Opportunities for Community Energy in Yea

2030Yea: Transitioning to 100% Renewable Energy

Prepared by Community Power Agency for 2030Yea Inc.
March 2021

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About the authors

Community Power Agency

The Community Power Agency is a not-for-profit organisation with expertise that enables and advocates for community energy. We support communities across Australia to engage in and benefit from the transition to renewable energy. Established in 2011, Community Power Agency provides expert advice and support for the development of community energy. We have supported more than 50 community energy groups to develop and deliver their own clean energy projects. Community Power Agency (CPA) seeks to ensure that the regeneration transition is led and driven by communities. We strongly believe that a fair and widespread transition can only be achieved when local people benefit and engage in the changes needed for a regenerative future.

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Acknowledgment

Community Power Agency wishes to acknowledge that the township of Yea is located on the lands of the Taungurung people. We pay our respects to their elder's past, present and emerging and we acknowledge that sovereignty has never been ceded. Community Power Agency also wishes to acknowledge the significant voluntary contributions made by all members of 2030Yea Inc. in developing the community survey and this report. Thanks also to Murrindindi Shire Council for their ongoing support and to IAG and their local brand WFI Insurance for their generous contribution towards this project.

Note:

This report does not constitute legal, financial or technical advice. Further advice from specialists will be required to develop detailed plans and determine the feasibility of any of the ideas suggested herein.

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Yea township top down panorama. Jan 2020 by Bob T
Yea River Conservation Reserve Jan 2020 by Ferylbob
Yea Victoria from above by Graeme Bartlett
Solar Farm in NSW by Community Power Agency

Contents

1. Introduction

2030Yea Inc. is seeking to determine the feasibility for the Yea community and surrounds of transitioning to 100% renewable energy over the next decade. Such a task is complex and requires an in-depth understanding of the local context and the community, as well as the available resources and infrastructure that could be employed to support such a transition. Community Power Agency (CPA) has been commissioned to develop this report to support the beginning of this process. This report will help to inform 2030Yea of the current desirable, feasible and viable community energy options in the Yea area that will support the town's transition to renewable energy. This study is intended as a 'first point of call' for understanding potential options for community energy in Yea to inform further planning and to direct future pre-feasibility studies. This report constitutes an initial high level analysis of the appetite in the community, local assets and resources, as well as opportunities as they relate to the development of community energy in Yea. With a growing interest in community energy, this is a timely piece of work. From a handful of initiatives in early 2010, to more than 110 groups and over 100 operating projects today, the community energy sector in Australia is growing quickly and is now firmly positioned as part of the transition to a clean energy future.

2. Background

2030Yea is an incorporated association of interested residents from the township of Yea and surrounds in rural Victoria who want to ensure Yea has totally renewable energy sources by 2030, using the best available renewable resources to support energy price reduction and net zero emissions in Yea by 2030. Their vision shown in Box 1 articulates how they might achieve this. The group formed in early 2020 through a community planning process coordinated by Murrindindi Shire Council. With 13 core members (six committee members), the group has achieved a tremendous amount since formation; holding committee meetings, writing proposals and policy submissions, and meeting with community energy advocates and local government. There is palpable enthusiasm and passion for change within this dedicated group which has already seen them secure three separate grants including funds from RACV Solar which will result in solar panels and batteries installed on the local recreation reserve that acts as an emergency safe place during extreme weather events. Although the group is entirely made up of volunteers from Yea, there is a strong desire to engage more broadly with the local community. 2030Yea recognise the need to build social license and stakeholder relationships in order to achieve their goal of a town powered entirely by clean energy. This has lead the group to begin a consultation process with the community through a survey on renewable energy, the results of which will inform parts of this report. Information collected through this process will shape the recommendations put forward here and will inform future plans and projects.

Box 1: 2030Yea Vision

Ensure Yea has totally renewable energy sources by 2030 by:

- improving the thermal efficiency of residential and commercial buildings, as well achieving energy efficiency of other electricity consuming processes
- encouraging the purchase of solar panels and batteries
- providing bulk-buys for heat pumps and other energy efficient devices
- distributing energy locally through a microgrid or a virtual power plant
- planning for community-scale renewable energy sources

3. Community Energy

3.1 What is Community Energy?

Community-owned renewable energy or community energy (CE) refers to projects where a community group initiates, develops, operates and benefits from a renewable energy resource or energy efficiency initiative. Community groups are formed based on a common interest or geographical region such as a town or suburb. Every CE project is different, being tailored to each community's needs and context. CE projects may be developed to:

- maximise local ownership and decision making
- generate jobs
- use resources efficiently and sustainably
- match energy production to local energy needs and circumstances
- help address climate change

CE projects provide a tangible way for urban, regional or remote communities to transform their energy supply to be cleaner, safer and more sustainable. The projects enable communities to develop and own renewable infrastructure and become consciously involved energy citizens. The potential for CE to contribute to the transition to clean energy in Australia is significant, given the abundant renewable energy resources available. CE is already a mainstream model of renewable energy development internationally, especially in countries like Denmark, USA, Germany and Scotland. There are a range of social, environmental, technological, economic and political motivators that drive CE projects in Australia and around the world.[1] Key motivators are shown in Figure 1.

3.2 The Community Energy context in Victoria and Hume

A supportive and accessible regulatory environment as well as willing and engaged communities are both vital to enable the development of renewable energy and sustain the momentum of the CE movement. In Victoria, there are now more than 50 CE groups, which is almost half of all the groups across the nation. There is also a similar number of community energy projects of varying scales and technologies up and running across the state[2]. This is partly due to the significant time and energy that the Victorian Government has spent exploring ways to remove regulatory barriers and enhance CE development. It is also closely connected

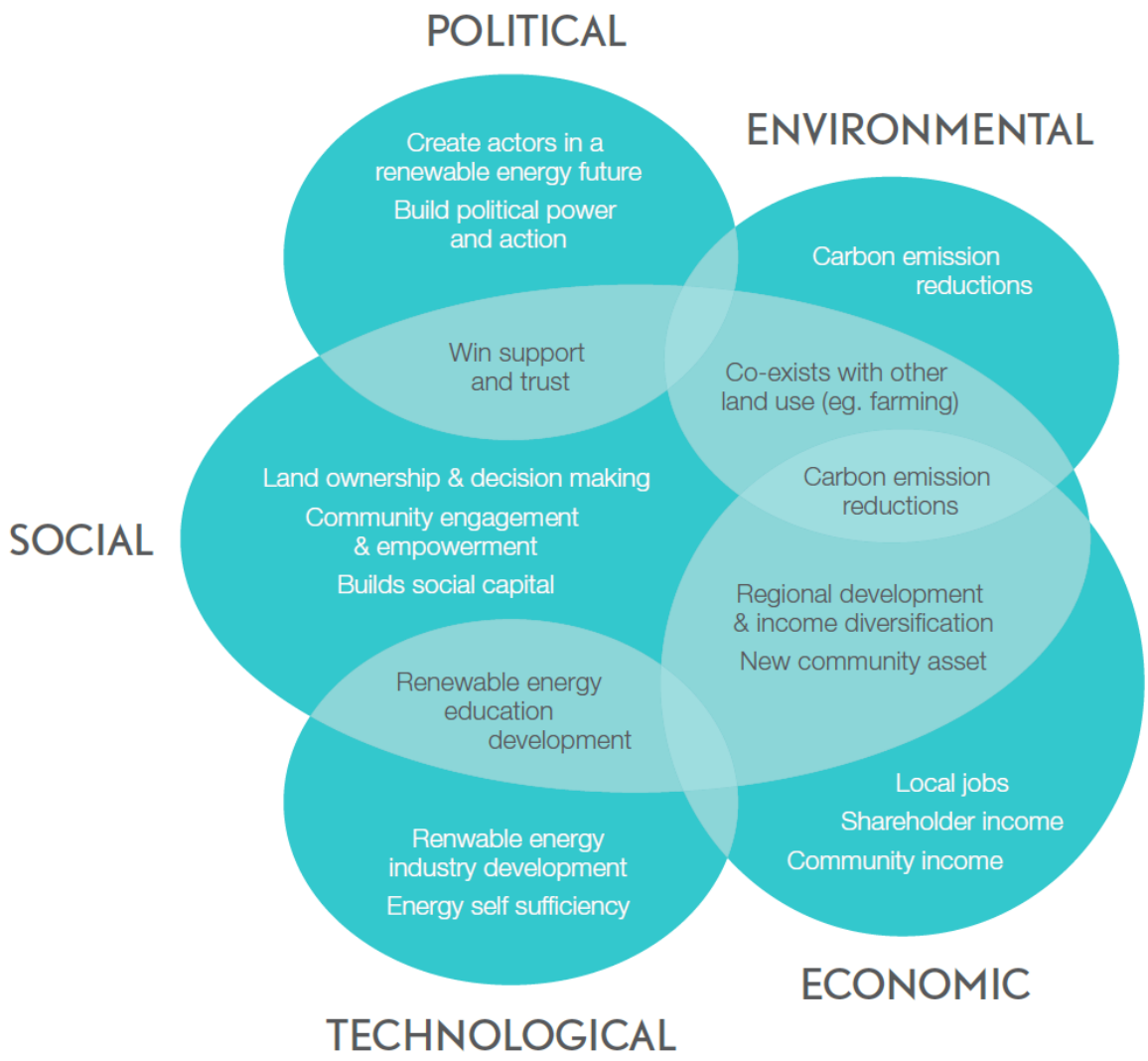
[1] Adapted from Lane, Hicks, Memery and Thompson, 2015. Guide to Community Owned Renewable Energy for Victorians

[2] Community Power Agency, 2021. Community energy map and database

to the coalition of community energy groups that have been delivering localised energy generation and distribution for community benefit for many years across Victoria.

The Victorian Government's 2015 Renewable Energy Roadmap and Action Plan has contributed to keeping CE on the agenda in Victoria. The Roadmap outlines a set of initiatives aimed at accelerating the development of renewable energy projects and transitioning the state's energy industry towards a low emissions future. Since the Roadmap's development, a suite of individual but aligned renewable energy strategies specific to each region in Victoria have now been created. These strategies (including the Hume Roadmap, which is relevant to Yea) involved wide community consultation and includes analysis of supply chain opportunities, skills, infrastructure, manufacturing and transmission opportunities.

Figure 1: Motivators and benefits of community energy



Source: Adapted from Hicks, J. & Ison, N., 2012. Community Energy. Home Energy Handbook

4. Methodology

This report draws on Community Power Agency's knowledge of existing community energy models and projects currently under development and operating in Australia. The report has been developed by employing a three-stage methodology to identify viable, feasible and desirable community energy options for the Yea area. This has been done by analysing a range of possible community energy models against the context of the Yea area. To this purpose we first considered the local demographics, attitudes and opportunities in relation to community renewable energy, before reviewing the renewable energy capacities in the region, and ultimately evaluating which CE technologies, models or initiatives would be most desirable and feasible for the area. Specifically, we have attempted to answer the following questions:

- How does the initiative/model work?
- How does it apply and fit in the Yea context?
- Why is it worth pursuing?
- What initiative(s) should be prioritised?

The models and project examples are listed in Section 9 and are structured under the following four main categories:

- Donation models
- Aggregated household models
- Investment models
- Partnership models

5. Building on local and regional assets

5.1 Location, demographic and socio-economic context

The township of Yea is situated on the Yea River within the Murrindindi Shire and Lower Hume Region (Figures 2 and 3), approximately 109 km north-east of Melbourne in Victoria. The Shire is protected by the Great Dividing Range but is still well connected with Melbourne and major regional cities: Healesville, Seymour, Shepparton, Mansfield, Benalla and Whittlesea are all within 60-90 minutes drive. The town is part of Victoria's Hume Region and an attractive rural service centre, in proximity to the townships of Alexandra, Eildon, Kinglake and Marysville. The region benefits from great natural beauty and tourist attractions such as Lake Eildon, picturesque national parks, the Great Victorian Rail Trail and access to Victoria's snowfields[3]. The Taungurung and Wurundjeri peoples are the Traditional Owners of the lands now called Murrindindi Shire. They inhabited the area for tens of thousands of years before European settlement and are estimated to have numbered around 1,000. This density of settlement was supported by the region's plentiful natural resources and temperate conditions. Only relatively recently has the living culture of the Taungurung and Wurundjeri people begun to receive widespread respect and a partnership between the Aboriginal communities and local stakeholders has been established to increase mutual understanding. The European settlers started exploiting the regional resources from the middle of the 19th century including pastoral agriculture, gold mining before 1900, and timber cutting and dairying until the 20th century.[4]

[3] Murrindindi Shire Council, 2021. https://www.murrindindi.vic.gov.au/Your-Council/About-Murrindindi-Shire

[4] Donkin et.al, 2011. Murrindindi Shire Heritage Study

Figure 2: Map of Victoria's Hume Region

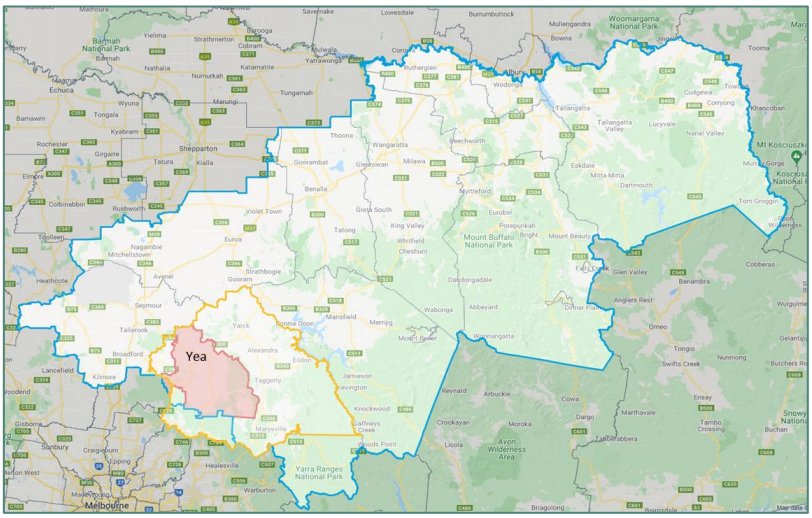
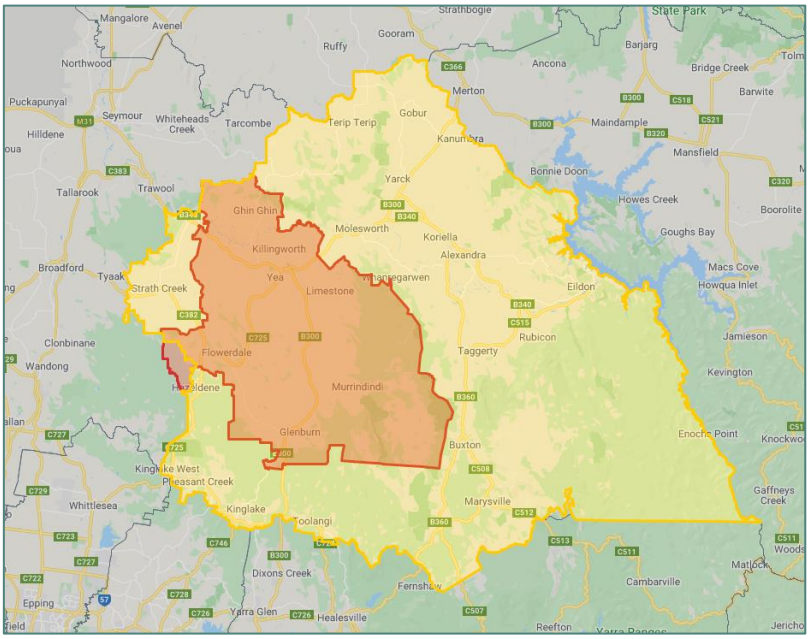


Figure 3: Map of the Murrindindi Local Government Area



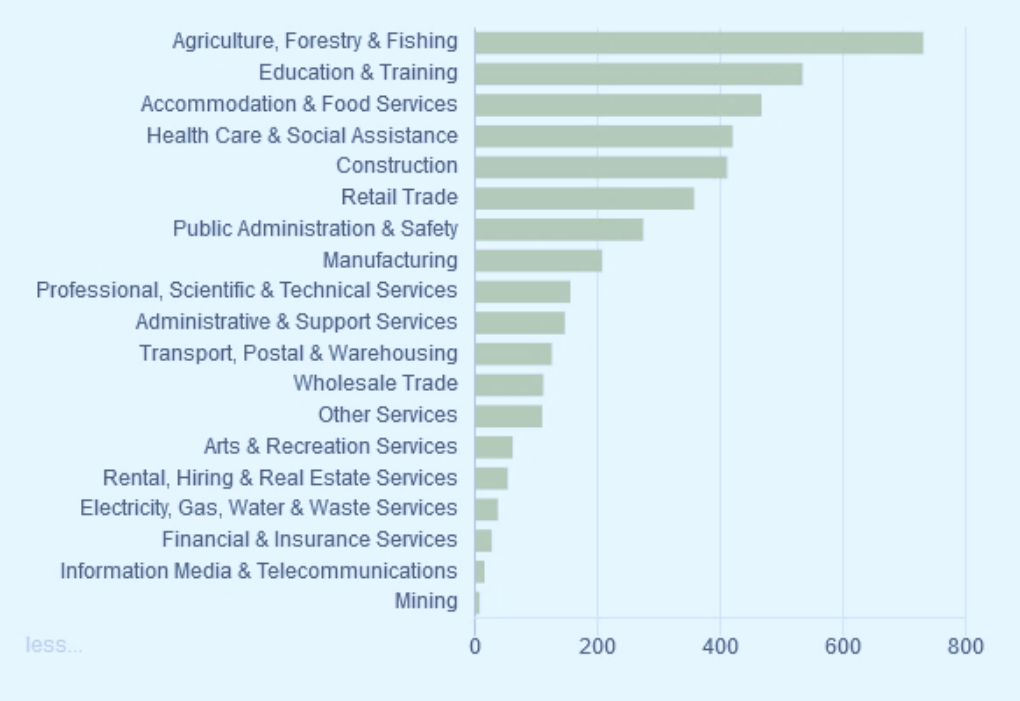
According to ABS data from 2016, Yea has a small population of 1,587 people as part of the Murrindindi Shire which holds a total population of 14,570 people. Since then, the population is considered to have increased significantly in the recent years, while attracting retirees, families ('tree changers') and farmers affected by droughts and looking for continuing business in more favourable conditions. Under a changing climate this is likely to continue. Population growth will affect land use patterns and increase regional energy demand and supply security.

Local economy and employment

Yea is set in a fertile valley on the northern slopes of the Great Dividing Range while the majority of the land usage in the region is classified as agricultural and agribusiness. In the Murrindindi Shire 43.6% of the area is considered under crown land / reserves land title, 43.3% of the land is under broad acre production, while 4.9% is covered by forestry.[5]

The Yea township supports approximately 579 jobs (total of 4247 in Murrindindi Shire) which are largely in primary production (dairy), forestry, tourism, light manufacturing and engineering. Other industries include a range of service provision organisations including education and health sectors. The region has a growing tourism industry with accomodation and food service presenting the second largest sector in the region. Wine production has accelerated most recently, and the number of wineries has increased across the Shire.

Figure 4: Number of jobs by industry in Murrindindi Shire



Source: Remplan, 2021.

The retail area of Yea still services the farming activities of the area, but over half of the shops now involve food service.Key local business in Yea township include a supermarket, several local cafes, bakeries, restaurants and multiple hotels and accomodation options including a caravan park. There are two local fuel stations, gift and book stores and other common services such as a real estate agent, nursery and florist. The nearby Yea Saleyards has also become a significant livestock selling centre for Central Victoria.

[5] Remplan, 2021.
https://www.renewableenergyroadmap.com.au/LGA/Murrindindi/Economy?mw=10&type=solarfarm

Housing situation and built environment

The Murrindindi Shire has a high concentration of owner-occupied buildings (78.9% in comparison to 67.6% across Victoria).[6] Hence, there is a relative small number of renters. In addition, the residential areas consist almost entirely of low-density, single story detached houses on their own blocks. This creates both opportunities and challenges for rooftop solar uptake. The centre of the town sits on the flood plain of the Yea River where the Goulburn Valley and Melba Highway meet and consists of commercial, retail and public buildings. The residential areas are primarily to the south of the commercial centre and extend onto the nearby hills, however new housing estates are being developed to the west also. The town hosts several large energy users, including four pubs, none of which have yet installed rooftop solar. However, heritage building listings in the commercial centre may present a challenge to such installations. The land surrounding the town centre comprises largely of pastoral properties and the area is known for its dairy industry, sheep and cattle. Being a farming community there is associated machinery along with the saleyards where cattle sales are held monthly.

Organisations and networks

The township of Yea boasts a strong and active community with a network of more than seventy community organisations, groups and institutions operating in the local area. The town is serviced by two primary schools, a high school and a childcare centre. It has both a hospital and aged care hostel also. Yea has a public library and a Visitor / Discovery Centre based at the Yea Wetlands, which enjoys great community support. There are three local churches and a valued Community House which acts as focal resource for the Yea district, delivering activities, services and providing a place for groups to meet. Some of the local groups include a gardening club, historical and film societies, Probus, Scouts and a Men's Shed/Pottery Studio, among many others. Yea also has multiple sporting clubs and facilities, such as a swimming pool, golf course, Racecourse and the Yea Recreation Reserve and Showground. There is a range of environmental groups including Landcare groups and the Wetlands Trust. The town holds regular events such as the monthly Yea Railway Market where local fresh produce and wares can be found and the town is one of the only three Cittaslow towns in Australia, an organisation which grew from the slow food movement. Murrindindi residents have identified the safe, resilient and socially connected nature of its communities, as well as the strong culture of volunteering as things that are highly valued at a local level[7]. Within Yea there is recogntion that the town is "big enough to be a well serviced community and small enough to know and be known"[8]

[6] 43% were owned outright, 35.9% were owned with a mortgage
[7] Murrindindi Shire Council, accessed 2021. Murrindindi 2030 Vision
[8] Murrindindi Shire Council, 2019. Yea Community Plan 2020

5.2 Key motivations for community energy in Yea

In order to better understand the attitudes, behaviours, needs and opinions of the wider Yea community in relation to community renewable energy, 2030Yea conducted a community survey in collaboration with CPA. This process served to both inform the development of locally relevant projects and also build the membership and profile of the group. The survey was distributed electronically via email on the 2030Yea website, social media pages, other local websites and through in-person interviews using a paper survey at the local markets. In total, 62 people responded to the survey from the beginning of February to mid-March 2021. More than 90% of those who completed the survey were either local residents or businesses, whilst more than half were located in the township of Yea itself (Figure 5, 6). The information collected through the survey indicates that respondents have a good degree of energy literacy and they also show significant support for community renewable energy in the township of Yea. When asked to consider associations with community energy in Yea, common responses were overwhelmingly positive and focused on the environment, wind, power and community as can be seen from Figure 7. This sentiment was also expressed in attitudes to the timeline for Yea to become powered by renewable energy. More than 85% of people surveyed would like to see this target reached before or by 2030.

When exploring preferences and attitudes to the different renewable technologies that might be employed in future community energy projects in Yea, community members showed a strong interest in rooftop solar PV and micro-grids – where energy is locally generated, shared / consumed and stored in community batteries. Despite the prevalence of local bioenergy and hydropower resources, neither of these technologies were considered to be options that the Yea community would most like to see employed (Figure 8). In relation to the benefits that new renewable energy generation projects deliver, respondents showed a strong desire for developments to return an environmental benefit and mitigate the effects of climate change, whilst also building regional resilience and sustainability (Figure 9).

Figure 5: Residency 1

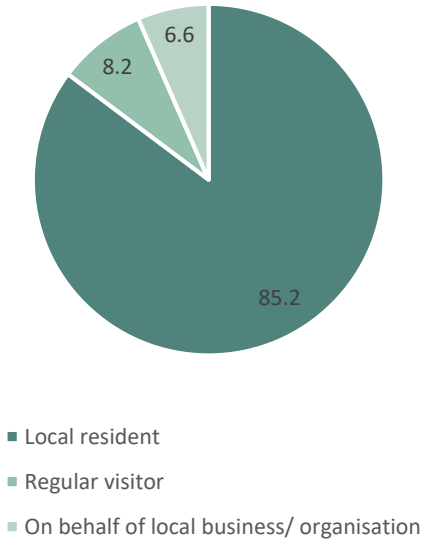


Figure 6: Residency 2

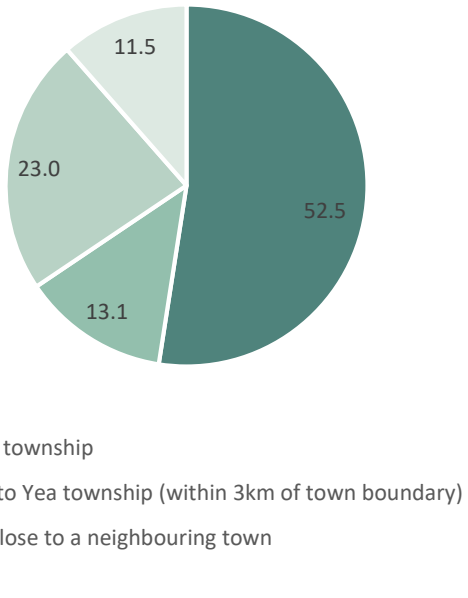


Figure 7: Word associations with Community Energy in Yea

Figure 8: Renewable Technologies - highest preference

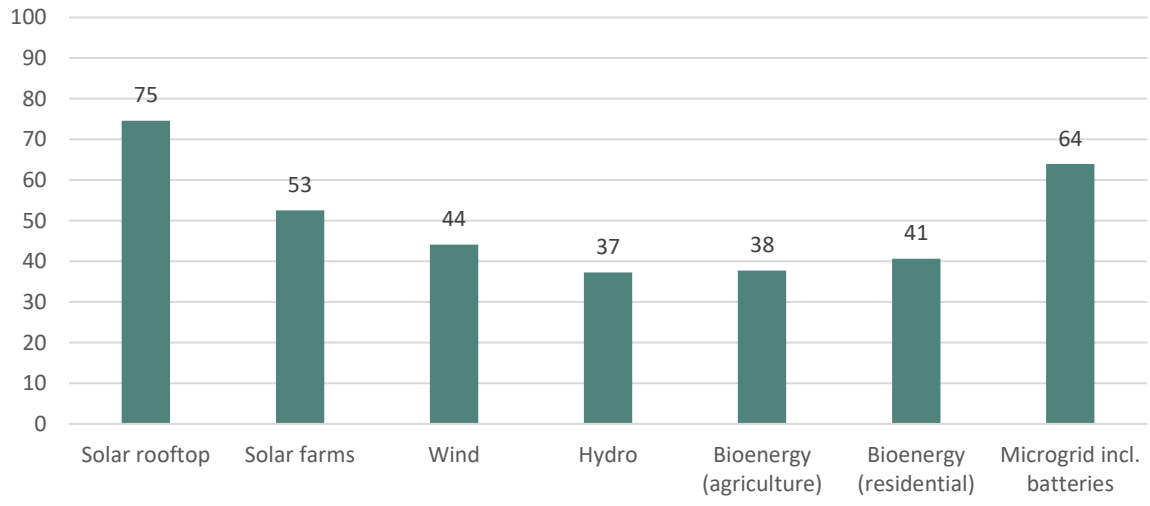


Figure 9: CE Benefits - greatest importance

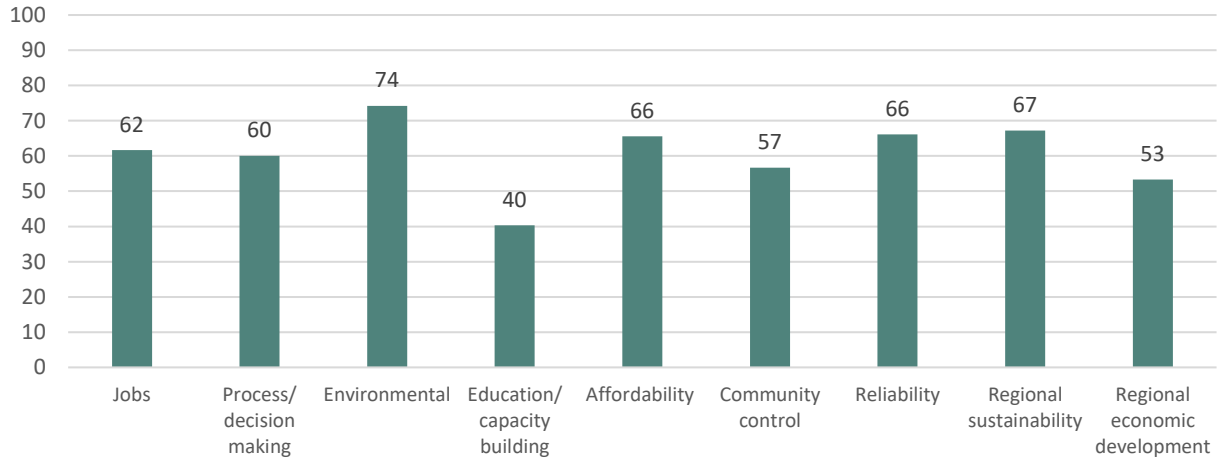


Figure 10: Future Vision - highest preference consolidated

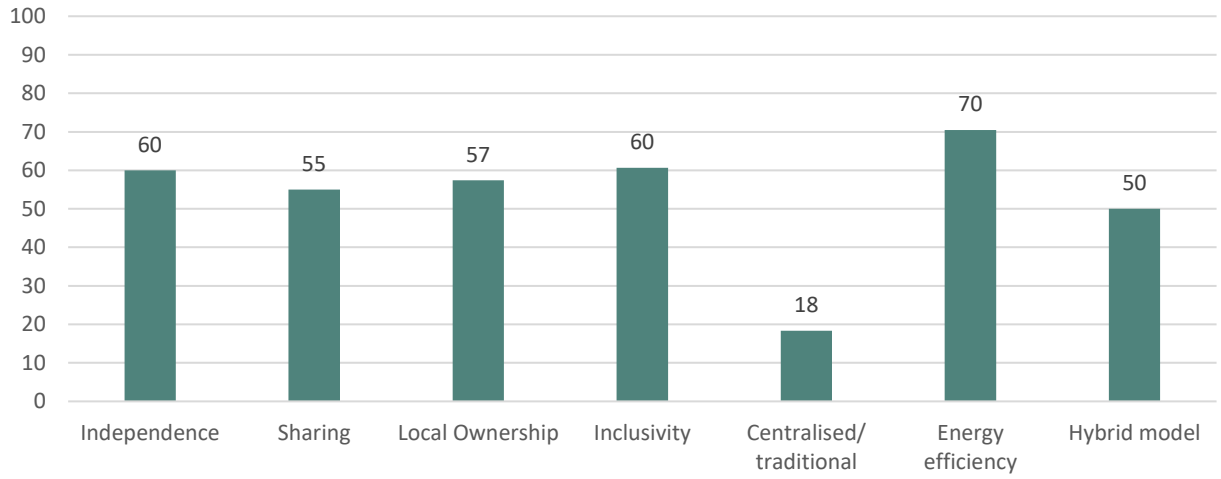
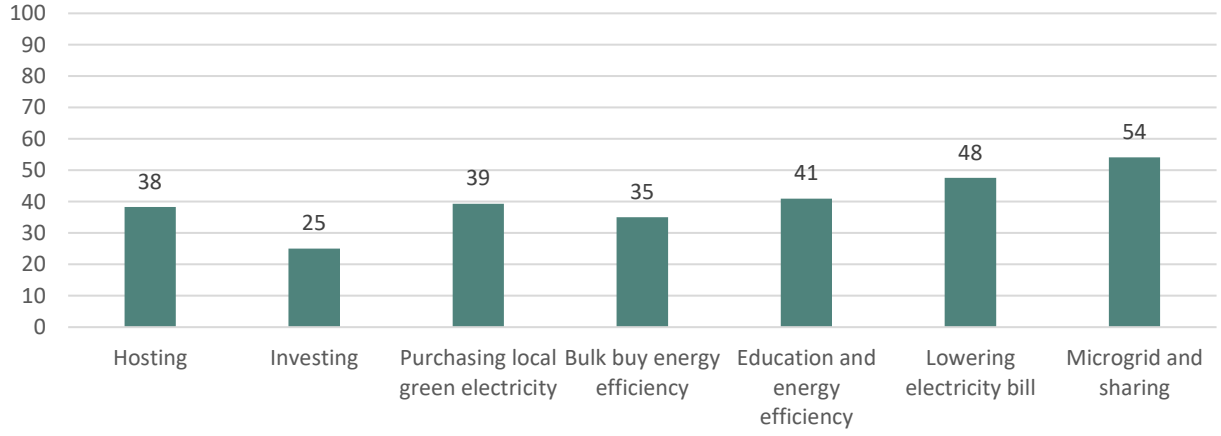


Figure 11: Interest in energy initiatives - extremely interested



There was also a clear need for projects to have a social outcome where energy is made more affordable and reliable for all. Local economic growth, capacity building and education were seen to be of less importance to those surveyed. However, when asked about the importance of producing and consuming energy close to the Yea area, an overwhelming 90% of those surveyed believed this was extremely or very important.

When asked to consider what sort of energy future they would like to see in their region community members showed strong support for Yea to be energy efficient (Figure 10). There was also a desire for homes and businesses to generate and consume their own local power and for low-income households to be included in the renewable energy transition. This was echoed when people rated their interest in various community energy initiatives, with more than half of all respondents extremely interested in participating in a local micro-grid or energy sharing program and a high degree of interest being shown in energy efficiency programs to lower energy bills (Figure 11). Learning more about renewable energy and energy efficiency and having options to purchase locally generated green power were also identified as priorities that the community were extremely or very interested in pursuing. Again, the importance of the social dimension of community energy projects was apparent in such responses and this indicates that developments must be responsive to the needs of the region and return benefit to local people in tangible ways such as increased energy literacy / efficiency, energy independence and bill savings.

5.3 Strategic community energy opportunities in Yea

Energy and infrastructure resources

The township has significant natural resources and some established infrastructure to support CE options. Although the rail service has now been discontinued in Yea, the district is well connected by road networks to Melbourne and regional centres with access to larger markets and populations. This may be of use in seeking a wider investor base for CE projects, and also in sourcing products and services required for project development. There is also a perception that there are good local solar resources and this is reflected in the high uptake of rooftop solar with 35% of dwellings installing solar in comparison to the state average of 20.6%[9]. Currently, in the town centre there are already at least ten separate solar installations and the local supermarket and nearby Killingworth Hill Café have Tesla electric car chargers (Table 1). Despite these achievements, it is estimated that the local region still has a solar PV potential of almost 40,000kW, which presents a huge opportunity for CE options.

Sector support

Victoria's Hume region has also been blessed with a series of highly motivated renewables-friendly MPs, including the current Independent member for Indi, Helen Haines, who recently launched a $483 million Local Power Plan to help boost regional economies. 2030Yea has contributed to the development of this Plan. 2030Yea is also in very good company amongst other community energy groups, as outlined in the *Community Energy context* section. Indeed the region has one of the highest density of community energy groups in Australia and 2030Yea have already built relationships with these established groups whom can mentor and support 2030Yea in their activities and early projects.

[9] APVI, 2021. https://pv-map.apvi.org.au/postcode

Partnering with Local Government

Murrindindi Shire Council provided the support to catalyse the formation of 2030Yea through coordinating the Community Planning Framework. The process involved the community exploring ideas and opportunities for the future of their town. A list of ideas was then collated and prioritised, one of which was the group 2030Yea. The Shire also continued to support the realisation of these priorities by running a Community Planning Small Grants program, of which 2030Yea was a recipient. Clearly, this supportive relationship with the the Shire of Murrindindi presents an excellent ongoing opportunity for 2030Yea to explore its community energy options.

Local Governments (LGs) have a limited number of resources and capacity, yet in many cases have found different ways to engage and ultimately benefit from renewable energy and energy efficiency measures. These ways of engaging can be classified into the various roles outlined in Table 2. This is of particular relevance in Murrindindi where despite there being a clear appetite amongst council and its staff to support community energy, there is a lack of resources available. 2030Yea has allies across several departments within council, however, as is the case within many regional councils, operating teams are made up of few individuals who are already juggling competing priorities. Despite this, the Shire has achieved some excellent outcomes for both the environment and its communities through its programs including the Dindi Solar Bulk-Buy, street lighting upgrades, HVAC system upgrades and 120kW's of solar PV installations across its own assets[10]. Unfortunately, a solar feasibility study undertaken by Council of the Yea Saleyards has determined that despite the large roof of the yard, the site does not present a good option for solar PV due to complications with grid connection and proximity. However, these actions indicate a commitment within council to renewable energy and highlight the potential for an ongoing partnership with 2030Yea.

Table 1: Rooftop Solar PV uptake in the Yea town centre

Business / Organisation	Address / Installation
Y Water Centre	2 Hood St – Rooftop solar
Foodworks Yea	10 High St – Rooftop solar 70kW + four Tesla Superchargers in carpark
Yea Chinese Restaurant	32 High St – Rooftop solar
Yea Bakery	44 High St – Rooftop solar
Yea Takeaway	68 High Street – Rooftop solar
Yea Pharmacy	72 High St – Rooftop solar
Yea Cidery	88 High St – Rooftop solar
Shell Petrol Station	98 High St – Rooftop solar
Yea Rec Reserve	Rooftop solar 22kW at oval, 47kWh battery Rooftop solar 7kW at Netball clubhouse, Tesla battery (planned)
Yea Library, and Early Childhood Centre (LG building)	Rooftop solar

[10] Murrindindi Shire Council, 2021. https://www.murrindindi.vic.gov.au/Your-Property/Environment/Roles-and-Responsibilities

Table 2: Typology of LG engagement in renewable and community energy activities

Typology	Characteristics
1. LG engagement as RE customers	Most common level of engagement in RE: councils purchase of green energy and undertaking energy efficiency measures in order to save money, reduce carbon emissions and lead by example
2. LG engagement as educators/ information providers	Most common level of engagement with their communities in RE: Councils demonstrate good practice as role models by installing small-scale solar PV systems and also educate their community by offering information about RE systems
3. LG engagement as facilitators	Councils facilitate RE action of their communities e.g. coordinate bulk-buy purchase and identify and broker relationships to reliable suppliers
4. LG engagement as innovators and participants	Councils actively drive and promote RE engagement to their communities through innovative programs e.g. rates based finance of RE deployment
5. LG engagement as catalysts and supporters	Councils catalyse CE initiatives by offering administrative support, council rooftop space or land as host site and providing funding to conduct feasibility studies
6. LG engagement as networkers and advocates	*Councils collaborate and network with different stakeholders incl. other councils to strengthen their capacities for RE engagement and to advocate for institutional changes and/or new policy schemes on higher government levels that enable locally led RE initiatives*

Source: Mey, Diesendorf, & MacGill, 2016.

6. Renewable energy resource assessment

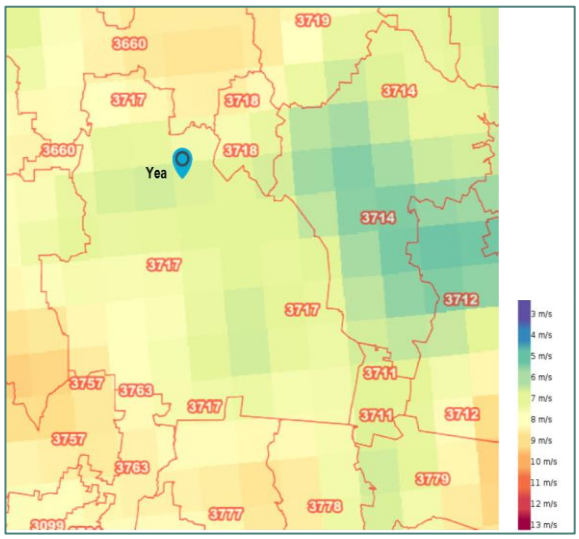
The Yea area is endowed with great natural resources and covers an area of around 1,392 km^2. The particular local geography with the flood plain, the slopes of the Great Dividing Range and its specific business activities (in particular agriculture) lends itself to renewable energy generation. The following information on available resources is presented in no particular order and is drawn from Australian Renewable Energy Mapping Infrastructure[11], a website for map-based access to Australian spatial data on renewable energy potential as well as from REMPLAN modelling. In places, where there is a lack of specific information for the location of Yea or where a regional perspective is also suitable, we draw on data for Murrindindi Shire. Yea and the region have been installing renewable energy for some time. Existing rooftop solar, solar farms and wind farms in the region have up to 7.3 MW of renewable energy capacity. The solar farms and wind farms which are under construction or approved, combined with a full rollout of rooftop solar across the region, would add a further 100.4 MW of capacity. The information about existing and planned capacities is drawn from the REMPLAN modelling, the Clean Energy Regulator and the Hume Region Renewable Energy Roadmap (Hume Roadmap).

[11] AREMI, 2019. https://www.nationalmap.gov.au/renewables/

6.1 Wind resources and generation

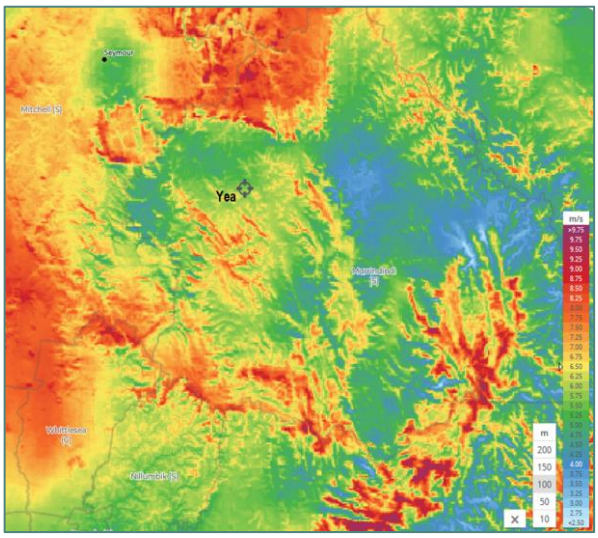
The Yea area has access to some excellent wind resources. At 100m (height above ground) average wind speeds range from around 6m/s to 7.5m/s, while at 150m the average wind speed is 7.98m/s (as shown in Figures 12 and 13). Average wind speeds in Victoria range from around 3.5m/s up to 10m/s. Higher quality wind resources can be found in the south and north of Yea's postcode area. Yet, many favourable sites are in state forest, national parks, and in mountainous areas and hence more difficult to access. There are no large-scale wind projects in the postcode area yet. However, the installation of the Cherry Tree Wind Farm (57.6 MW) north-west of Yea,[12] indicates the resource potential and the opportunities for communities benefiting from large-scale developments (see Box 2).

Figure 12: Average Wind Speed at 150m in Yea



Source: AREMI

Figure 13: Average Wind Speed at 100m in the broader Yea area



Source: Global Wind Atlas
https://globalwindatlas.info/area/Australia

Box 2: Example of Community Benefit Sharing Strategies: Cherry Tree Wind Farm

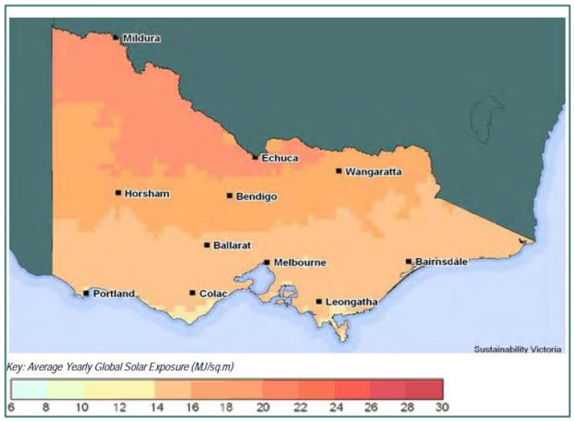
Community benefit sharing involves sharing the rewards of renewable energy development with local communities. It is increasingly becoming a common practice for Australia's wind and solar farm developers to share the financial benefits of their projects to enhance the social and economic outcomes of the local community. There are several benefit sharing techniques including co-ownership, sponsorships and benefit sharing funds. An example in proximity of Yea is Cherry Tree Wind Farm located near Seymour. It generates enough renewable energy to power approximately 37,000 homes each year. Construction has created about 80 jobs, with five ongoing employees. John Laing (owner) and Infigen (operator) set up a community engagement and benefit sharing process to obtain local social license for the project. They have supported several local community initiatives through sponsorship and established a Community Benefit Fund which offers $25,000 annually. In January 2021 it distributed funds to seven local community groups including sports and art initiatives. The next round of community benefit fund will be advertised locally towards the end of 2021.

[12] Cherry Tree Wind Farm, Infigen Website. 2021. https://www.infigenenergy.com/our-assets/contracted-renewable-energy-assets/cherry-tree-wind-farm/

6.2 Solar resources and generation

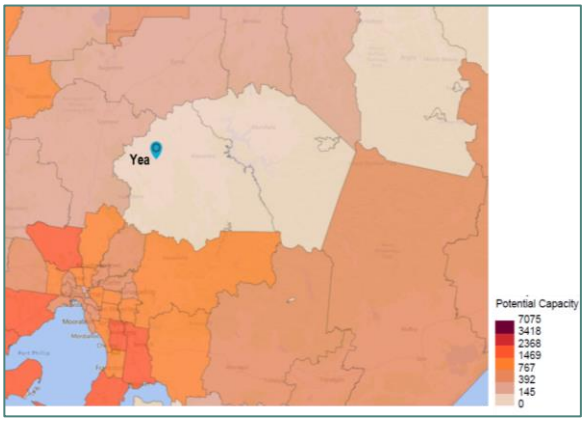
By global standards, Murrindindi Shire has excellent solar resources. The region has an average annual solar exposure of around 15.9 MJ/sqm. Areas in Victoria range between 14 and 19 MJ/sqm. According to the Global Solar Atlas, the region has a solar photovoltaic output of 4kWh compared, for example, with Germany which receives only 2.8 to 3.2kWh but has 53,8 GW of installed solar photovoltaic.[13] As shown in Figure 15, Murrindindi Shire has comparatively less available rooftop space for solar capacity (MW) and annual energy output (GWH) than other regions. Therefore, solar farms are likely to play a role in harvesting the area's solar resources, alongside rooftop PV. Given the region's well established and valuable agricultural sector, there is scope to develop renewable energy in ways to complement and augment agricultural activities. In fact, panel arrays can be placed in a way that supports growth of crops or forage grasses, while helping to retain soil moisture. In Yea, renewable energy is mainly deployed by small / medium sized solar PV with 2.6MW capacity (Figure 16).

Figure 14: Average Yearly Global Solar Exposure Victoria



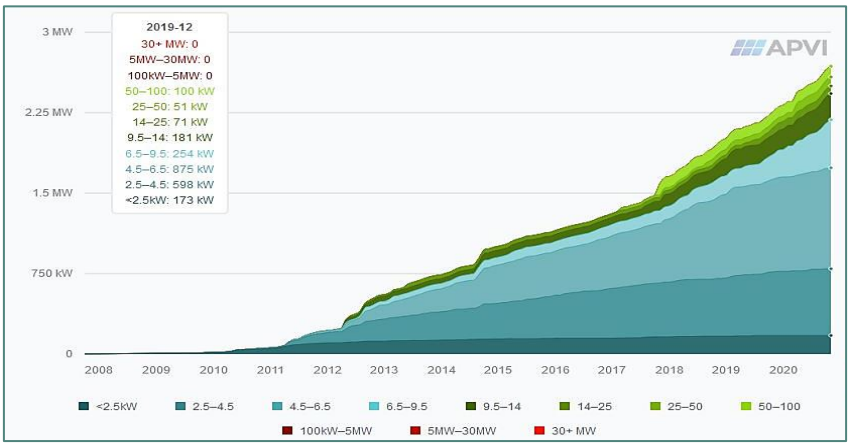
Source: Sustainability Victoria 2010.

Figure 15: Potential of Rooftop Solar PV based on available rooftop space (in MW)



Source: AREMI 2021.

Figure 16: Installed Solar Resources in the Yea postcode



Source: Australian PV Institute 2021.

[13] SOLARGIS, 2019 and Bundesministerium für Wirtschaft und Energie, 2021.

6.3 Hydroelectricity resources and generation

Hydroelectricity is one of the oldest used renewable energy sources in the country. Still today, hydro generation plays an important role in the wider region. To date, there is 780MW of hydro generation in Hume, with another 1,500MW flowing through the region's transmission network from the Murray 1 and 2 power stations, just over the far eastern border with New South Wales. Close to Yea, Victoria's oldest operating hydrogen plant is located: the Rubicon Scheme, which dates back to the 1920's and still supplies an annual output of 64 GWh. The much larger Eildon Scheme is also in the region and has a capacity of 120MW and provides an annual output of 184GWh (Figure 17). Although new large-scale hydro-schemes are unlikely, the Hume Roadmap highlights the opportunities for small run-of-river hydroelectric systems (pico and micro hydro). Existing examples include the micro-hydroelectric turbine at Steavenson Falls, Marysville, powering visitor infrastructure in the south of the Shire. A recently completed community owned micro-hydro scheme (61kw) on the Ythan Creek near Warburton (Yarra Ranges) also indicates the potential of community owned hydroelectricity schemes.[14]

Figure 17: Hydropower generation in Murrindindi Shire

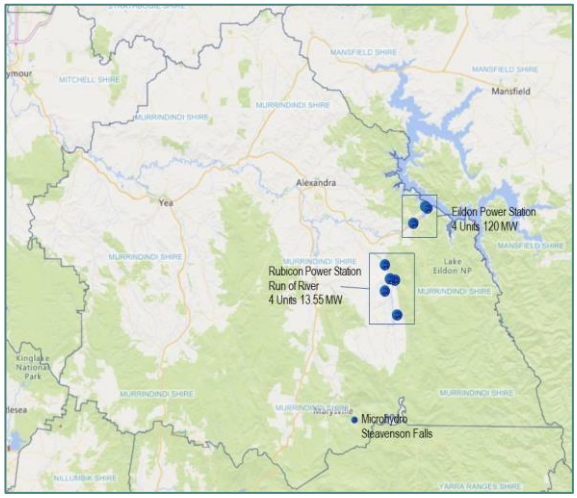
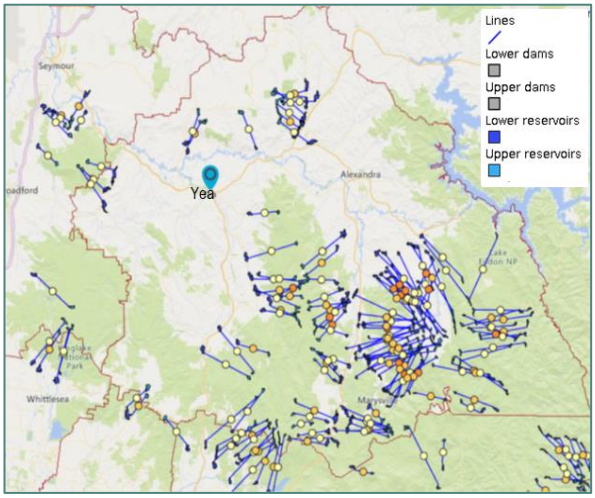


Figure 18: Pumped hydro resources (2GWh for 6h)



Source: AREMI 2021.

In 2017, research by the Australian National University (ANU) found great potential for pumped hydro energy storage to balance a zero-emissions grid based on wind and solar PV generation.[15] The Hume Roadmap also highlights this significant opportunity for the region and the availability of many potential sites. As indicated in Figure 18, the ANU research identified an abundance of development opportunities in Murrindindi Shire, south-east of Yea - the area around Buxton provides 22 high-profile sites. However, robust environmental assessments including water availability are crucial steps beforehand. Due to climate change,

[14] One Step off the Grid, 2018. https://onestepoffthegrid.com.au/victoria-community-micro-hydro-plant-becomes-powershops-newest-supplier/
[15] ANU, 2017. https://www.anu.edu.au/news/all-news/anu-finds-22000-potential-pumped-hydro-sites-in-australia

droughts will become more frequent in the region and hence stream flows will further decline in the future, making water a competitive resource. In addition, all development will require social license obtained through adequate community engagement processes. Lastly, pumped hydro energy storage developments are complex projects and will require careful planning, economic modelling and determination of the state's requirements.

6.4 Bioenergy resources and generation

Bioenergy is another consistent renewable energy source providing dispatchable generation to support the stability of the grid. In addition, bioenergy deployment can add value to existing waste streams and is in some cases cheaper to generate than electricity from solar PV. Bioenergy is based on biomass - organic matter originally derived from plants. Materials that can be used as bioenergy feedstocks include agricultural residues, such as bagasse or straw; purpose grown energy crops, such as short rotation coppice (SRC); waste wood or sawdust from forestry operations; and organic waste streams from industry, livestock, food production, and general human activities. Feedstocks may be 'wet' (for example, manure, slurries or liquors), or dry, like wood chip or municipal waste.[16]

The Yea area shows good potential for bioenergy since the high levels of agricultural production lend themselves itself to bioenergy deployment.[17] However, there are no bioenergy facilities in Murrindindi Shire yet. Sustainability Victoria estimates the potential in Murrindindi Shire to be more than 110,000 tonnes of biomass residues.[18] A breakdown of the commercial and industrial organic waste streams for bioenergy production in Murrindindi are presented in Table 3. For the entire Hume Region the bioenergy feedstock could supply 18 million GJ per year. However, the most productive regions are in the Goulburn Valley and the north-east of the region.

Table 3: Victorian Biomass Residues estimate by LGA

	Murrindindi Shire LGA
Primary production	95 tonnes/year
C&I Manufacturing	14,000 tonnes
Municipality solid waste / residuals incl. paper and card board	6,000 tonnes/ year
Forestry plantations	11,000 tonnes/ year
Forestry - sawmills	57,000 tonnes/ year

Source: Sustainability Victoria 2021.

[16] K Lovegrove, G James, D Leitch, A Milczarek A Ngo, J Rutovitz, M Watt, J Wyder 2018. Comparison of Dispatchable renewable electricity options

[17] AREMI, 2019.

[18] Victorian Biomass Residue Generation Estimates by LGA. 2021. https://app.powerbi.com/view?r=eyJrIjoiNTkzZDgwMDQtNGFhYy00NjQzLWJjZTUtM2M4NTcwMzgzMTI5IiwidCI6ImIwNzZjZTYwLWNhMmEtNDE4NS05MDQxLTg1MWQxYjdiYzAxYSIsImMiOjEwfQ%3D%3D

7. Network infrastructure

The National Electricity Market – in short, the NEM – interconnects and provides electricity to five regional market jurisdictions – Queensland, New South Wales (including the Australian Capital Territory), Victoria, South Australia, and Tasmania. It incorporates around 40,000kms of transmission lines and cables. The NEM involves wholesale generation that is transported via high voltage transmission lines from generators to large industrial energy users and to local electricity distributors in each region, which deliver it to homes and businesses.

These two levels of high voltage transmission lines (transmission network) and lower voltage distribution lines (distribution network), and balancing supply and demand over great distances make the network a very dynamic and highly complex system. Factors such as the capacity of the lines and the substation; the ability to actively control demand and dispatch / generate electricity and the availability of storage capacity affects the network's performance. Similar to the limitations of water pipes, the electricity network has a finite amount of capacity to transfer power. Higher voltage lines can transmit greater capacity. Where the grid is unable to accept any further electricity, restrictions come into play which can: a) curtail existing connected generators, thereby limiting the amount they are allowed to feed into the grid at any given moment; and b) limit the amount of new generation capacity that can be connected. For example rooftop solar exports can adversely affect the voltage on the grid, taking it outside prescribed limits. There is a limit to how much electricity a low voltage line can take from rooftop solar systems exporting to it. As this limit is approached, it has often been the case that a Distribution Network Service Provider (e.g. AusNet) will impose a zero-export policy or other constraint, meaning that less rooftop solar energy can be exported to the grid.[19] Since 25% of Australian homes now have rooftop solar and the appetite for solar PV and home batteries continues, the grid and the functions of the NEM are challenged.

Indeed, the electricity system is in the middle of a huge transition. While it was developed in the traditional sense of a centralised one-way stream from generators (mainly coal fired power stations) to consumers, the emergence of new distributed renewable energy systems means the network is under pressure to accommodate a growing number of renewable energy projects both from a household and commercial level. Furthermore, in the next few years, an increasing number of coal-fired power stations will close and therefore state governments are in the process of finding solutions to modernise the outdated and coal-based electricity grid.

The Victorian Guide to Community-Owned Renewable Energy emphasises that the grid connection is one of the key challenges for community groups. When building a renewable energy generation project, connecting to the electricity network is just as important as generating the energy in the first place. While a standardised process makes the connection of roof-mounted solar PV systems of up to 10kW relative simple, all other systems will be assessed individually by the electricity distributor – which will require time and further costs.[20]

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[19] Renew Economy, 2021. https://reneweconomy.com.au/solar-tax-networks-will-be-able-to-charge-households-to-export-solar-power-to-grid/, ARENA, 2020. https://arena.gov.au/news/flexible-grid-connection-could-reduce-rooftop-solar-constraints/

[20] Lane, Hicks, Memery and Thompson, 2015. Guide to Community Owned Renewable Energy for Victorians

Table 4: Elements of the electricity system

Generator Produces electricity.	**Generator transformer** Converts low voltage electricity to high voltage for efficient transport.	**Transmission lines** Carry electricity long distances.	**Distribution transformer** Converts high voltage electricity to low voltage for distribution.
Distribution lines Carry low voltage electricity to consumers.	**Homes, offices and factories** Use electricity for lighting and heating and to power appliances.	**Distributed energy systems - solar PV** Feed electricity to the grid.	**Storage** Feed electricity to the grid and help stabilise fluctuations.

Figure 19: Transmission infrastructure in the region

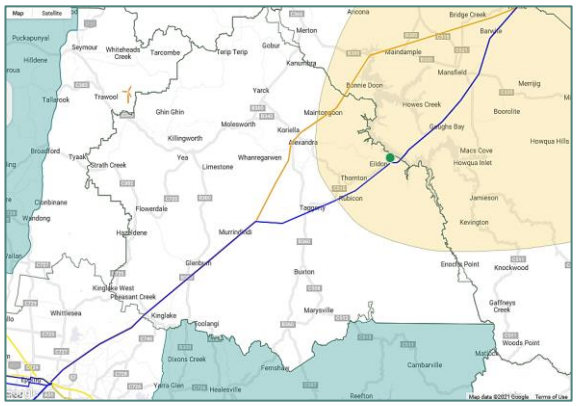
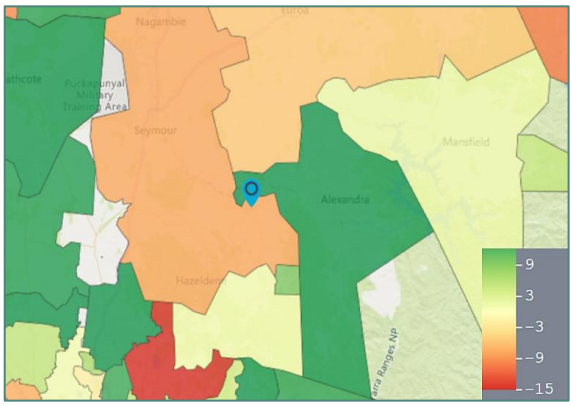


Figure 20: Available Distribution Capacity (MVA)



Source: AREMI 2021

Hume has two main high voltage transmission lines – a 220kV line from Shepparton to Wodonga via Glenrowan and Dederang, and a 330kV from South Morang on Melbourne's outskirts to Dederang and to New South Wales (see Figure 19).[21] The Yea area belongs to the AusNet Distribution Network. The main electricity infrastructure in the Yea area is through the Doreen (DRN) to Kinglake (KLK) to Rubicon A (RubA) to Seymour (SMR) to Kilmore South (KMS) 66kV loop, which supplies approximately 18,000 customers via the four zone substations at Kinglake, Rubicon A, Murrindindi, and Seymour. AusNet, the transmission network company, notes that the supplies to KLO, KMS and DRN are secured by duplicated 66kV lines, however the sections beyond these stations which includes Yea are at risk. Voltage collapse constraint is more likely, in particular if the combined loading on these four zone substations exceeds 35.0MVA both in the peak summer and winter months. AusNet

[21] Goulburn and Ovens Murray Regional Partnerships, 2019. The Hume Renewable Roadmap Project

does not plan any investments in network upgrades in the next five years, however their possible solutions to further increase the strength and stability of the loop include:[22]

- Contract network support via embedded generation connected at Seymour, to reduce network loading during risk periods.
- Contract network support via demand management, to reduce demand during risk periods.

Demand management is a method by which AusNet can ask customers to reduce load in response to network constraint, or bring dispatchable generation or storage online. In the future, the opportunity could be for batteries located in residences and businesses or large-scale or community batteries with renewable generation to support the network. This also means, that there is scope for new local renewable energy generation and community energy projects to play a role in providing such services to the network.

In addition, the Victorian Government is further encouraging network companies with the announced creation of a new institution to manage the "critical" next phase of the state's transition to 50% renewables by 2030. The aim is to strengthen connections to the grid in the areas of the greatest renewable energy potential and accommodate the increasing share of non-synchronous generation.

The VigGrid will manage the six Victorian Renewable Energy Zones (REZs),[23] [24] which were identified by AEMO for their development potential to deliver secure and clean energy for Victoria (see Figure 20). Although, Yea is not located in a REZ, the closest zone is Ovens Murray approximately 50km away. This region was identified because of its potential for additional pumped hydro power.

Figure 20: Proposed REZ in Victoria

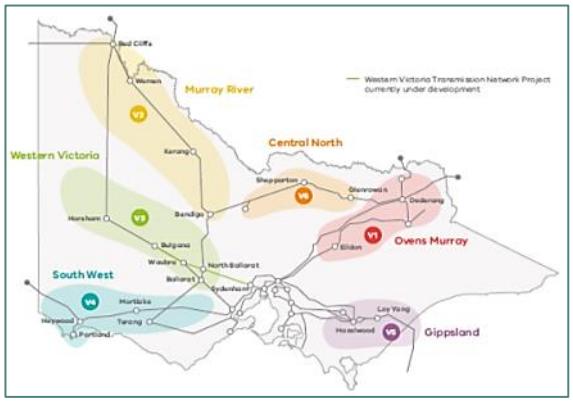
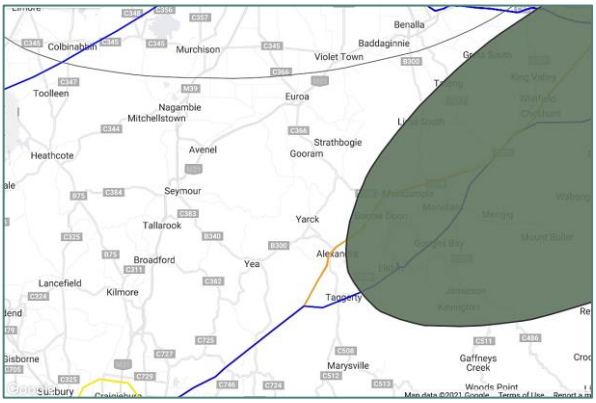


Figure 21: REZ Ovens Murray close to Yea



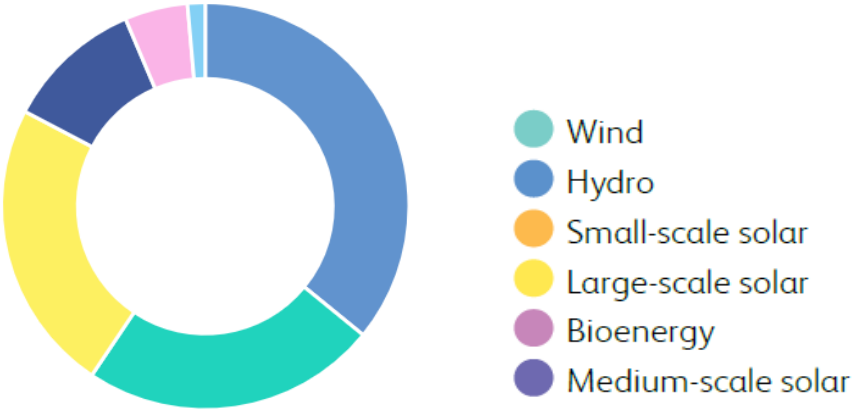
Source: Remplan. https://www.renewableenergyroadmap.com.au/

[22] AusNet, 2020. Distribution Annual Planning Report
[23] Renew Economy, 2021. https://reneweconomy.com.au/victoria-creates-new-body-to-modernise-grid-for-wind-and-solar-transition/
[24] DELWP, 2021. Victorian Renewable Energy Zones Development Plan Directions Paper

8. Technology options

In 2019, renewable energy provided for 24% of Australia's total electricity generation, while wind, hydro and solar PV were the dominant technology options in progressing our country towards a clean electricity system (Figure 22). However, clean energy technology options are quite diverse and also include storage as the critical link between renewables and a reliable, affordable energy future.

Figure 22: Renewable generation by technology type



Source: Clean Energy Council 2020.

As previously mentioned, the Yea area has significant natural resources and some established infrastructure supportive of CE options. However not every technology option might be suitable in the Yea context or it will require significant effort, organisational networks and financial resources that will make it potentially unfeasible and / or have an impact on the timeline. This section provides a brief overview of renewable energy and storage technologies and a high level assessment of their potential in the Yea context. The criteria for assessing the technology options are:

- **Speed of implementation** refers to time required for implementing a local project with the respective technology. Since 2030Yea wants to achieve 100% renewable electricity within less than 10 years, speed of implementation is a key assessment criteria.
  Low speed – Medium speed – High speed

- **Feasibility** refers to the technology's suitability with regard to the local context, and its potential to support achieving the 100% renewable electricity target.
  Low – Moderate – High

Table 5: Assessment of Renewable Energy Technologies in Yea

TECHNOLOGY	ASSESSMENT (why / why not this is a timely and feasible option for Yea)	IN A NUTSHELL
SOLAR PV – ROOFTOP	Installing more rooftop solar PV systems in town could be done relatively quickly e.g. through a community bulk-buy and information campaign. In addition, business and commercially owned buildings may provide larger roof space. Although Yea has some great solar resources, there is a well established solar industry, and high penetrations are technically achievable, the option to achieve 100% RE through solar PV rooftop is a moderately feasible option. Solar PV is only produced during the day and the rooftop potential is limited in Yea. In combination with batteries the feasibility of this option could increase.	**Speed: high** **Feasibility: moderate**
SOLAR PV – MEDIUM TO LARGE SCALE	Limited rooftop space makes mid to large-scale solar PV a highly feasible option for Yea. Solar PV already benefits from relatively low cost and experience, with a number of medium-sized and a growing number of large-scale projects in operation. A single large scale 60MW solar farm, would generate about 110GWh per annum – which would meet the Yea area's electricity demand multiple times. Although building a solar farm used to be much quicker than wind energy projects, the grid connection process, new rules (reliability) and regulatory uncertainy may delay medium to large-scale solar project implementation.	**Speed: medium** **Feasibility: high**
SMALL– SCALE WIND	Small-scale wind turbines usually with a capacity of 1–10kW can be a moderately feasible option for individual farms with sufficent wind resources at relatively low heights. However, assessing the potential for this technology at each farm is complex and hence can be a time-consuming process. This is also because unlike the solar industry, small-scale wind is less well established.	**Speed: slow** **Feasibility: moderate**
MEDIUM TO LARGE–SCALE WIND	Wind resources in the Yea postcode area are considerably good to very good. The Cherry Tree Wind Farm north-west of Yea indicates the feasibility to harvest wind resources in the area. However, land availability and opportunities to co-host wind turbines on farm land has to be separetely assessed. While the technology is a well-established industry in Australia, the development and implementation process can be time consuming, though this very much depends on the size of the wind farm and support from the local community. In addition, it needs to be located near transmission infrastructure to be able to export energy back into the electricity grid. Wind farms are already generating energy for regional towns in Australia as in Hepburn Shire.	**Speed: medium** **Feasibility: moderate to high**
MICRO HYDRO	Micro hydroelectric systems operate usually at around 5-100kW in scale and have a positive image. They are used to power homes, special community or tourist buildings or feed into the grid. The Yea river could provide opportunities for this established and simple technology. Micro hydro is considered to have lower impact on waterway flows and supported wildlife. The opportunities at the Yea river may be explored. However a individual site assessment has to be conducted and proximity to the grid considered. In addition, climate change and prolonged droughts will likely have an impact on water availability and the resultant electricity output. The cost of generation is expected to be higher than other technologies.	**Speed: medium** **Feasibility: moderate**
BIOENERGY	Energy generated from biomass particularly waste from agriculture, forestry and municipality processes is generally positively perceived. The agriculture	**Speed: medium**

	activities close to Yea and the estimated feedstock for the local government area indicate good potential for bioenergy generation. In particular, the waste streams from forestry activity and saw milling could offer good local sources. Although bioenergy is not yet a well-established industry in Australia,[25] there are bioenergy facilities in neighbouring shires while the interest in this technology is growing. Once operational, a 10MW Biomass Plant in Murrindindi Shire could generate gross annual revenue of $4.249 million and provide power for up to 14,118 homes. Depending on the type of feedstock, the feedstock-supply chain and size of the plant as well as the grid connection process, the implementation could take several years.	**Feasibility: moderate to high**
MICRO– / MINI–GRIDS	A microgrid can be defined as a group of homes and businesses who use, generate, and share electricity. It may be able to function both as part of the grid (also virtually as Virtual Power Plant), and autonomously (islanded). The great appeal of community microgrids is the ability to allow solar electricity and battery storage to be shared with the local community. However, the community benefits of the systems in regard to cost reduction or stabilising the grid has to be assessed on a case by case analysis. The development of a microgrid requires extensive community engagement (bring everyone on board – social license) and stakeholder involvement (e.g. AusNet, local businesses) while questions about ownership, risk appetite (e.g. financial consequences in case of damage) and local coordination (i.e. community grid operator) are just some of the many tricky aspects to solve. In addition, the regulatory environment still significantly constrains the ability to trade energy locally. Hence the process is very time consuming while the ultimate feasibility is not guaranteed (detailed cost analysis might indicate it is not worth it). This means, microgrids don't provide a viable long term strategy, since the outcome is uncertain.	**Speed: slow** **Feasibility: low**
BATTERIES INDIVIDUAL–LEVEL	Individual electricity storage – batteries usually in combination with solar PV – has received some great attention recently, motivated by the idea of self-sufficiency from the grid. Although the actual feasibility depends on the application and context, household level batteries can provide some high utilisation (e.g. 80-90%) of on-site solar generation with the grid being used as a back-up during low generation periods (e.g. winter). The costs of combined systems are still quite high - batteries cost at about $1,000/kWh (fully installed). Due to the increasing interest, as well as declining lithium-ion battery prices, increasing solar PV installations and increasing adoption of electric vehicles the battery market is growing. The network constraints around Yea also indicate a favourable situation for introducing battery storage, while additional storage could help to balance the load and reduce the potential need for punitive solar export limiting if more solar PV systems are installed.	**Speed: high** **Feasibility: high**
BATTERIES COMMUNITY–LEVEL	There is growing appetite for community batteries in Australia, with several trial projects underway. The interest is fueled by the opportunity that battery storage at scale (100kW-5MW) offers benefits over household batteries, including lower costs and increased ability to integrate more solar PV energy generation into the distribution network. A cost benefit analysis by ANU finds that thirdparty owned community battery models are likely to be financially viable, under current energy and market prices. However to ensure the future economic viability of these models, payments for the network services they	**Speed: medium** **Feasibility: moderate**

[25] KPMG, 2018. https://cdn.revolutionise.com.au/news/vabsvwo5pa8jnsgs.pdf

	provide need to be established. The calculation also includes discounted local energy transport price and would result in an average cost per house of about $430 (based on 200 houses for one year).[26] Key challenges yet remain, since community battery models are still very new and only trial projects are underway (e.g. Ausgrid[27]). Ausnet through its commercial arm, Mondo has a trial project just commencing in Yea area Project Edge. One of the key issues is setting up a collaboration and coordinating with Distribution Network Service Providers (AusNet)[28] and respective retailers, who have to see the benefit in a community battery. In addition, community batteries (if not part of an islanded microgrid – see issues above) will typically be located in front of the meter – which means they are grid connected and hence are required to pay network charges that could have an impact on the financial viability.[29] Finally, the current regulatory environment poses the risk for increasing inequalities by giving solar customers a disproportionate advantage. Yet, the Yea community survey particularly emphasised the importance of fairness and inclusivity of a community energy option. In achieving 2030Yea's target, a community battery could be part of a range of options, however the uncertainty, regulatory challenges and effort required make it only a moderately feasible strategy.	

Other technology options are too premature (e.g geothermal) or cost intensive (e.g. pumped hydro) and hence don't constitute a feasible option for Yea. However, there are further technology options the Yea community should consider on their pathway to 100% renewable electricity. They are described below.

Import or purchase renewable electricity (green power)

Australia is endowed with abundant renewable energy sources and many renewable energy projects operate across the country. In fact, WWF is calling on Australia to become a clean energy superpower, while there are hundreds of large-scale projects implemented as well as in the pipeline.[30]

The Victorian Budget 2020 / 21 will invest an unprecedented $1.6 billion to create renewable energy hubs across the state, improve crucial grid infrastructure, decarbonise our energy system and support more Solar Homes – the largest investment in clean energy of any state, ever.[31] Hence achieving 100% renewable electricity supply in Yea could also consider purchase from these existing or planned renewable energy projects. Renewable electricity is

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[26] ANU, Battery Storage and Grid Integration Program, 2020. Community batteries: a cost/benefit analysis

[27] Ausgrid has tested its first community battery project in Sydney, allowing its customers who register to participate in the scheme to virtually store up to 10kWh of excess solar energy per day, which will then be credited against their daily electricity use. https://www.energy-storage.news/news/electricity-distributor-ausgrid-launches-first-community-battery-project-in

[28] AusNet Services owns and operates Victoria's electricity transmission network, in addition to separate electricity and gas distribution networks in Victoria. The transmission network covers an area of approximately 227,600 square kilometres and serving a population of over 5.9 million people, or more than 2.1 million households and businesses.

[29] ANU, Battery Storage and Grid Integration Program, 2020. Implementing community-scale batteries

[30] WWF, 2020. Renewables Nation

[31] Premier of Victoria, Hon. Daniel Andrews, 2020. Making Victoria A Renewable Energy Powerhouse

accredited through the government's GreenPower Program[32] which meets stringent environmental standards and can be purchased through a direct agreement with a retailer by choosing GreenPower. Hence Yea could reach 100% renewable electricity if every business, household and institution in Yea chose to purchase 100% GreenPower through their electricity retailer, or through a group purchase of renewable energy through the local electricity supply.

Energy efficiency and behaviour change

As the Yea community survey has indicated there is also an appetite for increasing energy literacy and conducting energy efficiency measures. Indeed, reducing the electricity demand plays an important role in the transition of the energy system. It could be a vital step for the Yea community to reduce its electricity consumption and hence make it easier to match the existing electricity demand with local generation and/ or electricity purchase.

It is commonly understood that older appliances such as TV screens and fridges consume a substantial amount of electricity. In fact, the older the electrical appliances the more electricity they consume, constituting a significant share of household consumption (up to 35%). This presents a large opportunity to replace or upgrade old appliances such as fridges. Measures such as the Minimum Energy Performance Standards (MEPS) and Energy Labelling, help to guide improvement in energy efficient appliances. Another huge usage of residential energy is hot water heating. Although hot water systems can also be powered by gas and wood, highly inefficient electric storage hot water systems are still a very common in Victoria. Hence making people aware of these “power guzzlers”, and encouraging their replacement with a heat pump hot water unit or connecting them to solar PV, would provide huge electricity and emission reductions. There is also great potential in upgrading lighting to reduce electricity use, particularly for non-residential uses. Highly efficient LED lights for example, use approximately one-fifth the energy of a halogen downlight. Replacing old bulbs is a simple and effective energy-saving measure. In addition, increased energy literacy could also contribute to a reduction in electricity consumption. For example, simply switching off lights in rooms not used, or setting air-conditioner thermostats at 25 degrees for cooling and 21 for heating, can make a difference. However, to save electricity, impact comes with quantity and the number of households participating. Community education programs to increase electricity literacy provide a twofold benefit: on the one hand engaging the community in education and behaviour change and on the other hand contributing to the community’s 100% target.

9. Community energy models

A key motivation for community energy groups is the social dimension and in particular the aspect of “fairness” and sharing the benefits of renewable energy with all of their local community members. Indeed, the Yea community has emphasised through the survey their genuine preference for local energy solutions with inherent values of sharing, inclusiveness, increasing local resilience and affordablity to ensure everyone can participate (Figures 7, 8, 9). With the desire to reach 100% renewable energy as fast as possible, there might be a risk to overlook the aspect of “fairness”. We believe that an assessment of energy models should also bring awareness about who benefits and who is burdened by the decision about the future pathway. Project choices must be justified not only in terms of climate mitigation, but also in

[32] NSW DPIE, 2021. GreenPower

terms of their fairness to those already disadvantaged. In this sense, addressing questions of justice is paramount and also plays a role in determining social acceptance for local energy initiatives. Hence we propose to apply the same criteria as in the previous technology assessment but have included an additional criteria of **desirability and fairness** for the following community energy model assessment (shown below). We also consider *feasibility* here in regard to the potential of the initiative to directly generate a low, medium or high amount of renewable energy or energy savings and so ultimately support 2030Yea's target.

- **Desirability and fairness** refers to the potential of the initiative to address community interest and ensure inclusivity for vulnerable groups

  Low - little to no capacity to equally include disadvantaged groups
  Medium - some capacity to include disadvantaged groups)
  High - great potential to include a broad audience incl. disadvantaged and marginalised groups

Table 6: Community Energy Options Assessment

Models	Projects	Short Description	Summary assessment
Donation model	Small-scale crowdfunded projects	Small-scale renewabe energy projects e.g. rooftop solar PV enabled through community donations helping the host (e.g. Pottery Studio/ Men's Shed, or Pioneer Reserve) to save on its electricity bill.	**Speed: high** **Feasibily (kW impact): low** **Desirability: low to high, depending on the beneficiaries of the technology system (local pub versus local men's shed or community centre)**
	Revolving fund	Funds raised are not used for a single renewable energy or energy efficiency project, but to provide zero interest loans to non-profit organisations and/or businesses.[33]	**Speed: medium to high, can draw on existing experience e.g. Corena** **Feasibily (kW impact): medium, though depending on the lifetime – the sum of all projects could have a significant impact** **Desirability: medium to high, depending on the design**
Aggregated household model	Bulk-buy projects • Solar PV incl. batteries • Energy efficiency	Aggregate power of community buyers to purchase (a) product(s) at a discounted price. These products range from solar panels to batteries, as well as energy efficiency solar hot water systems.	**Speed: high** **Feasibily (kW impact): medium to high** **Desirability: low social inclusiveness due to the required capital and individual application**

[33] From May 2021, Solar for Business rebates will cover up to 50 per cent of the cost of a rooftop solar system with small businesses eligible for a rebate of up to $3,500. - https://www.solar.vic.gov.au/solar-small-business

	Solar Gardens	A solar garden is a centralised solar array that offers consumers the opportunity to purchase or lease solar panels with the electricity generated credited to the customer's energy bill.	**Speed: low, due to the complexity of the regulatory environment and stakeholder involvement** **Feasibily (kW impact): medium to high, depending on the size of the solar farm** **Desirability: low, due to the small number of apartment dwellers / renters in Yea, however can provide high inclusivity more generally if the implementation includes options for low-income households**
	Education and events	Info-sessions, individual consultations and home energy assessments as well as workshops on the latest clean technology updates. 2030Yea Inc are in the process of providing these activities through the DELWP Community Mini grant award in 2020 for Climate Adaptation in Yea and through the six renewable and climate adaptation presentations at the Yea Library starting April 8, 2021.	**Speed: medium to high** **Feasibily (kW impact): medium, though depends on the design of the initiative and the participation of the community** **Desirability: medium to high if requirements of particular vulnerable groups are considered and addressed**
Investment model	Renewable energy generation at medium scale or community batteries	Community initiated renewable energy projects that are funded by community investors, on the expectation that these investors will receive a certain return on their investment.	**Speed: medium to high** **Feasibily (kW impact): low to medium, but can be high depending on the size of the project** **Desirability: low to medium**
Partnership models	Council-community partnership	Community collaboration with council to initiate, invest and implement local renewable energy generation projects on council property (ies).	**Speed: low to medium considering the capacities in Murrindindi Shire Council** **Feasibility (kW impact): high, if council provides suitable land or facilitates partnership with land holders** **Desirability: medium, depending on the design of the initiative**
	Developer-community partnerships	Co-ownership model with community investment and/ or benefit sharing programs	**Speed: low to medium because of identifying host sites, partnership set up etc.** **Feasibility (kW impact): high** **Desirability: high, if the developer supports both co-ownership and local benefit sharing program to include all community members**

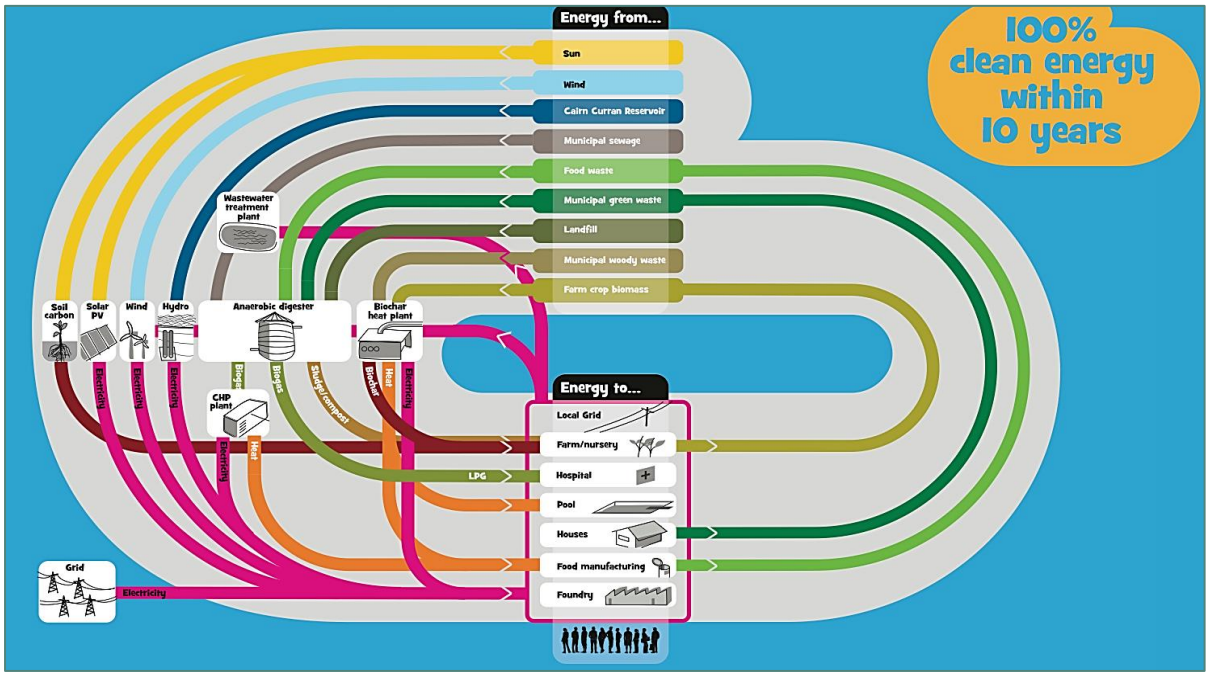
	Distribution Network Service Provider Partnership	Trial project for community battery	**Speed: unknown appetite of local DNSP** **Feasibility (kW impact): high** **Desirability: low to medium, depending on the design of the program**

Ultimately, the potential of each initiative to address the above criteria depends on its design and implementation. These criteria should be considered as guidance for further discussions and when considering the recommendations suggested in the following section. Reaching the target of 100% renewable energy by 2030 may require a number of community energy options and can be achieved through different pathways. In the following section we provide a discussion of the previous assessments and recommend options for 2030Yea to explore in order for it to achieve its vision.

10. Discussion and recommendations

The aim of 2030Yea is to reach 100% renewable energy by 2030. This will require the community to reduce and match its local electricity needs with a 100% renewable electricity supply over the next decade. Communities on the pathway to 100% renewable energy usually consider a mixture of technologies, energy efficiency measures and green power purchase from operating systems. For example, the Mount Alexander Sustainability Group considers a broad range of initiatives and projects to reach their target within the next 10 years in their Shire (Figure 23). They collaborate with Council and other local organisations to implement their strategy.

Figure 23: Achieving 100% renewable energy by 2025 in the Mount Alexander Shire by the Mount Alexander Sustainability Group



Source: MASG.org.au

The assessments of renewable energy technologies and community energy models undertaken in sections 8 and 9 indicate that there are a variety of ways that 2030Yea might achieve this aim, whilst the community survey results (section 5) also provide important context to any proposed next steps.

The technology assessment highlights that solar PV is one of the most viable technology options for the Yea area. Rooftop solar PV and mid to large-scale solar farms are assessed to be good renewable energy options and each of these were also popular amongst respondents to the community survey. Individual household batteries were also considered to be a worthwhile technology option, however they may be cost prohibitive for many community members. Despite great interest in the community around microgrids and community-scale batteries, these options were assessed to be far less viable. Mid to large-scale wind and bioenergy technologies showed moderate to high feasibility in the assessment, however there appears to be little appetite for these options within the community survey data.

The community energy model assessment shows that there is no single project or business model that can satisfy the various needs and desires of the Yea community, when aiming to achieve 100% renewable energy. Each model shows individual strengths and weaknesses, with the donation model highlighting the potential benefit of a revolving fund, whereas the aggregated household model indicates there would be gains made through bulk-buys and community education and events. However, each of these is fraught with challenges around inclusivity, and like in the establishment of investment-based projects, great attention would need to be paid to ensuring that the whole community was given opportunity to participate in the chosen initiative from the outset. The partnership model rated well in terms of inclusivity and impact, whether with Council or a corporate partner, however often these projects can take significant time to action.

Given the outcome of these assessments, the community survey and based on the research presented here, CPA recommend that 2030Yea adopt a multi-faceted approach to their community energy plans and consider the following most promising options to achieve their vision.

Short term strategy

1. Rooftop solar and batteries

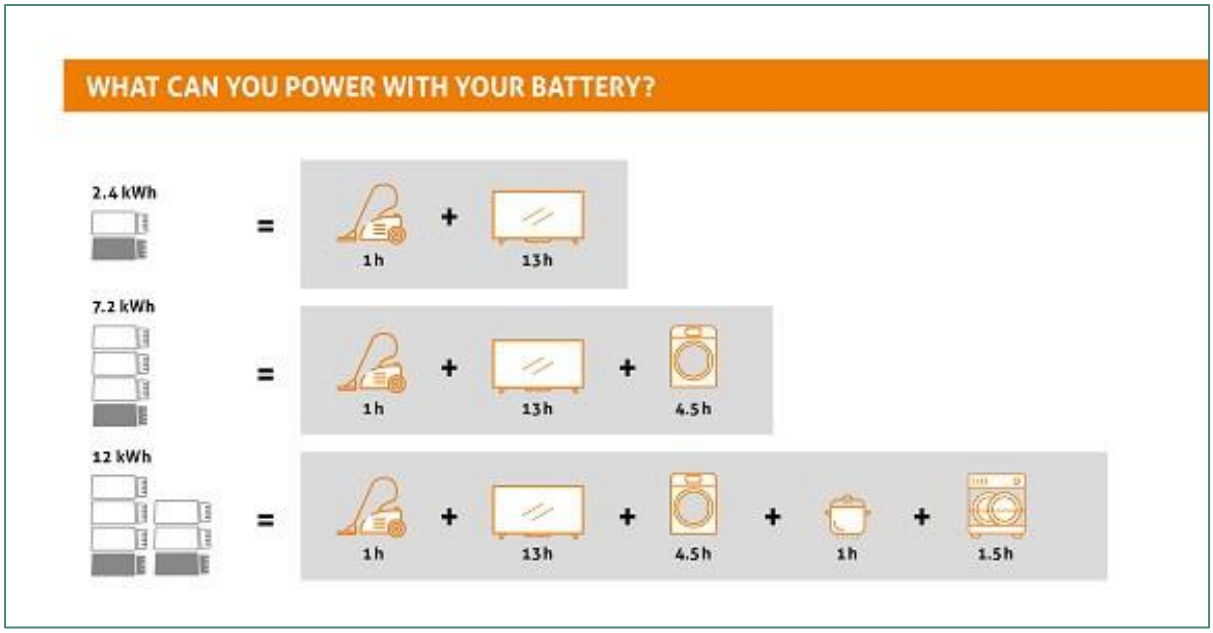
Yea has a current penetration of 35% solar PV across town. While the roof space is limited and not all properties might be suitable or available to install panels, we recommend to aim for dramatically increasing the solar PV penetration to at least 50% across Yea township and surrounding communities in the immediate future. Potential local network constraints will make it advisable to also include storage opportunities in form of small-scale batteries. A battery capacity of 4 to 8 kWh is usually sufficient for an average four-person home consuming around 4,500 kilowatt-hours (kWh) annually (see also Figure 24).

A bulk-buy initiative would be a suitable engagement option to support the local community in the process of increasing renewable energy generation and use. Since Murrindindi Shire and its local communities already have an experience of solar bulk-buys, another call-out or extension of the previous initiative could be a great way of progressing towards the 100%

renewable target. The current Solar Homes[34] program being offered by the Victorian Government also presents a real incentive for households to install solar and batteries, with rebates continuing to be available for both technologies until the end of June 2021.

However, not every community member might be able to participate in a bulk-buy initiative due to lack of capital and additional steps should be taken to ensure low-income households are not excluded. In this instance, a partnership with Murrindindi Shire Council where the council adopts a similar approach to the City of Darebin's successful Solar Savers[35] program could be a solution. This program has been progressively rolled out across a further 20 Victorian municipalities over the past two years, piloting the use of council special rates charges to fund solar installations for vulnerable residents at 0% interest, with households paying off the cost of their solar system through their rates notice. A second pilot is offering households a special low interest loan provided by a private sector finance provider. A bulk-buy that integrates such measures would take time to implement, therefore it is suggested efforts be made to establish a bulk-buy program as soon as possible to take advantage of current rebates and add these elements over time as the partnership with Council is developed and the business case approved.

Figure 24: Battery size or capacity should meet residential consumption demand



Source: Solarwatt, 2021.

[34] Solar Victoria, 2021. Solar Homes
[35] Central Victorian Greenhouse Alliance, 2021. Solar Savers

2. Energy efficiency

A crucial, yet often overlooked strategy in the energy transition is the reduction of electricity demand. Energy efficiency measures including education, appliance replacement and long-term behaviour change can help to reduce electricity usage and costs. Raising community awareness of opportunities to reduce their electricity consumption is also an important step to get people onboard with the 100% renewable electricity challenge. 2030Yea is making excellent headway in this regard with its upcoming series of renewable energy workshops delivered in partnership with Murrindindi Shire Council at Yea library. However converting these events and education into action could be supported by 2030Yea establishing an energy efficiency program providing energy assessments and audits. This could include a bulk-buy changeover program that seeks to swap inefficient electric storage hot water systems for electric heat pumps or solar hot water. The Solar Homes program also offers rebates for such replacements which could support the uptake of this. Energy audits could be undertaken for individual households and organisations e.g. schools, to identify energy savings and estimate the costs and benefits of energy efficiency improvements. There are numerous tools and training options available to upskill 2030Yea members to undertake audits, including Ecologic[36] and Boom Power[37], and there is a strong culture within local governments of supporting and even funding home energy audit programs. Incentives such as prizes and rewards can assist in uptake. A community competition similar to the Flag Program in Heyfield[38] could be initiated to identify households which save the most electricity during a specified period of time (18 months) and acknowledge their success.

3. Green power purchase

An additional short term strategy to achieve 100% renewable energy is to consider purchasing renewable energy from other regions, rather than generating it on-site or nearby. This would involve all (or a significant share of) community members in either switching energy retailers or specifically requesting green power from their existing one.

Although the large retailers AGL, Origin and Energy Australia are gradually getting greener, they continue to control over 80% of the market and are heavily invested in generating electricity from brown coal. But there are green options! According to the Green Electricity Guide, Victoria has the greatest choice of green energy retailers. The two highest ranked retailers in this guide, Powershop and Diamond Energy, are based in Victoria. Other green options include the companies Momentum Energy and Red Energy, which source large amounts of their power from hydro power. [39] Energy Locals is another emerging local electricity retailer who has been awarded as Green Energy Retailer of the Year 2020 by finder.com.au.[40] Energy Locals provides some key electricity retail services to Indigo Power which enables them to offer their services to local customers e.g. the billing and payment systems.[41]

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[36] https://www.getecologic.com/
[37] https://www.boompower.com.au/
[38] ABC, 2010. https://www.abc.net.au/local/photos/2010/10/19/3042494.htm?site=&xml=3042494-mediarss.xml
[39] TEC and Greenpeace, 2021. Green Electricity Guide
[40] https://energylocals.com.au/
[41] https://indigopower.com.au/about-us/#faqpart

Yea2030 could approach these smaller retailers to negotiate a group purchase of 100% renewable energy and hence receive a competitive price with existing household contracts. This could lead to a partnership campaign with the retailer to sign up residents and businesses to an accredited GreenPower source.

Long term strategy

4. Community medium-scale renewable energy project

The development of a medium-scale renewable energy project could be a long term strategy for 2030Yea in order to achieve their target. For example a single medium-scale 15MW solar farm (i.e. the size of the Sunshine Coast Solar Farm), generates enough electricity to power 5,000 homes per year.[42] Since solar PV enjoys a highly positive perception, a community-owned solar farm could receive strong support from the local community.

A first step for Yea2030 could be to seek out landholders in the area to investigate the option of hosting a solar farm of an appropriate size – whereby grid connection opportunities will need to be considered. However, setting up a solar farm requires a good understanding of the technical and business requirements. Therefore, it is advisable to seek close collaboration with either Council or a solar developer to support this process. A partnership with other community energy groups in the region for a joint project might also be a useful strategy. The North East Community Energy Network (NECEN), made up of 17 community energy groups from across north-east Victoria including 2030Yea, would be an excellent starting point for exploring partnerships. The Goulburn Broken Greenhouse Alliance of local governments could also present some interesting potential partners or land lease options.

Some final remarks

It is suggested that before embarking on any of the above mentioned recommendations it is crucial to determine whether the community embraces the ideas and is willing to participate. Critical to uptake of any initiative is the capacity of 2030Yea to present a clear vision and identify both community and individual participant benefit. In addition, visibility of 'quick wins' and action from community leaders such as Council and local business identities will be important. The following steps are advised:

- Firm up 2030Yea's target and define the boundaries for what you want to achieve
- Continue to bring the Yea community along and develop a firm shared vision with the community determining the purpose, motivations and local risk appetite
- Intensive community engagement with education measures and local events to make yourself known and create visibility about your goals and ideas
- Build on stakeholder mapping already completed and initiate one on one meetings with significant stakeholders in town to identify other local champions
- Make a detailed plan for implementing any of the above recommendations

[42] Sunshine Coast Council, 2021. https://www.sunshinecoast.qld.gov.au/Environment/Sunshine-Coast-Solar-Farm/Solar-Farm-Overview

The recommendations should be considered as guidelines, and while these are important, it is also necessary for 2030Yea to be flexible enough to respond to changing circumstances and emerging opportunities. The group has already made excellent progress and with further collaboration with the local community and the building a shared vision for a sustainable energy future, the town could position itself as one of the leading communities in Victoria.

Annex:

Community Survey

community power agency

2030Yea: Transitioning to 100% Renewables

2030Yea is a group of volunteers from Yea and surrounds dedicated to the goal of the township of Yea totally operating on renewable energy by 2030.

The vision of the group is to ensure Yea has totally renewable electricity sources by 2030. We are currently in the stage of gathering community interest and input. We hope to use this information to help us to develop locally relevant plans and projects that will help us to achieve our goal.

We appreciate the time that you are able to contribute to our plans by completing this survey. Survey results will form the basis of the next steps for our group. Results will be available on our website and emailed to our member list after the survey closes in early March.

This survey will take approximately 10 minutes to complete.

For more information about 2030Yea, to contact us or to join our group, go to www.2030yea.com

2030YEA COMMUNITY ENERGY

1. Are you responding to this survey as: (select one)	
A local resident	☐
A regular visitor or holiday home owner	☐
On behalf of a local business or organisation	☐

2. Do you live/work:	
In Yea township	☐
Close to Yea township (within 3km of town boundary)	☐
In or close to a neighbouring town	☐
Other:	

3. What are the first three words that come to mind when thinking about community renewable energy in the Yea region?
1.
2.
3.

4. What renewable energy technologies would you like to see being used in the Yea region? (rank 1-7; 1 is highest preference)	1	2	3	4	5	6	7
Rooftop solar PV for homes/ business	☐	☐	☐	☐	☐	☐	☐
Solar farms	☐	☐	☐	☐	☐	☐	☐
Wind energy	☐	☐	☐	☐	☐	☐	☐
Hydropower – using water	☐	☐	☐	☐	☐	☐	☐
Bioenergy – using organic matter such as agricultural crops or animal waste	☐	☐	☐	☐	☐	☐	☐
Residential/ business batteries	☐	☐	☐	☐	☐	☐	☐
Micro-grids – where energy is locally generated, shared/ consumed and stored in community batteries	☐	☐	☐	☐	☐	☐	☐

5. Assuming it is technically feasible and cost-effective for Yea to become powered by renewable energy, when would you like to see this target reached?	
2030	☐
2050	☐
Other:	

6. How important do you believe it is to produce and use the energy in or close to our region?	
Extremely important	☐
Very important	☐
Somewhat important	☐
Not so important	☐
Not at all important	☐

7. Please rank the following statements in order of your preferred future: (rank 1-7; 1 is highest preference)	1	2	3	4	5	6	7
Households and businesses generate and use their own power	☐	☐	☐	☐	☐	☐	☐
People share/trade energy with one another across a network	☐	☐	☐	☐	☐	☐	☐
The local community owns renewable energy generation	☐	☐	☐	☐	☐	☐	☐
Low-income households can benefit from renewable energy programs	☐	☐	☐	☐	☐	☐	☐
Large power plants supply electricity to everyone across the state	☐	☐	☐	☐	☐	☐	☐
Yea is as energy efficient as possible	☐	☐	☐	☐	☐	☐	☐
A hybrid system containing all of the features above	☐	☐	☐	☐	☐	☐	☐

8. If new renewable energy generation projects were to be proposed in Yea, how important do you think it is that the project delivers the following:	Very important	Important	Neutral	Not important	Do not know
Local employment opportunities and support for local businesses	☐	☐	☐	☐	☐
Opportunities for the community to have input/ invest in and/ or own the project	☐	☐	☐	☐	☐
Reductions in pollution, helping to address climate change	☐	☐	☐	☐	☐
Local training and energy education opportunities	☐	☐	☐	☐	☐
More affordable electricity for all	☐	☐	☐	☐	☐
Greater community control over electricity supply	☐	☐	☐	☐	☐
Increases in the reliability and efficiency of electricity supply	☐	☐	☐	☐	☐
Greater regional sustainability and resilience	☐	☐	☐	☐	☐
Regional economic development	☐	☐	☐	☐	☐

9. Please rate your interest in the following renewable energy initiatives:	Extremely interested	Very interested	Somewhat interested	Not so interested	Not at all interested
Hosting renewable energy - solar, wind, bioenergy, hydropower, other	☐	☐	☐	☐	☐
Investing in local renewable energy facilities/projects	☐	☐	☐	☐	☐
Purchasing local renewable (green) energy	☐	☐	☐	☐	☐
Purchasing heat pump hot water systems and other energy efficient devices through bulk buys	☐	☐	☐	☐	☐
Learning more about renewable energy & energy efficiency	☐	☐	☐	☐	☐
Participating in energy/thermal efficiency programs to lower your energy bills	☐	☐	☐	☐	☐
Participating in a local micro-grid or energy sharing program	☐	☐	☐	☐	☐
Hosting renewable energy - solar, wind, bioenergy, hydropower, other	☐	☐	☐	☐	☐
Investing in local renewable energy facilities/projects	☐	☐	☐	☐	☐

10. Would you like to stay updated about the plans of 2030Yea? Your details will be added to our (low volume) email member list. You will receive notice of future opportunities to provide input and feedback, and sharing the outcomes of this process. If yes, please provide your email below:
Email:

Thank you so much for your time!