



BARWON SOUTH WEST RENEWABLE ENERGY ROADMAP

CAPTURING OUR COMMUNITY'S VIEWS





ITS TIME TO CHANGE
THE WORLD



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Acknowledgement of Barwon South West's Aboriginal communities

The Renewable Energy Roadmap project team acknowledges Barwon South West's Aboriginal communities and their rich culture and pays its respects to their elders past and present. The project team recognises the intrinsic connection of traditional owners to country and acknowledges their contribution to its care. We acknowledge Aboriginal people as Australia's first peoples and as the traditional owners and custodians of the land and water on which we rely. We recognise and value the ongoing contribution of Aboriginal people and communities to Victorian life and how this enriches us. We embrace the spirit of reconciliation, working towards the equality of outcomes and ensuring an equal voice.

MINISTER'S FOREWORD



On behalf of the Victorian Government, I am pleased to present the Victorian Regional Renewable Energy Roadmaps.

As we transition to cleaner energy with new opportunities for jobs and greater security of supply, we are looking to empower communities, accelerate renewable energy and build a more sustainable and prosperous state.

Victoria is leading the way to meet the challenges of climate change by enshrining our Victorian Renewable Energy Targets (VRET) into law: 25 per cent by 2020, rising to 40 per cent by 2025 and 50 per cent by 2030.

Achieving the 2030 target is expected to boost the Victorian economy by \$5.8 billion - driving metro, regional and rural industry and supply chain development. It will create around 4,000 full time jobs a year and cut power costs.

It will also give the renewable energy sector the confidence it needs to invest in renewable projects and help Victorians take control of their energy needs.

Communities across Barwon South West, Gippsland, Grampians and Loddon Mallee have been involved in discussions to help define how Victoria transitions to a renewable energy economy.

These Roadmaps articulate our regional communities' vision for a renewable energy future, identify opportunities to attract investment and better understand their community's engagement and capacity to transition to renewable energy.

Each Roadmap has developed individual regional renewable energy strategies to provide intelligence to business, industry and communities seeking to establish or expand new energy technology development, manufacturing or renewable energy generation in Victoria.

The scale of change will be significant, but so will the opportunities.

Each community has a part to play in embracing cleaner energy and the benefits it brings for a brighter future.

The Hon Lily D'Ambrosio MP
Minister for Energy, Environment
and Climate Change
Minister for Solar Homes
State Government of Victoria

ABOUT THIS ROADMAP



This Roadmap captures the Barwon South West community's views following significant engagement and consultation between April and September 2019.

It is part of a very important, ongoing conversation about the region's transition to a renewable energy future and reflects the unique characteristics and the lived experience of the people of Barwon South West.

The Barwon South West community understands we must plan and act with purpose to achieve our renewable energy goals. There are some differences in the experience and opinions of Barwon South West residents, when we look and listen deeper to the feedback from our communities in the west (known as the Great South Coast) and the east (known as G21). These differences are explored in more detail later in this Roadmap, but essentially result from the "lived experience" of Great South Coast residents of renewable energy generation projects, mainly wind farms.

At the time this Roadmap was produced, three local councils in our region – Surf Coast Shire, City of Warrnambool and Moyne Shire – had declared a climate emergency. This is significant, because these council declarations reflect how Barwon South West communities are feeling about the current and emerging issues associated with our climate.

This Roadmap is about collaboration and engagement, particularly understanding how the various regions across Victoria can contribute to our state's renewable energy targets while delivering benefits for their own households, businesses and communities.

I'd like to thank Barwon Water for hosting this project. Their own renewable energy ambitions are an example of what is possible with focus and collaboration.

What resources are available and what opportunities do they provide? Are communities and regions "renewable energy ready"? And what can we learn from their "lived experience" to date?

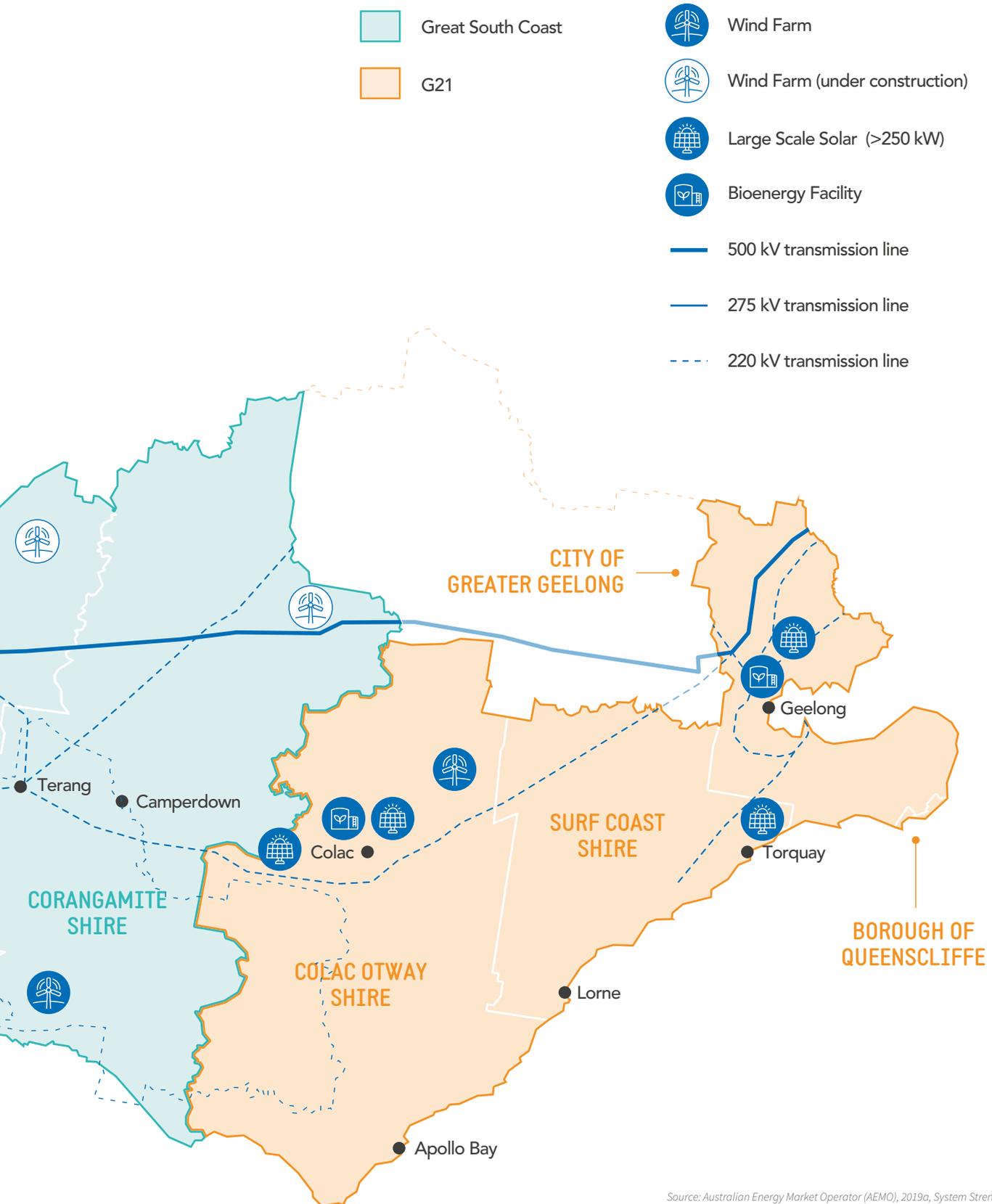
These are just some of the questions being asked as part of constructive, focussed conversations which continue across our state. Working with our communities we will continue to listen and learn, refine our shared priorities and develop action plans to progress these priorities – working together with a common purpose.

Colleen White

Regional Director
Barwon South West
Department of Environment,
Land, Water and Planning

OUR RENEWABLE ENERGY LANDSCAPE





Source: Australian Energy Market Operator (AEMO), 2019a, System Strength 2018-19. Retrieved from www.aemo.com.au [Accessed 18 October 2019]

COMMUNITY ENGAGEMENT

LISTENING, LEARNING AND SHARING WITHIN OUR COMMUNITIES

TALKING, LISTENING, LEARNING AND SHARING

Collaboration, consultation and engagement with local communities was key to this Roadmap's development. Across Barwon South West, this process involved:

- Engagement and consultation activities over almost six months.
- More than 30 qualitative interviews with various stakeholders.
- Multiple stakeholder workshops and meetings across the east and west of our region.
- Engagement at local events – farmers' markets, open house events, local hall meetings and festivals attended by thousands of people.
- Structured "listening posts" to ensure conversations were consistent.
- Detailed online survey.
- Engagement with our region's youth, via sessions held in schools and in after school youth groups.

Over almost six months between April and September 2019, across many forums and using a variety of stakeholder engagement tools, the Barwon South West community shared their aspirations, desires and interest in renewable energy generation and use, and any constraints or concerns, based on their experience and knowledge.

People from all walks of life contributed to the conversation, across community events such as markets and festivals, in schools, and via an online survey.

Barwon South West residents spoke up about what was happening with renewable energy in their area, and what they thought about it. What did they see as the benefits of renewable energy to the community and region? What are the challenges and constraints? What type of renewable energy systems are of most interest to our communities, and what does the best mix of energy generation look like for our region? Discussions also covered who should finance and run renewable energy generation, and residents let us know anything else that was on their mind about renewable energy.

In all, more than 500 people across the nine Local Government Authorities (LGAs) that make up Barwon South West were part of this engagement. They gave frank feedback about what people in our region think about renewable energy, and several key themes emerged.

KEY THEMES



SUPPORT FOR RENEWABLE ENERGY IS STRONG

There is strong support across our region for renewable energy generation and a progressive transition to renewables. People understand that this transition is essential, given the rising costs of energy supply to households and businesses and the pressures of climate change.

Very few people (less than one percent of all residents who contributed), did not support a shift to renewable energy. Their key reasons for not supporting the transition were perceptions about reliability of supply, appropriate use of valuable agricultural land and a perception that Australia's contribution to climate change was so small compared to other countries that it didn't matter how we produced our energy.



TAKE A STRATEGIC APPROACH AND LISTEN TO THE COMMUNITY

An important theme which emerged was community concern that renewable energy generation projects were not being planned in a systematic way across Victoria, leading to rushed and ad hoc projects. People were concerned that the rollout of renewable energy was being driven by the priorities of large commercial developers who did not listen to community concerns or act in the community's interest. One of the community's main concerns was productive agricultural land being used for renewable energy projects.

The most consistent concern raised by stakeholders was poor community consultation about proposed renewable energy projects. People felt they weren't involved in the planning of renewable projects in their area and that developers sometimes overstated the benefits.



SHARE THE BENEFITS

Sharing and retention of benefits derived from renewable energy infrastructure development in our region is key with Barwon South West residents, and building and maintaining trust between them and developers is critical. People felt it was important that renewable energy projects in the region created local jobs and an economic boost to local businesses. Barwon South West is uniquely positioned within regional Victoria to capitalise on renewable energy technology growth, with 30 specialist firms identified in the Victorian Government's "Wind and Solar Facilities – Victoria Business Supply Chain Directory" situated in Barwon South West.



WIND AND SOLAR ARE THE PREFERRED TECHNOLOGIES

Wind and solar renewable energy generation are seen by communities across our region as the most appropriate, given the climatic conditions and advantages, and offering the most potential, now and into the future. Wind and solar are also the types of energy generation that Barwon South West residents know most about.



CUT DOWN THE COMPLEXITIES AND COSTS, AND MAKE IT EASIER

Barwon South West residents are interested in a renewable energy future for the region and state, but said they see the current rules and regulations as highly complex and preventing community involvement and innovation in the renewable energy space. For example, residents say it is confusing to know how to go about getting rooftop solar and that battery storage or small-scale renewable energy projects are too expensive and this prevents some, like dairy farmers, from installing solar systems as they use most of their energy when the sun isn't shining.

UNDERSTANDING OUR COMMUNITIES AND STAKEHOLDERS

Barwon South West covers an area of more than 2.9 million hectares, incorporating several major regional centres including Geelong, Colac, Warrnambool and Hamilton.

ABOUT THE GREAT SOUTH COAST

The Great South Coast's vision is to transition to 100 percent renewable energy in a strategic and well planned way that equitably shares the benefits amongst the community.

The Great South Coast region covers 23,000 square kilometres of predominantly rural and coastal areas in Victoria. The region has significant infrastructure attributes including major passenger and freight road and rail assets and thoroughfare and the Port of Portland.

It also abounds with natural resources (particularly wind and sun) and environmental assets and attractions including marine and coastal parks such as the Twelve Apostles Marine National Park and the Budj Bim, Great Otway and Grampians National Parks. With a population of 101,702¹ the Great South Coast includes these local government areas (LGAs): Glenelg Shire, Southern Grampians Shire, Moyne Shire, City of Warrnambool and Corangamite Shire.



The Great South Coast contains some of the best renewable energy resources in Barwon South West, indeed in Victoria. It also has some of the best transmission infrastructure, offering a competitive advantage for the region. The area has great potential to benefit from Victoria's renewable energy transition and, because of heavy investment in renewable energy in the region

already, residents can provide a unique understanding of the benefits and challenges of renewable energy generation, particularly large-scale wind development.

Two councils within the Great South Coast, Moyne Shire and City of Warrnambool, have declared climate change emergencies, reflecting the views and priorities of local constituents.

¹ ABS2016a



RENEWABLE ENERGY INITIATIVES

Renewable energy generation, particularly wind, has long been a feature of the Great South Coast region. Further development is underway in all of the five LGAs represented in the western end of Barwon South West. Initiatives at either aspirational or feasibility stages include but are not limited to:

- Port Fairy Smart Energy Precinct.
- Negotiations with South Australia for a cross-border biohub.
- Hydrogen bus network.
- Hamilton industrial land bioenergy.
- Biochar energy (including for carbon sequestration).
- Green hydrogen export from Portland.
- Hydrogen production.
- Hydrogen refueling station.
- Power upgrades for dairies.
- Zero carbon plans.
- Power Purchase Agreement (PPA) to obtain 45 percent renewable energy.
- Electric vehicle charging infrastructure – strategy opportunities “charging the region”.
- Port of Portland operating and supporting the development of large-scale renewable infrastructure in the region.
- Renewable energy power take-up incentives and programs for industry and business.

CHALLENGES AND CONSTRAINTS

Great South Coast community members noted the following potential challenges and constraints to further renewable energy generation development and take-up within the area.

- The number of existing and committed large-scale wind farms in some areas means some residents are seeing landscape-scale change all around them and feel they have had little say.
- A lack of a strategic, co-ordinated approach to how and where wind farms will be located and no shared understanding of what is reasonable.
- Roads and other local town infrastructure (like bridges) are not fit for large-scale infrastructure development and the impact of heavy vehicles and the cost of repairs is often borne by local governments.
- Local councils need support as they are left with the responsibility of making sure wind farms comply with their permits creating a significant burden on council resources. They want to work with those responsible for setting permit conditions.
- Large-scale wind project construction has decreased the availability of short-term accommodation and affordable housing for low socio-economic status groups.

▲ Budj Bim Cultural Landscape

- Local councils need clarity on how to manage requirements under various relevant State Acts – for example those that cover noise and nuisance (*Public Health and Wellbeing Act 2008*) and wind farm approval planning conditions (*Planning and Environment Act 1987*).
- Community engagement requirements should be clear, consistent and part of permit requirements.

OPPORTUNITIES

Great South Coast community members also saw a number of opportunities for renewable energy development in their part of Barwon South West. They suggested the following:

- Think as a region and take a co-ordinated approach.
- Replace natural gas with renewable energy alternatives.
- Ensure profits and benefits stay within the region.
- Improve waste management.
- Look to improve regional jobs and growth, including education and training facilities focussed on retaining young people in the region.



GLENELG SHIRE



Population
19,758²



Area
621,857 ha



Average annual solar exposure
15.5 MJ/sqm



Average wind speed
6.9 – 8.9 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 154.9 MW of renewable energy capacity³. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 227.5 MW of capacity⁴.

In 2019 Glenelg Shire Council undertook and published a Renewable Energy Study to investigate the potential to develop the shire into a renewable energy hub for the state. The study looked at four key renewable energy types – solar, wind, biomass and hydrogen – on the basis they were most easily implementable, financially viable, with long-term future application and market potential in addition to delivering strong job growth. Glenelg Shire is committed to demonstrating leadership in the renewable energy sector.

◀ [The Twelve Apostles](#)



SOUTHERN GRAMPIANS SHIRE



Population
16,123²



Area
665,402 ha



Average annual solar exposure
15.8 MJ/sqm



Average wind speed
7.5 – 8.5 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 77.8 MW of renewable energy capacity³. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 137.1 MW of capacity⁴.

Southern Grampians Shire Council is focussed on a renewable energy future, with recent initiatives including participation in a Power Purchase Agreement initiated and facilitated by the Victorian Greenhouse Alliances.



Victorian average annual solar exposure
14 – 19 MJ/sqm



Victorian average wind speed
3.5 – 10 m/s



MOYNE SHIRE



Population
16,737²



Area
548,169 ha



Average annual solar exposure
15.3 MJ/sqm



Average wind speed
7.2 – 8.7 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 536.7 MW of renewable energy capacity³. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 1,065.6 MW of capacity⁴.



CITY OF WARRNAMBOOL



Population
34,242²



Area
12,095 ha



Average annual solar exposure
15.3 MJ/sqm



Average wind speed
7.7 – 8.5 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 7.1 MW of renewable energy capacity³. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 237.8 MW of capacity⁴.



CORANGAMITE SHIRE



Population
16,243²



Area
440,749 ha



Average annual solar exposure
15.3 MJ/sqm



Average wind speed
7.5 – 8.5 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 13.8 MW of renewable energy capacity³. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 172.2 MW of capacity⁴.

In October 2019 Moyne Shire Council joined a growing list of Australian councils declaring a climate emergency and calling for urgent action to address climate change. This declaration followed a presentation to councillors from their Youth Council, expressing their extreme concern about the impacts of climate change on their future.

Moyne's 2019-2029 Economic Development Strategy lists renewable energy as a key point under its Economic Direction 3 Major Local Industries. Moyne leads the way as Victoria's wind energy hub and more information on the shire's commitment to renewable energy can be found at www.moyne.vic.gov.au

The City of Warrnambool Council is one of three in our region that has declared a climate emergency. It has also committed to being a carbon neutral organisation by 2040 and among other things is looking at options for a hydrogen powered bus network.

Corangamite Shire Council has undertaken energy efficiency audits resulting in energy saving upgrades to council buildings and generated 156 MWh as a result of solar PV on kindergartens.

² ABS2016a

³ Capacity figures for both large-scale and rooftop solar include an 80% efficiency factor for conversion from Direct Current to Alternating Current. Sources: Australian PV Institute, 2019, Mapping Australian Photovoltaic Installations (PV Postcode Data & Large-Scale PV Systems). Retrieved from pv-map.apvi.org.au [Accessed 18 October 2019] and Department of Environment, Land, Water & Planning (DELWP), 2019, Wind farm and Solar Farm general locations (shapefiles).

⁴ Potential capacity is based on postcode figures developed by the Australian PV Institute (accessed Oct 2019, pvmap.apvi.org.au) and recalculated to apply best fit to the region. It is not an estimate of currently approved projects/installations.

ABOUT G21

G21's overarching vision for the region is to work together, be strategic, make connections and focus on economic, social and environmental solutions to create a positive future for young people, and progressively shift to a sustainable world for generations to come.

The G21 region covers 594,000 square kilometres and include these LGAs: Colac Otway Shire, Surf Coast Shire, City of Greater Geelong, Borough of Queenscliffe and Golden Plains Shire. Golden Plains Shire, while not technically a part of the Barwon South West region, is part of the G21 Geelong Regional Alliance, and the views of some of its southern residents are covered in this Roadmap.

Geelong is the largest city in the region and the second largest city in Victoria. The Surf Coast Shire is one of three in Barwon South West which has declared a climate emergency, following advocacy and activism on this issue from local residents.

Community engagement indicates G21 residents are very supportive of a renewable energy future for the region. The G21 area covers retirees and lifestyle



“sea changers”, many of whom commute to Melbourne for work.

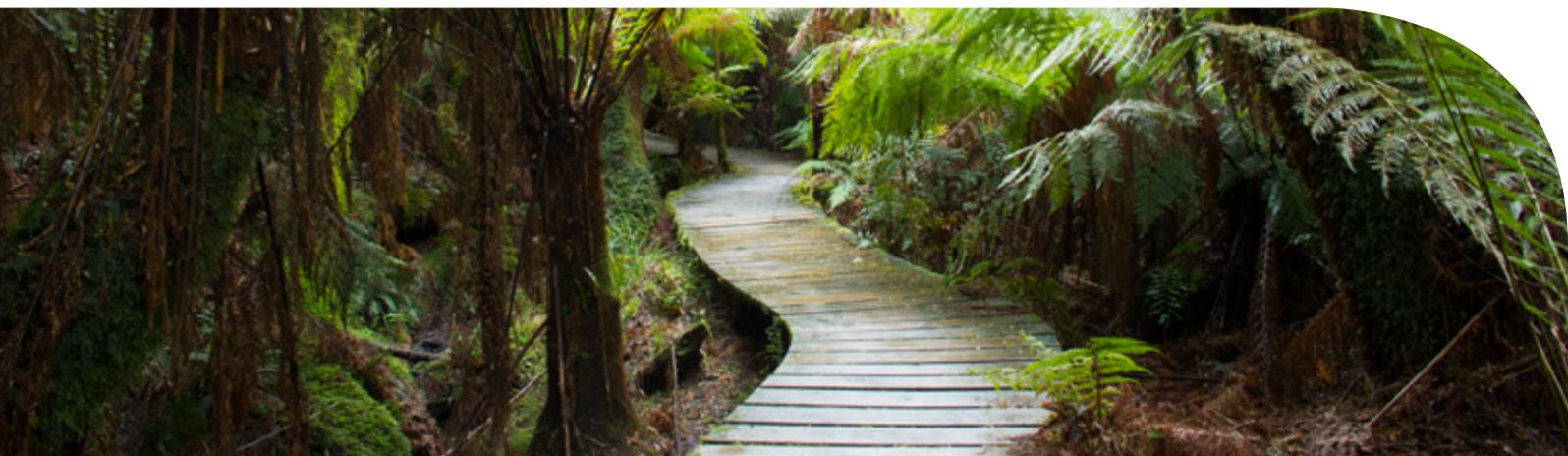
The Great Ocean Road, part of which is in G21, is an integral part of the fabric of Barwon South West.

The road and its surrounding environment are also at the forefront of the impact of a changing climate with increased erosion events, storms surges and rising sea levels.

The G21's water corporation, Barwon Water, has committed to a zero net emissions future by 2030

and is fast-tracking its switch to renewable electricity. After only three years of action Barwon Water is now 60 percent renewable (based on implemented and committed projects) with a 3MW solar farm at Black Rock Water Reclamation Plant and an innovative bioenergy project underway in Colac that is planned to save 8,000 tonnes of CO2 emissions per year.

▼ [Rainforest walk in the Otway Ranges.](#)



RENEWABLE ENERGY INITIATIVES

G21 communities have strong aspirations to move to a renewable energy future. This end of Barwon South West also has a well-coordinated approach for collaboration to achieve these aspirations through the G21 alliance. Initiatives at either aspirational or feasibility stages include:

- Deakin University micro-grid.
- Surf Coast Shire's renewable energy target of 25 percent by 2020.
- Colac Otway Shire's goal of being carbon neutral by 2020. 99 kW solar on Bluewater. 99 kW solar on council offices.
- Proposed 6MW solar farm – feasibility study pending.
- Water Corporations and Local Government Power Purchase Agreements (PPA).
- BRACE community Power Hub (eight community-based renewable energy groups).
- Barwon Water 100 percent renewable energy by 2025 and zero emissions by 2030.
- Local Government procurement policies which encourage renewable technologies.
- Green Tech Advisory Committee to support small-to-medium enterprises to adopt energy efficiency measures.
- Geelong Technical School school-based projects.
- Micro-grid investigations at Basil's Farm.
- Corporate fleet electric vehicles.
- Supply chain development with Vestas in Geelong providing local business opportunities.
- Inverleigh wind farm proposal.
- Community groups working on specific projects, for example the Community Owned Renewable Energy (CORE) Geelong.

CHALLENGES AND CONSTRAINTS

The following challenges and constraints came up as part of consultation with G21 communities:

- Solutions to renewable energy challenges must be equitable to ensure a just and fair transition for all.
- Lack of clear, consistent policy.
- Impacts of any development on the region's natural environment.
- Lack of appropriately skilled, local workforce.
- Slow uptake of technology.
- Lack of modelling data and shared learnings, local and international.
- Lack of regional vision.
- Resource constraints.
- Waste management.
- Lack of focus on culture, sharing experiences, building the case for change, normalising the renewable energy experience.

OPPORTUNITIES

G21 communities are solution-focused and offered the following ideas to government, regulators and legislators as a way forward:

- Support energy decentralisation initiatives, such as micro-grids, virtual power plants, and other community energy projects.
- Develop and promote policy that fosters regional innovation and local strategies that clearly contribute to Victoria's overall targets.
- Understand the impacts of renewable energy generation on local assets in G21, marine and terrestrial.

- Work with regional TAFEs and universities to develop appropriate skill-based programs. Conduct audits to understand what skills are needed, what we have, and address the gaps.
- Look to undertake study tours and exchanges – within Victoria, Australia and internationally – to share renewable energy initiatives and experiences.
- Communicate more clearly and effectively on the benefits, opportunities and limitations of renewable energy technology.
- Develop a collective, co-ordinated regional vision for G21 and the broader Barwon South West.
- Look for renewable energy collaboration opportunities across G21 through local governments and sustainability groups.
- Work to prioritise renewable energy projects, understand "hot spots" and constraints so decision making is informed and balanced.
- Focus on waste management and its impact on the local area. Develop a product stewardship program for renewable energy waste, such as solar PV panels and batteries.
- Tell our stories, look to share, mentor and lead with renewables.
- Being part of a network of Community Power Hubs across Victoria.



COLAC OTWAY SHIRE



Population
21,362⁵



Area
343,747 ha



Average annual solar exposure
14.8 MJ/sqm



Average wind speed
6.5 – 9.2 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 140.0 MW of renewable energy capacity⁶. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 205.9 MW of capacity⁷.

Colac Otway Shire Council has committed to be a carbon neutral organisation by 2020, undertaken energy audits at nine key council facilities and installed a 99 kW PV system on its sport and recreation centre, Bluewater. Further energy efficiency upgrades are planned and a range of additional measures are being considered, including purchasing green power and / or carbon offsets.

◀ *Aerial view of the City of Greater Geelong*



SURF COAST SHIRE

 **Population**
30,465⁵

 **Area**
155,294 ha

 **Average annual solar exposure**
15.2 MJ/sqm

 **Average wind speed**
7.0 – 9.4 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 11.8 MW of renewable energy capacity⁶. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 189.1 MW of capacity⁷.



CITY OF GREATER GEELONG

 **Population**
239,529⁵

 **Area**
124,799 ha

 **Average annual solar exposure**
15.3 MJ/sqm

 **Average wind speed**
7.2 – 8.1 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms and bioenergy facilities have up to 64.1 MW of renewable energy capacity⁶. Solar and wind farms under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 1,409.9 MW of capacity⁷.



BOROUGH OF QUEENSCLIFFE

 **Population**
2,929⁵

 **Area**
862 ha

 **Average annual solar exposure**
15.5 MJ/sqm

 **Average wind speed**
7.6 – 8.1 m/s



Renewable energy generation

Existing rooftop solar, solar and wind farms have up to 1.4 MW of renewable energy capacity⁶. Solar and wind farms which are under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 30 MW of capacity⁷.

Surf Coast Shire has adopted a target of 25 percent renewable energy by 2020, has initiated the website Powered by Positive to help people access the best information on renewable energy and established its Renewable Energy Taskforce to support the community to transition to renewable energy. The Shire is one of three in Barwon South West which has declared a climate emergency, following advocacy and activism on this issue from local residents.

City of Greater Geelong Council has installed two rooftop PV systems and planned a further 21 systems to be installed by the end of 2019. It continues to embed One Planet Living principles across the organisation and is one of the 48 local governments planning to join the PPA initiated and facilitated by the Victorian Greenhouse Alliances.

Geelong is a designated UNESCO City of Design and its Cleantech Innovations Geelong is a business and industry support program with a vision to establish Geelong as a Centre of Excellence for cleantech in Australia.

Borough of Queenscliffe Council has undertaken two rounds of energy bulk buy programs for residents (noting that 54 percent of houses are not permanently occupied). It is now looking to partner with Deakin University, electricity distributor Powercor and the local community to achieve its aspiration of being 100 percent renewable.

⁵ ABS2016a

⁶ Capacity figures for both large-scale and rooftop solar include an 80% efficiency factor for conversion from Direct Current to Alternating Current. Sources: Australian PV Institute, 2019, Mapping Australian Photovoltaic Installations (PV Postcode Data & Large-Scale PV Systems). Retrieved from pv-map.apvi.org.au (Accessed 18 October 2019) and Department of Environment, Land, Water & Planning (DELWP), 2019, Wind farm and Solar Farm general locations (shapefiles).

⁷ Potential capacity is based on postcode figures developed by the Australian PV Institute (accessed Oct 2019, pvmap.apvi.org.au) and recalculated to apply best fit to the region. It is not an estimate of currently approved projects/installations.



THE FACES OF OUR COMMUNITY

A wide range of community views were shared during this consultation and engagement process. The particular perspectives of four key community segments are captured here.

LIVING OFF THE LAND – FARMERS' PERSPECTIVE

Farmers interviewed were supportive of transitioning to renewable energy, but saw some practical difficulties in achieving it. They recognised the benefits to the environment, and expected a greater proportion of renewable energy supply to reduce energy costs. Many expressed an "ownership" sentiment, acknowledging it was up to everyone to do their bit to help deliver a cleaner energy future.

Some challenges raised included land use conflicts, a lack of coherent

government support to help with the technology transition, noting that the biggest constraint to investing in renewable energy generation is cost. Supply reliability was a concern, given that farmers' livelihoods depended on it. Some farmers were considering going back to using diesel because of the current cost of power. Farmers noted there are government subsidies for the coal industry but no specific support for farmers to transition to a renewable energy future.

YOUNG PEOPLE SAY WE MUST ADDRESS CLIMATE CHANGE

Over 150 locals aged between 11 and 18 had their say and indicated they are concerned about climate change and its impact on their future. They have a good understanding of how energy is currently produced, and they want that to change, to have less impact on the environment. They identified the main constraints to achieving this change as cost and the complexity of needing to change the whole energy system.

Alex Marshall from Surf Coast Shire is passionate about working for a sustainable future. "We cannot sit

around and hope others will fight for a better future for ourselves and others. We must be proactive, educate ourselves and take action" she says.

The biggest priority for youth was reducing pollution. They felt it was also important that energy supply is reliable and the community has more say in how energy is supplied. They listed solar and wind energy as they two most popular forms of renewable energy for the future and were enthusiastic about finding new ways to produce and store energy.





MOBILISING GLOBAL CONCERNS INTO LOCAL ACTION

Judith Brooks is a member of the Barwon Heads Association and a strong believer in the power of thinking globally and acting locally.

Judith sees a lot happening across Barwon South West, and she believes there is opportunity for better, regional co-ordination. "There are a lot more people worried about climate change, and discussing it, than the authorities realise. The support for renewable energy is based on its promise to give households a cleaner and cheaper energy source which will stop the rise in temperatures associated with global warming. There is real support for renewables but the community is beginning to understand that their effectiveness is limited by a power

grid in Victoria that will not meet our future needs. We must find ways to overcome current technical limitations and we should be focussing on battery storage and localised distribution of rooftop solar generation," says Judith.

Communities sharing information and knowledge will be key and community groups like the Barwon Heads Association are well placed to lead and influence the conversation. Judith says, "I see multiple benefits for our community. The potential for renewables to invigorate small businesses by reducing the cost of power bills is significant. Renewable energy generation development is essential and it needs to be appropriately resourced."

TRADITIONAL OWNER PERSPECTIVES ON RENEWABLE ENERGY DEVELOPMENT

Traditional owners have a continuing connection to country and waters that are being identified and developed for renewable energy. Damein Bell, CEO Gunditj Mirring Traditional Owners Aboriginal Corporation, says, "Traditional owners and their cultural heritage are bound to the land in both physical and other intangible ways. There needs to be an opportunity and process for cultural heritage protection and management to be considered as part of the development of renewable energy and other industrial installations. Government planners and industry developers must have appropriate cultural awareness, including training, from the outset of their feasibility investigations, so that recognition of country is part of all stages of the development process."

Legislative and policy drivers upholding the connection to country and waters are bound in the *Aboriginal Heritage Act 2006*, the *Traditional Owners Settlement Act 2010*, the *Native Title Act 1993* and through the *Environment Protection and Biodiversity Conservation Act 1999* with national and world heritage listings. Damein says, "Traditional owners understand the need to transition to renewable energy generation sources. But the impact of the industrialisation of the renewable energy sector must be balanced with the maintenance and growth of healthy country for the community and the environment, including its ecologies of plants, animals and fish. Traditional owners require information and resources to best understand and contribute to the renewable energy industry across Barwon South West."

Melinda Kennedy, Manager Land Sea and Waters for Wathaurung Aboriginal Corporation, says Wadawurrung Traditional Owners are intrinsically linked to land, sea, sky, all waters and all living beings, and therefore hold high respect and responsibility to country. "Our country is being damaged long-term with over development. Cultural heritage lies all across our land and waterways, something which is not always recognised. We wish for engagement in all aspects of the process of planning, and any ongoing works with renewable development. Traditional owners must be present during these processes. Current planning processes do not include our stories and pathways and water and sky and our creatures and we wish to protect them and move towards better education in understanding this, to strengthen partnerships and work together for a healthy future."

COMMUNITY DRIVEN RENEWABLE ENERGY

Local community energy groups share a vision for the future in which everyone has access to affordable, reliable and 100 percent renewable energy.

Community energy projects can help people participate in the shift to renewable energy both at home and in their community, bringing a range of benefits for everyone. Community energy projects include bulk-buy schemes which can help households buy quality systems from trusted installers at lower prices. Community donation and investment projects can help local schools, organisations and businesses install rooftop solar systems. Larger community owned renewable energy projects can help towns and regions produce more of the energy they consume.

Barwon Region Alliance for Community Energy (BRACE) is a network of community energy groups whose purpose is to facilitate cooperation and collaboration among its members to support a wide range of local community energy initiatives. Current members include: 100% Clean Bellarine, Anglesea Community Energy, Barwon Sustainable Energy Alliance, Birregurra Community Group, Colac Otway Sustainability Group, Geelong Sustainability, Southern Otways Sustainable and Surf Coast Energy Group.

BRACE members are passionate about driving the transition to a renewable energy future and has delivered a number of initiatives already. These include solar PV and battery bulk-buy schemes and the installation of rooftop solar power systems on school and community buildings. South West Community Energy Incorporated's renewable

energy education caravan is active in Warrnambool and Port Fairy, and is now working with the regional community there. Future ambitions include supporting a campaign to establish a network of Community Power Hubs across Victoria, energy efficiency audit and upgrade services for low income households, solar gardens for renters, a peer-to-peer energy trading platform, and micro-grids for remote communities with unreliable supply.

BRACE has identified a number of challenges and constraints to achieving this future, including the need to raise public understanding and acceptance of renewable energy technologies and developments, improving rooftop solar PV installation standards, and ensuring that the energy transition is just and fair.



CASE STUDY

ANDY'S SUSTAINABLE ENERGY FOCUS IS BLOOMING

When Andy Doeven was retrenched from his corporate job, he and his wife Debbie decided to buy a 20 acre block of blackberry infested land with a view to developing an energy self-sufficient flower growing operation.

With no background in electricity generation, farming (or flowers!), Andy set to work. Self-taught, and with plenty of initiative and ingenuity, Andy and Debbie's property now runs on a mix of energy sources, including solar and wind, and battery storage. Andy also has a petrol generator, which is for backup use only.

Andy's place has all the normal, modern conveniences, including TV and internet and he's installed a roof sprinkling system on the house and shed fed by two small dams on the property. He collects water for domestic use from his roof and pumps it into a header tank using an electric pump on sunny days.

Andy estimates he has spent a few thousand dollars over the past 25 years on set up and maintenance of his property's energy generation and storage solutions. Andy says, "This type of set up is well within everyone's reach. I don't see any constraints, and I don't understand why more people aren't pursuing small-scale energy generation and behind-the-meter opportunities. There are systems available now, second hand, and they're very affordable."

Energy storage, via batteries, is key to Andy's success. "Even on cloudy days we have electricity because of the behind-the-meter storage system."



UNIQUELY POSITIONED FOR A RENEWABLE ENERGY FUTURE

A combination of natural and built assets and infrastructure, an engaged and active community, a skilled workforce, a first class university and two TAFE institutions each with multiple campuses, and a culture which is open to change sees Barwon South West as uniquely capable of delivering and capitalising on the renewable energy transition.

This section focuses on the infrastructure and manufacturing advantages of the region (the community culture and renewable resources are described in other sections of this Roadmap) and gives some case study examples of how this region is open and committed to making the most of its combination of assets and experience.

REGIONAL TRANSMISSION INFRASTRUCTURE

Large-scale generation development needs transmission capacity so the energy produced can be transported to consumers. The more generators connect in a particular area, the more transmission network capacity is needed.

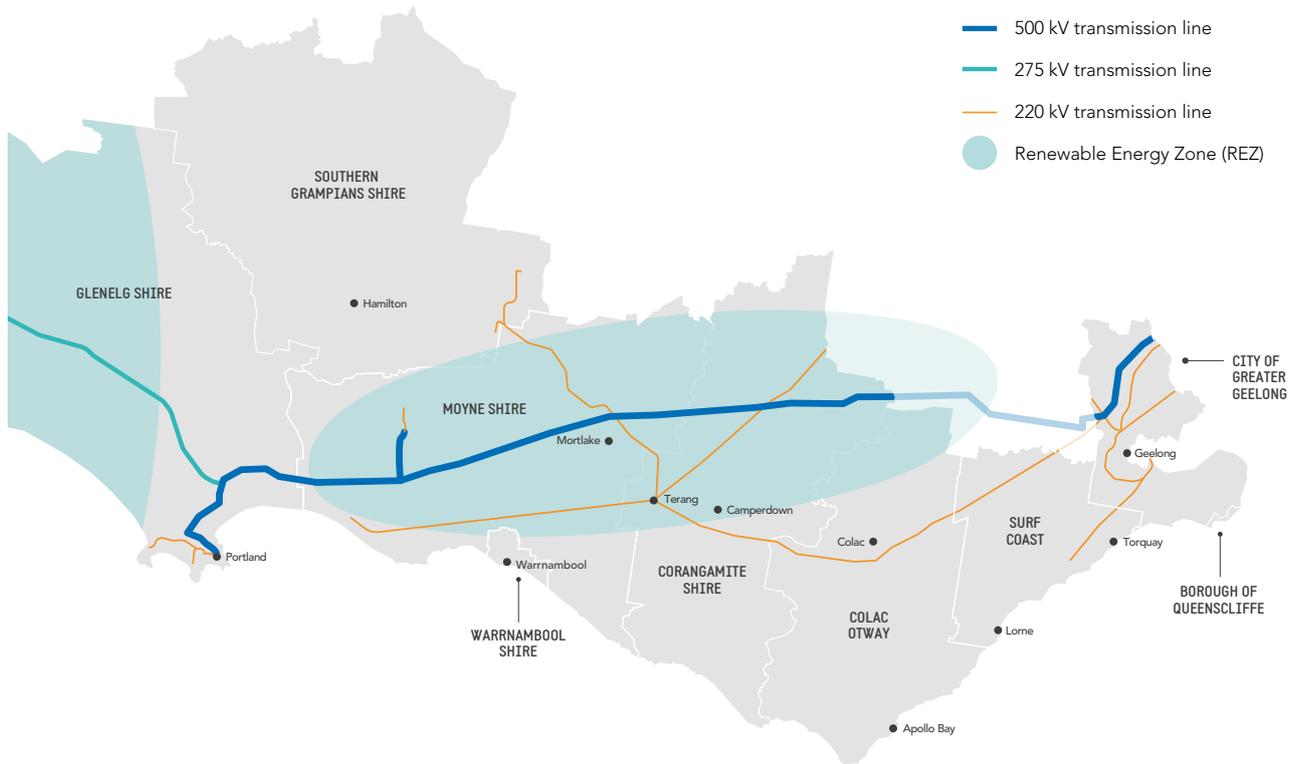
Barwon South West has the benefit of a strategic high voltage, 500 kV transmission line. It links the Latrobe Valley generators and the Geelong-Melbourne metropolitan area in the east (the state's major electricity demand hub), the Portland Aluminium Smelter to the west (the largest individual consumer of electricity in Victoria), and, further west, South Australia via the Heywood interconnector. This interconnector is a vital link for two-way trade of substantial amounts of electricity between South Australia and Victoria.

While this transmission infrastructure was built originally for large transfers of electricity from east to west, it now increasingly looks set to provide the means to transport electricity in the opposite direction.

Connecting to a 500 kV line is attractive for renewable generation developers, as their risks of not being able to maximise their plant's capacity are lower than if they connected in more remote areas without access to a major transmission line like this.



Transmission infrastructure and Renewable Energy Zones (REZs) of Barwon South West



That's why the Australian Energy Market Operator (AEMO) identified the region surrounding this transmission line as one of the optimal zones for development of Renewable Energy Zones (REZs) in the National Electricity Market (NEM)⁸. According to AEMO's 2018 ISP, the existing transmission infrastructure could accommodate around 2,000 MW of new generation capacity (some of which is already being built).

This transmission will allow the Barwon South West area to exploit its renewable energy resources to serve not just local needs for electricity, but also major demand centres in Geelong and Melbourne as well as greater Victoria, and via interconnection to support other states in the NEM.

MANUFACTURING RENEWABLE ENERGY

Manufacturing has been an important part of Barwon South West, and particularly the towns of Geelong and Portland. Both have built up expertise and skills in value-adding to raw materials from our mining sector and fabricating and assembling a range of metal products for the automotive sector, defence, construction and homes. As a result it has an extensive supply chain through well established businesses, including transport and logistics.

Over the past two decades, our region has seen renewable energy booming globally and seized the chance to build on its existing manufacturing capabilities to increase employment in this growing industry.

In this time, Barwon South West manufacturers have demonstrated significant capability, manufacturing a range of important renewable energy components.

But these communities know that manufacturing is an extremely competitive sector. Without continual investment to advance technological capabilities and maintain economies of scale, factories ultimately get overtaken by international competitors that do make these investments.

Looking forward, manufacturers seek policy certainty to invest with confidence in the long-term outlook. Investment in new equipment, technologies and skills is vital for manufacturers to achieve the kind of scale and technological advancement that is critical to global competitiveness.

⁸ Page 48 of AEMO's 2018 Integrated System Plan. The NEM covers New South Wales and the ACT, Queensland, South Australia, Tasmania and Victoria.



— CASE STUDY

REVIVING THE OLD GEELONG FORD FACTORY TO ASSEMBLE WIND TURBINES

When the Berrybank and Dundonnell wind farms were selected as two of the winning bids under the Victorian Government's renewable energy contracting tender, the turbine supplier to the projects – Vestas – agreed to establish a manufacturing operation in Victoria.

In partnership with Geelong-based Marand Precision Engineering, Vestas established a turbine assembly and testing centre and selected the former Ford motor engine factory as a suitable site.

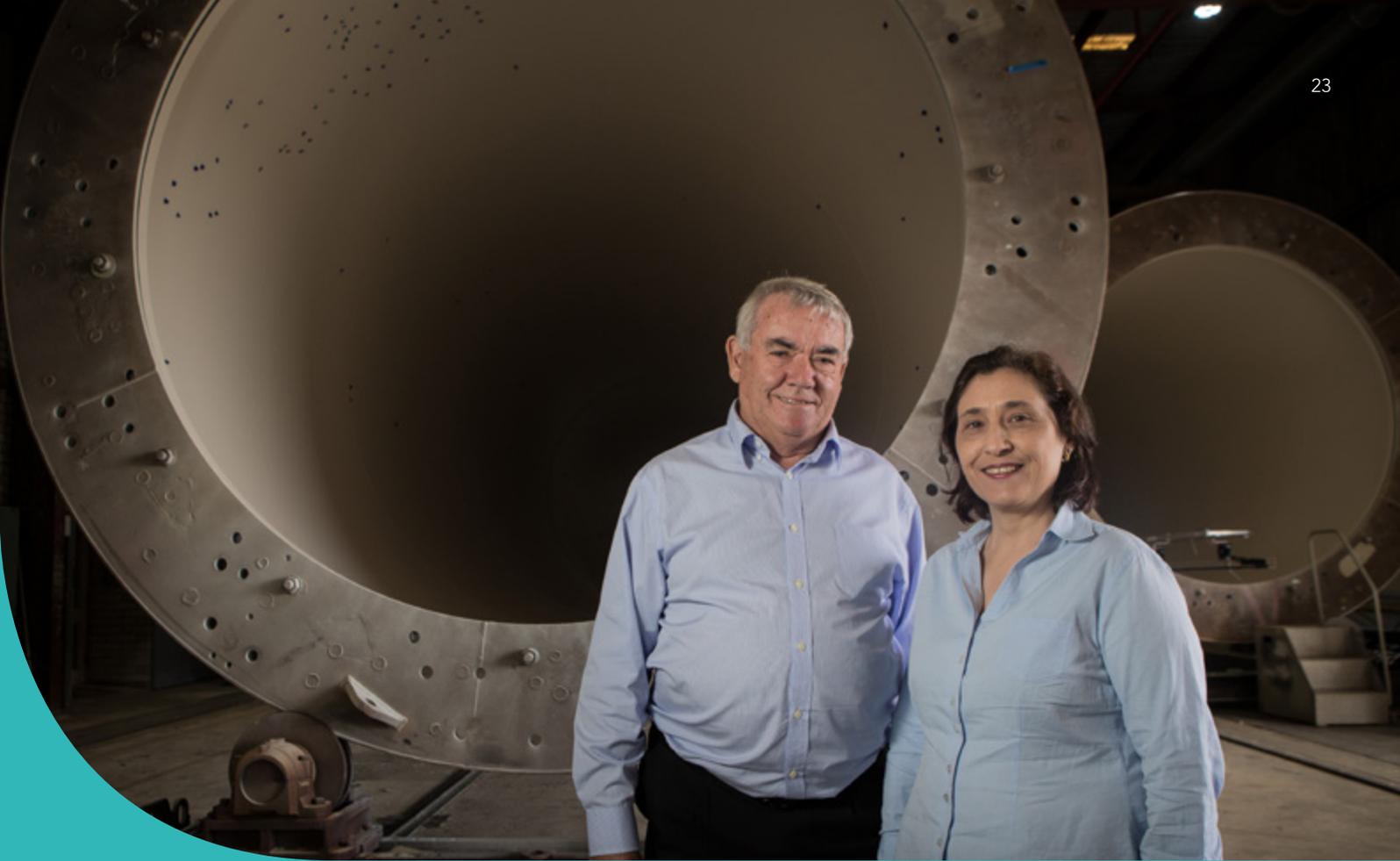
Vestas Asia Pacific President, Clive Turton, observed that, "In Marand we are partnering with an experienced manufacturing service provider with outstanding capabilities and skilled personnel. Their experience in automotive, aerospace, defence and rail industries meets all of our requirements around quality and technical expertise."

The revived plant will be used to assemble drivetrains and hubs – as well as test other wind turbine components that will ultimately be used for the Dundonnell and Berrybank Wind Farms. The centre will also form a logistics hub for equipment and servicing needs of wind farms.

The establishment of the Vestas centre is expected to deliver investment of around \$3.5 million and directly employ more than 20 people. It will also form a training centre that will aim to skill-up hundreds of Victorians in wind turbine maintenance.

Vestas will also partner with Deakin University's Carbon Nexus research centre which specialises in investigating ways to improve the use and reduce the cost of super strong and extremely light carbon fibre. This research collaboration will examine ways to make wind turbine blades longer, stronger, while keeping weight down and make them more effective in harnessing the energy within the wind.

◀ *The Hon Daniel Andrews MP, Premier of Victoria at the opening of the Vestas centre in Geelong.
Photo: Vestas*



CASE STUDY

WIND TURBINE TOWER MANUFACTURING IN PORTLAND

Over a decade and a half ago, Australia produced almost all the towers used for wind turbines in this country across several manufacturers. Keppel Prince, based in Portland in Barwon South West, has ridden the roller coaster of Australia's changing climate change and energy policies and is now the only manufacturer remaining.

Keppel Prince General Manager, Steve Garner, oversees a plant that began manufacturing wind turbine towers in 2000, when Victoria's first private sector commercial wind farm was established at Codrington.

Right now the business is strong. With a total of 360 staff, it is the second largest private sector employer in Portland, not far behind the aluminium smelter. Keppel Prince's tower manufacturing operation doubled its workforce in 2018, thanks to a surge in construction of new wind farms across Victoria.

According to Steve, a pivotal element that provided the confidence to expand employment has been the Victorian Government's target to expand renewable energy to 50 percent by 2030, and the fact they've backed this with a process for awarding contracts to new wind power projects that requires minimum levels of local content.

Steve says the wind industry is always advancing, with towers growing in size to exploit the use of longer turbine blades which can extract greater amounts of energy from lower wind speeds. This creates opportunities, but also challenges, because the larger base required for these taller towers necessitates investment in larger manufacturing facilities – investments that only make sense with confidence orders will continue over the longer term.

▲ *Steve Garner, General Manager of Keppel Prince, a wind turbine manufacturer in Portland Victoria with the Minister for Energy, Environment and Climate Change the Hon Lily D'Ambrosio, MP.
Photo: The Warrnambool Standard*



RENEWABLE ENERGY GENERATION IN BARWON SOUTH WEST

As was reflected in the community's feedback, the key sources of renewable energy generation in Barwon South West are wind and solar. Biomass is an emerging technology which is increasingly being harnessed in our region.

Barwon South West communities have an appetite for innovation and are keen to learn about, and if possible use new renewable energy generation sources, which may still be in their infancy. Over the years geothermal generation has been experimented with in Barwon South West, and with a world famous coastline, great knowledge and experience has been gained via various trials to harness the ocean's energy. The most successful renewable energy generation technologies used now, and likely in the future in Barwon South West, are wind, solar and, increasingly, biomass and these are the focus of this section of the Roadmap.



The Barwon South West region possesses some of the highest quality wind resources that are close to robust transmission infrastructure.

It is why it was a pioneering region in the development of wind power in the country. Codrington Wind Farm, located west of Port Fairy, was the first modern wind farm developed and built by the private sector in 2001. Codrington and the other “Portland Four” wind farms – Yambuk, Cape Bridgewater and Cape Nelson (south and north) and Cape Sir William Grant – were also built in this period, and all are still operating today.

Across the mid-to-late 2000s, the trend of large-scale wind farm development continued. A slew of permit applications was made, including Macarthur, Oaklands Hill (Glenthompson), Mt Gellibrand, Moreton’s Lane, Salt Creek, Woolsthorpe, Ryan Corner, Hawkesdale, Mortlake South and Berrybank. Of these, Macarthur, Oaklands Hill, Mt Gellibrand, Morton’s Lane and Salt Creek are all operational.

In the Grampians region to the north, the Waubra and Chalicum Hills wind farms were also approved and constructed during this time. The Waubra Wind Farm became the focus of concern about noise and health impacts.

As a result of early concerns a broad policy change was introduced, restricting wind farms from being built within two kilometres of a dwelling, and excluding development altogether in areas of Victoria considered to be a ‘protected landscape’, such as the Macedon Ranges.

Although the early 2010s saw a slowing of investment in wind in the region, Macarthur Wind Farm, connected in 2012, has stood for several years as Australia’s largest wind farm by a substantial margin (it has 420 MW of capacity with the next largest project being 270 MW).

After 2014, and in the context of a new state government policy supportive of renewable energy, a number of new permit applications came forward including Golden Plains and Dundonnell wind farms. A number of previously approved applications also moved to construction stage.

In 2017, the State Government introduced its Victorian Renewable Energy Target (VRET) legislation, and also set a target for greenhouse gas emission reduction across the state. The region currently has wind farms in operation with a total of 698 MW of capacity. These projects produce almost 1.9 million MWh per annum. This is equal to the average electricity consumption of 484,000 Victorian households – more than double the total number of households in the entire Barwon South West region.

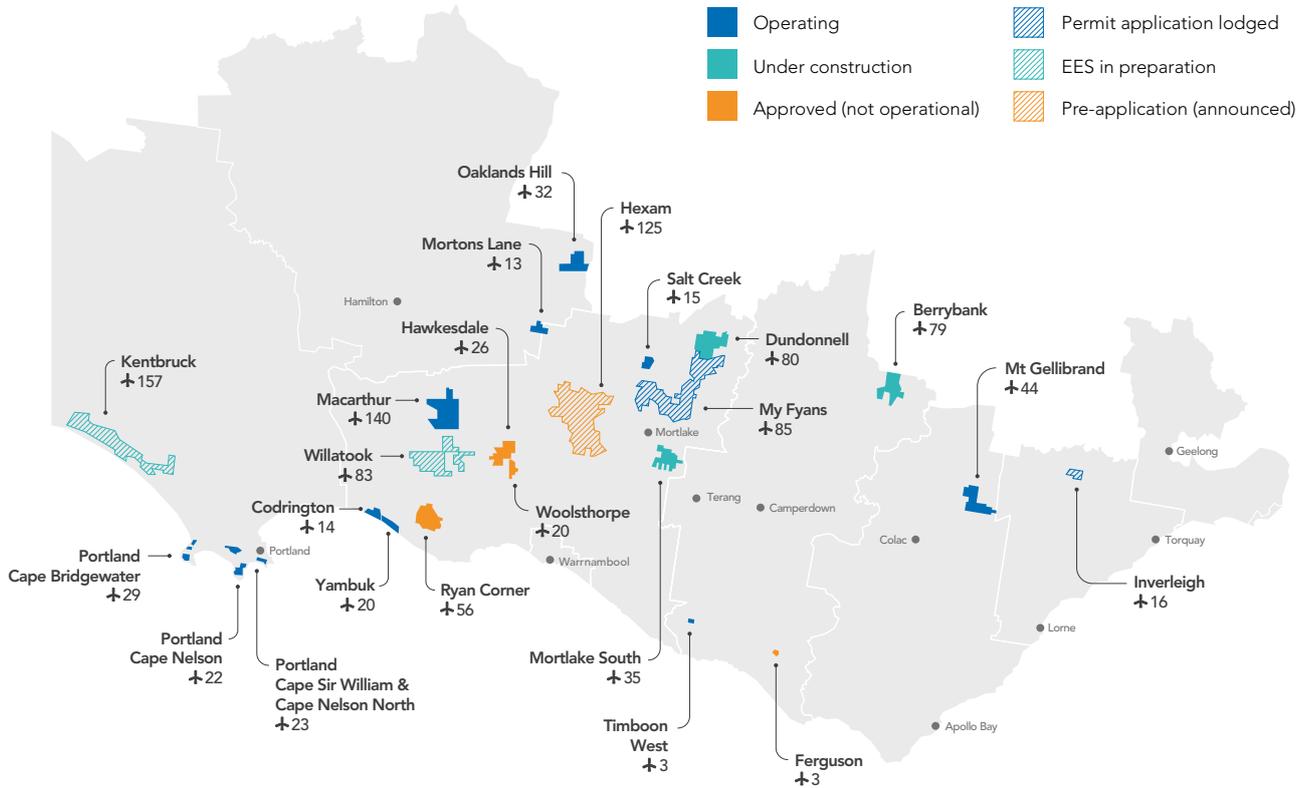
In addition, the region has another five wind power projects currently under construction, equal to 806 MW of capacity, and a further two projects of 79 MW which have been contracted but are not yet committed to construction. These projects are anticipated to produce close to another three million MWh of electricity per year – equal to 780,000 Victorian households’ electricity consumption. This exceeds the combined number of households across every region of Victoria outside of metropolitan Melbourne.

Projects that have been contracted or have entered construction since 2016 are providing substantial employment in Barwon South West and across the rest of the country. Once construction of all these projects are complete they are estimated to have provided around 2,000 job years of employment.⁹

The combination of our region’s currently operating wind farms and those in construction and contracted will produce around a quarter of Victoria’s entire supplies of renewable energy.

⁹ ROAM Consulting/Ernst & Young research undertaken for the Clean Energy Council which estimated 0.1 FTEs per megawatt installed. ROAM Consulting (2014) Report of the Clean Energy Council – RET Policy Analysis

Wind farm development across Barwon South West



THE OUTLOOK FOR WIND

In addition to the 698 MW of capacity currently operating, the region has an additional 885 MW under construction or contracted, with a further 3,644 MW of wind farm sites identified for development. On top of the 1,583 MW of wind power projects that are operating, under construction or contracted in Barwon South West, another 3,644 MW of wind farm sites have been identified for development.

If all of these projects were able to obtain sufficient transmission capacity and proceeded to construction, they could be expected to produce around 11.2 million MWh of electricity a year.

This is equal to the consumption of almost 2.9 million Victorian households, and 24 percent of Victoria’s overall annual electricity consumption.

Substantial employment would be created through construction of these projects, equivalent to around 4,700 full time jobs over a two year construction period. Ongoing employment in the operation and maintenance of the wind turbines would provide full time work for 360 people over the 25 year life of these projects.

Whether these projects ultimately proceed to construction will be determined by a complex array of factors. The region’s current transmission infrastructure is insufficient to support all of the

projects proposed, and upgrades would be required. Other important factors influencing whether projects proceed include whether there is sufficient local community support, when existing fossil fuel capacity retires, and the potential addition of energy storage such as pumped hydro and batteries to the wider grid.

Even if only half of the proposed capacity proceeds, it would represent a substantial source of new power supply and employment for Victoria and Barwon South West. It would also lead to a dramatic reduction in Victoria’s greenhouse gas emissions, which is vital given Victoria has one of the most emission intensive power supplies in the developed world.¹⁰

¹⁰From the OECD’s website, at www.compareyourcountry.org/climate-policies

SHARING THE BENEFITS OF WIND FARM DEVELOPMENT

The reality is that wind farms are very large and often very prominent structures in rural landscapes such as Barwon South West. While the land holders who host the wind farms do so voluntarily and are compensated for the turbines placed on their land, the turbines can also represent a visible change on the landscape for the remainder of the community. While Barwon South West has the potential to play a vital role in modernising and decarbonising Australia's electricity supplies, it is critical the residents surrounding these wind farms see benefits flowing into their own communities.

Often other members of the community benefit from the fact that wind farms create a significant economic stimulus during the construction period. To maximise the benefits to local communities it is critical that developers put in place processes to deliberately seek out local contractors and labour to undertake construction, which thankfully many already do.

There are opportunities to build community support in other ways, such as ensuring local service businesses (such as food and accommodation providers) capture extra earnings housing and feeding wind farm construction workers, or by assisting community service organisations. Developers can identify these opportunities by listening to local people.

Yet benefits for other members of the community can and need to extend beyond the typical 12 to 24 month construction period for a wind farm.

Since 2000 the Victorian Government has required all electricity generators, including wind farms, to pay an annual fee to the relevant council. The Payment in Lieu of Rates (PiLoR) scheme sets a minimum flagfall fee of \$40,000 per annum plus \$900 per megawatt of capacity, adjusted for inflation. Actual payments under PiLoR are negotiated between the council and generator based on the suggested schedule. For example, Moyne Council will receive slightly more than \$1.6 million per annum of payments from Dundonnell, Mortlake South, Macarthur, Codrington, Yambuk, Salt Creek and Morton's Lane wind farms.

It is now common practice for wind farm owners to also establish community benefits sharing programs that provide a pool of funding to support activities, services and facilities valued by the community near the wind farm. For example, the Mortlake South Wind Farm's Neighbourhood Benefit Program includes a proximity payment of up to \$180,000 per annum to be shared by people who live (own or rent) within a certain distance of a wind turbine generator via a pre-loaded EFTPOS card. This card can be used to purchase goods and services at participating businesses in Mortlake, Noorat or Terang. Dundonnell Wind Farm's Community mini-grid project will subsidise the installation of solar and battery storage systems for dwellings in proximity to the project.

It will also offer competitively priced electricity contracts to regional Victorian businesses and primary producers to reduce their energy costs and help these businesses to continue to operate sustainably. Such programs tend to be most successful when their funding is directed by the broader community, rather than the owner of the wind farm. Wind farms in the south west that have established community benefit sharing funds include:

- **Berrybank**
\$1.5m to support an initial 15 projects to 2021 and \$48,000 per annum on an ongoing basis.
- **Dundonnell**
\$50,000 per annum for a crisis accommodation program and mini-grid project.
- **Mortlake South**
\$120,000 for sponsorship program commencing nine years prior to construction, Neighbourhood Benefits Card and \$20,000 per annum on an ongoing basis.
- **Macarthur**
\$64,000 per annum.
- **Morton's Lane**
\$10,000 per annum.
- **Salt Creek**
\$40,000 per annum.
- **Pacific Hydro's South West Projects**
\$1.2m allocated since 2005.
- **Oaklands Hil**
\$53,000 per annum.
- **Mt Gellibrand**
\$80,000 per annum.

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CASE STUDY

PACIFIC HYDRO SUPPORTING LOCAL COMMUNITIES FOR THE LONG HAUL

▼ *Friends of St Brigid's Association*

Pacific Hydro was one of the original pioneers of wind farm development in the south west, constructing the Codrington Wind Farm in 2001. This was followed by Yambuk in 2005 and ultimately the four stages of the Portland Wind Farm.

Pacific Hydro's Great South West Sustainable Communities Fund gives a portion of the revenue from local wind farms back to the community each year, for the life of the wind farms. Eligible community groups and not-for-profit organisations can apply for project funding of up to \$10,000 annually from a pool of \$183,000. Since 2005, the Fund has provided \$1.8 million to more than 380 local sustainable projects in the region.

One of these projects is the refit of the previously disused St Brigid's Church into a performing arts venue, a men's shed and a place for locals to gather, share, learn and interact with each other.

Friends of St Brigid's Association's Teresa O'Brien says, "Pacific Hydro understands what it means to work alongside the community, support our dreams and ideas and engage in a meaningful way for the long-term. With their help, St Brigid's is now a vibrant local heartbeat in our area – a place where we can meet to celebrate and share our local strengths, including music, art and dance."

This year, the Fund also supported the installation of solar panels at St Brigid's, ensuring the building's sustainability now and for future generations.





CASE STUDY

HARVESTING THE WIND – A NEW CROP FOR WESTERN DISTRICTS FARMERS

Salt Creek Wind Farm

Peter Coy's family have grazed sheep for generations in the Victorian western districts, including at their Salt Creek property around 18 kilometres north of Mortlake. The property has a ridge running north south, 200-300 feet above the surrounding country, making it a perfect wind farm site.

Between June 2017 and July 2018 that stony ridge line was converted into a power station, with 15 wind turbines installed along it and with the merino sheep continuing to graze happily around the turbines. These turbines are expected to produce 172,000 MWh of electricity per annum – equivalent to the annual electricity consumption of 44,500 Victorian homes.

Harvesting the wind has provided a secure source of additional revenue for the Salt Creek farm that has drought proofed the property. At the same time the turbines take up minimal land and allowed sheep grazing to continue with little change.

Peter jokes that while the rain can vary a lot from year to year, not a month passes by when it's not windy at Salt Creek.

Unlike mining developments, farmers have full legal control over whether to allow renewable energy projects to proceed on their land.

According to the NSW Farmers Federation, the approximate annual lease payment for hosting wind turbines is around \$5,000 per megawatt of capacity. Although, this can vary depending on a number of factors associated with the desirability of the site for wind farm development, the levels of competition between developers for suitable sites and ultimately the financial attractiveness of pursuing renewable energy projects.

For a number of farmers around Australia these leasehold payments have been a vital shot in the arm, providing a secure source of revenue that is independent of the vagaries of the weather and agricultural commodity prices. The benefits of this extra revenue flow beyond the farms hosting the project. The lease payments often allow farmers to invest in upgrades and repairs to their farms that expand employment and also lead to increased expenditure in local shops and businesses.

▲ Peter Coy and his dog Claire at their Salt Creek property.
Photo: Emily Wilson



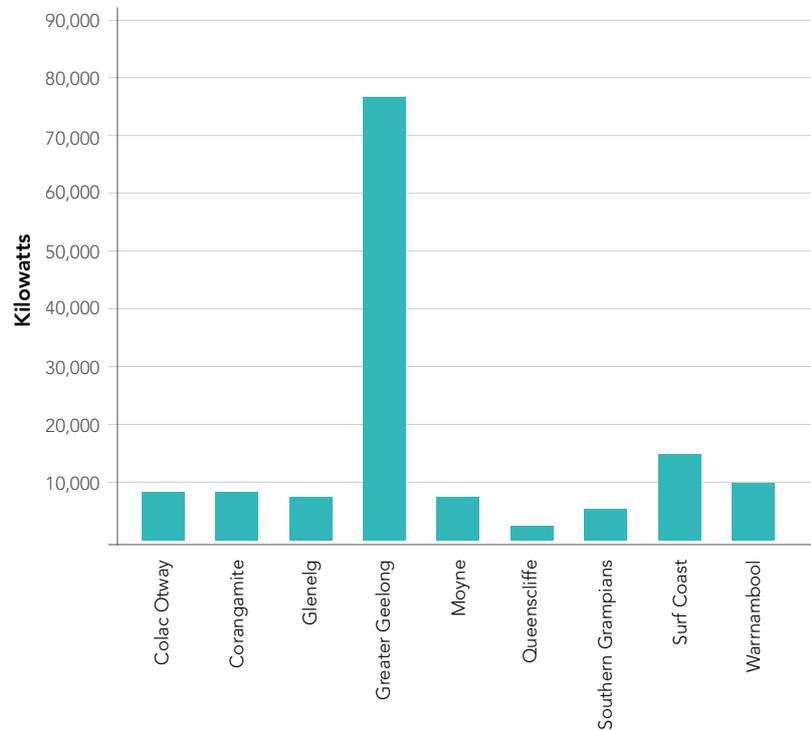
SOLAR

Solar has proven to be a highly popular option for residents in Barwon South West to manage their electricity costs and help reduce greenhouse gas emissions, despite our region having a lower level of solar resource compared with more northerly locales such as Mildura and the Wimmera. Many homes and small-to-medium sized business have installed panels on their rooftops to lower their energy bills. And there remains considerable potential for growth in the use of the technology.

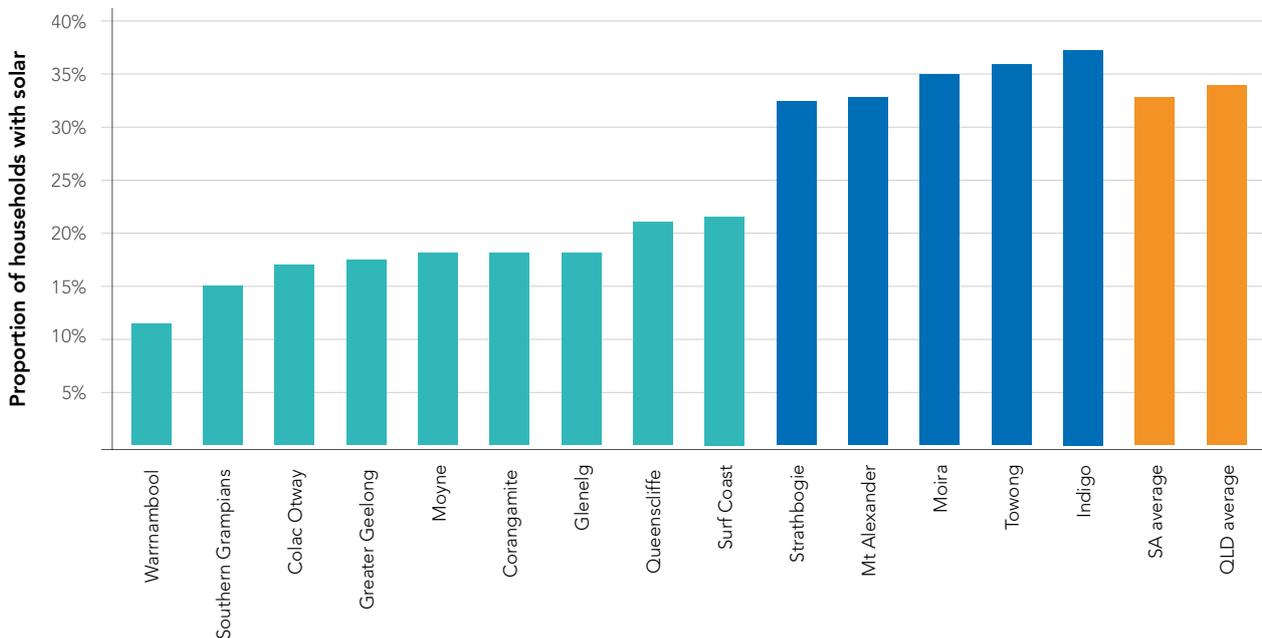
At present the region hosts close to 140,000 kW or 140 MW of capacity on rooftops – mainly households. Around 17.1 percent of households within Barwon South West have a solar system with this peaking at 21.4 percent in the Surf Coast Shire.

These systems would be expected to produce around 168,000 MWh of electricity per year, which is equal to the electricity consumption of 43,000 Victorian households, or enough to meet the needs of all households across Torquay, Warrnambool and Colac combined.

Solar capacity installed by shire



Proportion of households with solar – Barwon South West Council areas compared



With ongoing cost reductions likely, solar will become one of the cheapest options for new power supply and the appetite for the community to install solar will remain strong. Given these factors it is important that we use the best available information to maximise the use of solar while minimising additional expenditure on the network and maintaining its safety and reliability.

There is room for rooftop solar to meet a far greater proportion of the region's electricity needs. Aerial imagery analysis of roof space undertaken by the University of NSW and University of Technology Sydney indicates that there is enough suitable roof space in Barwon South West, including on large industrial estates in Geelong, Portland, Warrnambool, Colac and Hamilton, to accommodate 3,526 MW of solar power. This would produce 4.4 million MWh per annum – more power than the consumption of a million Victorian households.

Detailed studies on what could be accommodated by the electricity network with limited additional investment haven't been published, but distribution networks across many parts of Australia manage levels of solar PV penetration vastly greater than what currently exists in Barwon South West, indicating that the region has room to take even greater advantage of solar.

As an illustration of what's possible, the Victorian rural and regional shires of Indigo, Towong, Moira, Strathbogie and Mount Alexander all have rates of solar installation exceeding 30 percent of households. Yet even these kinds of rates of solar ownership are the norm in other parts of Australia. The chart above shows the proportion of dwellings with solar in each council area within the Barwon South West region in blue. These have plenty of room to grow before getting close to the levels achieved in the leading local government areas of Victoria (dark blue) or even just the average level achieved across the states of South Australia and Queensland (orange).

Victoria has the advantage that its smart meters provide some excellent data, which allows highly detailed analysis on whether further solar capacity can be absorbed. Potentially, anonymised smart meter data could be made available to researchers and other stakeholders that are independent of commercial interests, to evaluate emerging constraints and whether these relate to increased solar uptake or other factors. This might include Deakin University's micro-grid research hub and the newly established Centre for New Energy Technologies at Monash University. Such data could also reveal other insights about how we might better manage the electricity system to reduce costs, improve reliability and reduce carbon pollution, as well as improving transparency and increasing community trust about our power system.



CASE STUDY

SOLAR POWERED INDUSTRIAL ENERGY AT BARWON WATER

Barwon Water has recognised the challenges of climate change and with its Strategy 2030 targets of 100 percent renewable electricity and zero net emissions, is taking significant steps now to plan for a carbon constrained future.

Barwon Water's largest energy using site hosts the first megawatt-scale, ground-mounted solar array in southern Victoria. The Black Rock Water Reclamation Plant treats sewage from over 265,000 people and businesses, and now has around 35 percent of its annual electricity use supplied by renewable energy from the on-site Black Rock Solar Farm.

Barwon Water expanded Black Rock Solar Farm's initial 1 MW capacity (established January 2018) to 3 MW in 2019.

It now comprises around 8,100 solar panels, generating over 4,400 MWh of renewable energy and avoiding up to 4,500 tonnes of greenhouse emissions each year.

Barwon Water's other initiatives include a 300 kW solar array and 180 kVA/200 kWh battery installation at the Wurdee Boluc Water Treatment Plant, a 250 kW solar array at Torquay and an innovative waste energy biogrid (WEB) concept at Colac. Leveraging the collective buying power of Victorian water corporations, Barwon Water is a founding member of Zero Emissions Water, a consortium of 13 Victorian water corporations who have entered into a Power Purchase Agreement (PPA) sourcing around 78 GWh per annum from the Kiamal solar farm in north west Victoria.

▲ Barwon Water staff at the site of the Black Rock Solar Farm

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CASE STUDY

BARWON HEADS PRIMARY SCHOOL STUDENTS ENERGY INNOVATION

Inspired by the 2019 film 2040, which focuses on solutions to climate change, the students at Barwon Heads Primary School (BHPS) decided to take action. They were particularly moved by Bangladesh's solar power generation and electricity sharing as covered in the film, a poor country achieving so much, and it made them ask "what can we do?"

A group of BHPS students approached the local Bendigo Bank to see if they could take part in the Bank's "local legacy" program, supporting projects which leave a lasting, positive legacy for the Barwon Heads community.

The students joined forces with local clean energy group 100% Clean Bellarine, and industry partner Mondo, to develop a compelling case for why a solar system powering their school would be a positive move. They investigated solar panels as a generation source, learning more about how the panels work, including their potential and limitations.

The most compelling part of the students' vision was their intent to use energy generated to "connect the town" by powering other community buildings, with a longer-term view of sharing power amongst other residents with panels. The students envisioned using savings gathered from BHPS generating some of its own electricity to build an outdoor science classroom including an anaerobic digester to use up food waste from the school and community. This idea is an evolution of the school's existing "Waste Wednesday" program where anyone from the community can deliver food scraps to be used in the school's compost.

The Board of the Barwon Heads branch of the Bendigo Bank agreed to fund a 70 kW solar system for the school, comprising 226 panels and generating over 100,000 kWh annually. This system will supply the school with all its energy, leaving it free to re-allocate about \$23,000 worth of funds previously spent on electricity.

▼ *Barwon Heads Primary School
students at the school's garden*





BIOENERGY

Bioenergy is a widely used source of renewable energy globally and while still relatively niche in Victoria, Barwon South West is well positioned to take advantage of this technology's emergence. Bioenergy involves creating energy from biomass, often in the form of waste products – like straw, timber residues, agricultural residues, paper sludge and hulls and shells left over from processing food such as almonds and oats. The extremely varied nature of biomass, and the many routes possible for converting the biomass resource to energy, makes this area of renewable energy a complex one. Biomass can be transformed into both heat and electricity simultaneously, into transport fuels and at a smaller, domestic scale, biomass also has good potential as a fuel for micro-turbines and fuel cells.

The upcoming Circular Economy Policy expected from Victoria's Department of Environment, Land, Water and Planning (DELWP) will

consider the potential of biomass for greenhouse gas mitigation, the diverse range of sources and the coordination and planning required to process and deliver those resources to the energy conversion plant.

Within Barwon South West there are existing bioenergy operations at Colac and Warrnambool.

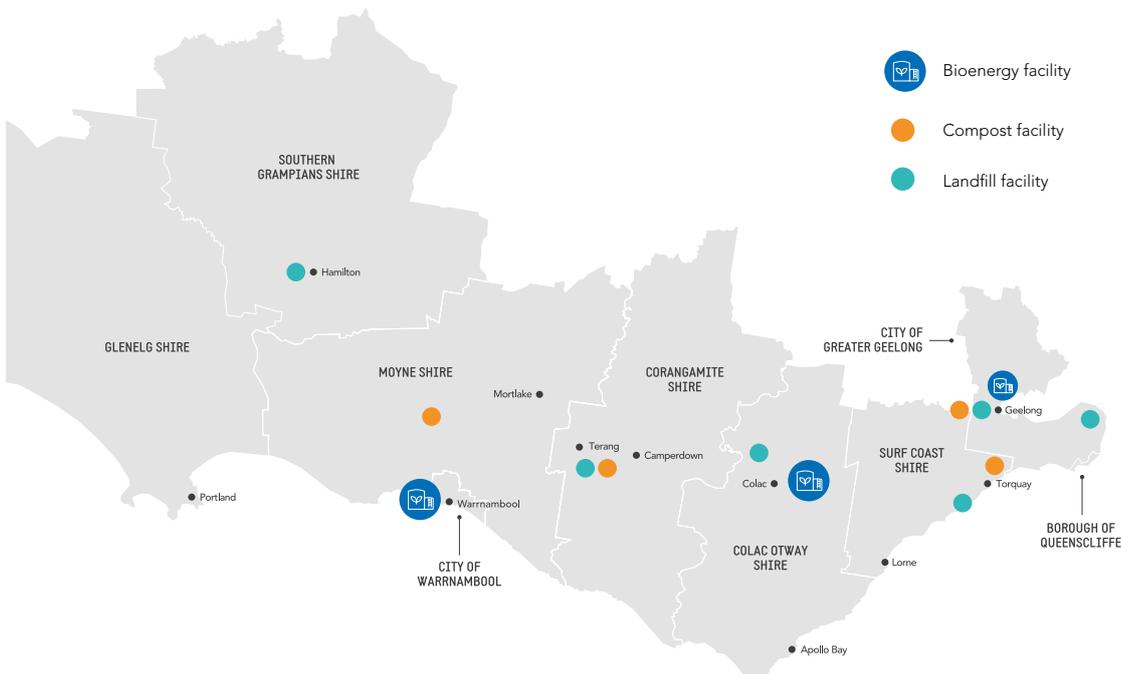
There is further opportunity to deploy bioenergy solutions further, throughout the region. The benefits of bioenergy are in its diverse application, use of waste resources, distribution of supply and diversifying a business' operations, increasing its resilience to economic pressures and circumstantial changes. Bioenergy can also reduce demand on the gas grid and ultimately could become a part of the strategy to decarbonise the gas network.

In and around Barwon South West there are plenty of raw materials such as plantation residues, and while straw has a number of other practical

applications, much of it is burned in the paddocks and could be redirected to bioenergy facilities.

There are currently few uses for animal effluent in the region of which an estimated 165,000 tonnes are generated from dairy cows, cattle and pigs (2015/16 estimates). Food waste resources which cannot be used for human or animal consumption are another possible source of energy using biomass technology. Bioenergy generation can complement wind and solar generation, providing continuous supply where the others are intermittent and supporting commercial and industrial hubs within proximity to biomass resources. This is significant, because the cost to transport waste to the energy conversion facility plays a part in the economic viability of any proposed project. Importantly, bioenergy can contribute to decarbonising other sectors of the economy such as the gas grid, transport and agriculture.

Barwon South West organics infrastructure (less wastewater treatment facilities)



Biomass residue estimates

GLENELG SHIRE

 **Plantation residues**
≈ 350,000 t

 **Sawmill residues**
≈ 165,000 t

 **Straw/chaff**
≈ 75,000 t

COLAC OTWAY SHIRE

 **Straw/chaff**
≈ 22,000 t

 **Dairy manure/effluent**
≈ 22,000 t

 **Plantation residues**
≈ 17,500 t

SOUTHERN GRAMPIANS SHIRE

 **Plantation residues**
≈ 17,000 t

 **Straw/chaff**
≈ 5,000 t

 **C&I paper and cardboard**
≈ 2,000 t

SURF COAST SHIRE

 **Straw/chaff**
≈ 41,000 t

 **Plantation residues**
≈ 7,200 t

 **C&I other organics**
≈ 6,300 t

MOYNE SHIRE

 **Plantation residues**
≈ 42,000 t

 **Dairy manure/effluent**
≈ 165,000 t

 **Straw/chaff**
≈ 8,000 t

CITY OF GREATER GEELONG

 **C&I other organics**
≈ 30,000 t

 **Straw/chaff**
≈ 23,000 t

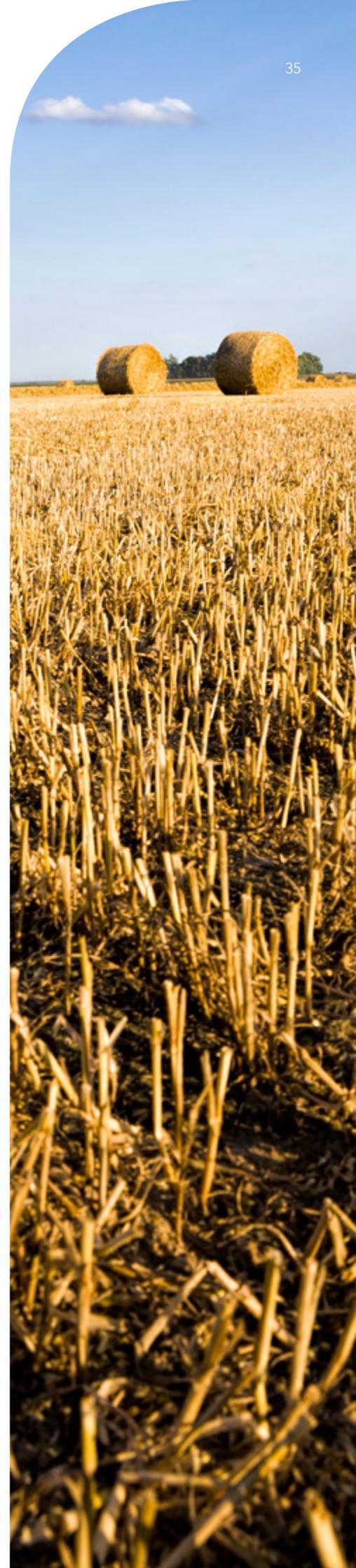
 **Poultry litter**
≈ 12,000 t

CORANGAMITE SHIRE

 **Straw/chaff**
≈ 230,000 t

 **Dairy manure/effluent**
≈ 95,000 t

 **Plantation residues**
≈ 18,000 t



REGIONAL COLLABORATION FOR A RENEWABLE ENERGY FUTURE

Achieving these community goals and priorities will require communication, collaboration and trust between the key parties. It will also require a clear, shared purpose and a willingness to embrace the change required for planned innovation and development.

There are a number of examples already in the renewable energy space within Barwon South West which are further evidence that our region is prepared to find tangible ways to work together to meet today's challenges, and those in the future. For example, the Port Fairy Smart Energy Precinct is an innovative partnership between government, business and community and is fostering collaboration on the most ambitious micro-grid in Victoria, with significant regional benefits. Wannon Water's Portland Wind Turbine is the first wind turbine constructed for an Australian water utility, and has made Portland the first city in Australia to reach net-zero emissions for its water and wastewater network. Some other examples are covered in the following case studies.



CASE STUDY

COLAC WEB – WASTE TO REGIONAL ECONOMIC SECURITY AND PROSPERITY

The Colac Waste to Energy Biogrid (WEB) is a multi-phased project which sees a unique partnership between local utility Barwon Water, and key industrial customers Australian Lamb Company (ALC) and Bulla Dairy Foods, to convert industrial waste into renewable energy. The project is an Australian first, and the energy created will be shared between the businesses involved, via heat and the transfer of hot water. The Colac WEB will reduce the businesses' collective reliance on grid electricity and natural gas, significantly reducing their carbon footprint. While this is an outstanding achievement in itself, the technical innovation, collaboration skills and co-operation between a local utility and industries, for a shared, positive outcome demonstrates a "can-do" attitude and tangible willingness to work together for a greater good.

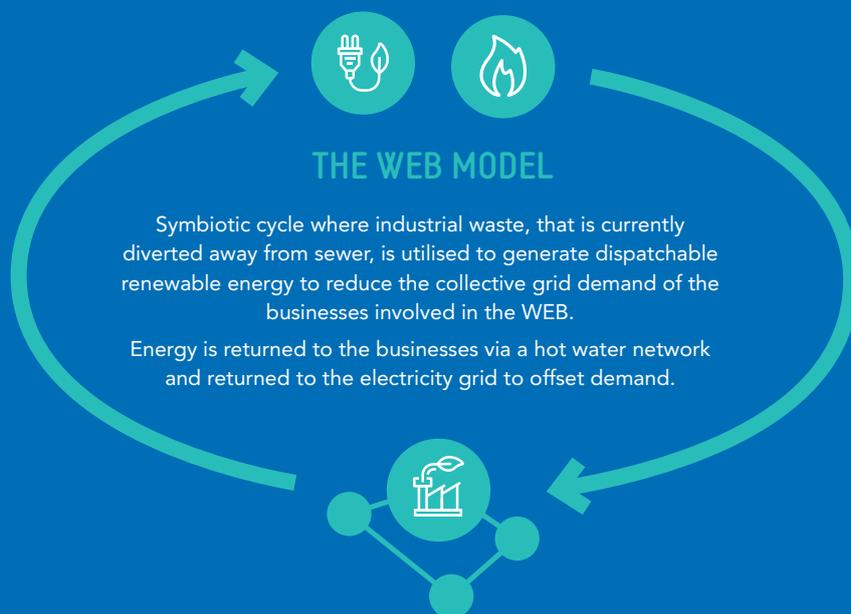
Financial benefits from the WEB will be shared between Barwon Water (and passed on to its 320,000 customers) and the project partners, ALC and Bulla Dairy Foods. The 8,000 tonnes of CO2 emissions avoided by the project will contribute to Barwon Water's zero net emissions target, while ALC and Bulla Dairy Foods will be able to offer future security to their 1,100 employees.

The WEB has three key drivers:

- To produce renewable energy and associated emissions reduction to help Barwon Water meet its strategy 2030 targets.
- To reduce local businesses' operating costs and reinvest these savings in job creation and improved productivity.
- To increase waste and energy security for Barwon Water, ALC and Bulla Dairy Foods.

The WEB participants are confident of achieving these outcomes. The project is currently at stage one which involves converting high strength waste from the industrial partners into renewable energy via a biogas cogeneration facility at the Colac Water Reclamation plant. Stage two will look at options to convert waste biomass residues into renewable energy.

Aside from the significant, measurable positive environmental impacts of the Colac WEB, the project showcases the value of strategic partnerships between local industries and a local utility in addressing waste disposal and energy security challenges, which can be replicated by others.



CASE STUDY

COUNCILS' POWERFUL COLLECTIVE APPROACH TO RENEWABLE ENERGY

In the largest ever emissions reduction project undertaken by local government in Australia, 48 councils across Victoria – including many from the Barwon South West region – have joined together to form Australia's largest ever renewable energy buying group, as they make the switch to 100 percent renewable energy.

Participating councils will use their combined buying power to secure 100 percent renewable (solar/wind) electricity via a Power Purchase Agreement (PPA). The proposed PPA will start in 2019/20 (with each council switching as their existing electricity contract expires) and will run for up to 10 years, helping drive investment in renewable energy for Victoria.

The PPA will represent about 45 percent of all Victorian council electricity consumption – a pool of some 250 GWh of electricity – while well over half the state's councils have joined up.

Participating councils will use the renewable energy to power municipal offices, leisure centres, streetlights and community buildings. The emissions reductions will be the equivalent of powering 47,000 homes with renewable energy, or taking 87,000 cars off the road each year. Councils are also aiming to secure financial savings and long-term certainty with these energy supply contracts.

The project was initiated and facilitated by the Victorian Greenhouse Alliances (local council networks) and Darebin City Council, with support from the Municipal Association of Victoria (MAV). MAV is undertaking the tender process and will oversee ongoing contract management.

CASE STUDY

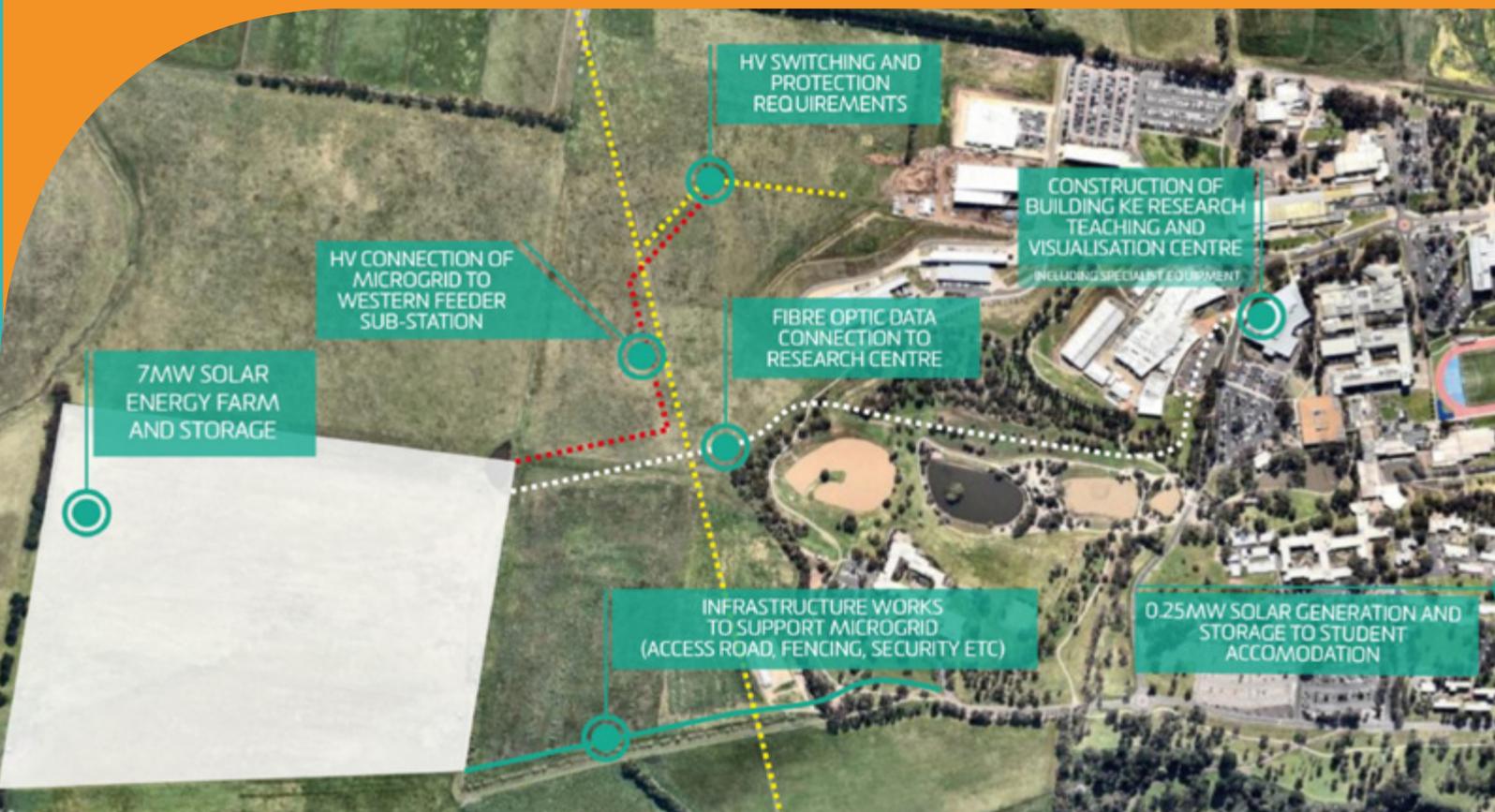
DEAKIN UNIVERSITY MICRO-GRID

Deakin University has established a large solar and battery micro-grid research hub at its Waurn Ponds campus in Geelong. The hub will assist Deakin to achieve its aspiration to be carbon neutral by 2030.

The micro-grid incorporates a 7 MW solar farm (located on 14.5 hectares of farmland at the rear of the campus) in conjunction with several smaller rooftop solar systems and a 1 MW battery storage system. The overall micro-grid is expected to supply around 54 percent of the Waurn Ponds campus' current power consumption and reduce about 12,000 tonnes of greenhouse gas emissions at the campus each year.

The hub also includes a research, teaching and visualisation centre in Deakin's Centre for Advanced Design in Engineering Training (CADET) building. The Centre will showcase the system for industry and community education and awareness and create a focus on teaching, research and training for the next generation of energy professionals.

The micro-grid research hub is a collaboration with the Victorian electricity network company AusNet Services and its subsidiary Mondo Power. The micro-grid will see researchers develop and test technologies that will enable greater use of renewable energy within our electricity system while maintaining reliability and reducing costs.



CONTINUING THE CONVERSATION

Barwon South West's natural and man-made advantages, and our community's readiness to seize the opportunities and economic uplift available in the continuing transition to renewable energy in Victoria, Australia and globally, make our region an optimal place for investment and collaboration for the future of the energy industry.

Our communities across Barwon South West are committed to a renewable energy generation future, and are acting now to help deliver it – for the region and for Victoria. This Roadmap covers a wide range of regional stakeholders, ideas, opinions, examples and challenges, and is by no means the beginning or the end of our conversation and transition to renewables. People from our region from all walks of life are coming together with a shared, common purpose of reducing the impact of climate change, and creating a better future.

To build on our existing tradition and culture of innovation and readiness for change, our communities want to ensure that governments, regulators and industry work with them, and understand Barwon South West's significant experience in renewable

energy generation and development, and our potential contribution for the future.

Our communities are saying they want decision-makers to support and listen to them, to understand their experience and point of view and ensure that while the region's natural assets are harnessed, any future innovation or large-scale development is considered and planned strategically, executed equitably and benefits are shared within the region.

Working together with developers, regulators and governments for mutual benefit, our region is ready to build quickly on our strong foundations.

▼ *Barwon Heads Primary School student Chloe Pannekoেকে*





*Budj Bim Cultural Landscape, inscribed
on the World Heritage List in July 2019*

