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snowyhydro

NEWS

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ISSUE 36



Record heat a

Snowy's critical role



CEO, Paul Broad, outlines how Snowy Hydro performed during the recent record heat and energy demand experienced across Australia...

The energy industry has consistently been front page news since the troubles in South Australia brought to light what many of us in the industry have been concerned about for some time. Short-term political and industry views have been driving decision making that has seen thermal baseload power prematurely exit the field while driving increased investment in renewables with no real plan to ensure stability and security over the long term. All the while, energy prices keep climbing, having real impacts on households and businesses. Rising gas prices, significant volatility resulting from high temperatures and demand, and the competitive marketplace will all make for challenging times ahead.

What will happen over the next six to 12 months in the energy market will heavily depend on demand response and the availability of gas, which we expect to be tight for the next few years. Add to this the closure of Hazelwood coal fired power station in

Victoria in the coming weeks and the very real issues being faced by South Australia, and it is easy to see incredibly unstable conditions continuing with no real short term solutions. This can only be managed by reductions in demand, which will occur if consumers reduce their energy consumption or businesses which utilise a lot of energy shut down. These types of pressures can force governments to think they must intervene with more distorting subsidies, but resorting to taxpayers' money to intervene in the market is not a long-term answer. All of this paints an extremely unpleasant picture for consumers and the market alike.

Meanwhile, Snowy Hydro continues to play a critical role in stabilising the National Electricity Market and keeping the lights on - particularly in NSW and Victoria. During the recent hot weather in NSW, our plant was working overtime to ensure the needs of the NSW market were met. Along with the rest of the industry, our assets were helping to meet record



nd generation

demand in the state. On February 10, the demand in NSW was so high that it exceeded generation capacity in the State including interconnector flows from other states. Our magnificent Snowy Scheme roared into action and we were running all of our NSW hydro at full output as well as our gas assets north of Sydney. In Victoria, we had ramped up our Murray Snowy Scheme assets and our gas power station at Valley Power and even our diesel peakers were running hot in South Australia.

The cooperation across our company and the coordinated response from our operations, trading and Snowy Mountains Control Centre teams improved immeasurably in recent years. The teamwork to ensure our assets are online and ready for action is second to none and underpins the company's performance during these times of record demand. The investment we have made over many years in the reliability and performance of our Snowy Scheme assets is evident. Millions of dollars has ensured the assets start on time when needed and that their performance is efficient, making use of every precious drop of water.

In this edition of Snowy Hydro NEWS you will read about the expansion of our business into large scale solar in South Australia. While there are very real challenges in that State, there are also opportunities.

One of those opportunities is to grow our retail business through Lumo Energy which currently serves around 50,000 customers in South Australia. The 100 megawatt solar farm comes online in 2018 and we are also colocating 29 megawatts of diesel generation down at Tailem Bend to improve our generating capacity in the State.

Also in the news has been our pumped hydro facility at Tumut 3 Power Station in Talbingo. You may have watched an ABC TV Lateline feature on T3. As the government grapples with the very real challenges facing the energy industry, the Prime Minister has taken a particular interest in the possibilities around pumped hydro. The great minds that envisioned the Snowy Scheme really were ahead of their time and we have been utilising our pumped hydro since T3 was completed in the mid 1970s. It is a particularly useful facility to draw on in times of low inflows and drought when water is a scarce resource. We will continue to look at ways that Snowy Hydro can play a role in ensuring the stability and security of the energy industry, after all we are the battery of the National Electricity Market. One thing is for certain, I don't expect that the energy industry will be off the front pages anytime soon.

So hot right now!

Heatwave summary



This summer has seen a number of heatwaves resulting in long-standing temperature records broken in NSW and southern QLD. Read on for our 2017 summer wrap up from **Senior Atmospheric Scientist, Thomas Chubb...**

What is a heatwave anyway?

It might sound like a simple concept, but there has been much debate around the precise definition of a heatwave. The Bureau of Meteorology (BOM) uses the following definition:

“Three or more days of high maximum and minimum temperatures that are unusual for that location.”

The definition is deliberately vague because many factors influence the way in which people are affected by heat. When issuing heatwave warnings for a given location, the BOM takes into account:

- Minimum and maximum temperatures during the event,
- The climate (i.e. both the mean and variability of temperature),
- Temperatures during the weeks leading up to the event

The BOM issues heatwave warnings of “Low-intensity,” “Severe,” and “Extreme” based on these factors.

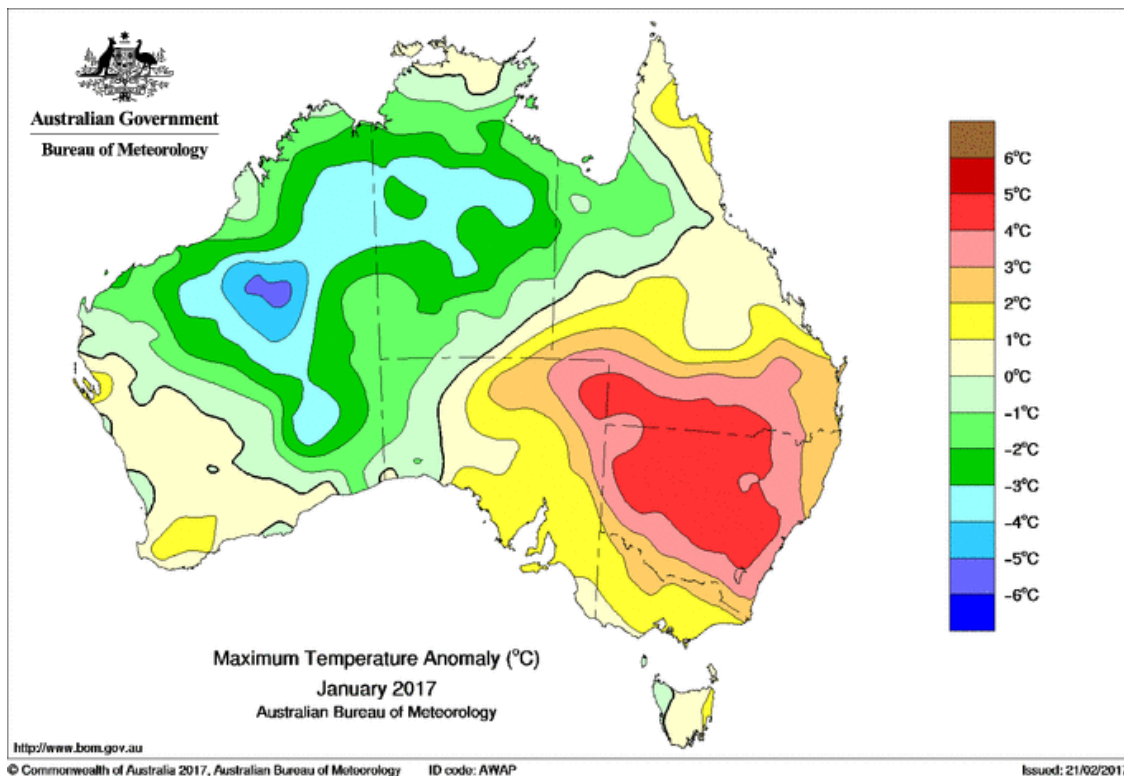
Primed for heatwaves

Summer began with a hotter and drier than average December for most of the south-east, but this was soon eclipsed by conditions in January. Mean monthly maximum temperature records tumbled across NSW and parts of southern Queensland, where they were 3-5°C above average.

Perhaps the most notable of these was Observatory Hill, in the Sydney CBD area, which recorded the hottest January in 155 years of observations. But most weather locations in the Sydney basin also broke records through January. Around the state and in southern Queensland, dozens of records were set for mean monthly temperatures (both minimum and maximum), as well as other metrics like the number of days above 40°C.

Further south, Victoria and South Australia escaped the worst of the extreme heat. The Snowy Mountains region observed a few hot days, however, generally the region wasn't as hot as 2013 or 2009.

The extreme heat experienced in south-east Australia was sourced from a hot “air mass” over central Australia. The air mass was hotter than usual this summer due to very limited cloud cover and low soil moisture. It was just a matter of time



Mean monthly maximum temperature anomaly: how much warmer than average maximum temperatures were in January.

before the right weather patterns transported this pool of hot air to the south-east in the form of an extreme heatwave.

As a side note, temperatures in the north-west were well below average due to a stronger than usual monsoon season.

Meteorology of heatwaves in Australia

The typical set-up for a heatwave in south-eastern Australia is a high pressure system over the Tasman sea, often with a trough or front located over the mainland. The resulting circulation (air moves anti-clockwise around a high in the southern hemisphere) causes hot air from the centre of the continent to be directed towards the south-east.

This occurred a number of times in January and resulted in temperatures above 40°C for a record number of days at many sites along the NSW eastern seaboard. However, the stand-out event occurred in early February, when an extreme heatwave developed over much of eastern NSW and south-eastern Queensland.

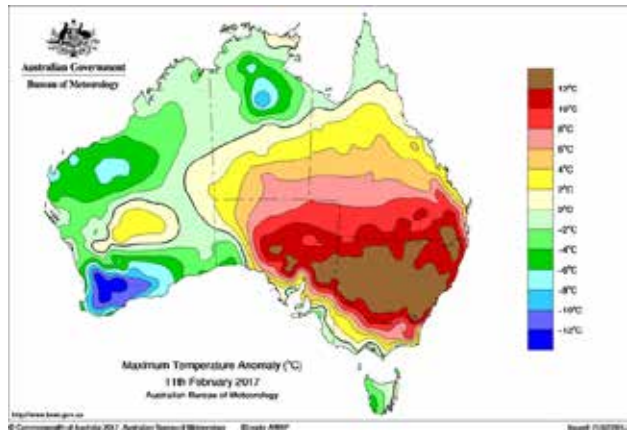
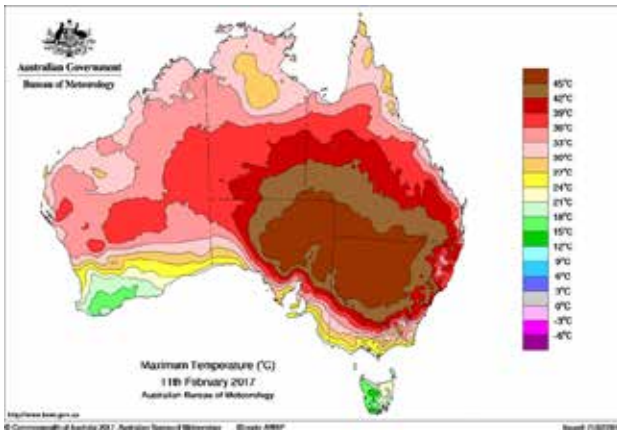
The February Heatwave

In early February, a high pressure cell stalled over the Tasman for about seven days as a trough approached from the west. The hot air mass was transported from the continental centre towards the south-east. On February 8, the hot air mass was transported by strong northerly winds, resulting in a very hot day for both Adelaide (42°C) and Melbourne (36°C).

As the trough continued eastwards, the high pressure system dissipated at the surface resulting in weak winds in the south-east. However the hot air mass had already been transported over the populated coastal regions, and with no weather systems acting to push it away, it persisted over eastern NSW for several days, from Friday February 10 through to February 12.

Large regions of NSW reported temperatures in excess of 45°C. While gentle sea breezes protected coastal areas and Sydney city from excess heat, a number of sites around western Sydney broke all-time maximum temperature records with temperatures up to 47°C.

The heatwave finally broke in most parts of NSW on February 12 with the arrival of the cool change.



Maximum temperature (left) and maximum temperature anomaly (right) reported across the country on 11/2.

As a cold front passes, the cool air mass behind the front undercuts and replaces the warmer air. This can rapidly decrease temperatures by 10°C or more in a matter of minutes.

Heatwave impacts

Bushfires

Bushfires are the most immediate and sensational impact of heatwaves. During the heatwave, the bushfire risk was rated “catastrophic,” and indeed there were more than 70 active fires. A number of these threatened communities and property. In the Snowy Mountains region, multiple fires were reported in the Blowering Dam area. Thanks to the efforts of emergency services, improved communication of the fire risks, improved understanding of impacts of meteorology on fire spread, as well as a decent dose of good luck, no lives were lost on this extreme bushfire day.

Heat exhaustion

The human impact of heat stress is often overlooked. Researchers have identified that extreme heat has been responsible for more deaths in Australia than all other natural hazards combined, but it will be some time before the heat stress impact of the 2017 heatwave can be assessed.

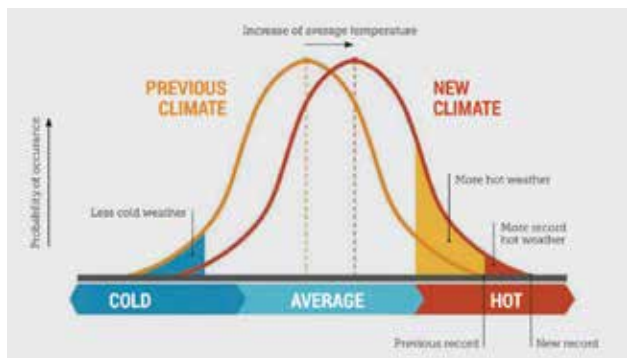
Energy demand

The heatwave made an extraordinary impact on the electricity demand. Demand in NSW exceeded total available capacity (including interconnector flows from other states) for a short period on Friday 10th February, until additional plant became available. This extreme event was timely in the context of the discussion surrounding the robustness of Australia’s electricity infrastructure.

Climate drivers and future projections

It is interesting that this summer has been so extreme in the absence of strong climate drivers. The El-Nino Southern Oscillation (ENSO) index, often associated with temperature extremes in the south-east has been firmly in neutral territory since October. On the other hand, the Southern Annular Mode (SAM) was negative for most of January, which means that cold fronts were less likely to extend to NSW latitudes. This may explain why the southern states escaped the worst of the heat this summer.

In the future, there is universal agreement among climate models that temperatures will increase, and the amount by which this happens will be controlled by human activities. Extremes of hot temperatures will be more intense and occur more frequently, while cold extremes will occur less often. To manage a warmer climate will require a combination of adaptation (i.e. acclimatisation and development of resilient infrastructure) and mitigation (i.e. commitment to greenhouse gas emission reduction).



Changes of extremes in a future (warmer) climate. Image credit: climatecouncil.org.au



Investing in large scale solar



Snowy Hydro is investing in large scale solar in South Australia. Chief Operating Officer, Roger Whitby, outlines the project and how it will add to our existing generation portfolio in the State...

Snowy Hydro Limited has invested in a battery ready 100 megawatt solar facility in Tailem Bend in South Australia to boost its generation capacity and grow its electricity retail business - Lumo Energy.

By entering into a long-term agreement with experienced renewable energy investor and developer Equis, Snowy Hydro will be able to access 100 megawatts of renewable solar generation on completion of the solar farm in 2018, with the ability to install up to 100 megawatts of large-scale battery storage on the Tailem Bend site.

"This is an exciting opportunity for Snowy Hydro to source renewable generation in South Australia to complement our existing capacity," Snowy Hydro CEO and Managing Director Paul Broad said.

"The solar farm represents a significant, strategic investment in South Australia by Snowy Hydro and demonstrates our commitment to growing both our generation business and our Lumo Energy business, which services around 50,000 electricity customers in the State.

"We are pleased to be working with Equis to deliver more renewable energy to South Australia, backed by reliable fast-start thermal capacity. Importantly, this unique generation facility at Tailem Bend is also 'battery ready' with the ability to install up to 100 megawatts of large-scale battery storage on the site."

David Russell, CEO of Equis, said: "As Asia's largest renewable energy developer and investor, the Tailem Bend solar project represents an exciting expansion into Australia for Equis and an unique opportunity to leverage our development and construction expertise to deliver large scale, reliable renewable energy for Australian consumers.

"We are delighted to partner Snowy Hydro on the Tailem Bend solar project to build one of Australia's lowest cost solar generation projects with a unique "battery-storage ready" design, further enhancing the project's long term attractiveness as a stable, low cost source of power."

Snowy Hydro currently owns and operates 5500 megawatts of generation capacity across Australia, including the iconic 4100 megawatt Snowy Hydro-electric Scheme in the Snowy Mountains region of NSW.

The Taillem Bend project will mean Snowy Hydro has access to 264 megawatts of generation capacity in South Australia. The company already operates 136 megawatts of thermal capacity at Port Stanvac and Angaston and will add a further 28 megawatts of diesel generation at the Taillem Bend site from 2017.

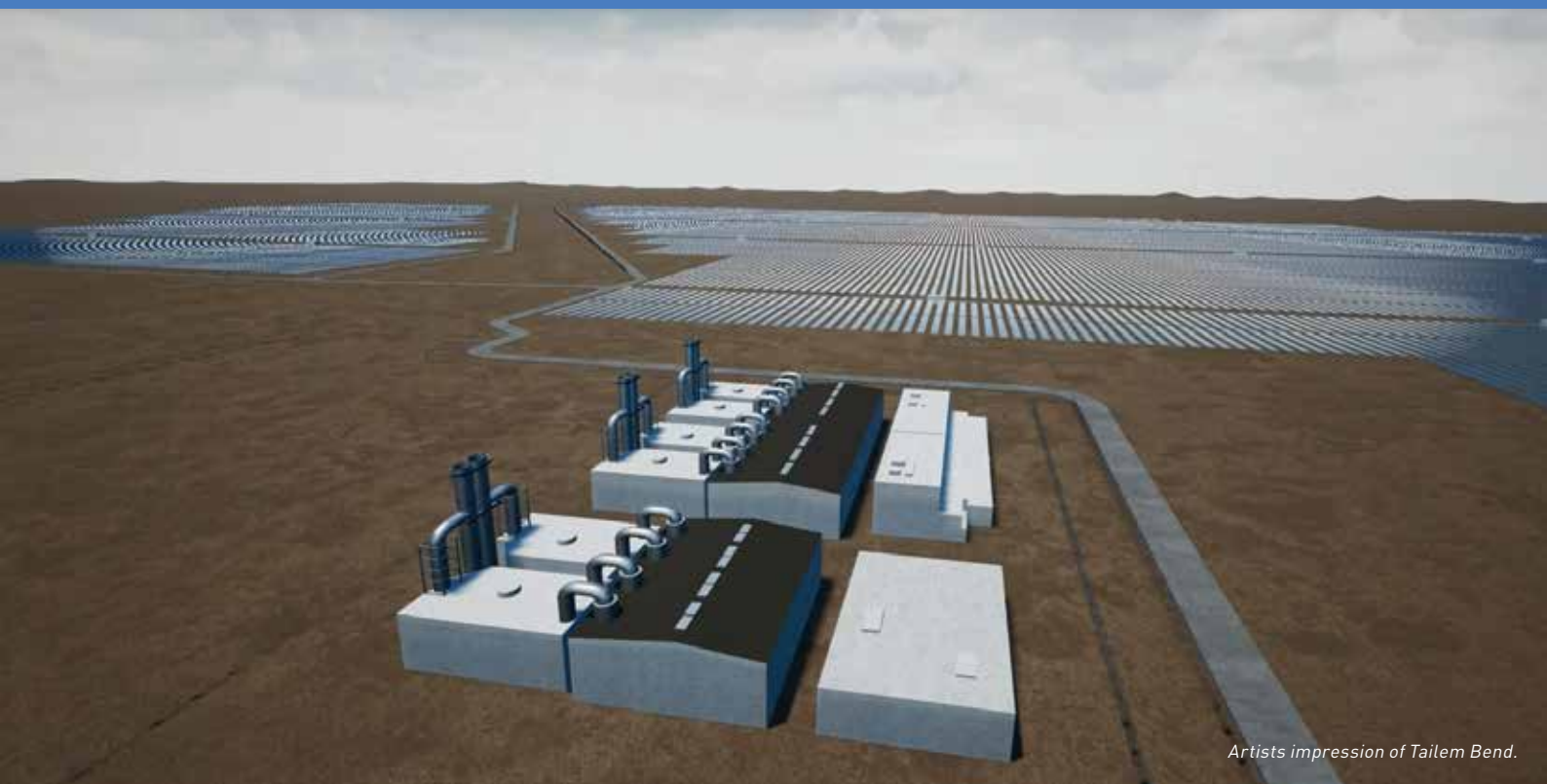
“We combine the power of the mighty Snowy Scheme with gas and diesel fired peaking generators to deliver a flexible and reliable mix of energy to our growing customer base every day,” Mr Broad said.

“We have been keeping the lights on in NSW and Victoria since construction days in the 1950s and are one of the most experienced and diverse companies operating in the National Electricity Market.

“Through our award winning retail companies - Red Energy and Lumo Energy - Snowy Hydro services more than one million gas and electricity customer accounts. We pride ourselves on superior customer service and look forward to growing our Lumo Energy retail customer base in South Australia.”

About Equis

Founded and headquartered in Singapore, Equis is Asia's largest independent renewable energy developer and investor. Equis is also Asia's largest independent energy and infrastructure fund manager. With more than US\$2.7 billion of funds under management, Equis and its invested platforms employ over 600 professionals across fifteen (15) Asian offices in Aomori, Bangalore, Bangkok, Beijing, Brisbane, Fukushima, Hong Kong, Ibaraki, Jakarta, Manila, New Delhi, Singapore, Taipei, Tokyo and Yunlin. In addition to the Australian portfolio, Equis currently owns a portfolio of over 3,623MW of renewable energy across Asia including 1,204MW of wind power, 1,726MW of solar power and 693MW of hydro power.



Artists impression of Taillem Bend.



An improved rescue service

Farewell Snowy Hydro SouthCare

Snowy Hydro Limited has been a longstanding partner and sponsor of the Snowy Hydro SouthCare rescue helicopter service for more than 15 years. During that time we have invested more than \$7 million in the service through direct sponsorship, marketing support and staff donations.

Since October 1998, Snowy Hydro SouthCare has also enjoyed the strong support of our region which has warmly embraced the rescue service. The SouthCare chopper is a familiar sight and sound across the region providing life-saving aero-medical and rescue services. It's a community resource on call 24 hours a day, every day of the year and it's vital to our region's one million residents and five million visitors each year.

The service has received overwhelming community support over the past 18 years. It's because of that support, the ACT and NSW governments now see this as an essential service and have committed to fully fund core operations without the reliance on community fundraising. It's a unique and outstanding success story.

From April 2017 the current SouthCare helicopter will retire. The ACT and NSW governments have contracted Toll Helicopters to serve the community with a new state-of-the-art aeromedical helicopter. An Agusta-Westland 139 will commence operations out of Canberra, as part of a fleet of eight servicing

southern NSW and the ACT, and will be on call 24 hours a day with two additional back up helicopters. The new helicopters will have increased power and performance with the capacity to provide an even better service to the ACT and south-eastern NSW community. Each aircraft will be fitted with the latest aviation and safety technology, including single engine performance and a greater range, night vision technology and a larger working space for the medical crew in the rear of the aircraft. The facilities on board enable life-saving operations and major medical interventions to be carried out immediately.

A bigger and better aero-medical service is great news for our region, however it does mean that Snowy Hydro will no longer hold the naming rights sponsorship for the ACT based helicopter. While we are in discussions with Toll regarding the new helicopter, it is unlikely that a sponsorship arrangement, like the one we have enjoyed for 15 years, is feasible across the fleet of helicopters.

Snowy Hydro is incredibly proud to have been able to support this essential life saving service for the last 16 years and we would like to thank our Snowy Mountains communities for also supporting the service. Together we have contributed to the success of the service and it is an outstanding example of our community spirit.

Cabramurra: a key operational town



A lot of misinformation has been circulating about the future of Snowy Hydro's operational town - the beautiful Cabramurra. Executive Officer, Safety, People & Services, Gabrielle Curtin, has the facts...

Cabramurra has a long and proud history as part of Snowy Hydro's operations. During construction days it was a thriving town with around 2000 residents. We know many locals and people from further afield that have memories of growing up in or visiting Cabramurra during earlier times.

Over the years, the population and make-up of Cabramurra has changed. Primarily, the town accommodates Snowy Hydro staff who service, operate and upgrade our facilities in the region including the Tumut 1 and Tumut 2 power stations and associated water and power station facilities. At peak times there can be around 100 staff and contractors based out of Cabramurra and when major upgrades are not taking place, then there can be around 30-40 staff working there.

In January 2016, Snowy Hydro moved its staff working in the Upper Tumut region to 'drive in, drive out' arrangements.

By January 2018, all of our staff will have transitioned to the new arrangements and there will no longer be any permanent residents in the town.

We believe it is better for our staff and their families to be based in larger regional communities where they can access the full range of services that families require including, medical, social, schooling and other community and health services. When workers are rostered on, they will be based in the town, but when they are not rostered on, they will return to their homes. Snowy Hydro is supporting their staff during the transition period.

These changes do not affect the town's place and importance in Snowy Hydro's operations. It will continue to be a key operational base for Snowy and remains open to the public to visit during the day.

An Antarctic journey

for women in science



Back in December, **Senior Climate Scientist Dr Johanna Speirs** was selected to spend 20 days in Antarctica for “Homeward Bound” - a state of the art leadership program designed for women in science. Here she describes her experiences being part of the program...

It was an incredible experience being part of the Homeward Bound program. Last year was the inaugural year for Homeward Bound, however, it aims to continue and equip 1000 women over 10 years to lead, influence and contribute to policy and decision making, particularly in the area of climate change and environmental sustainability.

The Homeward Bound program is helping address the issue of underrepresentation of women in leadership positions in STEM (science, technology, engineering, maths and medicine). At the undergraduate university level, women emerge from STEM fields at a relatively comparative rate to men, however, they are in the profound minority globally when it comes to executive decision making roles in STEM fields.

The Homeward Bound Antarctic voyage took us to the South Shetland Islands and along the Antarctic Peninsula - areas sensitive to climate change. There were 16 on-shore landings, including two visits to research bases of the USA and Argentina. Overall, the journey was incredibly inspiring. Not just because we were in Antarctica surrounded by towering rugged mountains. And not because icebergs would float past, twice the size of our ship, and also not because of the impressive

Antarctic biology such as penguin colonies of over 200,000 birds.

It's hard not to be inspired by the Antarctic environment alone. However, what I found most inspiring were the amazingly talented and intelligent participants on board. Every one of the 76 participants, as well as the organising and expedition staff, had incredible personal stories about how they've got to where they are today, what they've achieved, and what they're capable of doing next.



Homeward Bound selected 76 women in science to undertake the leadership journey in Antarctica.

We formed close relationships over the three weeks and everyone was motivated to personally and collectively create change towards a more equitable and sustainable society.

The leadership content was a learning journey of self-awareness. In the 12 months leading up to the Homeward Bound journey, we worked on collaborative projects, had readings and online lectures and we also undertook diagnostic tests to provide insights into our learning styles, attitudes and behaviours.

During the Antarctic voyage, we digested our results and tried to understand what we're doing well, but also what we need to improve to become more effective communicators, collaborators and leaders. We worked with clarifying our own values and purpose, and developed strategies to achieve our personal, family and work goals. We learnt the importance of shared values when collaborating with others.

This process certainly made me realise how my personal values are naturally aligned to those of my closest friends and family and also connect to Snowy Hydro's values. One of the most eye-opening aspects of Homeward Bound was learning how much our personal perception and inner-dialogue can influence our professional behaviour and achievements. Sometimes the only thing holding us back is ourselves. Homeward Bound made us think about what resistances we need to let go of, and where best to focus our time and energy to achieve our goals.

Upon coming home, I feel empowered to encourage future generations to enjoy successful careers in science and help make wiser decisions in how this planet's resources are managed.



Events highlight the best of our region



The Snowy Mountains hosts some of the best community festivals and events on offer in NSW, many of which we are proud to partner with. **Visitor Centre Team Leader, Luke Judd** outlines the events...

Snowy Hydro is a proud sponsor of many festivals and events throughout our region. It has already been a busy start to the season with Australia Day celebrations, Rock the Turf, Tumbatrek, Nimmitabel Show, Lake Jindabyne Flowing Festival, Tumbafest and Cooma Show.

The festivals and events Snowy Hydro partners with is not just a way that we can support our community through sponsorship; but it's an important avenue to talk directly with people within our communities. They allow us to provide accurate information about our operations, gauge any points of concern the community may have and provide an opportunity to put a face to our business.

Festivals and events also provide us with a unique opportunity to promote our retail energy company - Red Energy - through sponsorship and participation. Red Energy was a major sponsor of the Tumut Rock the Turf event and it was a great success. Many people recognise that without Snowy Hydro and Red Energy's support these events may not get off the ground.

The upcoming Lake Light Sculpture event in Jindabyne in April will provide another opportunity to raise awareness around Red Energy with Snowy Hydro and Red Energy partnering to support the event.

The recent Flowing Festival in Jindabyne saw increased participation from the local area schools and a great overall turnout for the bi-annual event. We look forward to seeing these events continue to grow as the strength of our festivals and events is a reflection on the success of our communities. Below is a list of the upcoming events, we hope to see you there.

FESTIVAL & EVENT	DATE
Cooma Multicultural Festival	March 19
Jindabyne Lake Light Sculpture	April 14-17
Man from Snowy River Bush Festival, Corryong	March 30-April 2
Tumut Festival of the Falling Leaf	April 29
Batlow Cider Festival	May 20



Competitors battling it out at the Lake Jindabyne Dragon Boat Challenge



Murray 2: Open for inspection



Murray 2 Power Station and Visitors Centre opened to the public in early March. Visitor Centre Team Leader, Mel Castle, explains...

As a result of modernisation works at our Murray 1 Power Station, in late 2017 we temporarily closed the Murray 1 Visitors Centre to ensure the safety of not only our employees, but the visiting public. As an alternative during the major works and to continue to provide excellent visitor facilities and access to the iconic Snowy Scheme in the Khancoban region, we have opened a temporary visitor's centre and power station inspections at Murray 2 Power Station.

Located only 5kms from the Khancoban town centre, the Murray 2 temporary visitor centre has a cafe where you are able to purchase fantastic coffee and light refreshments whilst enjoying the view over the impressive tail bay down to the Khancoban Pondage and surrounding mountains.

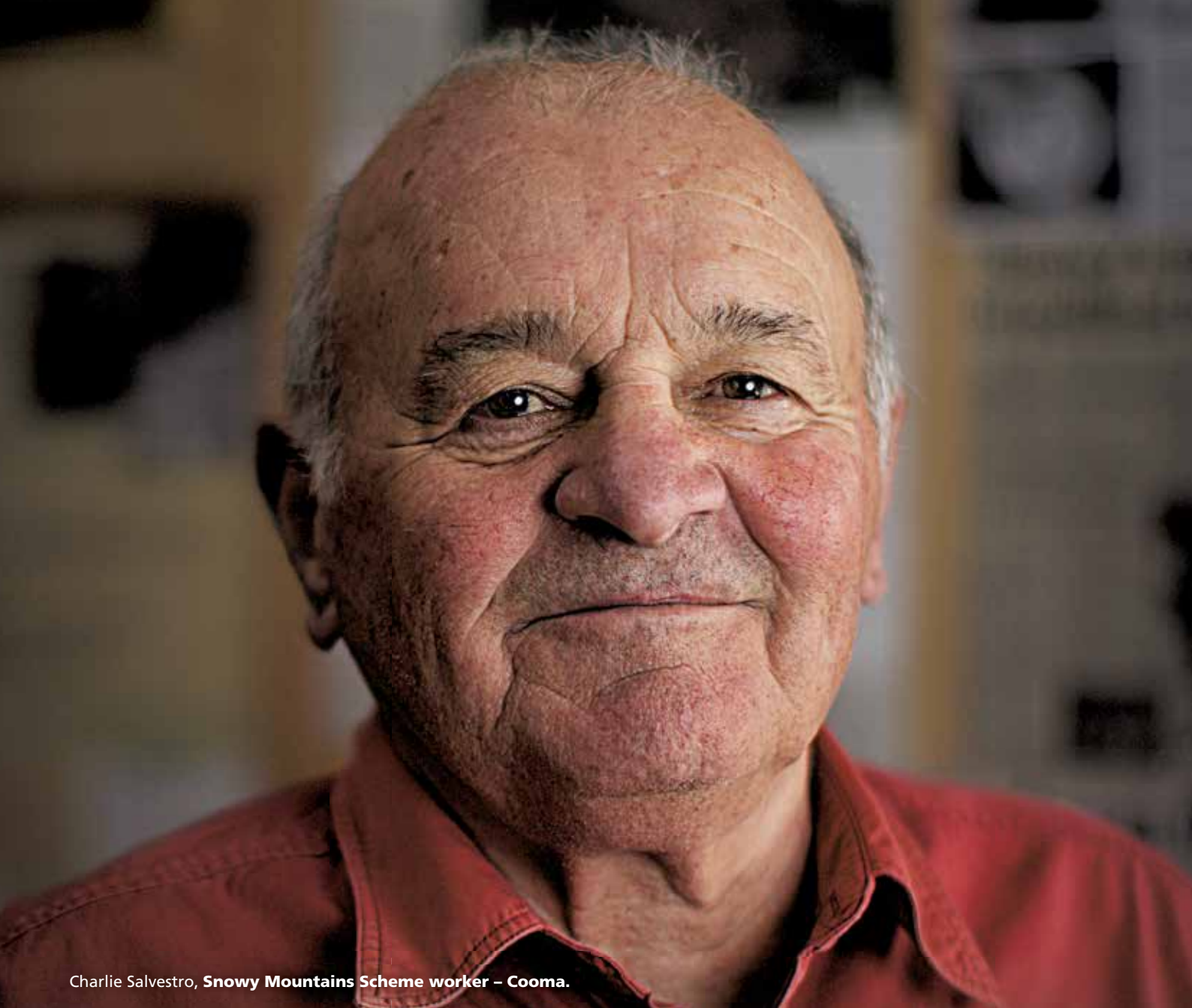
Murray 2 Power Station inspections are hosted by our great customer service team at 11am and 2pm daily. Visitors are able to view informative displays, watch our short video on the business and the Scheme and view the power station from inside the viewing platform.

Murray 2 Power Station is located at the end of Power Station Road, Khancoban. We are open 7 days per week during summer (Oct to Apr) and Monday - Friday during winter months (May - Sept). Entry is free of charge.

Groups and School visits are welcome too - all you need to do is phone the visitor's centre to make your group booking on 02 6076 5117.



The Murray 2 Temporary Visitors Centre serves tea, coffee and light refreshments as well as souvenirs and merchandise.

A close-up portrait of an elderly man with weathered skin and a slight smile, wearing a red collared shirt. The background is blurred, showing what appears to be a wall with some papers or notices.

Charlie Salvestro, **Snowy Mountains Scheme** worker – Cooma.

Ten years.
Minus 15°C.
Slept in a canvas tent.
That's 110% Australian.

The Snowy Mountains Scheme was hailed as a Civil Engineering Wonder of the World. It achieved that title thanks to the grit of people like Charlie Salvestro, just 16 when he took the bus from Cooma to Guthega to ask for a job. Over ten years he worked in often freezing temperatures and many miles from the nearest beer. Red Energy is an all-Australian company owned by Snowy Hydro so, like Charlie, giving 110% is in our blood. That's why we think the people of the Snowy Region deserve fair prices, genuine discounts and local award winning customer service.



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