstruct temperature and snow cover at Cabramurra over the last 1000 years. The reconstructed climate records are showing patterns consistent with global trends.

For instance, the stalagmite has recorded rapid warming and reduction in snow cover since about 1960, similar to trends observed elsewhere in Australia linked to global climate change. Some initial results of the study at Yarrangobilly Caves were recently presented at the International Union for Quaternary Research Congress in Japan showing the global reach of some of our local research.





# Snowy River Flushing Flows 2015



The Department of Primary Industries - Water recently commenced high-flow releases from Jindabyne Dam into the Snowy River. **Manager, Water & Weather, James Pirozzi, has the details...**

Each year the Department of Primary Industries - Water (DPI Water) sets annual release targets for the Snowy River which include daily releases and flushing flows (or large releases) to improve the health of the Snowy River below Jindabyne Dam. As per last year, there are five planned high-flow releases. However this year there are two releases during winter and three during spring.

The annual release targets for Jindabyne Dam will total 147,900 megalitres. The pattern of daily releases seeks to emulate flows in a natural unregulated snow melt river system and to encourage scour and clearing of sediment. This means that the operation of the release valves below Jindabyne Dam will be a regular feature during winter and spring as a number of high flow events will be delivered.

The level of Lake Jindabyne is expected to remain above average in the coming months in order to ensure that the required volume of water for the full environmental release program is available.

A flushing flow, which will peak at 8,110 megalitres per day, is scheduled for October 28. Snowy Hydro will again open a viewing area for the public below Jindabyne Dam for the flushing flow release.

All other releases will be via the two cone valves at the base of the dam wall.

DPI Water will be responsible for advising downstream landholders and other stakeholders of the flushing flow details and river heights. The peak flow rate is less than the 2014 event, however it is anticipated that the river level will rise from 0.98m to approximately 1.68 metres at the Dalgety gauge. The rise in water levels will vary depending on your location and inflows from tributaries, but flows will be within the river channel.

The total volumes targeted and the apportionment of water between all of the Montane catchments is also determined by DPI Water and the target for the Montane River releases is 64,700 megalitres. The Montane Environmental Program will deliver additional water to the Murrumbidgee River below Tantangara Dam, the Goodradigbee River, the Geehi River below Geehi Dam and the Snowy River below Island Bend Dam.

If you want more information about the targets and release patterns for the Snowy and Montane Rivers environmental release programs contact DPI Water. Visit [www.water.nsw.gov.au](http://www.water.nsw.gov.au) or email: [information@water.nsw.gov.au](mailto:information@water.nsw.gov.au)

# Upper Murray River Works Program Update



**Snowy Hydro has been supporting works in the Swampy Plains and Upper Murray River since construction of the Scheme over 50 years ago. Area Manager, Murray, Drew Twigg, gives an update...**

Snowy Hydro has been supporting works in the Swampy Plains and Upper Murray River since the flow in these rivers was altered following the construction of the Scheme over 50 years ago.

Whilst erosion within river channels is a natural process that occurs in all river systems, altering the volume and pattern of flow in a river, which has occurred in the Swampy Plains River, and to a lesser extent in the Upper Murray River below the Swampy Plains River confluence, can exacerbate the natural rate of erosion. Other activities that have been shown to exacerbate the natural rate of erosion of river banks include stock access to river banks, vegetation clearing of river banks and floodplains and removal of large wood from the river channel.

Changes to both our business as well as the river management authorities and accountabilities have

resulted in the works program evolving over time. Currently, the majority of funding for River Works in this area is provided by Snowy Hydro with a smaller contribution from the Murray Darling Basin Authority (MDBA) and occasional inputs from DPI Water, with the work execution being managed by NSW Office of Water.

In 2010, it was identified by all parties involved that there was a requirement to conduct an assessment and achieve a common understanding of the challenges that the waterway faced. This resulted in Water Technology (an independent company specialising in river systems) being commissioned by the NSW Office of Water in conjunction with the MDBA and Snowy Hydro to develop a Streamside Restoration Plan for the Swampy Plain and Upper Murray Rivers between Khancoban and Lake Hume full supply level.



## *The relationships with both NSW Office of Water and MDBA have developed and strengthened over time and the group now has a vision and a plan...*

The key objectives of this project were:

- Identifying the features, values and issues present within the system.
- Identifying opportunities for the pro-active management of erosion through the improvement of riparian vegetation and the management of willows.
- Providing a planning component that focuses on complementing and building on the existing works programs.
- Identifying and prioritising the activities required to manage for the identified values, threats and objectives.

Following this initial assessment, a series of high flow events occurred within a relatively short period of time, including one of the largest on record. This resulted in reports from landholders of changes in many locations including the failure of several areas of older rockwork. As a result the river was reassessed in 2014 and the plan adjusted based on the changes observed.

The works program has historically had a strong focus on rock beaching activities which line the waterway with rock walls, primarily on the outside bends. Rock beaching is a very effective method of managing in channel erosion in specific locations over the short to medium term but has a limited life span and can often just 'move' the erosion issue to areas downstream of the work site. Ongoing educational sessions coupled with generational change are slowly seeing growth and acceptance of fencing and revegetation strategies which provide longer term stability of river banks.

The relationships with both NSW Office of Water and MDBA have developed and strengthened over time and the group now has a vision and an overarching Plan for the management of these

Rivers. Regular inspections and discussions are now being formalised to ensure that the works planned each year are consistent with the priorities for management set out in the Restoration Plan and are agreed by all parties early in the season, with follow up sessions during and after the works are conducted. Within Snowy Hydro, the program is overseen by the Murray Region Area Manager with technical support from the Water and Environment team.

A site visit was conducted in July including participants from NSW Office of Water, the MDBA and Snowy Hydro to view some of the rockwork and revegetation sites that are presently either under construction or recently established. Inspections to confirm the work plan for 2016 will begin in October.

Over the past two years Snowy Hydro has also held annual briefings for landholders in the area to keep them informed of Snowy Hydro's involvement in the works program. These are planned to occur again in Mid November 2015. Snowy Hydro will be seeking expressions of interest for these sessions from landholders.



*A revegetation site established in 2014.*

# Looking after 1



The foreshores of the major lakes of the Snowy Scheme are popular areas for visitors and locals, however we need to ensure the behaviour of a few people doesn't spoil it for everyone. **Manager Environment, Charlie Litchfield, explains...**

People love walking, boating and fishing around the Snowy Scheme's lakes and access to the foreshores has always been provided for the benefit of the local community and tourism industry. A recent survey found that there are least fifty businesses operating around the Scheme's lakes which demonstrates the economic activity that relies on access to the foreshores.

In recent times (particularly around Lake Eucumbene) the foreshore area has been increasingly spoilt by the dumping of rubbish, vandalism and increasing amounts of anti-social behaviour. A recent example at Lake Eucumbene lookout resulted in someone destroying and stealing a beautiful sundial.

Based on reports from lakeside caravan parks and locals, it seems there is only a small group of people who disregard the rights of other lake users and adjoining landowners. These people blatantly

disregard the policy to camp only in designated areas equipped with bins, toilets and other facilities. Their behaviour spoils an otherwise enjoyable day around the lake when someone comes across dumped rubbish, human waste or mindless vandalism.

The caravan parks and designated camping areas around Lake Eucumbene provide excellent facilities for visitors, boaters and fishers. To ensure everyone can safely enjoy the foreshores and lakes we encourage anyone wanting to stay overnight around the lakes to use these facilities. By doing this you will not only help to keep the area clean but you will be supporting local businesses.

Snowy Hydro works with lakeside operators to protect the foreshores through rubbish bag distribution and lakeside clean-up days in partnership with operators, lake users and other agencies. We have also recently released our





# lake foreshores

SnowyLive smartphone app. The app has helpful information for locals and visitors to the region about Snowy Hydro's four visitor facilities and advertises some of the caravan parks around the Snowy Mountains. It also provides real time lake levels for Eucumbene, Jindabyne and Tantangara.

If you want an enjoyable overnight stay, please do so only in designated caravan parks and camping areas where impacts such as rubbish and waste can be managed properly. It's up to all of us to work together to ensure these areas remain the attractive and popular places they are for all who visit.

## Download the SnowyLIVE app!

Snowy Hydro's free SnowyLIVE water app is now available from either the Apple App Store (for Apple devices) or Google Play (for android devices). Search 'SnowyLIVE' and look for the power station icon to download!



The damaged sundial at the Lake Eucumbene Lookout



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