snowy hydro



7 ISSUE 57 • WINTER 2022

FLORENCE

Snowy 2.0 project update
Spot the robot dog
TrueGreen renewable energy

BMS

INSIDE

- CEO's message З
- Snowy 2.0 project update 4
- Snowy 2.0 upstream surge shaft 6
- High-tech hound 7
- 8 Safety on our roads
- Stepping up at Murray 1 9
- 10 TrueGreen renewable energy
- Celebrating culture and identity 13
- Community & education 14

Follow us

- @snowyhydroltd
- @snowyhydroofficial **O**

We welcome your feedback:

1800 623 776 (a) communityfeedback@snowyhydro.com.au

For more information, please visit our website snowyhydro.com.au. Sign-up to our e-newsletter or follow us on Facebook.



and CEO Paul Broad

Safety is Snowy Hydro's highest priority - we are committed to getting the job done, but above all, we want everyone to go home safely at the end of the day.

It's something I am particularly passionate about, which is why I'm proud Snowy is making a contribution to improving local road safety by supporting NSW Police to increase highway patrols in the Snowy Mountains.

We are co-funding two extra police officer positions and a new four-wheel drive highway patrol vehicle so that the Cooma-based command have additional presence on the Snowy Mountains Highway and other key roads to help deter poor driver behaviour. This new road safety commitment also adds to capacity for police undertaking important highway patrol functions including alcohol and drug testing, checking heavy vehicle compliance and timely emergency response.

When combined with improved mobile phone coverage along the highway - another Snowy Hydro partnership with the NSW Government resulting in \$1.3 million joint funding to deliver new small cell antennas at priority sites between Adaminaby and Talbingo - it's a great outcome for community safety, with these important initiatives focusing on roads used by hundreds of thousands of people.

Within our business we are always looking at new ways of utilising technology to enhance our operations and improve safety outcomes. Recently we purchased some of Australia's first Starlink satellite dishes to help deliver more reliability by providing fast, stable internet in locations with historically patchy connections.

You may not know that for 12 years Snowy Hydro has operated and grown its commercial and industrial (C&I) capability. With our TrueGreen[™] 100% renewable energy guarantee, delivered through our awardwinning retailer Red Energy, we're enabling C&I businesses across Australia to transition away from fossil fuels to renewable energy.

These renewable electricity agreements with C&I customers, combined with Snowy's existing hydro and gas assets, and our 10 wind and solar offtake contracts, are underpinning a stable and secure transition to a low-carbon emissions future at the lowest cost for consumers. Snowy 2.0 will only add to this asset base.

CEO UPDATE A message from Managing Director

Our Snowy 2.0 pumped-hydro project, which is expanding the mighty Snowy Scheme, powers on at multiple construction sites in the mountains. We now have all three of our huge 11-metre diameter tunnel boring machines (TBMs) in operation, with the last, Florence, taking on the very long headrace tunnel excavation of about 15 kilometres.

It was fantastic to join members of our local community at the commissioning event for TBM Florence and have them celebrate another exciting milestone for Snowy 2.0 with us at Tantangara.

Over near Khancoban, our Murray 1 Power Station has been on the receiving end of a refurbishment project to recondition and replace the bushings of its generator step-up transformers. This will help to increase the lifespan of the transformers by an extra 15 years - an amazing achievement and part of Snowy's deep commitment to thoroughly maintaining its assets.

We're looking forward to next month's Nations of Origin annual multi-sport tournament run by NSW Police and Citizens Youth Clubs (PCYC). It's the largest Aboriginal youth sporting event in NSW and is proudly sponsored by Red Energy. The event is part of the Red and Snowy Hydro funding and support partnership with NSW PCYC, which assists this highly-respected organisation in providing a range of youth programs.

Finally, with winter here, and bearing in mind our collective focus on being safe on the roads, I'd ask everyone to please be mindful of the unpredictable and sometimes severe weather conditions that can occur at this time of year. If you're driving please take extra care.

Maroad

Paul Broad Managing Director and CEO

PROJECT UPDATE

Lobs Hole view

Snowy 2.0

Lobs Hole

The Lady Eileen Hudson tunnel boring machine (TBM) has now excavated 2.2km of the main access tunnel, with 600 metres remaining to reach the northern end of the power station complex. Once complete, the TBM will be disassembled, extracted and reassembled at Talbingo. The supporting services will also need to be reassembled and recommissioned, ahead of Lady Eileen's next mission to excavate the 6km tailrace tunnel heading east from Talbingo to the power station.

Also at Lobs Hole, TBM Kirsten is gaining momentum, with approximately 800 metres of the emergency cable and ventilation tunnel excavated. This tunnel is parallel to the main access tunnel and passes the southern end of the power station complex. Once past the power station, at 2.9km, the Kirsten will be modified to begin uphill excavation for the inclined pressure shaft.

Tantangara

TBM Florence is now fully commissioned has tunnelled several hundred metres west to Marica, where it will eventually meet up with TBM Kirsten. The headrace tunnel has a straight alignment and a 0.5% downhill gradient, as TBM Florence heads west under the Gooandra plateau. This 15km tunnel is expected to take about 3.5 years to complete.

Ravine Road

Camp gym

Providing safe, all-weather access to the Snowy 2.0 construction sites is key to keeping workers safe and the project on track. Ravine Road, the main access road into Lobs Hole, is 15km long with 850 metres of elevation difference from top to bottom.

Sunset over camps at Lobs Hole

Upgrade works to improve vehicle access have included widening the road to two lanes, with 250,000 cubic metres of material excavated. The upper section of the road is above the snow line and often in the clouds. A newly-laid asphalt surface on the upper 5.9 kilometres will aid snow clearing and allow lines and snow poles/reflectors to be installed. This will help guide drivers of trucks and other vehicles in low visibility conditions. When Snowy 2.0 is complete, the local community will enjoy the legacy of safe road access to Lobs Hole.

Accommodation camps

The Snowy 2.0 onsite camps are bustling, busy places accommodating about 1,400 workers this winter at Lobs Hole, Tantangara and Marica.

Construction of the camps is well-advanced with gyms, mess halls, and entertainment areas built and walking trails being installed. Workers are bussed in and out of site for their roster swings as a safety measure to minimise the number of vehicle movements on the mountain roads.



warkors at Marica

TBM Flo on the go

Snowy 2.0's third and final tunnel boring machine, TBM Florence, has been officially welcomed to the project with a special event at Tantangara.

Snowy Hydro and Future Generation teams were joined by community and business leaders, school students and family members of the late Florence McKenzie for a unique opportunity to view the TBM before it began its journey underground.

Among the special guests was local Berridale student Riley Douch, who won the Snowy 2.0 TBM Naming Competition, suggesting Florence Violet McKenzie (1890-1982), Australia's first female electrical engineer. Some of Florence's relatives, Scott and Will Wallace and Luke McKew, flew from interstate to attend.

TBM Florence is a mammoth 143-metre machine that will excavate the headrace tunnel linking Tantangara to the underground power station and providing the water supply to drive the generators.



Asphalting on Ravine Road

PROJECT UPDATE

Upstream surge shaft

Surge shaft shed under construction at Marica

Snowy 2.0's upstream surge shaft is located at Marica on the headrace tunnel, 2.7km upstream of the power station at 1,280m elevation. At 28 metres in diameter and 285 metres deep, the concrete-lined shaft will be one of the largest diameter operational shafts in the world.

The surge shaft has two key purposes for the operation of the power station: as a water storage and vacuum relief when the power station starts up, and to absorb the momentum of water movement within the headrace tunnel when the power station is shut down.

During turbine start-up, water from the headrace tunnel within the inclined pressure shaft starts flowing through the power station. When the valves open at the turbines, modelling indicates it will take up to seven minutes for the entire length of water to start moving. Water coming down the inclined pressure shaft into the turbines with 800 metres of elevation difference will move significantly faster than water entering the headrace tunnel at Tantangara 16 kilometres away. A similar concept is the way vehicles move in a traffic jam - there is a delay between the

first vehicle moving and the last vehicle gaining full speed.

This supply versus demand issue with initial start-up continues until all the water is moving within the headrace tunnel and the water balance equalises. The surge shaft stores and provides the additional water volume required to manage the supply and demand profile.

Once fully operational, water typically flows through the power station's headrace tunnel at four metres per second. When the power station is shut down,

Surge shaft model

the water flow is stopped at the valve and it takes some time for about 18 kilometres of water to come to a full stop. During this time, extreme water pressures will develop within the tunnel as the huge volume of water compresses.

The surge shaft acts as a pressure relief valve for the headrace tunnel, allowing the water to surge up within the shaft, well above the water level within the Tantangara Reservoir. The water then drains out of the surge shaft until it is at the same level as the reservoir.

Construction of the surge shaft will span four winters, and with Marica above the snow line, a large shed is being constructed over the top of the shaft to facilitate 24-hour operations in all weather conditions.

HIGH-TECH HOUND

Snowy Hydro teams regularly investigate ways new technology can enhance existing operations, from digital engineering tools to remotely operated weather measurement systems. One recent trial utilising scanning technology and autonomous vehicles could pave the way for sophisticated remote inspections across certain Snowy assets.

Australian technology company Emesent, a world leader in drone autonomy, LiDAR mapping and data analytics, recently visited the Snowy Scheme to test a series of scenarios using a Boston Dynamics robotic dog. Emesent's locallydeveloped Hovermap LiDaR scanning hardware combines scans of the physical environment with drones and robotic vehicles that can navigate themselves around the real world with minimal operator involvement.

The robotic dog, named Spot, demonstrated impressive skills by climbing several sets of stairs inside Tumut 2 Power Station. An initial scan of the area allowed the operator to set waypoints for Spot and then control its progress remotely from the floor above. In confined spaces, a camera can be attached to Spot's back to capture imagery, or a manipulating arm connected to open doors, turn valves or pull levers.

The trials gave the Snowy team the opportunity to understand Hovermap's capabilities and explore the potential for a business case towards greater safety and productivity using platforms and drones. Following a debrief of Spot's performance during the trials, the Snowy and Emesent teams will be able to work together to adapt the solutions and provide input to Hovermap's product development roadmap.

STAR POWER

Anyone who lives or works in remote areas will appreciate the value of reliable internet connection. Snowy Hydro's recent purchase of some of Australia's first Starlink satellite dishes will help deliver more reliability by providing fast, stable internet in locations with historically patchy connections.

Starlink is a global constellation with 2,000 Low-Earth orbit satellites operated by Elon Musk's SpaceX aerospace company. The technology is considered a disruptor in the communications space as it provides a fast link in both directions compared with traditional satellite internet, which tended to have slow uplink.

Since acquiring its first dish during Starlink's beta release in 2021, Snowy has added another two satellite dishes for connectivity at the Snowy team office at Polo Flat, Tooma Dam cottage and the Hunter Power Project site office.

TECHNOLOGY



Spot in action



Climbing the stairs at Tumut 2



SAFETY

Police explain the vehicle features

Eyes on the road

Driving on Snowy Mountains roads can be tricky, even for experienced local drivers, as conditions can deteriorate at a moment's notice with a change in the weather. With roads shared by residents, workers, tourists, and transport companies, every day brings a mix of potential hazards.

A new road safety commitment between Snowy Hydro and NSW Police will expand police presence by increasing highway patrols in the Snowy Mountains over the next three years.

Two highway patrol vehicles and five more police officers are now available for patrols on the Snowy Mountains Highway and other

local roads. This includes one new four-wheel drive highway patrol vehicle and two additional police officers that have been co-funded by Snowy Hydro and NSW Police.

Snowy Hydro's commitment to road safety and driver education is in our DNA. In 1959, 10 years before seat belts were made compulsory in Australia, Sir William Hudson mandated that all Snowy vehicles have seat belts fitted and all staff and workers wear them when driving. On the education side, Snowy's Young Driver Training program has helped hundreds of learner drivers understand the dangers of alpine driving with practical behind-thewheel training sessions.

Visible police presence is important as it can help deter poor driver behaviour such as speeding, dangerous overtaking and driving under the influence of alcohol or drugs.

Snowy Hydro CEO Paul Broad said the company's support for NSW Police and local road safety operations would benefit all road users. "Safety is, and always will be, the highest priority for Snowy Hydro. We are proud to be supporting this joint initiative with NSW Police to increase highway patrols throughout the Snowy Mountains. These are the communities in which we live, work and serve."



Transformer refurbishment at Murray 1

Stepping up at Murray 1

An ongoing focus at Snowy Hydro is ensuring the assets of the iconic Scheme are in peak condition and ready to generate clean renewable energy when needed. From the smallest mechanical parts through to giant turbines, careful operation and regular maintenance is a top priority.

Inside Murray 1 Power Station, a series of step up transformers adjust the electricity from the station's 10 generators ready for its journey across the transmission network. These original, 50-yearold transformers are still in good operating condition, but some of the internal components must be replaced to ensure continued safe operations.

When electricity is generated, it undergoes a series of transformations before it powers our homes. Typically, electricity travels at high voltage across power lines to reduce energy loss during transmission. When it reaches its destination, the

electricity must be reduced to low voltage to make it safe for residential and commercial use. This is the role of transformers to adjust the voltage up or down as required.

The Murray 1 refurbishment program involves the replacement of the transformer bushings, the ribbed porcelain casings that cover the high voltage connections. Due to the dangerous nature of working around high voltage electricity, a number of precautionary steps must be followed before the components can be replaced.

Firstly, the transformer is removed from service and a spare transformer put in its place. The offline transformer is then detanked, which involves taking off the lid, removing the active parts (including the core and coils) and carrying out inspections and any necessary repairs. The active parts are placed into a spare tank for a dry-out process to ensure the

REGIONAL WORKS



removal of any moisture. The team completes welding works and modification of the old transformer tank and lid, before re-tanking the unit into the original body.

The customised dry-out tank was built by the Melbourne-based Wilson Transformer Company, which navigated a six-week government approval process in order to cross the closed Victoria/ NSW border during the pandemic. Local contractors including Roddy Engineering and PHE Tumut have also been involved in the project.

Reconditioning and replacement of the bushings will help to increase the lifespan of the transformers by an extra 15 years. The Murray 1 transformer refurbishment, along with similar programs at Blowering Power Station and Jindabyne Pumping Station, is expected to wrap up later this year. Bushing replacements in Tumut 3's step-up transformers will continue through to the end of 2024.

TRUEGREEN RENEWABLE ENERGY

The Snowy Group's Commercial and Industrial (C&I) business, which started in 2011 to provide customer optionality to Snowy and diversification of our successful Red Energy business, has grown to be a market-leading retailer, providing award-winning service across 11,000 sites. Our renewable electricity agreements with C&I customers, combined with Snowy's existing hydro and gas assets and 10 wind and solar offtake contracts, are underpinning the nation's secure and stable transition to a low-carbon emissions future at the lowest cost for consumers. Snowy 2.0 and the Kurri Kurri gas plant will be crucial additions to this asset base.

Snowy Hydro is currently offering C&I customers a premium renewable energy product - TrueGreen[™] comprising 100% renewable energy, matched with 100% renewable certificates (LGCs). Our TrueGreen[™] product also meets the requirements for customers to be granted market-leading accreditation. Another product in development provides economical renewable energy alongside mandatory and matching certification. These diverse, flexible, and secure renewable energy offerings enable C&I businesses across Australia to transition to renewable energy.

The University of Newcastle was the first university to sign a TrueGreen™ 100% renewable electricity contract to power its Newcastle and Central Coast campuses. Macquarie University's TrueGreen™ contract with Snowy Hydro and Red Energy will enable a switch to a 100% renewable electricity source for its North Ryde campus. Both contracts are for seven years.

The University of Sydney will be powered by 100% renewable electricity by the Snowy group from 1 July 2022. The positive impact will be in excess of removing 31,200 cars from the road, bringing the university a step closer to its target of net zero emissions by 2030.

The Victorian Energy Collaboration (VECO) is the largest emissions reduction project ever undertaken by the local government sector in Australia. 46 Victorian Councils have pooled their electricity needs into one long-term contract with Snowy Hydro and Red Energy, which will provide the VECO group with renewable energy generated from wind farms in Victoria. This initiative will lower Victoria's carbon footprint by 260,000 tonnes of CO2 each year.

Sal Tringali, Head of C&I at Snowy Hydro, said: "We are excited to be the leading renewable energy producer and proud of the fact that we are able to assist our customers in navigating a least-cost, leastrisk path to decarbonisation, through providing marketleading, premium renewable products, alongside industrybest customer service."





DISCOVER **THE SNOWY** SCHEME

Stop by for a coffee on your way to the Snowy Mountains.

Play in our interactive immersive theatre experience.

Discover more about the past, present and future of the mighty Snowy Scheme, Snowy Hydro and renewables.

VISIT US

Snowy Hydro Discovery Centre and Cafe

Monaro Highway, Cooma Open 7 days Weekdays 8am - 4.30pm Weekends and public holidays 9am - 2pm



snowyhydro.com.au 1800 623 776



Got an event or function coming up?

The Discovery Centre is available to host functions/events for up to 100 people.

To find out more or to book please email bookings@snowyhydro.com.au



Celebrating culture and identity

Playing sport has long been associated with fitness and friendship, as well as a fun way to learn about teamwork and community spirit. Nations of Origin, a multi-sport tournament run by the Police Citizens Youth Club (PCYC) NSW, takes these benefits even further with a focus on indigenous culture and stories of identity.

Red Energy and Snowy Hydro are the major sponsors of the Nations of Origin event held each year as part of NAIDOC week celebrations. Since its inception, the tournament has brought together thousands of players, volunteers and mentors from across NSW. With key pillars of education, reconciliation, cultural identity and sport, players also need to meet a range of criteria to compete, including a minimum of 80% school attendance.

The idea of Nations of Origin came about after consultation with young people and Aboriginal communities and aims to



encourage indigenous youth to celebrate their diverse culture. It is now the largest Aboriginal youth sporting event in NSW, with more than 1,400 young people competing in previous vears.

This year's tournament will kick off on 12 July at Port Stephens in the NSW Hunter region, with teams competing over four days in rugby league, football fives, basketball, gymnastics and netball. Each team represents an Aboriginal nation, wears the totem of that nation and must have both indigenous and nonindigenous players in a ratio of 70:30.

Past players say they loved meeting young people from around the state, representing their own culture and learning about other communities. On average around 60 participants in Nations of Origin go on each vear to further develop their skills and complete PCYC NSW Blue Star Citizenship or Leadership

programs. Many return to the Nations of Origin tournament in subsequent years as youth mentors.

PCYC is Australia's pre-eminent youth organisation working with the community and police to empower young people to make positive life choices in a safe, mentor-rich environment.

The Red Energy and Snowy Hydro partnership also provides funding and support for other PCYC NSW programs including Fit For Work, which is designed to increase employment opportunities and is linked to the NSW Police Commissioner's RISEUP strategy. Red Energy is also able to deliver electricity supply efficiencies and savings that allow the PCYC to invest more of their resources into youth programs.

Nations of Origin runs until 15 July, with each of the five sports held at different locations around the Port Stephens area.

COMMUNITY & EDUCATION

H20 kids activities in Cooma





A venue like no other

Are you looking for a unique space to hold an upcoming event? Snowy Hydro's Discovery Centre is now available for hire and could be the perfect venue to run a team workshop, community forum or industry conference.

With plenty of parking, wheelchair access and a spacious cafe, the Cooma venue offers guests a fascinating glimpse of the mighty Snowy Scheme's history, current day operations and future plans. There's also a state-of-the-art immersive theatre with a 14-metre wide screen, guaranteed to keep guests fully engaged in your presentation!

For more information or to book your next event, contact us using the email address, bookings@snowyhydro.com.au

Community grants announced

Round 1 of the Snowy Hydro Community Grants Program has attracted strong interest from more than 60 applicants, with grants awarded to projects focused on sport, health, events and the environment.

Recipients include Monaro Committee for Cancer Research to support living costs and medical expenses for local cancer patients, Tumut Swimming Club for a branded gazebo and PA system, and Adelong Alive Museum for a new computer. Grant funding has also been awarded for the establishment of an interpretive indigenous walking trail and to secure spots for Khancoban and Corryong youth to attend a pilot Outward Bound program.

If you have a burning idea to boost the Snowy Mountains region, get cracking and participate in our next round of applications. Round 2 opens on 1 September 2022 and closes 15 October.

For more information on eligibility, assessment criteria and to access the online application form; snowyhydro.com.au/communitygrantsprogram

Careers at Snowy Hydro

Interviews will soon commence for the next round of trainees and apprentices to join the Snowy Hydro team. A range of entry-level programs is on offer for school leavers, university graduates and TAFE students, with opportunities across engineering, science and mechanical and electrical trades.

After a series of interviews, online testing, medical and reference checks, successful applicants for the 2023 intake of trainees and apprentices will be offered the opportunity to start their very own Snowy story.

Snowy Hydro traineeships offer 12 months' full-time employment in business administration or information technology, with the ability to study and work at the same time. Apprenticeships in electrical and mechanical trades at Snowy are a four-year development program with the opportunity to live and work in a new region every 12 months. Successful applicants typically have a solutionsbased mindset, can think outside the box and are keen to bring new ideas to the Snowy business.

For the latest information on career opportunities at Snowy Hydro, visit snowyhydro.com.au/careers/

H20 Kids

The Snowy Hydro H20 Kids holiday program is run through our local out of school hours (OOSH) providers as part of each centre's individual holiday program. Providers can opt for either an excursion to the Discovery Centre in Cooma or an incursion visit to their centre as part of our outreach program.

Over the Easter school holiday break there was much fun, laughter and excitement as the kids from across five OOSH centres got busy learning about the water cycle, tunnel boring machines and the power of water program delivered at the Discovery Centre.

Kids had a blast, with hands-on weather experiments, making their own playdough mountains and engineering their uniquely designed TBMs. They delved into the STEM experiments like true little engineers, bringing their curious minds, problem-solving skills and many guestions formed through critical thinking. For details on upcoming H2O Kids holiday programs: snowyhydro.com.au/ education/education-programs





Kirsten Banks (right) and Kirsten Brennan, Q&A panel

I Spy with my little eye

A new addition to Snowy Hydro's Next Generation Education Hub is a fun series of activity sheets called. I Spy. Testing observation skills and basic maths, the activity involves searching for a number of icons that represent different parts of the Snowy Scheme and hydro-electricity generation, including transmission towers, safety vests and snowflakes.

Snowy Hydro's Next Generation Education Hub has plenty of activity sheets to explore and download at snowyhydro.com.au/education/nextgen.



Women in STEM

In May, astrophysicist, science communicator and Snowy 2.0 TBM namesake, Kirsten Banks, joined Snowy Hydro engineer Kirsten Brennan on a Q&A panel in the immersive theatre at the Snowy Hydro Discovery Centre to answer questions about their careers in STEM. Local students joined Snowy Hydro employees for lunch with the two Kirstens.



Switch to Red Energy.

snowyhydro

131 806



