snowy hydro

NEWS

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CEO UPDATE

A message from Managing Director and CEO Paul Broad

This is a year that none of us will forget, especially those in the Snowy Mountains. The destructive bushfires and COVID-19 have made certain of that.

In the face of these extreme challenges, it makes me extraordinarily proud that as an essential service provider we have maintained energy supply to the grid at all times and supported our impacted Red Energy and Lumo Energy customers through an unprecedented period of financial hardship.

We could not have achieved this without a great team, who have responded magnificently to an uncertain and changing environment and adopted remote and changed work practices. Some of our staff have been redeployed into other roles and a number of Snowy 2.0 workers have relocated to the region for months at a time due to coronavirus restrictions.

In these difficult circumstances, Snowy Hydro continues to play a significant role in the region by investing locally and as a major employer.

It's one of the many reasons why our Snowy 2.0 project, which continues to progress in leaps and bounds up at Lobs Hole and at the Polo Flat segment factory site, is so important. Creating thousands of jobs and with opportunities for local businesses to get involved, Snowy 2.0 is a win-win for energy consumers and the community.

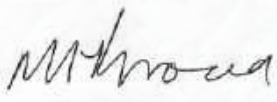
We recently welcomed the Federal Government environmental 'green light' for the project Main Works. This important milestone means we will soon start construction on core infrastructure such as the underground power station, tunnels, chambers and shafts.

Our three tunnel boring machines (TBMs) have been built, with one shipped to Port Kembla and being transported to Lobs Hole, and the other two to follow soon. The size of these machines is incredible and a huge crane is required to help assemble them at the construction site.

The large individual components of the TBMs, along with shipping containers of equipment, are being trucked into Lobs Hole via Cooma and the Snowy Mountains Highway. Please be aware of extra traffic on the roads and check the website of our contractor, Future Generation, for updates about truck movements.

We have a lot going on in our Snowy Hydro regions, including over at Talbingo, where the Lower Tumut team has successfully removed and replaced the turbine from the Jounama Small Hydro Power Station. We work hard to keep our assets maintained and this job added an extra layer of complexity.

Over winter, as we have for many decades, our hydrographers have been out in all weather measuring snow depths, which gives us information to help plan for inflows into our storages. After several drier-than-usual years, we are hoping for improved inflows during the spring snowmelt.



Paul Broad
CEO and Managing Director

Jounama, small but powerful

Jounama spillway, in the Talbingo region of the Snowy Scheme, is capable of releasing 4,000 tonnes of water per second. The Jounama Small Hydro Power Station was built 10 years ago to capture the "wasted energy' that was flowing over the spillway. The small hydro has a generating capacity of 14 megawatts, but in an interconnected system like the Snowy Scheme, every megawatt is valuable at times of peak energy demand. Even though Jounama has only been on the scene for 10 years, it certainly has held its own with interesting and challenging projects.

Earlier this year, during normal operation of Jounama Small Hydro Power Station, a vibration was identified that required the unit to be removed from service. Further investigation by the team determined that vibration was coming from the turbine and at this point, we knew that this was not going to be an easy fix. A project team assembled and work got underway.

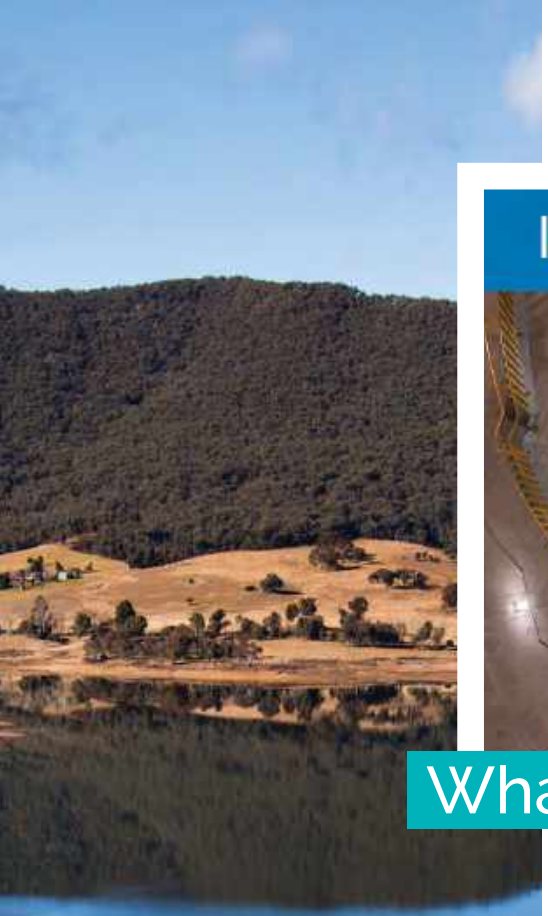
The process of removing the turbine from the Jounama power station is a complicated one. The turbine has to come out of a hatch that is downstream of the silo and under normal conditions, this hatch is under water. The power station's tailbay water level must be lowered via pumps to allow for the hatch to be opened.

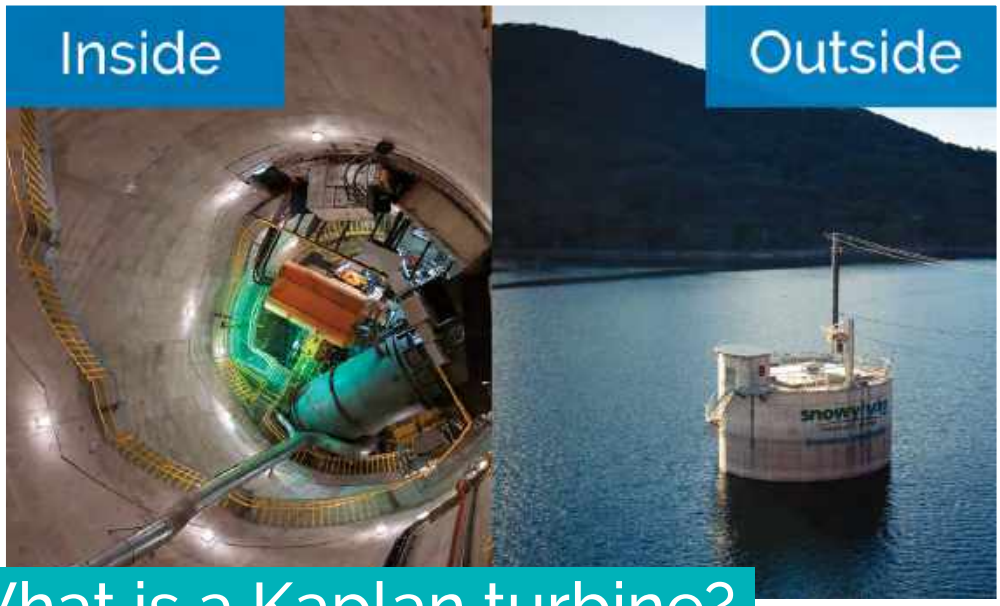
This process, however, is completely dependent on the Blowering Reservoir water level being lower than the tailbay level. The team's ability to remove and then reinstall the turbine is literally a race against time. With the natural inflows into Blowering and limited releases from the lake due to the irrigation off-season, the team was within days of not being able to replace the turbine.

The turbine was installed, reflooded and a final leak test took place to ensure it was secure. To complete the job, a 300-tonne mobile crane was required to remove the draft tube gate, which on this unit is located out in the middle of the tailbay.

DID YOU KNOW?

Over a 12-month period, Jounama produces, on average, 45,000 megawatt hours of electricity. It's projects like Jounama that represent Snowy Hydro's ability to adapt in a changing electricity market through innovation, continuous improvement and identifying new opportunities to increase our generating capacity.





What is a Kaplan turbine?

What looks like a concrete cylinder actually houses the Jounama Small Hydro Power Station. Most of the Snowy turbines are Francis reaction types, which are vertical installations. However, Jounama uses a Kaplan turbine, which is unique in the Scheme.

Kaplan turbines are more complex than Francis turbines. They have a lot more moving parts to allow the turbine to be fine-tuned by changing the pitch on the blades. Basically, Kaplan turbines operate just like the propeller on an aeroplane.

A few of the most common hydro turbines are:

- Kaplan turbines - very low head pressure
- Francis reaction turbines - intermediate head pressure
- Pelton Wheel - high head pressure
- Bulb turbine - often used to capture tidal fluctuations in the ocean and can be used for bidirectional generation.

The main advantages of having a Kaplan turbine at Jounama is that the turbine suits low head, high flow hydro situations. The head of Jounama to Blowering is only about 30 metres, compared with Tumut 3 Power Station, which is at 150 metres. Kaplan turbines also don't require large reservoirs and infrastructure to generate electricity. However, they do have a maximum capacity of approximately 95MW and require more maintenance, as more moving components mean more wear and tear.

When the water level at Blowering Reservoir exceeds 357.5 metres above sea level, the turbine access hatch to the Jounama silo becomes submerged by the water, so any significant turbine work must be timed with Blowering water levels.

When the levels are high, the silo becomes an island and until recently, in this situation the station could only be reached by boat. Late last year we built a bridge to create safe and easy access!

SPOTLIGHT ON SNOWY

Monique Sellies

Storeperson

TENURE: 2 YEARS
LOCATED: COOMA

Why Snowy Hydro?

I was born in Darwin up in the Northern Territory, however, I have spent most of my life here in the beautiful Snowy Mountains. When I learnt about the Snowy Scheme while growing up, I always thought of Cooma as the start of Australia's multicultural history and as a first generation Australian, that resonates deeply with me. I enjoy working for such an iconic business like Snowy Hydro and I appreciate the range of opportunities I have been provided. It has been very inspiring watching how the business continuously supports local communities during the good and the bad times, especially during the last very trying six months.

How has COVID impacted your role?

Prior to COVID-19 I was working as a customer service officer at the Snowy Hydro Discovery Centre. Due to the restrictions placed on cafes, Snowy provided me with a new opportunity to work in our stores warehouse. While my role at the Discovery Centre was focused on tourism and customer service, I'm now servicing the needs of internal customers.

What have you learnt so far?

Lots of things, like the process for receiving, transferring and sending items out to the Snowy Hydro regions, and the people who work there. I have completed my dangerous goods training, and learnt about the risks involved in transporting certain goods. I have also completed my forklift training and I am now learning how to safely load/unload a truck, transport heavy pallets and the hazards involved when operating a forklift within this environment.

What does a normal day 'in the office' look like for you?

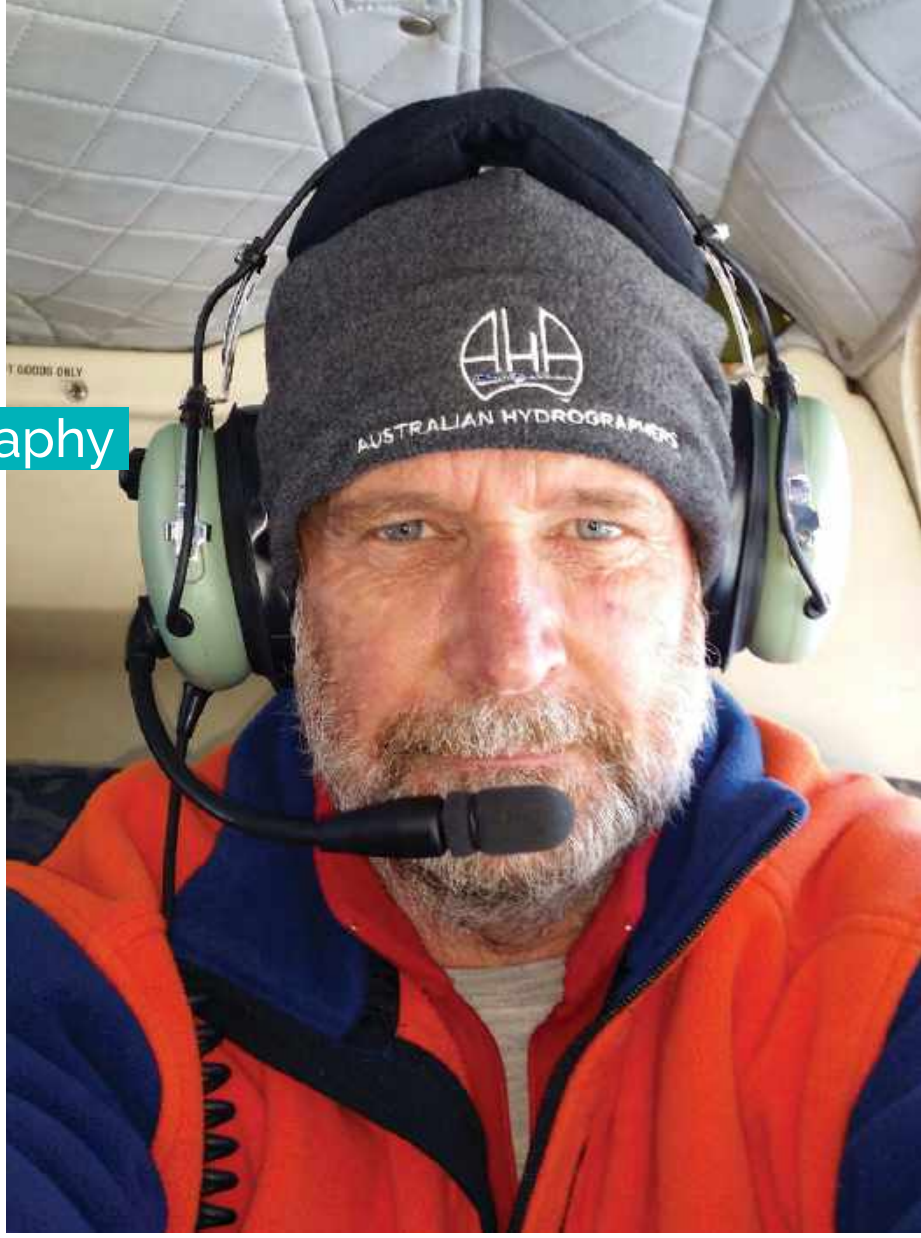
There is no normal day at stores, and that's what I really enjoy! Every day is something different, from day-to-day receiving and unloading trucks with a forklift, to unexpected event organisation when certain items are needed from stores, helping other departments of the business, through to preparation of invoices for payment.

Has changing roles at Snowy been a good opportunity for you?

It's a fantastic and valuable experience for my career development. I have the chance to gain experience, up-skill and learn, all while remaining a part of the Snowy business. For this, I am extremely grateful.

Mic Clayton
Team leader, hydrography

TENURE: 18 YEARS
LOCATED: COOMA



What's your role at Snowy Hydro?

I work across the Snowy Scheme measuring the water cycle, covering an area which extends from Cooma in the east, Tumbarumba in the west, Tantangara Reservoir in the north and the Victorian border in the south (approximately 8,000 square kilometres). Our team measures snow depths in winter, as part of the data collection activities we undertake across our extensive hydro meteorological network. Other activities include stream flow measurement, meteorological and water quality monitoring, and data management to make the data useful for the company and other stakeholders.

Why do you enjoy working at Snowy Hydro?

It's the variety of field and office work - managing the data from rivers and the rest of the monitoring network, through to the inputs into our databases and information-sharing with stakeholders. Water is Snowy's primary fuel, so it's integral to the company. In effect, you can't manage it unless you measure it! Our information feeds into the State's water management plans. Plus, I work on the roof of Australia - what a great place to do your job. Before I came to Snowy I worked in a variety of hydrographic settings, including at Sydney Water, where I spent a lot of time in sewers measuring that part of the water cycle!

Career highlights?

The 2012 floods! It was the biggest inflow event we have ever measured in this region and it was the Snowy hydrographic team which measured record flood flows across our catchments. Oddly, this event occurred in March, statistically our driest month of the year. Another highlight has been contributing to the development of the National Guidelines for Hydrometric Monitoring through the Bureau of Meteorology.

What is the career path to be a hydrographer at Snowy Hydro?

Well, I would encourage all those interested in environment, science and engineering to be a hydrographer because it's the best job in the world. Snowy Hydro is a premier authority on measuring snow depths and alpine hydrology. To do this work you need to be qualified in the Diploma of Water Industry Operations (Hydrography).

Given you measure snow depths for a job, does that mean you're a great skier?

I can ski, but not as well as my kids! I prefer cross-country skiing. People often think measuring snow depths is a pretty easy job, but when the wind is howling and there's blizzard conditions, I can assure you that you just want to get the job done and go home for a nice cup of coffee and dry out in front of the fire!

To check out our latest career opportunities, visit **snowyhydrocareers.com.au**

PROJECT UPDATE

SNOWY 2.0

- A fibre optic cable is being laid in Talbingo Reservoir through to Lobs Hole as part of the construction and operation of Snowy 2.0. A barge has been laying the cable, which will provide communications from Snowy Hydro's Tumut 3 Power Station to the main access tunnel.
- The main access tunnel (MAT) portal at the Lobs Hole construction site is finished. This portal is where the first of three tunnel boring machines (TBMs) will be launched in a couple of months' time and will excavate the 2.7km tunnel down to the power station cavern, hundreds of kilometres underground. Work is now underway at the portal site preparing a special 'cradle' for the TBM, with local businesses such as Cooma Cranes subcontracted to our Snowy 2.0 principal contractor, Future Generation Joint Venture, to provide onsite services. A water treatment plant is also being constructed to treat water used by the TBM in operation and allow it to be recycled.
- The 137m TBM that will be used to bore the MAT has arrived at Port Kembla and the components are being transported to site. Shipping containers of equipment and large individual parts - up to 174 tonnes in weight - are being delivered, including some escorted, oversized loads. The TBM will then be reassembled at Lobs Hole.
- To deliver power to the TBMs, worker accommodation camps and other construction activities at Lobs Hole and Tantangara, an onsite electricity substation is being built. Two large transformers that convert the electricity from 330kV down to 33kV have been delivered, before being installed and commissioned. The transformers, weighing approximately 85 tonnes each, were transported through the mountains on trailers with prime movers at each end.
- To move the very large Snowy 2.0 loads through Cooma, Future Generation and Transport for NSW have carried out modifications to the roundabouts in the main street.

Fast facts

- A 750-tonne crawler crane will be used to assemble the TBM's massive 11m-diameter cutterhead, the main drive and front shield
- A 300-tonne crane has been brought onsite to help build the 750-tonne crawler crane
- The 300-tonne crane will also be used to install the TBM tailskin

The roundabouts operate normally for traffic, but can be driven on by oversize, overmass trucks once signage has been temporarily removed. The new-look roundabouts have been well-received by the community.

- The exploratory works accommodation camp for up to 250 people is under construction, with many project workers employed by Snowy 2.0 principal contractor Future Generation currently being accommodated locally in Adaminaby and Providence Portal.
- Other Snowy 2.0 works starting in coming months include Aboriginal and cultural heritage field surveys at Tantangara and construction of temporary worker accommodation at Cooma's Pacific Hills site.

Roads and transport

With a range of large loads for Snowy 2.0 to be delivered to site in the next few months, people driving through the Snowy Mountains will see an increase in truck movements. Some of the trucks using the Snowy Mountains Highway will have oversized loads and some brief, rolling road closures will be required. Transport for NSW, local NSW Police and Future Generation Joint Venture will coordinate communications for these truck movements and road closures once the schedule has been locked in. Information will be available on the **futuregenerationjv.com.au** website and the **LiveTraffic app** - note, this will be subject to change at short notice.

JOBS AND BUSINESS OPPORTUNITIES

Local people interested in Snowy 2.0 jobs should visit the **futuregenerationjv.com.au** website and local businesses can find tender packages on **gateway.icn.org.au**

PROJECT UPDATE

SEGMENT FACTORY UNDER CONSTRUCTION

It's all action at Polo Flat, where construction of the Snowy 2.0 concrete segment factory is racing ahead.

The factory site requires a lot of concrete - and that's before it starts actually producing any concrete segments to line the Snowy 2.0 tunnels!

For example, more than 5,500 cubic metres of concrete are needed in the slab for the segment curing shed, with about 2,500 cubic metres laid to date.

In total, there will be 20 concrete slabs laid as part of the factory construction works. About 11 slabs have been completed. There are also 12 slabs required for the concrete batch plant and other facility foundations.

In addition to the many concrete pours, the steel frames for the segment shed are being erected and site earthworks and an access road upgrade are continuing.

Local businesses are playing an important role in the segment factory construction, with Cooma Sand and Concrete contracted by Snowy 2.0 principal contractor Future Generation Joint Venture to provide services at Polo Flat.

In addition, Tumut-based Maliyan Horizon, an indigenous civil construction company, has been partnering with Future Generation subcontractor Civilex on site earthworks, providing plant and equipment and local workers.

The segment factory is expected to start operations before the end of this year and will manufacture about 130,500 concrete segments to line more than 30km of Snowy 2.0 waterway and access tunnels.

The factory will create approximately 125 jobs when in operation, and Snowy Hydro hopes many of these will be filled by locals. There will be a range of skilled and unskilled jobs available. These include truck and forklift drivers, machine operators, plant operators and administration workers. We are also working with Monaro High School to pilot school-based trade training.

Visit **futuregenerationjv.com.au/job-opportunities-1** to register your interest in a segment factory job.

SNOW DEPTHS MEASURING

INTO THE WHITE

Every week during winter for more than 65 years, snow depths have been measured in the Snowy Mountains.

Measuring the snowpack and its water content - the 'fuel' of the Snowy Scheme - is an important job for Snowy Hydro's team of hydrographers.

Snowy uses the data gained for operational purposes, to help understand what sort of inflows we are likely to receive into our dams during winter and spring. Snow depth information is also made available to the public online.

Snowy Hydro is a leading authority on measuring snow depths and alpine hydrology. Snow samples are collected in calibrated hollow metal tubes and these are weighed to determine the water content.

The measurements are taken from a number of points at snow courses within Kosciuszko National Park - the three primary snow courses are Spencers Creek (halfway between Perisher and Charlotte Pass), Three Mile Dam (near Mt Selwyn) and Deep Creek (between Cabramurra and Khancoban).

It is interesting to note that big snowfalls over winter might make skiers happy, but they don't always equate to big inflows into Snowy Hydro storages - it's the water volume within the snow that really matters.

Snow melt provides about two-thirds of inflows into Snowy Hydro's 16 dams and this water is used to generate hydropower and for irrigation and environmental releases.

Fast facts

- The snow depth has been measured every week during winter at Spencers Creek since 1954.
- The majority of snowflakes have a six-sided structure.
- The smallest snowflakes are called diamond dust crystals and can be as small as the diameter of a human hair.
- A snowflake can be made of as many as 200 ice crystals fused together and can take on a variety of forms, from your normal snowflake shapes through to ice needles and columns.

RED ENERGY AMBASSADORS

Meet two of our amazing Red Energy Ambassadors. Maddy Proud is a member of the 2019 netball championship-winning Sydney Swifts and Danny Buderus is a rugby league State of Origin and Newcastle Knights legend.

Maddy

What has been your 'Proudest' moment in netball?

There have been a lot of proud moments for me throughout my career. Captaining the Australian 21-and-under team at the World Youth Cup in Glasgow in 2013 and being able to wave the Australian flag at the opening ceremony was incredible. Also, winning the Grand Final with the NSW Swifts in 2019 was something I'll never forget.

You play predominantly centre or wing attack for the NSW Swifts - do you like to always be in the middle of the action?

I play in the midcourt because I'm not tall enough to play anywhere else! I started my netball journey as a goal defence, but slowly worked my way down the court as everyone grew around me. In saying that, I love being in the midcourt and being able to control the pace of the game. There's never any time to stop and you're always part of the action.

The Swifts have relocated to Queensland for the 2020 Super Netball season, how do you think you'll go?

I'm excited for the experience and while it will be a huge challenge, it will be a great opportunity to show other teams what we've got. While we wish we were able to play more games at home in front of our incredible members and fans, we just can't wait to be back out on the court doing what we love and at least we will have plenty of sunshine!

What are your future goals for the remainder of your playing career?

I would love to win another premiership (or two, or three, or four) with the Swifts and hope to one day be able to represent my country with the Diamonds.

You have 18,000 followers on Instagram. Have any of your posts gone viral?

I received so much love through Instagram after I tore my ACL last year. I had people reach out who I never would've dreamt of hearing from, which is one of the great things about social media – just like sport it brings people together. While I wouldn't say anything has gone 'viral', I love to get a plug in about my book!

Can you tell us about the children's book you wrote, Grace on the Court?

Grace on the Court is about a girl called Grace Parker as she starts her first year of high school, aged 13. It follows her first high school netball season as she tries to navigate the 3 B's: boys, boy bands and ball sports. I wrote it because I didn't think there were enough books out there for young girls about sport – particularly netball. I think that if young girls can enjoy reading and playing sport, it will help them in their development throughout the teenage years. I've written a sequel to Grace on the Court, but am currently waiting for it to be published!

What have been the highlights as a Red Energy Ambassador?

I loved our trip to the Snowy Mountains to learn all about the Snowy Scheme, meet incredible people and see some amazing things. To learn about the history of Snowy Hydro and be able to visit some iconic locations was an experience I will never forget – I'm so grateful to Red Energy for giving me this opportunity!

Impressions of the Snowy Scheme? (when you visited in 2019)

I was in awe from the moment we got there. I never fully understood how big it all was and what must have gone into building such an incredible thing. To learn all about how it works and what it does for our country was an unforgettable experience.

Could you tell a turbine from a penstock?

Ummm, next question?

What's a fun fact about you that we may not know?

When I was younger (from about age 5-7) I was a HUGE tomboy. I used to get confused for a boy when I walked down the street with my brothers (you can refer to a few old Instagram posts for proof). This was mainly because I loved sport so much and was always playing with my brothers and their friends in the backyard – I just wanted to be like them!

Red Energy is 100% Australian-owned and operated. For more information about its great plans, go to **redenergy.com.au** or call **131 806**

Danny

Reflecting on your rugby league career, how did you achieve such longevity and success?

You need consistency and for this to happen, you need routine. Routine in your preparation, and understanding your 'why'. My 'why' was family, respect for teammates and being the best that I can be.

You were part of a great Newcastle Knights team that played many finals and won a premiership - how important is teamwork to achieve excellence in any job?

Teamwork is highly important. Understanding personalities and what makes people tick creates a great work environment when you can get the best out of them. Our years of success were made up of all different personalities – the one thing we all had in common was the will to win and compete.

You broke both legs, suffered dislocations, tendon and ligament tears and other injuries through your 257-game career with the Knights - how is the body in retirement?

One thing professional sport teaches you is routine and a training DNA. I train differently now, mostly for wellbeing and to feel good. The body is fine considering. I stretch every day, and also train daily with about eight ex-Knights teammates, which consists of 30 minutes' exercise, an ocean swim and the best part - a coffee catch-up. We generally kick off around 5.30am and is the best way to start the day.

Where do State of Origin matches, particularly the 15 you captained, rate among your rugby league achievements?

On reflection, I think more about moments in games and results more than being the lucky one leading the team out first in the stadium. There were some personal battles to become a captain – belief and understanding my role and responsibilities in being a leader.

What's your current role with the Knights?

General Manager of Football

What have been the highlights as a Red Energy Ambassador?

I have loved meeting a wide variety of people over the years as a Red Ambassador. My trip to the Snowy Scheme was definitely a highlight and taught me so much about how our electricity is created. Another highlight was seeing thousands of kids over a number of years enjoy the Danny Buderus Footy Clinic, which was sponsored and inspired by Red Energy.

Impressions of the Snowy Scheme? (when you visited in 2019)

Inspirational, and it shows you when people work together what can be created. To see how this originated through people power really blew me away. The sacrifices and commitment people made for this to happen is really a story to behold.

Could you tell a turbine from a penstock?

Yeah...No! mmm maybe.

Can Newcastle win the 2020 premiership?

2020 has been a crazy year for everyone, and nothing would surprise me on the footy field. Anything is possible. It's been a tough time, but one thing that hasn't wavered is the fans and supporters like Red Energy, who have stuck solid.

What's a fun fact about you that we may not know?

I have to admit I'm a clean freak (don't know if that's fun) and I possess a range of brooms to sweep around the house...

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Educating the next generation

The Snowy Hydro Discovery Centre in Cooma has been a staple on school trip itineraries for decades. Thousands of local and visiting students have stopped by to learn about the mighty Snowy Scheme for a day trip or en route to the ski fields.

Our education program aims to ignite students' imagination and expand their knowledge about a range of curriculum including geography, STEM, history and social science subjects. With a state-of-the-art immersive theatre, the learning programs can be complemented by a range of experiences including a virtual fly-over of the Scheme.

With Snowy 2.0 well underway, students can learn about the project, view a scale model tunnel boring machine, and discover Snowy Hydro's important role as Australia transitions to a renewable energy future.

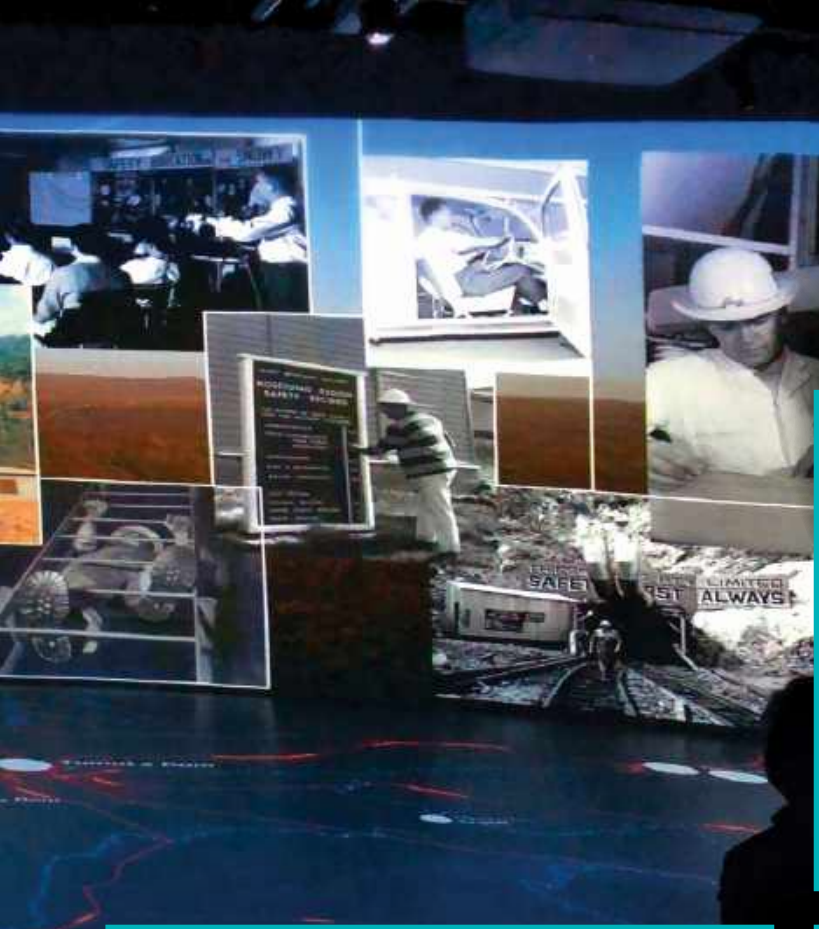
The COVID-19 situation has meant that most of the educational experiences at the Discovery Centre have been placed on-hold until visiting school groups can return. While the team is missing the visiting groups this year, Snowy can still accommodate local school groups.

To organise a tailored session for your school, please contact us on 1800 623 776 or email education@snowyhydro.com.au

Online education hub coming soon

The team is working hard to take our Discovery Centre education experiences directly into the classroom and living rooms across Australia. Later this year, Snowy Hydro will launch a brand-new, online education hub. Learning about the Snowy has never been more accessible, featuring a behind-the-scenes tour of a power station, an interactive Snowy 2.0 digital pop-up and interactive/ downloadable classroom resources.

Stay tuned to **snowyhydro.com.au** education and our social media channels for updates.



Snowy 2.0 digital pop-up book

Snowy Hydro has launched a new digital pop-up book showcasing Snowy 2.0 and taking the pumped-hydro renewable energy project to a younger generation.

Bringing to life the engineering and purpose of Snowy 2.0 in a fun and interactive way, the pop-up book is designed to engage and inform young people.

snowyhydro.com.au

Local school holiday fun

This September/October school holidays, the Discovery Centre in Cooma is hosting school holiday activities through the local Outside School Hours Care (OOSH) providers in our regions.

The program is designed for children six to 12-years-old and activities will be focused on STEAM (science, technology, engineering, arts and maths), while showcasing Snowy Hydro and the Snowy Scheme story.

It is designed to be a fun, hands-on, activity-packed program, covering Snowy's past, present and future. All programs will be delivered by trained and experienced staff, including a guest like a real-life engineer. Each session will run for about two hours, with each participant taking home a 'show bag' of goodies.

Science of the Snowy Scheme competition

Can gum leaves generate electricity? What about Vegemite?

The annual *Science of the Snowy Scheme competition* is back! With a range of fantastic prizes up for grabs, including behind-the-scenes experiences at Taronga Zoo for the winners and their families and a visit to a Snowy Hydro power station for their class, the stakes are high!

To participate in the *Science of the Snowy Scheme* competition, local primary school students should get creative and design a power station of the future that generates 100% Australian-made, renewable energy and explain how it works.

To enter or find out more, visit **snowyhydro.com.au/scienceweek2020**

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