

Victoria's Investment Prospectus

ENERGY STORAGE



VICTORIA
Australia

Victoria, one of the world's most exciting energy markets



Contents

Acknowledgement of Country

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom have ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

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Traditional Owners at the centre of decision-making processes

Strong and mutually beneficial partnerships with Traditional Owners and First Peoples are imperative to the electricity transition's success and integral to ensuring the goals and objectives of self-determination set out in the Victorian Government's Self Determination Reform Framework and the Department of Energy, Environment and Climate Action's (DEECA) Pupangarli Marnmarnepu 'Owning Our Future' Aboriginal Self-Determination Reform Strategy 2020–2025.

We will be continually guided by Traditional Owner and First Peoples' communities – now and in the future – who have expressed a strong interest in investing in renewable energy to deliver their interests and their desire to own and manage renewable energy generation and storage technology and infrastructure to meet their communities' cultural, spiritual and economic needs.

As part of a once-in-a-generation renewable electricity transition and transformation, there is an obligation for industry and government to create genuine partnerships with Traditional Owners and First Peoples, to ensure that their self-determining rights and interests are upheld. This will be the catalyst for historical change and reform that will see immediate and future flow-on effects. It will have a positive impact on the environment and advance the social and economic outcomes for Traditional Owners and First Peoples and all Victorians.

The Victorian Government has committed to a target of:

At least 6.3 GW of energy storage capacity by 2035



Why invest in Victoria's energy storage sector?



Government initiatives drive demand

Our supportive policy environment and strong targets provide certainty to investors – including the energy storage targets of at least 2.6 GW by 2030 and 6.3 GW by 2035.



Short, medium and long-duration investment opportunities

Victoria welcomes investment in a range of energy storage technologies, including short, medium and long-duration storage. Delivering long duration storage into Victoria ahead of planned coal generation closure presents significant opportunities for renewable energy developers in Victoria.



Battery manufacturing

\$523 million has been provided for the national Battery Breakthrough Program, providing production-linked incentives to support manufacturers in developing critical battery manufacturing capabilities in Australia.



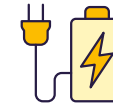
Emerging storage technologies

The Australian Government's Future Made in Australia Innovation Fund supports innovation, commercialisation, pilot and demonstration projects, and early-stage development in priority sectors. It may help unlock opportunities for deploying innovative storage technologies in Victoria.



Exciting revenue opportunities

Energy storage operators can capture proven market opportunities including energy arbitrage and ancillary services.



Abundant opportunities for new storage developments

Victoria's established supply chains and skilled workforce are perfectly placed to support your storage project. With 335 MW of existing storage capacity and 1600 MW under construction, there are still significant opportunities for investment to help meet Victoria's ambitious storage targets.

Our legislated targets are driving investment

Victoria's changing energy market is creating investment opportunities

Victoria's energy market is in transition, shifting from its historic fuel source of brown coal to a more diversified, renewable mix. The Victorian Government has entered into structured transition agreements with owners of 2 of the largest coal-fired generators, that will see these assets close in 2028 and 2035 respectively.

This creates unprecedented opportunities for investment, as the state will need an estimated **\$35 billion** of additional investment to provide 25 GW of new renewable energy and storage capacity by 2035.

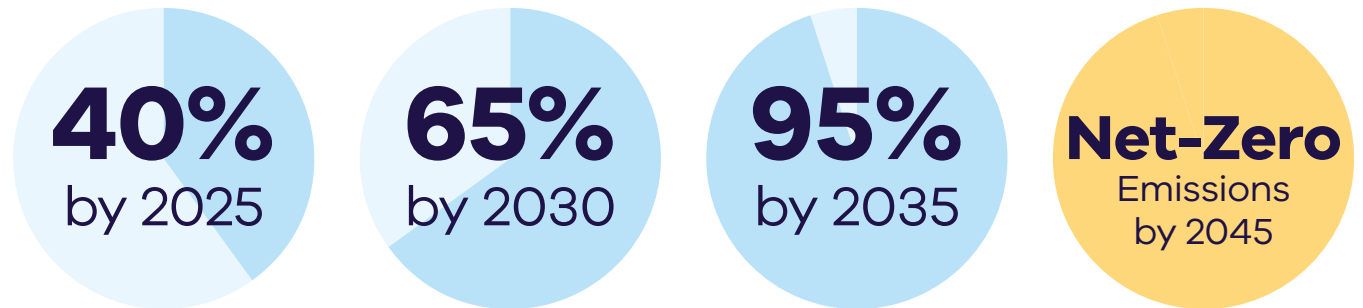
Our transition to renewable energy is supported by strong targets set by the Victorian Government, creating significant opportunities for investors.

Victoria's Electricity Future

The Victorian Government has released its vision for Victoria's future electricity system.

The Victoria Electricity Future is a four pillared plan that will enable the renewables big build, empower households and businesses to lower energy bills, manage the transition away from fossil fuels, create jobs, skills and supply chains.

The Victorian Government has legislated renewable energy targets of:



Energy storage capacity targets of at least:



Offshore Wind Energy Targets:



For more information, visit: energy.vic.gov.au/renewable-energy/victorias-electricity-future

Large-scale battery facilities and technologies

The next generation of large-scale storage in Victoria is underway, demonstrating the significant potential for investment in this sector with several fully commercial batteries in the pipeline.

The growing number of utility-scale batteries being developed and operated without government funding shows how this technology is becoming an increasingly attractive investment prospect for the private sector – a trend that is supported by our strong policy framework.

Investment Opportunity

Victoria will require significant new investment in energy storage of all durations. The Australian Energy Market Operator (AEMO) has identified that investment in shallow, medium and long duration energy storage, along with generation and transmission, is urgently required to deliver reliable and affordable electricity during the energy transition.¹

¹ 2024 Integrated System Plan for the National Electricity Market, <https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp>

Rangebank Battery Energy Storage System

Battery storage is an essential enabler of the energy transition, helping to provide energy system stability as more renewables are channelled into the grid. Situated within the Rangebank Business Park in Melbourne's southeast, the Rangebank Battery Energy Storage System will provide 200 MW/400 MWh capacity of reliable and flexible energy to Victorians upon completion in late 2024.

Jointly developed by Eku Energy and Shell Energy with minority equity partner, Perfection Private, the grid-scale battery will connect to Victoria's transmission network at the Cranbourne Terminal Station. It will play a vital role in helping Victoria achieve its energy storage targets of at least 2.6 GW of capacity by 2030 and support the delivery of renewable energy across the state.



Case study

VicGrid – shaping Victoria's future grid

VicGrid is changing the way Renewable Energy Zones are planned and developed and delivering the infrastructure Victoria needs to connect renewable energy sources to the grid.

As part of its role, VicGrid is:

- Introducing a strategic and proactive process to ensure timely coordination of investment in transmission, generation and storage infrastructure across our Renewable Energy Zones.
- Delivering the Victorian Transmission Plan which will give industry a clear picture of the state's long term strategic plan and identify priority areas for investment to be released in 2025.
- Implementing the Victorian Access Regime to give industry certainty of access to the network and reduce the risk of curtailment.
- Designing and procuring major projects like the transmission to support offshore wind.
- Managing the \$480 million already committed across 12 projects to address known capacity constraints to maximise Victoria's renewable energy potential.



Flagship investments enabling new project connections

VicGrid is working in partnership to deliver flagship projects that will not only unlock significant new generation and storage, but present strong investment opportunities in their own right.

Victoria to New South Wales Interconnector West (VNI West)

A proposed high-capacity 500 kV double-circuit overhead transmission line between Victoria and New South Wales, VNI West will allow up to 2.7 gigawatts of new generation across both states. It will also connect Victorian electricity generation and storage to load centres across the border, enabling increased export opportunities to other states.

Marinus Link

A proposed high voltage direct current interconnector comprising 250km of undersea and 90km of underground cables, which will enable the neighbouring state of Tasmania to import excess supply of solar and wind produced in Victoria.

Gippsland Offshore Wind

VicGrid is leading a coordinated approach to transmission infrastructure development for offshore wind generation in Gippsland. The proposed transmission technology will be either a double circuit 330 kV or a 500 kV overhead transmission line, with next steps being to refine this area to a corridor (and then a route).

To register interest in these investment opportunities or to find out more, please email: market.engagement.vicgrid@deeca.vic.gov.au



Powering Victoria's renewable energy future

What is the SEC?

The SEC is a government-owned renewable energy company that:

- invests in renewable energy and storage projects that accelerate the energy transition and deliver sustainable returns
- supports households to go all-electric to reduce their energy bills and emissions
- builds the renewable energy workforce our energy transition requires.

How the SEC invests:

By 2035, Victoria will need 25 GW of new renewable energy and storage capacity. The SEC will contribute to this by investing an initial \$1 billion towards delivering 4.5 GW of new renewable energy generation and storage. Its work will ensure Victorian households and businesses continue to have the power they need as we transition to renewable energy.

The SEC's investments include opportunities in renewable generation and storage. Utility-scale storage can address critical system gaps and help catalyse investment in large wind and solar generation to replace ageing coal assets. The organisation will also continue to explore emerging technologies, including long duration energy storage opportunities, that accelerate the sector's maturity and global competitiveness.

The SEC's investments focus is on achieving sustainable returns while delivering broader benefits to the Victorian public and enabling the market.



Find more information, visit: secvictoria.com.au

The Melbourne Renewable Energy Hub

The SEC is accelerating the renewable energy transition by investing in one of the world's biggest battery projects – the Melbourne Renewable Energy Hub.

The hub will comprise 3 battery components totalling 600 MW in size and is being developed in partnership with renewable energy investor Equis Australia.

The SEC's \$245 million investment in the hub enabled construction to begin immediately and supported one of the project's battery components to double in size.

Once complete in late 2025, the hub will deliver 1.6 GW hours of energy storage, with potential to expand. That's enough to power around 200,000 homes during peak evening consumption.



Fast-tracking planning approvals

Both the Victorian Government and the Australian Government are committed to getting your project through planning approvals as quickly as possible.

Fast-tracked planning approvals

The Victorian Government Development Facilitation Program fast-tracks the planning permit approval process for large renewable energy facilities and utility installations. This provides certainty to investors by removing the risk of delay by third-party appeals.

For more information, visit: planning.vic.gov.au/planning-approvals/planning-enquiries-and-requests/development-facilitation-program

Furthermore, the Australian Government is providing \$168 million to better prioritise approval decisions for renewable energy projects of national significance, and support faster decisions on environment, cultural heritage and planning approvals.

Clearer biodiversity planning guidelines

The Victorian Government is developing interactive spatial tools and guidance materials to improve upfront planning for renewable energy projects and provide clearer requirements for managing biodiversity impacts.

In 2024 two new maps have been developed: Habitat Value and the Marine Biodiversity Values (MBV). The maps combine information on thousands of species habitats to show the relative biodiversity value of habitats in Victoria.

Biodiversity values mapping provides decision-makers with an objective and comprehensive view of the relative biodiversity importance of all parts of Victoria's land and state waters, to help prioritise areas for protection or avoid areas of high biodiversity value in development footprints. The values mapping does not highlight areas that are "no-go" zones for development. Instead, they can be used to consider the relative value of biodiversity to help design infrastructure that minimises impacts.

For more information, visit: energy.vic.gov.au/about-energy/news/news-stories/better-managing-biodiversity-impacts-of-energy-projects

For more information or to download the map datasets visit:

Habitat Value: environment.vic.gov.au/biodiversity/habitat_value

MBV: marineandcoasts.vic.gov.au/marine-and-coastal-knowledge/MBV

Victorian Big Battery

300 MW/450 MWh lithium-ion battery

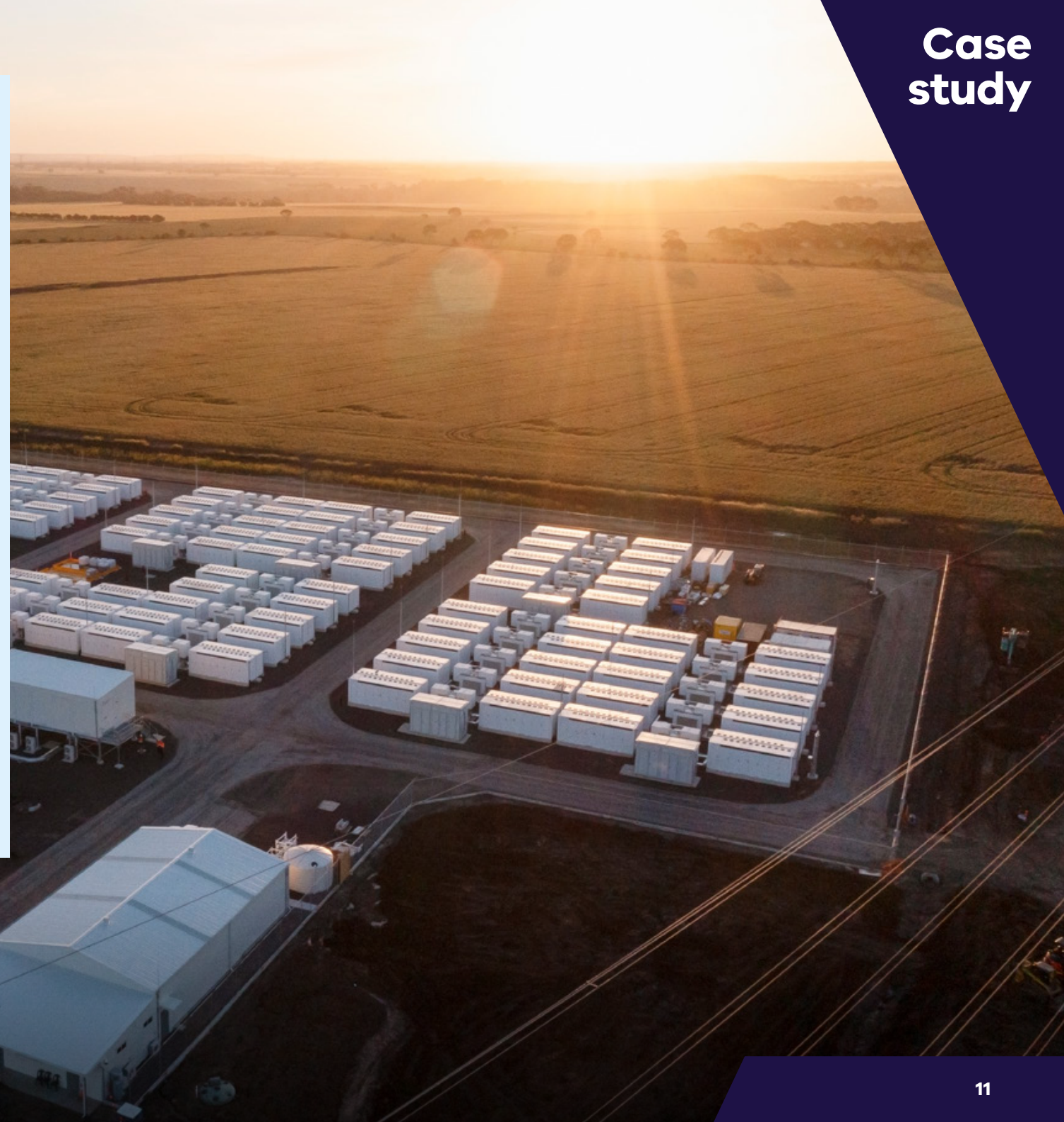
The Victorian Big Battery (VBB) is Australia's largest lithium-ion battery located at Moorabool Terminal Station, just outside Geelong. Owned and operated by Neoen, it plays 2 important roles in Victoria's electricity system.

Firstly, it allows for increased power flows through the Victoria-New South Wales Interconnector during peak demand summer months. This reduces the risk of unscheduled load shedding during summer.

Secondly, the VBB delivers a 250 MW network support service - System Integrity Protection Scheme (SIPS), which allows the battery to operate automatically and instantly in response to a network failure.

For more information visit: energy.vic.gov.au/renewable-energy/batteries-energy-storage-projects/victorian-big-battery

Photo credit: Victorian Big Battery (energy.vic.gov.au)



Investing in a Future Made in Australia

The Australian Government is investing \$22.7 billion to transform the nation into a renewable energy superpower. As the country's leading manufacturing state, Victoria can be central to these ambitions.

Future Made in Australia has been designed to maximise the economic and industrial benefits of the net zero transition. It is focused on facilitating private sector investment and building a stronger, more diversified and more resilient economy powered by renewable energy.

The Victorian Government can connect you with the Australian Government's specialist investment vehicles, including the:

- **Clean Energy Finance Corporation:** Australia's 'Green Bank', with access to \$30.5 billion in investment capital from the Australian Government

- **Australian Renewable Energy Agency:** Provides financial assistance for research, development, demonstration, commercialisation and deployment of renewable energy technologies.
- **National Reconstruction Fund:** A \$15 billion national investment fund designed to diversify and transform Australia's industry and economy.
- **Net Zero Economy Authority:** \$399 million to establish the Net Zero Economy Authority and support the economy wide net zero transformation.

Key initiatives include:

- **\$7 billion** production tax incentive for the processing and refining of critical minerals
- **\$6.7 billion** production tax incentive for renewable hydrogen
- **\$2 billion** for early-mover renewable hydrogen projects as part of the Hydrogen Headstart program (bringing total investment to \$4 billion)
- **\$1.7 billion** to promote net zero innovation, including for green metals and low-carbon fuels
- **\$1.5 billion** to strengthen battery and solar panel supply chains through production incentives
- **\$134 million** to fast-track approval processes for renewable energy projects.

For more information, visit: <https://treasury.gov.au/publication/p2024-526942>

Capacity Investment Scheme

The Capacity Investment Scheme (CIS) provides a national framework to underwrite 23 GW of renewable capacity and 9 GW of clean dispatchable capacity by 2030.

The Australian Government will provide revenue underwriting for successful CIS tender projects, with an agreed revenue 'floor' and 'ceiling.' This will offer a long-term revenue safety-net that decreases financial risks for investors and encourages more investment when and where it is needed.

Competitive tenders for renewable energy and storage will be held approximately every 6 months. The first was held in May 2024 where Victoria secured a minimum allocation of 1.4 GW of renewable energy capacity. This is in addition to the 600 MW storage tender held in early-2024 for projects in Victoria or South Australia.

Through the CIS, the Australian Government is committed to bring jobs and investment to regional communities, strengthen industries that create our sustainable future and support First Nations people to preserve their unique culture and heritage and remain on Country.

The Victorian Government is engaging with the Australian Government to finalise the bilateral Renewable Energy Transformation Agreement (RETA). The RETA will set out Victorian allocations for future tender rounds of the CIS, securing support for investments in renewable energy and storage projects in Victoria.

For more information, visit: dcceew.gov.au/energy/renewable/capacity-investment-scheme



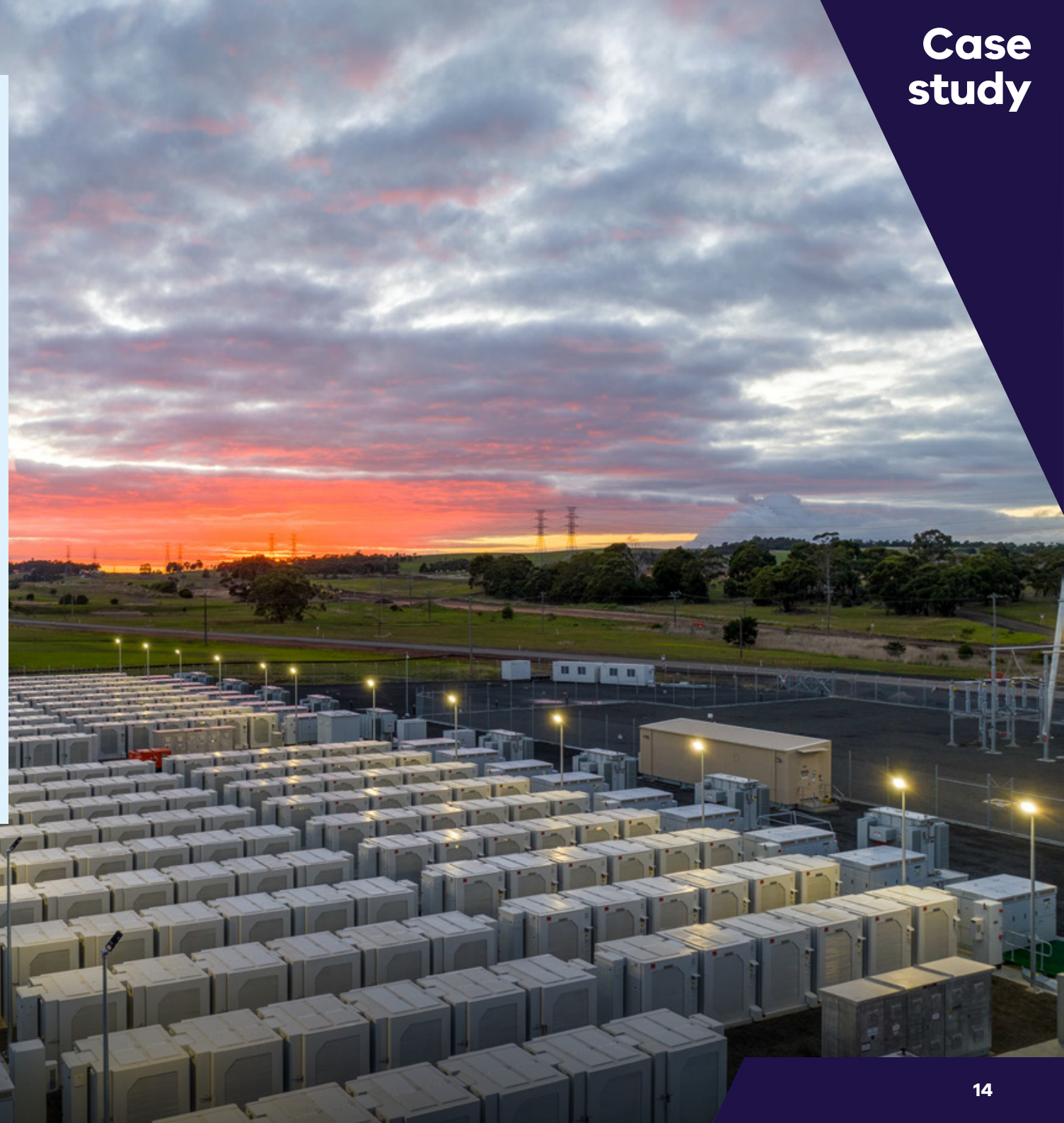
Hazelwood Battery Energy Storage System

The Hazelwood Battery Energy Storage System (BESS) in the Latrobe Valley is Australia's first utility-scale energy storage system to be commissioned on the site of a retired coal-fired power plant.

Jointly funded and developed by ENGIE and Eku Energy, the 150 MW/150 MWh system has the capacity to store the energy equivalent of an hour of energy generation from the rooftop solar systems of 30,000 Victorian homes, which it discharges to help meet peak demand.

With access to 1,600 MW of network transmission capacity on site, the Hazelwood BESS will play a critical role in increasing renewable energy capacity in Victoria while delivering essential system services to the grid.

Photo credit: Hazelwood Battery Energy Storage System



Microgrids and virtual power plants

The Victorian Government is delivering on innovative solutions that will reduce reliance on the electricity network and share renewable power—boosting demand for investment in energy storage.

Victoria has seen a rapid rise in distributed and consumer energy resources (such as home solar and batteries) and the innovative control systems that compliment them.

As these technologies and systems advance, we are moving beyond the traditional single-way energy system, towards two-way power, islanded assets and the empowerment of consumers to support their communities and the electricity grid.

Microgrids and virtual power plants are expected to play an increasing role in Victoria's energy system.

Storage systems are integral to these systems, creating opportunities for market entrants and investors.

Neighbourhood Batteries

The Victorian Government has committed more than \$42 million to fund installation of 100 neighbourhood batteries across Victoria.

The 100 Neighbourhood Batteries Program provides grants to install neighbourhood batteries to improve energy reliability and provide energy storage capacity for locally-generated solar power. This is expected to increase access to renewable energy and help lower energy bills.

For more information visit: energy.vic.gov.au/grants/neighbourhood-batteries/100-neighbourhood-batteries

Microgrid Demonstration Initiative

The \$10 million Microgrid Demonstration Initiative (MDI) supported the development and implementation of microgrid demonstration projects. These projects address key microgrid sector challenges and contribute to unlocking Victoria's microgrid sector.

Funded projects include:

- Euroa Environment Group's Euroa Microgrid
- Monash University's Microgrid Electricity Market Operator
- Origin Energy's Virtual Power Plant (VPP)
- SwitchDin's Birchip Cropping Group Microgrid
- Totally Renewable Yackandandah's (TRY) Constrained SWER Microgrid Demonstration.

For more information visit: energy.vic.gov.au/renewable-energy/microgrids



Totally Renewable Yackandandah

The vibrant Victorian gold-rush village of Yackandandah has 3 active microgrids, with residents generating, storing and sharing their own electricity whilst both topping up from and exporting to the National Energy Market (NEM).

This endeavour is a passion for volunteer group Totally Renewable Yackandandah (TRY), that strives for 100% renewable power. Over the past few years, TRY has partnered with residents, the Victorian Government and renewable expert, Mondo, to create the Yack Microgrid amongst 33 residential households on the edge of town.

The microgrid connects 17 homes with solar energy systems, smart energy controllers and 9 household batteries.

In a further effort to test the scale and timing of electricity demand, the project also incorporates 5 highly efficient CO2 residential hot water heat pumps.

totallyrenewableyack.org.au



Corryong Islandable Microgrid (CIM)

The Victorian Government and AusNet are working with communities in Mallacoota, Omeo and Corryong to increase their bushfire and energy resilience through a \$7 million Community Microgrids and Sustainable Energy Program (CMSEP)

Following the 2019-20 bushfires, an opportunity was recognised to provide power independently of the electricity grid during bushfires and extreme weather events in rural settings. The Corryong Islandable Microgrid (CIM) is part of the existing CMSEP that has supported the installation of solar, battery and smart energy systems for properties in Omeo, Mallacoota and Corryong.

The CIM seeks to improve energy resilience in Corryong with the use of a 4.99MW centralised microgrid, 3kVA generator and smart-grid technologies. Solar and battery systems recently installed through CMSEP will complement the microgrid by providing extra local generation to reduce demand on the main battery and generator.

Expected to be completed by early 2026, the microgrid is designed to power Corryong for up to 5 days. Depending on factors such as the power consumption within the microgrid, initial charge level of the battery, available solar generation and any additional fuel supplies, the microgrid could supply power for more than 5 days.

The \$28.6m project is supported with funding from the Australian Government Disaster Ready Fund, in partnership with the Victorian Government, AusNet and Mondo.

engage.vic.gov.au/project/community-microgrids/page/community-microgrids-corryong

Access to Victoria's world-class renewable energy talent

Our growing, highly-skilled workforce drives project delivery and fosters industry growth. To meet the needs of the sector, the Victorian Government has committed to significant new energy skills and workforce initiatives.

World-class education and training

Victoria has a globally renowned education and training system, including:

- 2 global 'Top 50' universities.¹
- 4 dual-sector universities (offering both tertiary and vocational education).
- 12 independent technical and further education (TAFE) locations under a single TAFE network.
- a diverse talent pool with strong growth across the broad range of occupations relevant to the renewable energy sector.
- the highest number of engineering managers of any Australian state or territory.

Government investment in skills and workforce

The Victorian Government is investing in the skills and workforce requirements needed for Victoria's transition to a renewable energy future. Major initiatives include:

- The Victorian Energy Jobs Plan, which will set out actions to develop the workforce required to deliver our nation-leading target of 95 per cent renewable electricity generation by 2035 and drive investment confidence. The plan is due to be released in early 2025.

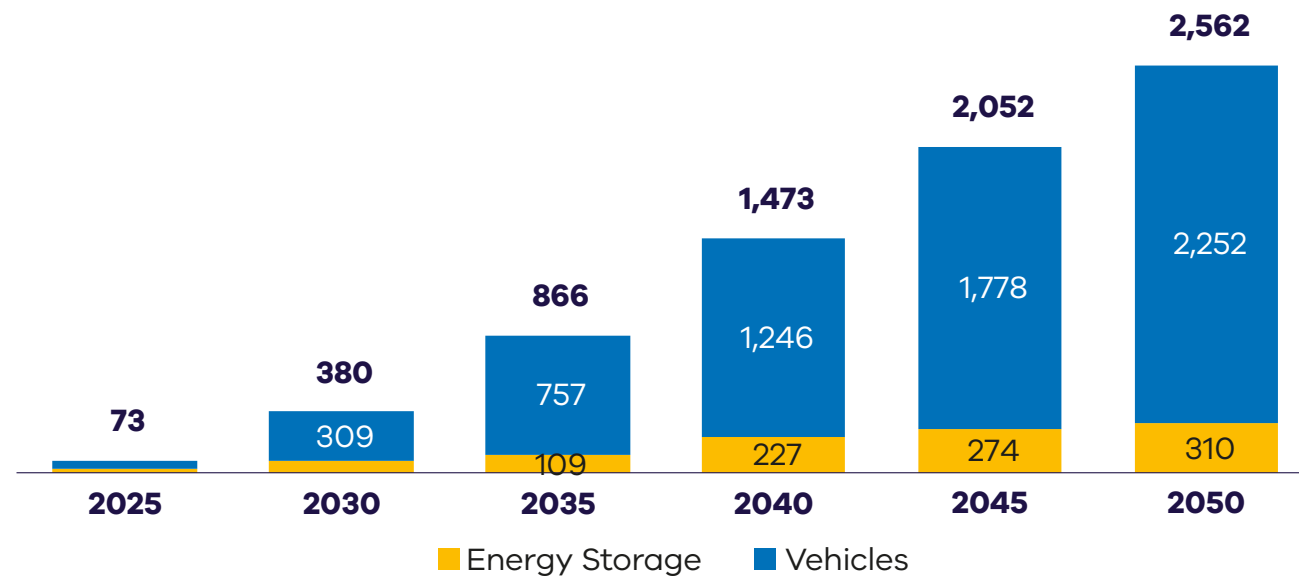
- Establishing the SEC Centre of Training Excellence to attract and train a skilled renewable energy workforce, working with industry to ensure Victoria has the workers required to support the energy transition.
- The Wind Worker Training Centre and Renewable Hydrogen Worker Training Centres are funded initiatives to ensure Victoria has a pipeline of skilled workers to meet workforce needs and deliver the wind and renewable hydrogen projects now and in the future.

¹ QS World University Rankings 2024 topuniversities.com/world-university-rankings?page=2

An ideal location for your next Asia Pacific battery and ZEV manufacturing facility

Our advanced manufacturing capability, skilled workforce, world-leading battery research and access to Australia's rich source of critical minerals make Victoria the ideal place to establish your battery and ZEV manufacturing operations.

Forecast demand for energy storage and electric vehicles in Australia's National Electricity Market (GWh)¹



¹ Source: AEMO ISP's 'Step Change' scenario which is considered to be the most likely of the scenarios modelled by AEMO



Security of mineral supply

- Australia is home to some of the largest recoverable critical mineral deposits on earth, including high-quality cobalt, lithium, manganese, rare-earth elements, tungsten and vanadium
- There is the option to refine critical minerals near their source or co-locate a refinery with manufacturing in Victoria
- The northwest region of Victoria hosts globally significant deposits of mineral sands, including rare-earth elements in high demand as inputs to the permanent magnets utilised in electric vehicles and wind turbines.

Victoria has:

- 22% of Australia's **ilmenite** (~7% of global economically demonstrated resource)
- 51% of Australia's **rutile** (~32% of global economically demonstrated resource)
- 39% of Australia's **zircon** (~27% of global economically demonstrated resource).



Seamless logistics

- There is strong capacity to ship goods – including Australian minerals – into Victoria via the ports of Geelong or Portland
- Transfer products by train to a nearby manufacturing site
- Export products to local and international markets through the Port of Melbourne, Australia’s busiest and most connected port.



Existing supply chain capability and skills

- Building on a long tradition in automotive, aerospace, defence, metal, chemical and general manufacturing, Victoria continues to be the destination of choice for leading businesses
- Victoria has the highest number of manufacturing engineering skills relative to other states and can support large-scale production.



Renewable energy and environmental credentials

- Recycle batteries to strengthen critical mineral supply, leveraging Victoria’s existing battery recycling capability
- Decarbonise your operations with 95% renewable electricity through Victoria’s grid by 2035, Power Purchasing Agreements and the potential for green shipping using methanol.



Enabling speed to market

- Access specialist advice from Invest Victoria, including site location services, development, statutory approvals and intergovernmental coordination.

Manufacturing Opportunities

Preliminary estimates suggest Victoria could need up to:

- 3,600 utility-scale battery packs by 2035¹
- Around 820,000 distributed battery packs by 2035¹

Initial Victorian demand for batteries creates a foundation for providing OEMs with long-term pipeline certainty

¹ Indicative estimates are based on internal forecasts and modelling conducted by Accenture (2023) for the Department of Energy, Environment and Climate Action and are subject to change.

Selectronic Australia

Selectronic is a Victorian-based inverter manufacturer which produces industry leading grid-forming battery inverters.

Together with PowerPlus, an Australian energy storage provider, Selectronic partnered with IBM Research Lab on a project supported by the Victorian Government's New Energy Jobs Fund – to implement, test and demonstrate a range of ways for new energy technologies to interact and operate.

Using system optimisation methods developed specifically for solar and energy storage applications, the joint project demonstrated significant value gains across the whole system.

The project developed a highly localised solar generation forecasting model that can adapt to changing conditions dynamically, as well as a system optimisation approach.

selectronic.com.au



SP PRO Series 2i inverter
Photo credit: Selectronic

e-Cube

With the support of the Victorian Government's New Energy Jobs Fund, Clean Technology Partners developed 'e-Cube' to connect small to medium utility-scale renewable energy projects to the grid.

e-Cubes have been deployed in 23 solar PV projects across Victoria, New South Wales and South Australia with an aggregate capacity of over 160 MWdc. By combining the HV switchgear, protection equipment, metering and SCADA within one easy-to-install unit, e-Cubes provide a 'plug and play' utility interface for grid-connected solar, battery and hybrid assets.

clean-tech.com.au

cleantechcontrols.com.au

An e-Cube

Photo credit: Clean Technology Partners



Opportunities to partner with businesses and government

Prospective investors can partner with network providers, businesses or technology companies to participate in a variety of market opportunities. The government-owned State Electricity Commission (SEC) will also work with industry and investors to drive the uptake of renewable energy generation and storage.

Commercial Opportunities

The uptake of commercial and industrial-scale storage is driven by a range of factors. These include the increasing accessibility of behind-the-meter power purchase agreements (PPAs), an appetite to reduce high energy use and costs, limiting exposure to retail market fluctuation, and the desire for improved energy security.

Revenue group	Value generating service
Competitive physical markets	<ul style="list-style-type: none">• Energy arbitrage• Frequency regulation• Contingency ancillary services
Competitive financial markets	<ul style="list-style-type: none">• Cap contracts• Volume firming contracts
Non-market ancillary services	<ul style="list-style-type: none">• System restart• Voltage control• Network loading control• Transient and oscillatory stability
Network support	<ul style="list-style-type: none">• Congestion relief• Transmission/distribution deferral• Unserved energy reduction• Interconnector support• System Integrity Protection Scheme
Generator support	<ul style="list-style-type: none">• Improve marginal loss factors• Minimise curtailment• Enable fast ramping• Reduce FCAS 'causer pays' fees
Cost avoidance	<ul style="list-style-type: none">• Demand charge reduction

Energy storage research and development

Victoria's universities produce world-leading research and development across all aspects of energy storage technologies.

Victoria is looking to attract investment in a range of energy storage technologies and has strong research and development capabilities across its universities to support technology development.

The state's world-class research organisations are delivering cutting-edge innovation across the full spectrum of established and emerging energy storage solutions.

This includes the following leading centres:

- Deakin University's Battery Research and Innovation Hub (see next page for details)
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- RMIT's Centre for Advanced Materials and Industrial Chemistry
- The University of Melbourne's Melbourne Energy Institute
- Monash University's Monash Energy Institute.



Institute for Frontier Materials

The Institute for Frontier Materials (IFM) at Deakin University is a large research institute, working with industry to address material challenges in the energy, mining, environment, health, transport, textiles and manufacturing sectors.

In the area of energy storage and electromaterials, IFM's researchers are at the leading edge in:

- development of novel, high-performance battery electrolyte materials including solid, polymer and gel electrolytes
- advanced nanostructured electrode materials and characterisation
- battery materials design, recovery, recycling and the circular economy
- extreme testing, operations and application of battery devices.

Electrolytes and electrode materials technologies developed at IFM can be used to produce advanced lithium-ion and lithium metal batteries with enhanced safety, lifetime and energy density.

IFM's researchers are also world leaders in sodium-ion and sodium metal batteries.

IFM welcomes the opportunity to work with industry on sustainable energy storage solutions. Its partners include Toyota, Calix, Solvionic, Talga and many others.

ifm.deakin.edu.au

Battery Research and Innovation Hub

Deakin University's Battery Research and Innovation Hub is a unique, world-class research and innovation centre focused on advanced battery prototyping and the commercialisation of energy storage technologies.

The specialised facility was developed with \$10.3 million in co-funding by the Victorian Government and Deakin. It includes a dedicated research innovation laboratory for new battery design and development, prototyping, and a cell and systems test facility for multiple battery types and sizes.

Research can be tailored to meet specific industry needs and consumer demands as batteries continue to evolve from small personal use items to powering our modes of transport and electricity supply.

batteryhub.deakin.edu.au

Photo credit: Battery Research and Innovation Hub



EnyGy® Ltd

EnyGy Ltd is a Victorian-based innovation company focused on the development and commercialisation of graphene-based technologies, enabling the production of next-generation energy storage solutions. Positioned at the forefront of ultracapacitor (also known as supercapacitor) technology, EnyGy has pioneered world-leading graphene technology that facilitates the cost-effective manufacture of ultracapacitors with energy densities up to 2 times greater than those currently available.

EnyGy's strategy achieves compact energy storage based on graphene. The patented invention encompasses a cost-effective and scalable method for fragmenting graphite into microscopic sheets and introducing ions or molecules between the layers of graphene nanosheets to create a stable graphene film.

Potential applications for these technologies include:

For cells: smart grid, consumer electronics and data storage.

For modules: transportation, rail, wind and UPS/DVR systems.

The pioneering efforts at EnyGy have led to the emergence of a novel category of energy-dense ultracapacitors.

enygy.com

Photo credit: EnyGy

Innovation and emerging technologies

Victoria is a strong supporter of new and emerging technologies and their role in the future grid. This may include concentrated solar thermal and compressed air energy storage.

RayGen Resources

RayGen manufactures an innovative solar PV and thermal water-based energy storage solution. The Victorian company's technology achieves 70% round-trip efficiency, which is significantly higher than other electro-thermal storage technologies on the market. It is purpose-designed for utility projects and large behind-the-meter commercial and industrial customers.

Breakthrough Victoria (BV) is investing \$20 million to enable the state's transition towards clean sources of energy and will help the technology expand into more markets. The investment is an example of BV helping to commercialise Victorian IP, enabling RayGen to continue growing and expanding while remaining in its home state.

RayGen's flagship solar and storage project, consisting of 4 MW solar and 3 MW/50 MWh (17 hours) storage, is located in Carwarp, Mildura.

raygen.com



Case
study

Our experienced supply chain is open for business

Victoria boasts full or partial supply chain capability for most phases of large-scale battery development. This includes the design, build and integration of components.

Our renewable energy supply chains are continuing to expand following the deployment of our initial grid-scale batteries. With a wide range of specialist manufacturing expertise and facilities, Victoria is at the forefront of Australian manufacturing innovation.

Zenaji

Zenaji is installing its Eternity Battery, with cells being warranted for 20 years or 22,000 cycles (at greater than 80%), with potential cell life of 40,000+ cycles.

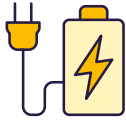
The Eternity Battery is a stand-alone battery or a building block for large-scale energy storage at 48 V (LV) or higher voltages to be configured to suit inverter requirements. The sizing starts at 16 kWh and can scale up to grid scale while remaining safe with high C rates.

Built in Victoria to exacting standards, it is set to change the landscape for those wanting batteries designed to meet their long-term needs with enhanced safety and extreme cycle life.

With emerging markets for its home and small business products being established around the world, Zenaji has patented technology enabling maximum efficiency, long-life batteries to power the most demanding electricity projects.

Zenaji is currently looking at growing its manufacturing facility in Melbourne to meet high local and international demand.

**Case
study**



Battery infrastructure

- Metal stamping
- Metal roll forming
- Metalwork forming
- Batteries
- Galvanised steel mounting posts
- Racking/mounting hardware
- Mounting system assembly
- Shed/housing
- Climate control



Electrical balance of plant

- Control panel
- HV cable
- LV and MV cable
- DC cable
- Fibre optic cable
- Electrical conduit
- Lighting/luminaries/poles
- Inverters
- Medium voltage switchgear
- Electric panel assemblers
- MV distribution transformers
- Electrical pits
- Wire harness assemblies
- Power conversion skids/enclosures
- DSP control systems
- Isolation units
- Gravel/raw materials



Civil/site works

- Site preparation
- Trenching
- Access/roadworks
- Foundation piles
- Concrete precast and placement
- Reinforcing steel
- Earthworks equipment and crane hire
- Sediment barriers
- PCV tests and energisation
- Water works
- Logistics



Project Management Services

- Regulatory/planning
- Electrical engineering
- Mechanical installation
- Surveying
- Environmental monitoring
- Geotechnical testing
- Electricity grid support
- Communications
- Video footage/ photography
- EPC contractor
- Supply chain consulting
- Engineering
- Site analysis
- Stakeholder engagement
- Technical due diligence/ auditing
- Environmental due diligence/ auditing
- Project management

Full or partial supply chain capability

Full supply chain capability

Key Victorian Government entities

We can help facilitate connections with key Victorian Government entities and industry members across our renewable energy sector.

Department of Energy, Environment and Climate Action (DEECA)

DEECA works with industry and the community to develop Victoria's secure and sustainable energy future.

For information on Victoria's energy policy landscape and facilitated connections across the Victorian Government and renewable energy sector, contact the Business and Industry Engagement team at:

BIE@deeca.vic.gov.au

For more information, visit:

energy.vic.gov.au

energy.vic.gov.au/industry/investment-opportunities

Breakthrough Victoria

Breakthrough Victoria is an independent investment management company established in 2021 to manage the Victorian Government's landmark \$2 billion Breakthrough Victoria Fund.

For more information, visit:

breakthroughvictoria.com

Invest Victoria

Invest Victoria is the Victorian Government's investment attraction agency. Services include:

- market regulatory information
- statutory approvals coordination
- site location services
- identification of infrastructure and utility requirements
- advocacy within government.

For more information, visit:

invest.vic.gov.au

SEC

The SEC is a Victorian Government-owned renewable energy company. It is partnering with the private sector to deliver 4.5 GW of new renewable energy and storage projects with an initial investment of \$1 billion.

For more information, visit:

vic.gov.au/state-electricity-commission-Victoria

Sustainability Victoria

Sustainability Victoria empowers Victorians to live sustainably by taking action on climate change and using our precious resources wisely – to deliver a sustainable future for us all.

For more information, visit:

sustainability.vic.gov.au

VicGrid

VicGrid coordinates the planning and development of Victorian Renewable Energy Zones (REZs). It also oversees the \$540 million REZ fund that will be used to strengthen the grid and develop each REZ.

For more information, visit:

energy.vic.gov.au/renewable-energy/renewable-energy-zones

For international investors

Contact a local Victorian Government Trade and Investment Office to help you:

- navigate investment opportunities in Victoria's new energy technology sector
- set up a briefing with energy specialists
- arrange inbound market visits
- introduce you to the Victorian Government's Energy Business and Industry Engagement team and Invest Victoria.

For more information, visit:

global.vic.gov.au/meet-our-global-team/all-office-locations

Victorian Government Trade and Investment office locations



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