snowy hydro

NEWS

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Spotlight on Snowy 2.0

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INSIDE

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This page: Talbingo Reservoir. Cover image: Walking through the Snowy 2.0 main access tunnel.

CEO UPDATE

A message from Managing Director and CEO Paul Broad

What a memorable year it has been for Snowy Hydro! We've been powering ahead with key projects, keeping the lights on for millions of Australians and maintaining our magnificent Snowy Scheme assets so they're ready to deliver on-demand power at any time.

At the same time, we have been managing the ever-changing COVID-19 situation, with great flexibility shown by our staff and contractors. Despite the challenges, the Snowy team can deliver outstanding results no matter where we work. It's great now to be emerging from the restrictions and we're looking forward to an exciting 2022.

Recently we celebrated completion of the Polo Flat precast factory construction and the production of concrete tunnel-lining segments from both automated carousels. Raw materials are being sourced from the local area to mix concrete at the onsite batching plant.

There will be a total workforce of about 110 people at full operation, with a significant number of these roles filled by locals. The segment plant is something we fought hard to establish in the mountains, so that its economic benefits could flow through to the community. I'm very proud to see it now up and running.

Our Snowy 2.0 nation-building renewable energy project is certainly go, go, go.

Tunnelling is proceeding very well, with the Lady Eileen Hudson tunnel boring machine approaching the halfway mark of its 2.6-kilometre drive at Lobs Hole. After a year of cargo deliveries, the last of the TBM components were delivered to Tantangara, where TBM Florence is being assembled in preparation for launch early next year.

I am pleased that TransGrid's transmission projects which will connect Snowy 2.0 are working their way through the planning process. These projects are important not only for Snowy but also for wind and solar power in NSW and Victoria, which will use most of the upgraded transmission capacity.

Snowy 2.0, Australia's largest committed renewable energy project, is on-track, on-budget and creating 4,000 jobs, including local jobs and opportunities, while providing a major economic boost to our Snowy Mountains region. In addition, thousands more jobs are being delivered indirectly through supply chains and support services.

To date, more than 150 local region businesses have been involved in the project and there has been $70 million injected into the regional economy.

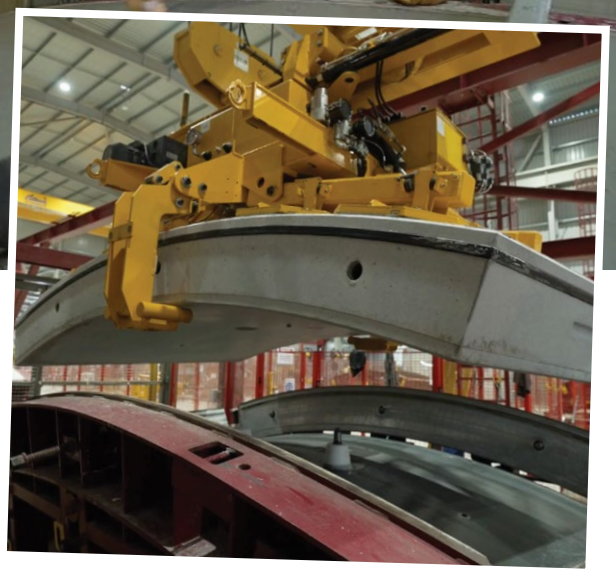
In the Snowies we've had some good inflows into our dams as a result of the spring snowmelt, which is excellent after a few years of reduced inflows due to drought. We've also been busy preparing for another summer and the risks posed by bushfires. This is a major safety focus for us, with people and physical assets to protect, as well as the broader community.

Our wonderful Science of the Snowy Scheme competition for local school students has produced some exciting ideas for Snowy Hydro's next big renewables project. It's great to see the creativity, innovative thinking and problem-solving coming from the next generation of local engineers and scientists!

Finally, on behalf of us all at Snowy Hydro, I would like to wish everyone a safe and happy Christmas and New Year.

Paul Broad
Managing Director and CEO

Screeding the segment surface



Lifting the segment from its mould

Polo Flat is pumping

With the Lady Eileen Hudson tunnel boring machine (TBM) now excavating well into the mountain and the second machine, TBM Kirsten, ready to go, production has picked up significantly at the Polo Flat segment factory. When in operation, the TBMs will slot a permanent concrete ring into place every two metres of excavation. Keeping them fed will require an ongoing supply of segments onsite, ready to be transferred onto the machines.

The automated segment production carousels went through an extensive installation, commissioning and testing phase of all sections. This was conducted to ensure the production line runs smoothly and moulds are transferred between workstations and through the steam curing chamber without any fault. The belts were load-tested, locking mechanisms inspected and all safety protocols checked.

With two carousels running at peak production, 90 tonnes of concrete will be poured every hour. A team of 24 workers will run each line, performing different tasks along a series of stations – from inserting rubber gaskets into the segment mould, to adding a reinforcement cage and screeding concrete.

Raw materials are sourced from the local area for production of concrete from the main yard batching plant, which is then transferred into the factory and poured into specially-designed moulds. It takes around 10 hours to cure each segment from casting to demoulding, with around 110 segments produced per carousel every day. An onsite laboratory will test and check the quality of concrete for every segment produced.

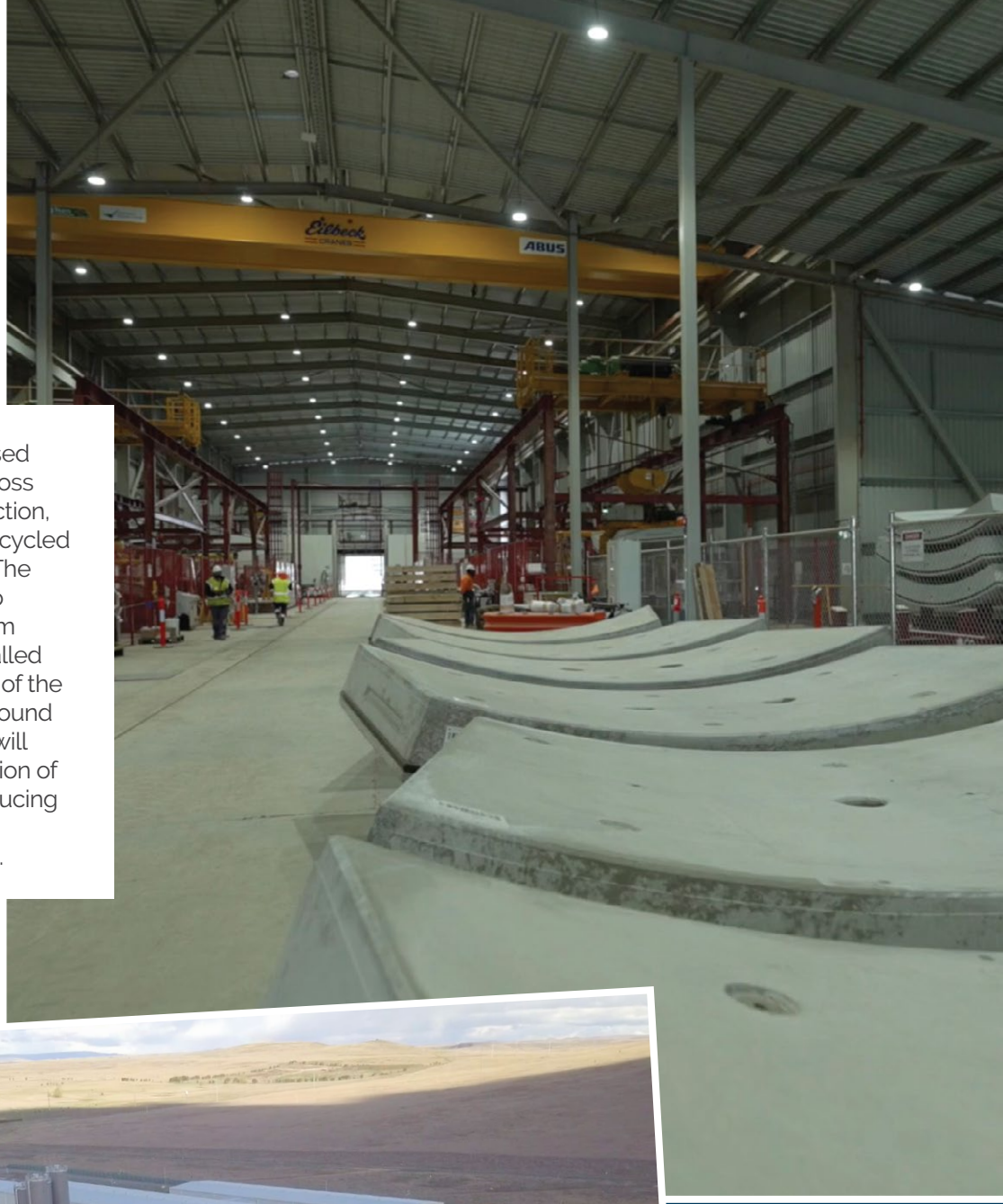
Once demoulded, the segments move to a pre-storage area in a stack of three. Wooden dunnage separates the segments and each set of three remains together for the rest of the transportation process. After arriving onsite, the segments are loaded onto the TBMs and installed around the excavated rock face of the tunnel.

An important step in the transfer of the segments from Polo Flat to various sites is ensuring trucks do not bring any unwanted seeds or weeds along for the ride. Large vehicle washing facilities are in place at the Polo Flat precast factory and Lobs Hole to give the wheels and undercarriage a high pressure clean prior to departure. The wheel washers, which are similar to a drive-through car wash without the roof, hose off any dirt and vegetation in a few moments using targeted water jets.

The segment factory will be operated 24 hours a day, seven days a week while the TBMs are tunnelling. Snowy Hydro opted to build the factory locally rather than import segments to support local jobs and investment, employing more than 120 people over the construction. With 27 kilometres of tunnels to be lined with concrete rings for the Snowy 2.0 project, Polo Flat will be busy producing segments for the next few years.

Reuse, recycle

Recycled material is used whenever possible across the Snowy 2.0 construction, with the main use of recycled materials at Polo Flat. The segment factory is also using a by-product from steel manufacturing called 'slag' in the production of the concrete segments. Around 70,000 tonnes of slag will be used in the production of 130,500 segments, reducing the amount of cement needed by 40 per cent.



Finished concrete segments

Aerial view of the segment factory

Positions vacant

At full operation, the total workforce for the batching plant and segment factory is about 110, with many of the positions filled by local people. Roles are currently open in segment-creating, loading, maintenance and transportation.

Visit futuregenerationjv.com.au to apply for roles at Polo Flat and across the Snowy 2.0 project.

PREPARING AND PLANNING

Bushfire risk mitigation is a year-round focus for Snowy Hydro and with the hottest months just around the corner, teams are stepping up maintenance programs in line with official weather forecasts.

Aerial observation flights over Snowy-owned power lines are conducted annually to check for equipment defects, as well provide a bird's eye view of any bushfire hazards that may need attention. Ongoing maintenance around asset protection zones is essential to prevent vegetation from encroaching on power stations and easements. Work varies from clearing away ground vegetation, to removal of overhanging branches or entire trees growing too close to vital equipment.

Snowy teams also complete bushfire preparation training as part of comprehensive safety management programs. All s enior managers review how their work practices and operating instructions can be impacted on days of severe bushfire levels. On certain high risk days, travel to some sites may be cancelled and any work that could cause a spark, such as welding or grinding, will be rescheduled.

During the summer months, the NSW Rural Fire Service provides regular bushfire updates, with fire danger rating levels discussed each morning at the Snowy teams' daily 'toolbox' session. In addition, Snowy's emergency response teams meet year-round for a range of training and drills, including bushfire readiness exercises.

PLAN AHEAD!

As bushfire season approaches, fire authorities and emergency services teams work closely with the Bureau of Meteorology to understand expected conditions. The factors impacting bushfire severity include the amount and dryness of fuel, recent rainfall and temperatures.

This year, relatively cooler weather and above average rainfall over the spring months is expected to ease fire risk in some areas, but will accelerate vegetation growth. Higher grass fuel loads heighten the risk of grass fires, which start easily and spread quickly. They can also be more difficult to extinguish.

The NSW Rural Fire Service recommends all property owners have a four-step bushfire plan:

1. **DISCUSS** what to do if a bushfire threatens your home.
2. **PREPARE** your property for bushfire season.
3. **KNOW** the bushfire alert levels.
4. **KEEP** all bushfire information numbers and download the mobile app.

For helpful tips on preparing your property, visit **rfs.nsw.gov.au**

Tree removed from trash racks on dam wall

Floating debris in Tumut 2 Dam

Preparing to dive to submerged logs

REGIONAL WORKS

Taking out the trash

The effects of a major bushfire can be felt for many years as communities rebuild damaged and destroyed property. Natural environments also need time to recover.

Significant loss of trees and undergrowth impacts the stability of terrain and after snowmelt or heavy rainfall, burnt vegetation can be washed into waterways.

Following the 2019-20 bushfires, a large number of trees in the steep valley around the perimeter of Tumut 2 Dam have found their way into the water.

Snowy Hydro's civil teams in the Upper Tumut region remove floating trees by hooking them to boats and bringing them ashore, but many of the trees become waterlogged and sink. Over time, they build up against the trash racks around the intake for the Tumut 2 Power Station.

The metal racks are designed to protect foreign objects making their way into the power station turbines.

If the sodden logs are left to pile up, the water flow into the power station becomes restricted, and the pressure against the trash racks can damage and potentially dislodge the metal bars.

Specialist divers are brought in to secure the submerged logs with slings that are then hooked to a crane. The piles of logs are lifted out of the water and deposited on the dam wall, where they can be cut into smaller pieces and removed.

The process typically takes two weeks to complete and the power station must be taken offline while the clean-up is underway.

Grout plant at Lobs Hole

Snowy 2.0

Crane lift for TBM Florence cutterhead assembly

Construction works for the Snowy 2.0 pumped hydro project are powering ahead, with the second tunnel boring machine in the final stages of commissioning, while the third TBM is being assembled ready to start tunnelling in the new year.

At Lobs Hole, the Lady Eileen Hudson, the first TBM to start excavating, is approaching the halfway mark excavating the main access tunnel. More than a kilometre of concrete-lined tunnel has been built, with ventilation, conveyors and services installed to facilitate the process. Progress is steady, with around 80 metres excavated each week.

The Lady Eileen is tunnelling to the northern side of the underground power station cavern and typically has a crew of up to 18 personnel onboard. The machine is operated by a pilot from the TBM's control room where components including its emergency and ventilation management systems are managed. It's currently on the go 24 hours a day, with three rotating crews working alternate shifts.

TBM Kirsten, the second tunnel boring machine to begin excavating, will approach from the southern side of the cavern. The 205 metre-long machine will be on the move following the final commissioning process, which involves the installation of 11 trailing gantries. The gantries house all the segment handling facilities, services and back-up systems for the TBM.

Five are installed prior to launch, with the remaining six gantries installed as the TBM moves further underground. TBM Kirsten will initially excavate the emergency cable and ventilation tunnel down to the power station complex before beginning the uphill tunnelling for the inclined pressure shaft. The two TBMs will excavate at the same time, but with a head start of several months, the Lady Eileen will have completed the main access tunnel by the time Kirsten arrives at the cavern location.

Over at Tantangara, the cofferdam, which prevents higher reservoir levels from entering the excavation for the intake structure, is now complete. A 50 cubic metres-per-hour concrete batch plant is assembled and commissioned and will supply concrete for the massive intake structure at Tantangara. Construction of facilities including water treatment plants, power supply, grout plants and support structure for tunnel operations are well underway.

All components for the third tunnel boring machine, TBM Florence, are onsite and being assembled in preparation for launch early in 2022. After being transported in sections, the giant cutterhead is currently being welded together. The front shield, middle and tail shields which house all the mechanical components including the main drive, motors and segment erectors, are now assembled within the launching cradle and the team is focusing on assembling the trailing gantries.

At Marica, seven kilometres of roads are being constructed from the Snowy Mountains Highway to provide machinery and vehicle access to the location of the upstream surge shaft. Once construction of the Snowy 2.0 project is complete, these roads will form part of the road network required for the facility's ongoing operations and maintenance. Trenching is also underway along Gooandra Trail for the installation of underground power and communications facilities from Lobs Hole through to Tantangara.

On the accommodation front, the main camp at Lobs Hole now has over 600 individual ensuite rooms available and is increasing capacity with 24 additional rooms opening each week. Tantangara and Marica camps, and the Joule Ridge facility at Cooma, are all making good progress, with personnel gradually moving in over the coming months.

Lobs Hole with view of the main camp

TBM Kirsten cutterhead

Inside the main access tunnel

Water release from Jindabyne Dam

WATER CYCLE

The flush of spring

Water stored in the dams and reservoirs of the Snowy Scheme is the all-important fuel for creating hydro-electricity, and the latter half of the year is when storage levels receive a welcome top-up. Two-thirds of Snowy's annual inflow is captured in the six months between May and November as spring weather melts the winter snowfall – and thanks to a wetter than average year, storage levels are sitting slightly higher than they have in recent years.

Snowy's Weather and Water team closely monitors climate outlook and longer-range forecasts and has been anticipating a wetter season this year. Snow depth depends on the exact timing of weather fronts and temperatures, so there is less certainty of snow water content ahead of the snow season. But after three years of severe drought, 2021 delivered on its promise, with a good year for snowmelt and inflows.

Towards the end of the main inflow period, the gates of Jindabyne Dam are opened to deliver a spectacular flushing flow that replenishes the rivers and streams by mimicking the natural alpine snowmelt. The predetermined release peaked at a rate equivalent to more than 10,000 megalitres per day in an eight-hour period and is part of Snowy Hydro's obligations under the Snowy Water Licence.

The flushing flow occurs annually under the direction of the NSW Department of Primary Industry and Environment (Water) and helps restore the natural environment and health of the Snowy River. Seasonal flow is critical to the river ecosystem, as it contributes to the natural water levels flora and fauna need to thrive, and triggers fish spawning and breeding activities.

Environmental releases from Jindabyne occur every day of the year, but planning for the flushing flow release in October begins as early as February. Snowy teams look at inflow forecasts and continually track and review the data throughout the year to ensure water levels are where they need to be to operate the spillway gates on release day.

Jindabyne Reservoir also stores water to supplement generation at Murray 1 and Murray 2 power stations on the other side of the Great Dividing Range and with good inflows continuing, levels are expected to remain high over summer. Locals and visitors using the lake for recreation will need to be aware of changed foreshore conditions.

A LIFT FOR LOCAL BUSINESS

When Cooma Crane Hire started operations 45 years ago, the original Snowy Scheme was already up and running - but in business, timing can be everything. The announcement of the Snowy 2.0 project in 2017 offered a new opportunity for regional businesses to be part of Australian construction history.

Cooma Crane Hire owner Craig Bottom took over the family business from his father in 2013 and secured work on Snowy 2.0 in 2019. He now has equipment across multiple work sites, has acquired two new cranes and extended his workforce from seven to 15 employees.

A 90-tonne crane and 60-tonne crane were onsite from the start of the project to unload deliveries and help build the exploratory camp and sections of the TBM at the main access tunnel portal. Next was the main camp at Lobs Hole, lifting roofing and hundreds of accommodation modules into place. At Marica, a 100-tonne crane is doing the main lifting, with a 20-tonne franna busy with general lifts onsite. A 60-tonne crane and a 20-tonne franna are based at Tantangara, building its accommodation camp.

Each crane has an operator as well as a dogman or dogger, whose job is to prepare the load by hooking up slings, chains or shackles. Once the load is secured, the dogger directs the operator from the ground using a combination of radio communication and hand signals. Millie is Cooma Crane Hire - and Snowy 2.0's - only female dogger and has been with the company for a little over six months. After attaining a high-risk work licence, Millie was trained on the job - a role Craig says requires a practical mind and a good attitude.

Most of the Cooma Crane Hire fleet, which includes concrete pumps and trucks as well as cranes of all sizes, has been deployed across Snowy 2.0 work sites. Craig's team also handled concreting at the main access tunnel portal at Lobs Hole, and concreting activities at Tantangara - and with construction of Snowy Hydro's major pumped hydro expansion continuing for several years, there is still plenty of work ahead.

Millie and Craig from Cooma Crane Hire

Cooma Crane Hire preparing for a lift at Tantangara

Start your Snowy Story

Snowy Hydro has a range of entry-level programs on offer for school leavers, university graduates and TAFE students. With opportunities across science, engineering, mechanical and electrical trades and much more, there has never been a better time to start your Snowy Story.

Laura Hobbs

After applying in Year 12, Laura Hobbs was accepted into Snowy's business administration trainee program and joined the Cooma-based Functional Services team in February 2021.

"I enjoy working with my team, who are great in supporting me while allowing me to work independently," Laura said. "I also like the inclusive environment and the fact that no matter my age and experience level, my suggestions and ideas are valued and respected."

Laura says her day-to-day role in information management involves a diverse range of tasks in a highly customer service-oriented environment.

"Working at Snowy has helped develop my communication, organisational and problem-solving skills. It has also helped me to become a more confident person."

Emily Martin

Emily Martin's fascination with water engineering and renewables led her to explore roles with Snowy Hydro. After starting as a receptionist in the Sydney office in 2017, Emily moved to a part-time role on the Snowy 2.0 project while completing her studies. Next was a full-time position with the Snowy 2.0 Environment team.

Emily is now based onsite at Tantangara and Marica and has built her expertise in approvals framework and learning more in the technical space around road design and construction water management.

"Snowy involves so many disciplines and there is a big focus on learning, so you learn about other disciplines, but also get the big picture on how it all fits together," Emily said. "I love that there are always opportunities available to try something different."

Tom Hain

Second-year cadet Tom Hain began his Snowy Story in 2019 as an administration trainee in the Cooma office. The 12-month program provided an opportunity for Tom to learn about the technical side of the business and understand what roles were available that suited his interest in engineering. He successfully applied for an engineering cadetship and is now finishing his second year of electrical engineering studies at Wollongong University.

Tom says his time working at Snowy has been "hugely beneficial" to his studies, with the bonus of making lifelong friends along the way.

"Being a trainee and then a cadet, I've learnt how to adapt to different positions and work with a whole range of people," Tom said. "Over the summer of 2020-21, I had the opportunity to work out at Khancoban and there was never a dull day."

RED ENERGY

The power of positive thinking

Lauren Parker with the silver medal she won at the 2020 Paralympics

Paralympic silver medallist and Red Energy Ambassador Lauren Parker knows better than most the road to sporting glory is paved with unexpected twists and turns. After a start-stop lead-up to the Tokyo Paralympic Games and a dramatic finish in her event, Lauren flew to the US to compete in the Ironman 70.3 world championships. The week before her first race, in an innocuous post-training incident, Lauren ended up with third degree burns to her toes.

Racing in a couple of long-distance triathlons post-Tokyo was supposed to be a wind-down for the world champion. With the stress of the Games behind her, Lauren had just finished training on a 45-degree day in Las Vegas and was waiting in the car while her friend and manager, Brad Fernley, packed up their gear.

"I was resting in the front with my feet up on the dashboard and my toes were touching the glass," Parker explained. "I had no idea that my toes were burning because I can't feel my feet and it was nice and cool in the car. After 40 minutes I noticed my toes blistered up like big bubbles."

By the following day, Parker was in hospital with the worrying prognosis her toes may need to be amputated. Luckily, the burns had not penetrated to the bone.

"My 70.3 Ironman race was the next weekend and the nurses came up with a protection to keep my toes from getting really wet in the race and help prevent infection," she said.

Two of the nurses treating Parker attended the Ironman event to re-bandage her feet after the swim leg, and again at the end of the race.

"I have become life-long friends with these nurses," Parker said. "They are just beautiful people that really care."

On top of her injured feet, Parker had to contend with high winds, rain and hail, which made the notoriously tough Utah course even tougher – and three hours longer than expected.

"I had to dig deep and just persevere and not give up," she said. "It was a real mental challenge, but that made it even more satisfying crossing the line."

It's the same remarkable mindset Parker displayed in Tokyo in August after missing out on the Paralympics gold medal by one second. With strong performances in the swim and bike legs and a 26-second lead coming in the final lap of the run leg, Parker got caught up behind a slower competitor at a crucial moment. She was beaten on the finish line by US competitor and good friend, Kendall Gretsch.

"I was gutted and felt that this was the greatest disappointment of my life because of how it happened," Parker said. "At the same time, I am proud of what I've gone through and had to overcome in my life in order to achieve a Paralympic Games silver medal. Not many people have those. I look at the medal and use it as fuel for the fire for Paris in 2024!"

Lauren competing in Utah in September

red energy

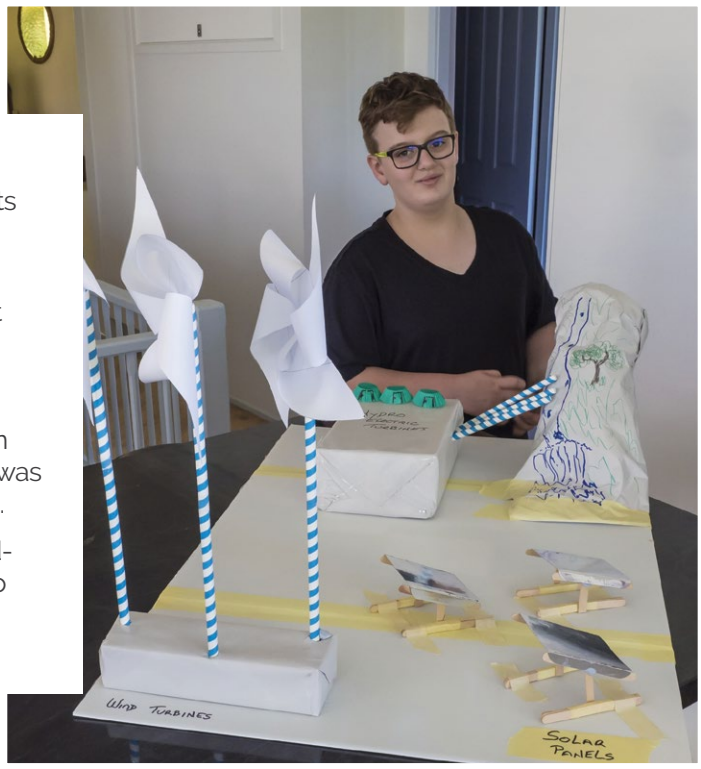
Bright sparks

Science of the Snowy Scheme

Do you have a brilliant idea for Snowy Hydro's next big renewables project? This was the task put to school students around the Snowy Mountains for the fifth annual Science of the Snowy Scheme competition.

Students were invited to describe their renewables concept in a three-minute video pitch and could use props, models and diagrams to help explain their idea. Entries from scientists, engineers and construction workers of the future demonstrated there's no shortage of clever ideas brewing in classrooms and homes across the region. The competition was conducted virtually in 2021, with all entries submitted online.

Prizes for winners and runners-up include a class meet-and-greet with astrophysicist Kirsten Banks, a trip to Taronga Zoo (Sydney or Dubbo) and a VIP experience at one of Snowy Hydro's power stations.



Oliver Britt with his green energy model.

Kids from Auburn PCYC enjoying the activities.

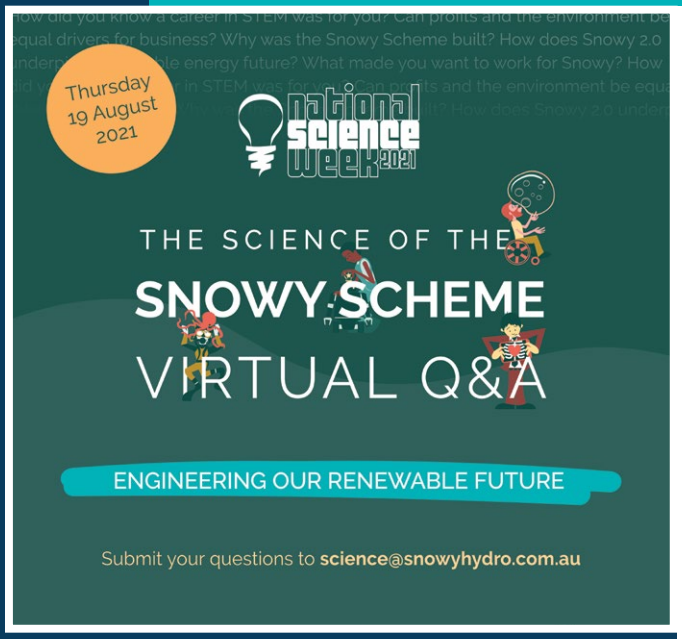
PCYC holiday fun

After a year of disruption to its programs and fundraising activities, the PCYC NSW has plenty of fun planned for the summer holidays. For young people attending a PCYC holiday program, the Snowy Hydro poster competition offers a chance to win unique Snowy experiences, as well as cash prizes for the PCYC to spend on equipment and craft.

Entry is easy and fun – just tap into those powers of imagination and create a poster illustrating how Snowy Hydro sends electricity out to homes and businesses. Take a photo of the poster and upload it to enter.

Snowy Hydro is a proud partner of PCYC, helping support its mission to empower young people to reach their potential.

National Science Week

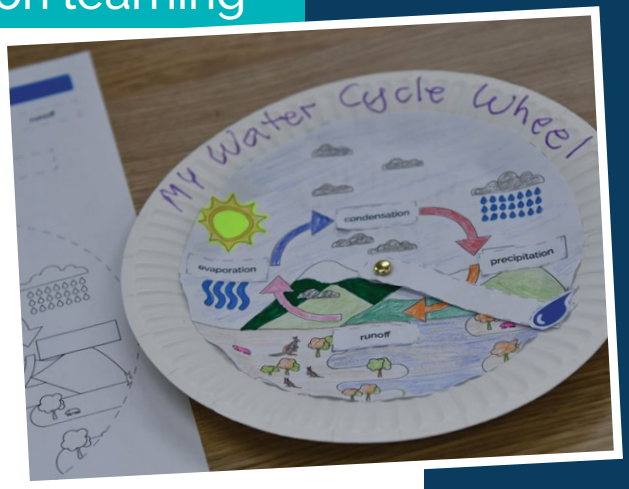


National Science Week required a quick pivot in 2021 due to COVID stay-at-home restrictions in several states. Wherever possible, events moved online, opening up opportunities for students, teachers and science fans all over the country to attend.

A virtual panel of Snowy Hydro experts including climate scientists, hydrologists and engineers was set up to support local students celebrating National Science Week. The theme for the panel was 'Engineering your Renewable Energy Future' and students heard stories from Snowy workers about their professional journey and the different paths they followed.

More than 300 students joined the special online event to learn about renewable energy and careers in science, technology, engineering and maths. The sessions have been recorded and are available on the Snowy Hydro website Next Generation Education Hub for teachers to share with their students.

Virtual visits and hands-on learning



The Snowy Hydro Discovery Centre in Cooma is a favourite destination on the school calendar and a key part of the education programs that have helped generations of Australian students learn about water and hydro power. In recent times, many class groups have missed out on the opportunity to travel to the centre, but there's a fun new way to enjoy the experience without leaving home.

The Discovery Centre Virtual Excursion offers a whistle stop tour of the many interactive and immersive experiences students would see in real life, including the historic diorama with its birds' eye view of the entire Snowy Scheme, and the high-tech digital screens showing in real time where water is being delivered and power generated.

The virtual excursion is available at the Next Generation Education Hub, along with a range of learning modules for students of all stages. For the younger learners interested in the world of water, the Water Cycle Wheel is a fun craft-based activity that explains how Snowy Hydro works with the water cycle to harness the power of water to generate renewable energy. The Water of the Snowy Scheme module also includes fact sheets and lesson plans explaining Snowy Hydro's role in the water cycle.

Find out more: **snowyhydro.com.au/education/nextgen**

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