snowy hydro



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A new era for Cabramurra

Visualising the future

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CEO UPDATE

A message from Managing Director and CEO Paul Broad

It's amazing what you can achieve if you put your mind to it, think outside the box and be a bit agile. At Snowy Hydro we're very pleased to be achieving a lot in these challenging times, especially within our local Snowy Mountains communities.

More than 1,100 employed on the Snowy 2.0 project and \$68 million spent with regional businesses. An economic boost to the area, keeping many in our supply chains employed when tourism and other sectors are struggling. Snowy Hydro staff and contractors busy keeping the business running at full capacity and continuing to support local suppliers.

From a COVID perspective we have been, and continue to, monitor the situation as it evolves and are of course ensuring NSW Government health orders are implemented.

While many of our staff work from home and travel between our sites is highly restricted, we're getting on with some very important projects.

At our operational town of Cabramurra - a major Snowy asset that was horribly damaged in the January 2020 bushfires - preparation for the reconstruction is underway. The Cabramurra of the 2020s will emerge as a fit-for-purpose township with a range of accommodation options for Snowy Hydro contractors and staff.

Snowy 2.0 charges on, with our Lady Eileen Hudson tunnel boring machine (TBM) now well underground, digging out the main access tunnel into the site of the underground power station cavern.

Following in the historic footsteps of Lady Eileen Hudson, we have been delighted to involve the local community in a competition to name our second and third TBMs. The competition saw schoolchildren from 15 local schools submit names, with almost 3,000 votes cast online for the winning names - Kirsten Banks and Florence Violet McKenzie, both groundbreaking Australian women in the fields of science, technology, engineering and maths.

We are now assembling the Kirsten TBM, which will excavate the cable tunnel, and our growing workforce, led by principal contractor Future

Generation Joint Venture, is active over multiple worksites including Lobs Hole, Tantangara, Marica and Polo Flat.

The factory at Polo Flat producing the tunnel lining segments for Snowy 2.0 is also home to our new fleet of Snowy segment trucks, which you'll be seeing on the roads. These distinctive vehicles have three trailers and are about the same length as a standard B-double, but have much greater manoeuvrability for mountain roads as they deliver segments to site. And carrying nine segments at a time, they reduce heavy vehicle traffic for Snowy 2.0.

Beyond the local community, Snowy Hydro continues to provide essential services to the National Electricity Market (NEM). In particular, the last few months have really reinforced Snowy's role in keeping the lights on for millions of Australians.

Things started to heat up in the market just as the temperatures started to cool down. Baseload coal plants experienced failures on top of already planned outages, coupled with lower renewable output. When cold fronts started coming through and demand shot up, the system was very tight and our flexible and reliable hydro was called on to fill the gaps.

Then in May, there was an explosion at the Callide C coal station in Queensland, causing the biggest load-shedding event since the market started back in 1998. This meant less power flowed south to NSW and called on more generation from Snowy, which included hydro and output from our Colongra gas peaker. We also ran our Murray region hydro and Victorian gas peakers when the coal mine feeding the Yallourn brown coal station in Victoria flooded.

Yes, we've been very busy!

Snowfall and the coming spring melt contribute around two thirds of the water stored in Snowy Hydro's dams, so we look forward to replenishing our storages in the months ahead.

Paul Broad Managing Director and CEO

Washing day at Cabramurra. National Archives of Australia

REGIONAL PROJECTS

A NEW ERA FOR CABRAMURRA

Rendered image of the new building at Cabramurra

wenty months after the Dunns Road bushfire tore through Cabramurra, the next chapter of the historic Snowy town is beginning to take shape. The January 2020 bushfires destroyed 35 houses, three apartment blocks and Edinburgh Cottage - where Queen Elizabeth and the late Duke of Edinburgh stayed during their tour of the region in 1963.

The town's former school building and community tennis courts were also lost. Demolition of damaged buildings and facilities is now complete and preparation for reconstruction is underway.

The rebuild marks the start

of a new era for the town, first established in the 1950s as a basic construction camp for workers building the Snowy Scheme. At an elevation of almost 1,500 metres, Cabramurra is one of the highest towns in Australia and well-known for its winters, often enduring months of deep snow coverage. First generation Cabramurra families made do without modern conveniences such as clothes dryers, relying instead on the good old rotary clothesline on washing day - whatever the weather.

Cabramurra of the 2020s will emerge as a fit-for-purpose accommodation facility offering a range of accommodation options for Snowy Hydro staff and contractors. The first stage of rebuilding is the construction of 100 apartments, a new staff medical centre, and a purpose-built fire refuge.

The building design is focused on alpine safety, energy efficiency and bushfire resistance. Canberra-based construction contractor Manteena has commenced work onsite, and together with architects Fender Katsalidis, have introduced an innovative modular construction method which will accelerate the construction schedule.

The first phase of the reconstruction is expected to be up and running by winter 2022.

Myth busting

SEGMENTS ON THE MOVE

With excavation now underway for Snowy 2.0's main access tunnel, the tunnel boring machine (TBM) is using nine precast concrete segments per ring. A permanent concrete ring is slotted into place every two metres of excavation.

A key part of this phase of construction is the safe and efficient transfer of concrete segments from Polo Flat to Lobs Hole and Tantangara. A fleet of trucks with bespoke trailers has been commissioned for transportation with the least possible disruption to the community.

With multiple trailers the trucks must be huge...

Each truck has three compact trailers pulled by a prime mover and is 26.5 metres in length and 2.5 metres wide - basically the same dimensions as a B-double. They are no bigger than many other trucks already using roads around the Snowy Mountains.

How heavy are the loads?

When fully loaded, each of the three trailers will carry three, seven-tonne concrete segments - a total of nine per truck. The total vehicle weight will be 91 tonnes including the truck, trailer, segments and packing. By transporting nine segments at a time, heavy vehicle movements through Cooma and Adaminaby are reduced by two-thirds.

What extra safety measures are in place for the loads?

A purpose-built lashing system will restrain and lock each load of segments to its trailer with hydraulic tensioning control. The interlock load restraint system prevents any movement of the truck and trailer until the entire load is fully secured and a warning light will alert the driver of any pressure reduction.

Will there be local traffic congestion?

The clever triple-axle design of the articulated trailers means the trucks can easily manoeuvre roundabouts and winding roads, will travel within regular single traffic lanes and do not require a pilot escort. The trucks have a speed limit of 90 km/h and will use recently installed turn-out lanes along the Snowy Mountains Highway to allow other drivers to pass. Motorists are requested to be patient and maintain an appropriate distance.



Segment truck (right) compared with B-double (left) Future Generation is currently recruiting truck drivers who are familiar with local roads and experienced in seasonal road conditions. Potential applicants will require a multi-combination licence, with all other training provided.

For details visit futuregenerationjv.com.au/job-opportunities-1

PROJECT UPDATE

Snowy 2.0

As the Lady Eileen Hudson tunnel boring machine (TBM) progresses underground, the newly-named Florence and Kirsten TBMs are being prepared for excavation duties at the emergency, cable and ventilation tunnel (ECVT) and headrace tunnel.

Following a brief pause in July to install the remaining gantries and connect the conveyor belt, Lady Eileen - the first TBM to start tunnelling - is now more than 160 metres into the mountain. By the 200-metre mark, the TBM will have the permanent ventilation and conveyor systems installed and be fully operational. The machine will continue full steam ahead excavating the 2.7-kilometre main access tunnel to the power station complex. Significant progress at the ECVT portal has seen the excavation of 330,000 cubic metres of material to create a 25-metre high vertical portal face. The cradle that supports TBM Kirsten is complete and assembly of the tunnel boring machine is underway.

Work continues on the assembly of the middle and front shields and the tailskin, with the main drive, probe drills and segment erector being installed inside the shields. A total of 11 trailing gantries will also be assembled and connected together to form the 205m-long TBM.

The TBM Kirsten will excavate a 2.9km-long tunnel to the power station complex and then continue to tunnel uphill at a 25-degree grade to create the inclined pressure shaft and meet up with the headrace tunnel. A tunnel at such a steep incline is a world first. Infrastructure to support Snowy 2.0 construction at Lobs Hole has also progressed, with the completion of a 100 cubic metres per hour concrete batching plant, which will supply concrete for power station construction, shotcrete ground support underground and the Talbingo intake structure, as well as for foundations and footings for other amenities onsite. Other works include warehouses for general stores and equipment.

At Tantangara, where the headrace tunnel will be built from, excavation and preparation of the adit portal is well advanced and some components for TBM Florence have been delivered. After heavy snowfall over the winter months, activity at Tantangara will step up a gear during the spring, with the assembly of the TBM to commence following the delivery of the oversize and overmass components, and installation of the concrete batch plant and water treatment plants. Other work fronts at Tantangara include earthworks for the camp facility and the cofferdam. Measuring almost 400m long and up to 11m high, the cofferdam will prevent the inlet structure from being inundated by the water level of the Tantangara Reservoir over the next few years, allowing construction to be completed in the dry.

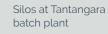
At Marica, the 2km access road from the Snowy Mountains Highway has been established and the camp construction has commenced. The coming months will see the road extended west a further 3km to the upstream surge shaft site on the headrace tunnel.

The construction of the Rock Forest site just outside Adaminaby has also recently been completed and is now operational. This facility is a key link in the logistics chain for the project, providing a staging area for transport trucks prior to being dispatched to project sites.

Tantangara adit in snow







Excavator and workers at Tantangara





Lady Eileen Hudson TBM underground



Engineering presentation



Pressure pipes design

ith its 27 kilometres of tunnels linking two dams and an underground

power station, Snowy 2.0 is utilising world-leading hydro construction techniques and the latest developments in design technology.

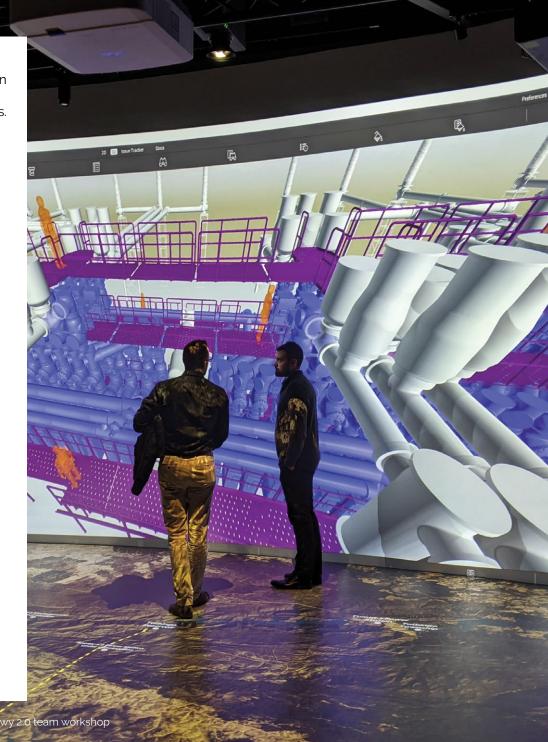
Key to understanding the project's many complex components is being able to visualise how the elements fit together. This is where digital engineering tools can make a world of difference. Typically in major infrastructure projects, a mix of technical drawings, detailed specifications and information-rich models are used alongside construction schedules for a holistic view. Building information modelling (BIM) is not new to construction, but the inclusion of sophisticated graphics makes the review process more visual and interactive.

The modelling platform being used for Snowy 2.0, Revizto, is capable of handling large amounts of data and information which can be stored in the cloud and accessed simultaneously by people in different locations.

During review meetings, the Snowy 2.0 team can explore 3D imagery which illustrates where the project is up to and 3D design models to illustrate where it's heading. Clicking on different components of the model reveals further detail, including which materials will be used. This will be a valuable feature for asset maintenance down the track, when a worker onsite will be able to utilise the original 3D model and drawings. As construction progresses, detailed technical information can be added or adjusted within individual components. 3D models show how the structures are taking shape and each component of the model has its own dataset covering different disciplines including civil and structural engineering, environmental information and planning.

When it comes to viewing the 3D models, the Snowy 2.0 team has made good use of the Cooma Discovery Centre's immersive theatre and 14m widescreen for group workshops and VIP visitors. And the interactivity doesn't end there. With the aid of virtual reality goggles, teams can walk through the tunnels and explore the underground power station for a realistic view of the pumped hydro complex. Not surprisingly, the VR walkthrough is also a popular activity for visiting high school students.

On completion of Snowy 2.0, the modelling will become a unique and permanent asset for Snowy Hydro, with detailed construction records throughout the life of the project.

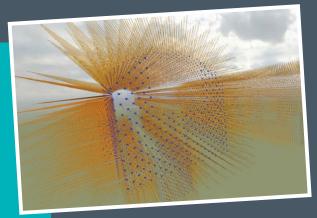


ROCKBOLTS

What may initially present as an abstract image is in fact a design illustrating the rockbolts for Snowy 2.0's underground power station.

Using a construction methodology developed and refined by the Snowy Mountains Hydro-electric Authority for the original Snowy Scheme, rockbolting will be used for Snowy 2.0 to support the excavated walls of the main cavern.

The visual model can be interrogated, with a few clicks of the mouse, to work out precisely how many rockbolts are in the proposed design.



Power station rockbolt design

ENVIRONMENT

RECYCLING PROJECT A BOTTLER

wilding the Snowy 2.0 pumped hydro project is thirsty work and thanks to local crane operator Craig 'Nicko' Nicholls, thousands of plastic water bottles from the project construction sites are being recycled for a good cause.

Nicholls, the Rocky Plain owner-operator of BCB Cranes and a Future Generation JV subcontractor, is the driving force behind an environmental and philanthropic project to turn used plastic bottles into cash for community benefit.

Future Generation supplies bottled water at all camp accommodation and in crib rooms across the project to ensure crews have fresh drinking water while the water treatment plant is completed.

With the support and assistance of the 1,100-strong Snowy 2.0 onsite workforce, Nicholls and the crews have so far collected and recycled more than 90,000 bottles, raising \$9,000 to support the volunteer-based Kosciuszko Huts Association.

"After the 2020 bushfires and then COVID, I could see all these empty bottles discarded into bins and as I was often picking them up (with the crane), I thought 'wow', we can do something here," Nicholls said.

"I'm quite passionate about the Snowy Mountains huts, their purpose and history - I had a bush wedding at the Cooinbil hut - and of course, many of them were destroyed by the fires.

"I put the bottles and the burnt

huts together and thought this was a way to do something positive, keep a lot of plastic from going into landfill and maybe leave a legacy from the (Snowy 2.0) project.

"I'm hoping that the funds from the recycling can contribute towards the rebuilding of a local hut."

After Nicholls spread the word among the Snowy 2.0 workforce last year, he discovered they were keen to get involved in the recycling plan. Since then, empty bottles have been collected by Snowy 2.0 workers and placed into giant bags located around the worksites before being taken to Tumut for wholesale recycling.

Snowy Hydro has supported the recycling initiative, donating a tandem trailer to help with transport logistics.

The initiative, though, is all site-based and Nicholls couldn't be prouder.

"I'm a local lad, I love this (Snowy 2.0) project and I'm passionate and driven about what we, the workers, can do to save all this plastic from going to landfill and turn it into something positive."

"Everyone onsite has got behind the bottle recycling. It would be great if when a hut around this area was rebuilt that we could say the Snowy 2.0 workforce has contributed to it," Nicholls said.



Craig Nicholls



Florence Violet McKenzie, left, and Kirsten Banks

TBM NAMES

Science superstars

trio of impressive Australian women has inspired the names bestowed on the three tunnel boring machines (TBMs) at the heart of Snowy 2.0.

With the first TBM christened the Lady Eileen Hudson, local school students were charged with researching influential women of science, technology, engineering and maths (STEM) to help name the remaining two giant excavators.

A shortlist of six Australian women in STEM was selected from more than 70 nominations put forward by students in the Snowy Mountains region. Almost 3,000 votes were collected, with astrophysicist Kirsten Banks and electrical engineer Florence Violet McKenzie winning the majority of votes.

Florence McKenzie (1890-1982) was the first woman to be awarded

a Diploma in Electrical Engineering in Australia and is best known for establishing the Women's Emergency Signalling Corps in 1939, a signalling instruction school that trained 3,000 women and 12,000 servicemen in Morse code, visual signalling and international code. Florence was suggested as a TBM name by Riley Douch from Berridale Public School.

Kirsten Banks, also known as Astro Kirsten, is an astrophysicist who uses influential social media platforms to convey her love of astronomy to a broad audience, particularly curious school children and science students. Kirsten is currently completing a PhD in the field of galactic archaeology with the Milky Way as her key focus. By studying the stars in our galaxy there are several hundred billion of them - Kirsten hopes to uncover some of the secrets of the Milky Way's formation and evolution. Kirsten was suggested by Kobe Burnes from Brungle Public School.

In her own time, and in a very different way, Lady Eileen Hudson was also an influencer in the field of science. As an ambassador representing the original Snowy scheme, Lady Hudson was an important advocate for the project, hosting politicians, royalty and VIPs during the construction years.

Her husband Sir William Hudson was the Scheme's first commissioner and is considered the father of Snowy.

As a thank you for their winning suggestions, Riley and Kobe will visit the site of the TBM they helped name, and their entire class will enjoy a special VIP visit to the Snowy Hydro Discovery Centre.

REGIONAL PROJECTS

Mighty and mega

Fans of the television program Aussie Mega Mechanics may have spotted some of the famous Snowy Hydro assets and locations over recent weeks. The second season of the observational documentary series premiered in August with the Cabramurra-based team and Tumut 1 Power Station featuring in the first episode. Activities at Jindabyne, Khancoban and Talbingo will also be showcased throughout the series.

Camera crews from Wild Bear Entertainment, which produced the series for the Discovery Channel, shadowed our hydro teams as they tackled a range of challenging repairs and maintenance, including a 50-tonne valve replacement hundreds of metres underground.

The series will also follow an intense five-day inspection of aircraft for the Royal Flying Doctor Service, a tricky repair aboard one of Brisbane's River City ferries and a rocket test at Gilmour Space Technologies.

Keep an eye on our social media for teasers of upcoming Snowy episodes. Aussie Mega Mechanics airs on Monday nights at 7.30pm on Foxtel's Discovery Channel with past episodes available on-demand.

Matthew Warner

Maintenance team leader Matthew Warner was involved in three different shoots at Guthega and Jindabyne and described the experience as fun and rewarding although a little stressful at times, with safety being a top priority during filming. "We had detailed toolbox talks prior to shooting and explained to the crew what the hazards were and where they could go around the site. At no time did we not know where they were."

Matthew hopes the audience will enjoy seeing Snowy assets, the process to maintain them and the challenges faced on a daily basis. He says the team is looking forward to seeing the show go to air and "getting ready for the obvious fame that will follow!"



For operations coordinator Sam Rowbotham, the filming made for an unusual few days. "It did slow down some of the work, as we had to do several shoots of each scene which meant repeating the same job a couple of times. For some scenes that were taken inside confined spaces where the TV crew couldn't go, we got to jump behind the camera and film our work mates."

GET SOCIAL WITH SNOWY

With so much happening across Snowy Hydro every week, it can be hard to keep up – and that's where our engaging online content comes in.

From our website to our Facebook, Instagram and LinkedIn pages, and our official YouTube channel, a fresh snippet of news is never far away.

Snowy's talented amateur photographers love snapping spectacular pictures when out and about in our regions. Naturally snowfall pictures are popular – but every season brings its own Snowy Mountains magic.

Black and white images from the archives are eternal favourites and behind the scenes of our power stations always get the thumbs up. Regular video updates from Lobs Hole and Tantangara are a great way to follow Snowy 2.0 progress, complete with time-lapse and drone footage of our tunnel boring machines being assembled and on the move.

Don't be shy – follow us on Facebook, Instagram and LinkedIn and subscribe to our e-newsletter and YouTube channel.

Join our growing audience online



snowyhydro.com.au

RETAIL

Wild about seals





Amalie's first birthday

LOVE ANIMALS?

Take a look at Red's energy plan that comes with a year-round membership to Taronga Zoo.

Visit redenergy.com.au/zoo

Taronga's Brad McKenzie. Photo: Paul Fahy

hen the Taronga Conservation Society closed its Sydney gates to visitors during COVID restrictions in 2020, staff made an interesting discovery. A quick pivot to install cameras and 24/7 live streams of animals and keepers going about their daily routines became an instant internet hit.

At the Seals For the Wild exhibit, a popular attraction that aims to both entertain and educate audiences on the impact of their choices around wildlife and sustainability, the loss of visitors on location was soon replaced by a far bigger audience to the online version of the show.

Taronga Foundation director Leila Davis says with the support of corporate partners like Red Energy, which sponsors Seals for the Wild, Taronga was able to continue sharing animal tales, and keep up their critical conservation efforts.

"When partners sign up to support the work we are doing in conservation and sustainability, and saving animals in our wildlife hospital, it helps to tell our story to a much wider audience," Leila said.

While Taronga Zoo Sydney may be temporarily closed to visitors, daily health care, training and breeding programs for the animal residents must go on. Australian sea lion pup Amalie recently celebrated her first birthday and is a critical addition to the declining sea lion population.

Taronga has bred five Australian sea lions over the past 14 years, and marine mammals unit supervisor Brad McKenzie says they're a special breed. "Everything about Australian sea lions is magnetic, they really stand out in the seal world. They're unique, fascinating and great problem-solvers."

To celebrate her birthday, keepers created colourful ice and gelatin treats for Amalie to push around in the water. After learning to swim in her first year, Amalie's next big achievements will be weaning from her mother and moving to a full fish diet.

Taronga recently added the Red Energy Penguin Cam to its live action channels, along with lions, elephants, meerkats and more. On the education side, videos of keeper chats sharing some of the fun characteristics of their charges are regularly uploaded to Taronga TV.

Taronga Zoo: taronga.org.au/taronga-tv

COMMUNITY AND EDUCATION

START YOUR SNOWY STORY

A career at Snowy Hydro can begin in many different ways, through opportunities for school leavers, university graduates and those still studying. At any one time, 10% of our workforce is in a development program and we aim to foster emerging talent as our business continues to grow and evolve. With a range of entry-level programs on offer across different parts of the business, the future is bright for the next generation.

Top: Khush Dodhia-Shah, Middle: Chloe Marsh Bottom: Ian Grant

Ian Grant is six months into his new role as an electrical apprentice and on a professional journey he describes as "unexpected", with many learning curves along the way. He began his Snowy career as a Business Administration Trainee in 2020, based in Cooma, which gave him a taste of working in a large organisation and an idea of potential opportunities.

"I wanted to continue my career in the business as well as gain a trade and I couldn't think of a better workplace to complete an electrical apprenticeship," Ian said.

"Everyone in the organisation wants to support you while you are learning the ropes of how the business works – or in my case the tricks of the trade – as everyone is always willing to share their knowledge."

Chloe Marsh joined Snowy six months ago as a fitting and machining apprentice based in Jindabyne. It's a career choice well-suited to her love of hands-on work and being out in the field. "Coming to work each day is interesting and no two days are the same," Chloe said.

"My team and I regularly travel to different sites both within and outside of the Kosciusko region. My favourite experience so far would have to be walking the Guthega pipeline for an inspection in snow shoes after a fresh dump of snow."

Chloe has already learned the basics of fitting, servicing machinery and is starting to learn machining.

"Snowy is a great company to work for. They provide plenty of support and learning opportunities and they have a very high focus on staff safety, which as an apprentice is something I really appreciate."

Now a graduate mechanical engineer in the Capital Projects team, Khush Dodhia-Shah started his Snowy story as a vacation student over the summer of 2019-20.

"Being based in WA, there wasn't much in the way of renewable or hydro assets to work on and the power industry had challenges and complexity, but not to the scale of the NEM," Khush said. "I loved home, but wanted to explore a new challenge and really liked the power industry. So Snowy seemed perfect for that.

"It's a super unique opportunity out here, with so much to do and learn. I've felt comfortable here as there is a good feel about the company, which I think comes from the culture and from being regionally-based. I've made some good friends and no weekend has been the same because there's so much to do out and about here if you're keen!"



Mind games

ducational activities are all about having fun while you learn and Snowy Hydro's Next Generation Education hub is filled with ideas to keep children of all ages (and the young at heart) entertained and challenged.

At first glance, these two images of the Lady Eileen Hudson

tunnel boring machine may appear identical, but take a closer look. Apply those powers of observation to see how many differences you can pick up.

For more brain games, visit Next Generation Education online to download and print activity sheets about the past, present and future of the Snowy Scheme. There are now eight different learning modules, with new content and resources continually added. You will also find the solution to our TBM spot the difference challenge. snowyhydro.com.au/education/ nextgen.

CAN YOU SPOT THE DIFFERENCES? (there are 10!)



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*Available to NSW residential customers signing up to the Living Energy Saver plan. Fixed supply and usage rates only until 31 December 2022 after which rates become variable. Eligibility criteria and conditions apply. Basic Plan Information Documents available at redenergy.com.au/bpid