Submission to Government Administration Committee Inquiry into energy prices in Tasmania

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About RE-Alliance

RE-Alliance is working to secure an energy transformation that delivers long-term benefits and prosperity for regional Australia. We do this by listening to the needs of communities most impacted by the transition, facilitating collaboration across the renewables industry to deliver social outcomes and advocating for meaningful benefits for regions at a policy level.

RE-Alliance operates across Australia's eastern seaboard - from northern Queensland to north-west Tasmania. We play a unique role, as allies of and advocates for renewable energy host communities and assisting renewable energy developers seeking to deliver best practice community engagement, community funds and to build social licence. We are recognised as a leading voice on community engagement and social licence in Australia.

RE-Alliance is actively engaged in community engagement and environment issues associated with renewable energy and transmission projects, in nominated and designated Renewable Energy Zone (REZ) regions. We are actively engaged in and represented across Tasmania, particular in the North West of the state and with communities across the North West Renewable Energy Zone.

Below we respond to the key questions which the Government Administration Committee A has set in its terms of reference for the inquiry. Our comments draw from experience in Tasmania and other Australian states and are informed by on the ground perspectives.

Comments in response to the Inquiry's Terms of Reference

(1) Factors that impact energy prices for Tasmanian household and small and medium business customers, with particular reference to energy generation, distribution and retail costs

We note that Tasmania's Renewables, Climate and Future Industries (RECFIT) agency's best case scenario in the renewable energy action plan[1] predicts that a 200% Tasmanian Renewable Energy Target will reduce energy costs in Tasmania. Under the worst-case scenario, the agency says the 200% target could increase costs. Clearly there are a number of factors that would drive the good and bad outcomes. In essence, though, delays that increase reliance on gas and diesel add significant costs and expose Tasmanians to a potential energy deficit in future. Whereas, enabling more renewable energy, improving energy resilience and empowering communities (eg. through increased access to solar) will reduce the risk of spiralling fossil fuel linked costs for Tasmanians. We note that Tasmania is already short on renewable generation for industrial growth - demand for spare capacity outstrips supply, so companies like Norske Skog cannot decarbonise at the pace desired without more generation becoming available.[2]

We have commented on some of these issues below:

Transmission

In relation to the energy transition, there is a link between the impact of transmission project delays on future energy prices. These delays will affect consumers - whether on residential, business or industrial rates. We refer the Committee to the following key resources that go into more detail on these issues.

- Nexa Advisory - Removing Transmission Roadblocks discussion paper[3]
- Endgame Economics - Modelling electricity bill impact of transmission project delays[4]

Interconnectors

In a power system that is highly reliant (such as Tasmania and South Australia), or increasingly reliant (such as Victoria, NSW, Queensland and WA) on renewable energy sources, interconnectors and flexible storage (like pumped hydro) play key roles.[5] While Basslink was key to Tasmania's price stability and energy resilience for years, its failure coinciding with low rainfall exposed the risk of one single connection on power prices and on energy resilience. Interconnectors – plural – ensure energy resilience and are a key enabler of lower consumer costs. For these reasons, and the opportunity that increased renewable generation from Tasmania presents for clean industry developments, regional developments and benefit sharing, RE-Alliance supports the Marinus Link project.

Generation

Renewables technologies are consistently and demonstrably cheaper than fossil-fuel alternatives.[6] They also do not rely on fluctuating commodity prices and ongoing risks from supply-chain concerns which have plagued fossil coal, oil and gas supplies in recent years. Tasmania is in a good position given the existing, extensive hydro resources and has some of

[1] https://recfit.tas.gov.au/__data/assets/pdf_file/0012/313041/Tasmanian_Renewable_Energy_Action_Plan_December_2020.pdf
[2] https://www.abc.net.au/news/2023-08-10/tas-labor-pamphlet-mimics-power-bill-to-target-rockliff-liberals/102707914
https://www.amwu.org.au/tasmanian_energy_crisis
[3] https://nexaadvisory.com.au/site/wp-content/uploads/2022/04/Removing-transmission-roadblocks-discussion-paper-080422.pdf
[4] https://nexaadvisory.com.au/site/wp-content/uploads/2022/06/Report-Modelling-Electricity-bill-impact-due-to-transmission-delay_2022-06-07.pdf
[5] See for example: https://www.energycouncil.com.au/analysis/interconnectors-is-there-a-link-between-europe-and-australia/ and https://www.energycouncil.com.au/analysis/which-state-pays-for-interconnectors/
[6] https://www.csiro.au/en/research/technology-space/energy/energy-data-modelling/gencost

the best wind resources in the nation. Solar and battery storage are also highly viable options in many parts of Tasmania whether for utility, industrial or household scale.[7]

Consumer energy resources

In metro, regional and rural Australian communities, gaining some control over energy prices through rooftop solar and battery storage underpins our status as the world's rooftop PV leader.[8] Consumer adoption of solar is so high in the rest of the east-coast grid (known as the national electricity market, or NEM) that it is a key factor influencing the wholesale generation market price, as it pushes out the need for other sources during the day.[9]

Solar for many consumers who own it has changed the impact of power price rises on their cost of living. Tasmania's rooftop PV adoption is relatively small, but growing with an estimated +50,000 systems installed today ~ covering around 20% of dwellings.[10] Tasmania's solar feed in tariff currently pays 10.87c/kWh, lower than the generous 1:1 rate which applied from 2013-2019, but still comparatively good.

But rooftop solar isn't equally accessible for all. Solar ownership generally and battery ownership particularly are often out of reach for those most in need of the bill reduction, and / or impossible for renters to install. While some innovative approaches exist, there is simply no driver for landlords to install solar, or batteries on their investment properties, effectively limiting the options for renters to save on energy bills.[11] In public and social housing contexts, again there are some changes and some examples of innovation but a substantial cohort of existing buildings housing people on low-incomes where no investment is being made to upgrade or improve their thermal efficiency, let alone add solar.[12] And, while the Tasmanian government's energy saver loan scheme is a good initiative and offers no-interest loans of $500-10,000[13], this is likely to be inaccessible for many renters and those on low-incomes struggling with existing costs.

In the case of rural and regional households who may have a lot of space, and potential ability to invest in solar at their place and potentially use it to supply bigger power needs, there are limitations on how much the local grid will allow being installed and able to export (in Tasmania this is set at 10 kW per phase).[14] For larger systems, the connection and the buy-back (FiT) rate must be negotiated.[15] These issues are discussed further in our Farm Powered report (**attached**).

Our on the ground experience bears out that there is latent demand for more targeted incentives to enable regional and rural households and renters to access solar. Victoria's Solar Homes program includes a structured rebate and a no-interest loan for landlords and tenants. Legislative changes or program investment (or both) may be required, but the government should be mindful of evolving technologies and practices that ensure grid resilience and

[7] https://pv-map.apvi.org.au/live
[8] https://www.pv-magazine.com/2023/04/20/australia-paving-way-for-global-solar-energy-adoption/
[9] https://www.abc.net.au/news/2023-09-23/rooftop-solar-cannibalising-australian-power-market/102889710
[10] https://www.solarquotes.com.au/australia/solar-power-tas/.
[11] https://reneweconomy.com.au/low-income-and-disadvantaged-households-should-be-priority-for-clean-energy-68313/
[12] https://reneweconomy.com.au/low-income-and-disadvantaged-households-should-be-priority-for-clean-energy-68313/
[13] https://www.premier.tas.gov.au/site_resources_2015/additional_releases/energy-saver-loan-scheme-to-help-tasmanians-with-cost-of-living-pressures
[14] https://www.solarquotes.com.au/systems/feed-in-tariffs/tas/ & https://www.tasnetworks.com.au/solar-connections
[15] https://www.solarquotes.com.au/systems/feed-in-tariffs/tas/

consumer assets are managed and rewarded as key contributors to the operation of the energy system.

- **We strongly support more action to enable more Tasmanians to access financial incentives to install solar panels.**

(2) Opportunities and challenges for the State of Tasmania as owners of power generation and transmission infrastructure

Ongoing public ownership of energy infrastructure and additional private development of renewable energy sources presents a significant opportunity for Tasmania. It is crucial to acknowledge that renewables are the most cost-effective options for energy generation. Furthermore, technological developments continue to drive down the costs associated with renewable energy, which directly benefits consumers. Emphasising the development and utilisation of renewable sources is a key strategy in keeping energy prices manageable.

The Basslink debacle serves as a stark reminder of the vulnerability of Tasmania's energy infrastructure. Marinus, with its potential to shore up energy import/export resilience and capacity and secure energy supply to the state, is of paramount importance. It not only enhances energy security but also has the potential to lower consumer costs by ensuring a more reliable and affordable energy supply. The failure of the single Basslink interconnector between Tasmania and the mainland resulted in higher power prices for consumers and exposed the state's vulnerability to supply disruptions. The promotion of the Marinus Link project is essential to mitigate these risks and ensure a more reliable and cost-effective energy supply for Tasmanian households and businesses. Marinus Link is a key piece of infrastructure that can help prevent similar price impacts in the future.

Basslink Failure - Summary of impacts

- Increased Energy Costs
  The Basslink failure, which occurred in 2015-2016, resulted in a loss of the interconnection between Tasmania and the mainland Australian energy grid. This loss[16] limited Tasmania's ability to import cheaper electricity during periods of high demand. And, the failure coincided with climate change exacerbated dry spring with little rainfall meaning the normally reliable hydro assets were insufficient. As a result, Tasmania had to rely more on its local energy generation, augmented with more expensive gas and diesel power plants. [17] [18]
- Reduced Energy Resilience
  The loss of the Basslink connection made Tasmania's energy infrastructure less resilient. The state became more vulnerable to supply shortages, especially during extreme weather events or unexpected outages,[19] which could result in price spikes. Basslink - now owned by APA group[20] - remains Tasmania's key link to the NEM.
- Consumer Impact
  Consumers in Tasmania faced higher electricity prices due to the increased reliance on more expensive local fossil fuel generation. These higher prices affected both households and small to medium-sized businesses, leading to increased energy bills.

[16] The cause of failure was - eventually - found to be poor operational management that overheated the cable at times putting the reliance on imports/exports at serious risk which came to light when the single cable failed.
[17] https://reneweconomy.com.au/tasmanias-crazy-lurch-back-into-the-expensive-fossil-fuel-era-71550/
[18] https://reneweconomy.com.au/tasmania-bins-contract-with-basslink/
[19] https://www.abc.net.au/news/2019-06-02/hydro-tasmania-confirms-basslink-outage/11172028
[20] https://www.afr.com/companies/energy/apa-agrees-773m-deal-for-basslink-20221017-p5bqfl

Marinus - Opportunity, risk mitigation and resilience
To enhance Tasmania's energy security, and mitigate the risk from one cable failure, the Marinus Link project is vital. Marinus aims to establish a second, higher capacity interconnector between Tasmania and the mainland, reducing the state's dependence on a single connection and providing a more reliable energy supply.

- **Energy Resilience**
  Marinus Link will significantly enhance Tasmania's energy resilience by providing an additional, secure interconnection to the mainland grid. This reduces the risk of a single point of failure affecting energy supply and prices.
- **Lower Consumer Costs**
  With Marinus Link in place, Tasmania will have access to a more diverse range of energy sources, including affordable renewable energy from the mainland. This diversity can lead to lower consumer costs, as Tasmania can import cheaper electricity during periods of high demand or reduced local generation.
- **Stimulating Economic Growth**
  Marinus Link will also promote economic growth in Tasmania by creating jobs and supporting the development of renewable energy projects. It can lead to increased energy generation from renewable sources, which can contribute to stable and lower energy prices for consumers.

(3) Any other (incidental) matters

Under-served regions
Addressing energy accessibility in rural and regional communities is an incidental but critical concern. Extending energy infrastructure to these areas is vital to achieving energy equity. It's essential to explore innovative and cost-effective means to provide energy access to under-served regions.

Consumer-owned resources
The benefits of consumer-owned solar and shared battery solutions cannot be overstated. These initiatives are vital in promoting energy equity, as they empower consumers to take control of their energy costs. Encouraging the adoption of such solutions will contribute to a more balanced energy market.

Community empowerment and long-term benefit sharing
The energy transition brings with it a host of opportunities and challenges for local communities. Communities need support in the form of education and information so that they can be empowered to actively participate in shaping and benefitting from the energy transformation happening in their region.

While landholders gain, for renewable generation projects, there are questions over whether arrangements for transmission host landholders provide sufficient compensation. In the last 18 months, NSW, Victoria and Queensland have introduced additional compensation arrangements for transmission hosts and - in Queensland - near neighbours.

- **We would like to see Tasmania adopt a higher compensation structure for transmission hosts and – along the lines of Queensland – near neighbours.**

By involving, collaborating and co-designing with the community, we can go beyond one-dimensional consultation and shift to genuinely engaging communities in iterative, ongoing dialogue about local priorities, trade-offs and outcomes. Such a process was adopted by TasNetworks in developing a benefit sharing fund for the North-West Transmission Development project.[21] Indeed, directly involving and working with the local community on the approach to benefit sharing is good practice and is further explored in the RE-Alliance Community Benefit Sharing Handbook (**attached**).

Other ways that communities can engage and participate in the energy transition is through co-ownership, co-investment and other partnership arrangements such as equity offers.

- **The Tasmanian Government should direct RECFiT to provide legal and technical advice and/or support for renewable energy communities' ownership, co-ownership, co-investment and direct equity ownership.**

As the number of projects increases, it is critical that there is an appreciation of the consultation burden already being faced by communities managing the challenges of multiple projects in their region. RECFiT is - we understand - working to address this through a coordinated approach to regional benefit funds and we look forward to seeing the next steps here.

<u>No transition without transmission, and no transition without regional and rural communities</u>
Transmission design and delivery takes a long time to develop and Australia has spent decades talking about what we needed and not building any, until now. And now, we are doing this in parallel with a significant build of renewable energy generation in the same regional and rural areas. Less than optimal communication about why this is needed now and what the impacts will be is leading to concern within communities that are hosting or may host new energy infrastructure.

We see a very strong need for governments to recognise and support rural and regional Australia in dealing with and responding to the significant scale of infrastructure coming to them. Decisions that don't involve community input, or are experienced as a tick-box process create significant space for the unknown and unfamiliar to become the unwanted. This undermines all of the drivers for a just energy transition that delivers for consumers, the community and climate.

<u>Climate action needs renewable energy and transmission</u>
In general, to move energy generated from large wind, solar, pumped hydro, and energy storage facilities, we need additional capacity in transmission and/or new transmission lines to be built. For the most part - on land - these will be high voltage alternating current (HVAC), like the North West Transmission Development corridor (part of the Marinus Link project).[22] These overhead lines are faster to build and significantly cheaper. These components are key elements influencing the final cost of energy paid by consumers.

[21] https://www.tasnetworks.com.au/config/getattachment/0359ee42-c6e4-4753-a7a5-79374ccebd22/youth_panel_recommendations_brochure.pdf
[22] https://recfit.tas.gov.au/major_investment_projects/project_marinus

Fire risk and transmission

Electric sparks can ignite fires. In Australia, it is common for lightning strikes to start bushfires. The risk of fires being started by transmission lines is extremely low, and they are designed and managed to minimise these risks.[23]

In Australia, there have been no instances where transmission lines have caused a fire.[24] Of course, when bushfires do burn near to transmission lines, there are increased risks, but energy and emergency management agencies work hard to retard fire near to these assets and minimise the risk to ongoing power supply. We note that there have been fires started or exacerbated by Single Wire Earth Return lines in the distribution network - not transmission lines. Transmission lines, when managed and maintained properly, pose a very low risk of starting a fire. Transmission networks are unlikely to start or be damaged by fire because:

- Transmission lines are supported on tall towers (up to 80m high)
- The lines have dedicated easements (corridors) with an average width of 5Om, which allow access to private land in order to maintain infrastructure
- There is greater control of vegetation growing immediately underneath the lines, which reduces the risk of contact from trees and branches
- If transmission component failures do occur, they often occur in extreme weather events that are usually accompanied by rain (e.g. cyclones and thunderstorms)
- Individual transmission line conductors are separated by great distances and are not likely to clash during extreme weather events

The design of transmission lines and network assets is required to consider and address fire risk. Where lines are located in environments deemed to be high risk, additional measures must be put in place. These will likely include more frequent condition inspections and higher standards for asset and easement maintenance. Operationally, transmission companies apply asset management and maintenance practices to minimise risks and look after the transmission lines and surrounding easements.

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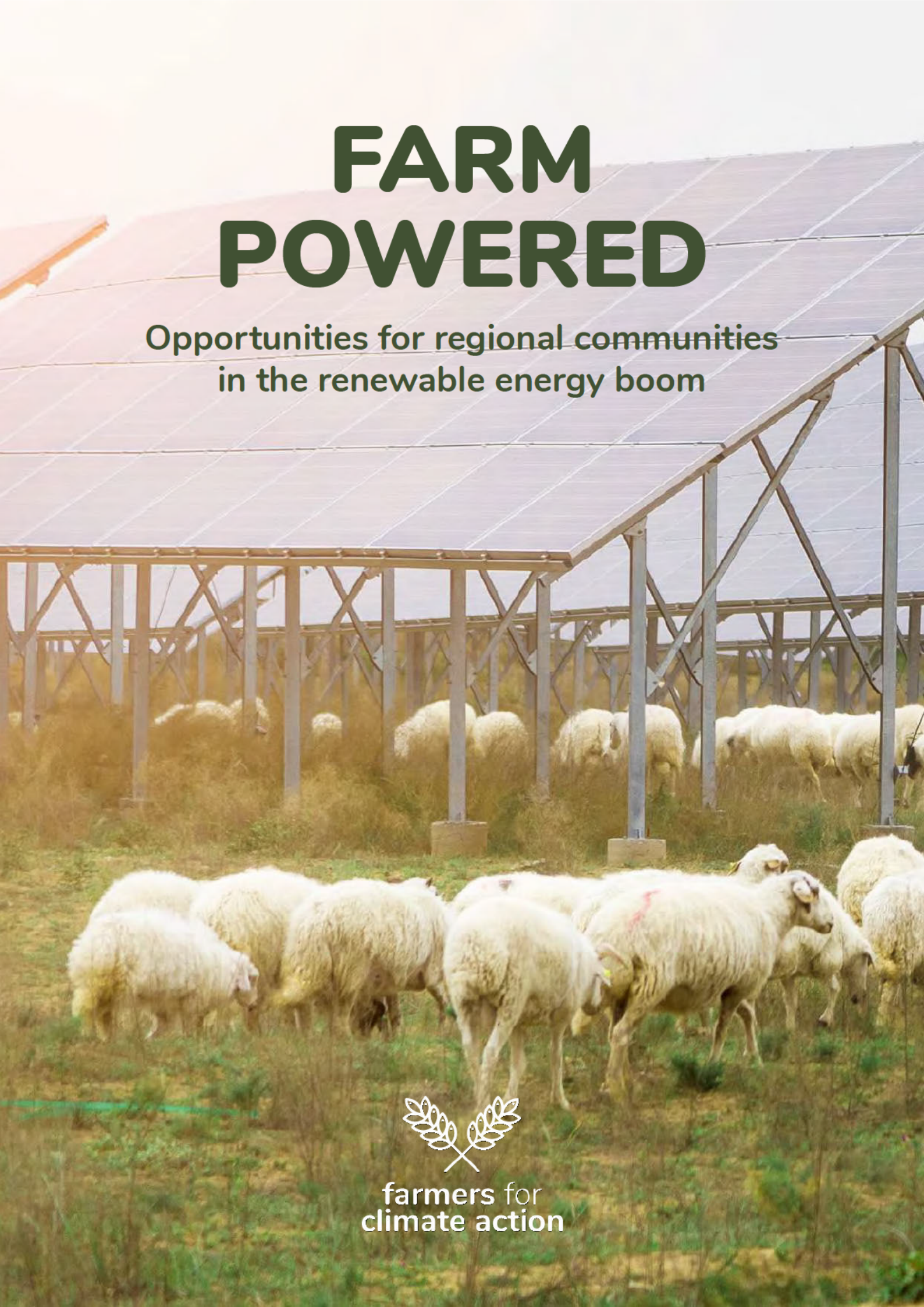
[23] RE-Alliance Transmission and Fire fact sheet (forthcoming).
[24] Validated with transmission companies in Queensland, NSW and Victoria

FARM POWERED

Opportunities for regional communities in the renewable energy boom



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TITLE PHOTO: ARNPRIOR SOLAR, EDF RENEWABLES

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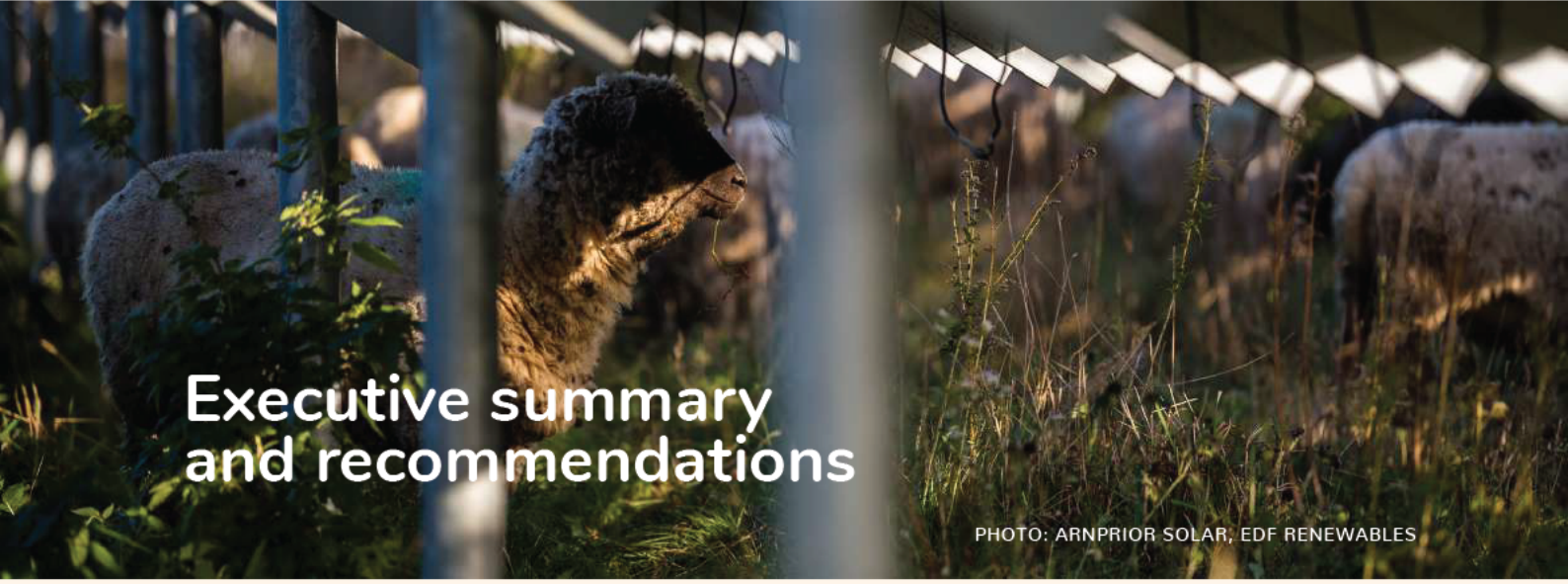
GLOSSARY AND ACRONYMS

ABS	Australian Bureau of Statistics
AD	Anaerobic Digestion
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
CAPs	Covered Anaerobic Ponds
CEFC	Clean Energy Finance Corporation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAPRs	Distributed Annual Planning Reviews
DER	Distributed Energy Resources such as rooftop solar PV units, battery storage, thermal energy storage, electric vehicles and chargers, smart meters, and home energy management technologies
DSNPs	Distributed Network Service Providers, such as Essential Energy in NSW
DPI	Department of Primary Industries, NSW
EV	Electric Vehicles
GDP	Gross Domestic Product
HVCs	High Voltage Customers
ISP	Integrated System Plan 2022, Australian Energy Market Operators
Large-scale renewables	Refers to corporate energy business owned and operated solar and wind developments
LGV	Local Government Area
LOUS	Local Use of System
LPG	Liquid Petroleum Gas
NEM	National Electricity Market
NGO	Non-Government Organisation
NMI	National Meter Identifier
MW	Megawatt of electricity
On-farm renewables	Refers to the use of solar, bioenergy, and storage that replaces a farmer's use of electricity and diesel for producing fuel and fibre. This is called 'behind the meter' and does not attract network charges, but excess can be exported to the grid for a feed-in-tariff
REZ	Renewable Energy Zone
RIT-T	Regulatory Investment Test for Transmission, the Federal process to deliver financial sign-off for new transmission projects
SAPS	Stand Alone Power Systems
Small to mid-scale	Refers to 1-5MW solar plants that connect to the medium voltage distribution network and are for export only - for the purposes of this report, they would be farmer/community driven
SWER	Single Wire Earth Return (thin lines that connect most farming properties to the grid)
TNSP	Transmission Network Service Provider
V2G	Vehicle to grid



Executive summary and recommendations

PHOTO: ARNPRIOR SOLAR, EDF RENEWABLES

Australia's public and private sectors are making much-needed investments as we shift from an energy system powered by coal, oil and gas to one powered by renewables and storage. These critical investments will power more industries and communities, creating hundreds of thousands of jobs in rural and regional areas as Australia significantly reduces emissions over coming decades.

Nationally, the imperative to rapidly deploy renewables is clear. This is key to achieving the deep emissions reductions we need to limit climate change impacts, protecting the future of farms and food security. It is crucial we capitalise on the huge opportunities at farm and regional level.

On a farm level, renewable energy paired with storage can provide cheaper and more reliable energy to replace diesel and grid electricity, while improving productivity, boosting resilience and diversifying income for farmers. Farmers' leadership in this shift also benefits consumers and Australia's global economic interests. As Farmers for Climate Action's recent Fork in the Road report found, reduced costs for farmers mean lower food prices for consumers. Adoption of renewable energy on farms will also serve current trading partners and supply new international markets that increasingly demand low-carbon food and fibre.

It is also becoming apparent that farming and renewable energy - when done right - are complementary. For example, 'agrivoltaics' involves combining energy generation with food and fibre production on the same land, grazing sheep or growing crops under solar panels. In addition to a new income stream, it can deliver a range of productivity benefits, including protection for sheep from heat and wind and in horticultural systems, higher soil moisture and reduced need for irrigation.

At a regional level, renewable energy generation through wind and solar in particular comes with massive regional opportunities through industrial revitalisation and employments.[1] In addition to new job opportunities, increased local use of energy - facilitated by on-farm storage - can also increase the efficiency of the entire electricity network by reducing the need for new long-distance transmission. Renewables paired with storage are increasingly becoming a viable option to reduce costs, improve financial sustainability and replace gas use in industry, including food manufacturing. More sustainable food manufacturers mean a more stable farm sector.

Though critical to renewable energy's success, current energy regulations, policies and programs have not sufficiently engaged nor accounted for farmers or regional communities. There is a focus on large-scale renewable energy developments, often delivered without adequate consultation or benefit sharing with the farmers and regional communities affected.

We need a plan to make sure farmers and farming communities can benefit from the roll-out of renewable energy at all levels. This plan needs to tackle a range of key challenges, including high capital costs for behind the meter on-farm renewables and battery storage; lack of agriculture-specific skills and knowledge in the renewables sector; distribution network constraints and rules and Renewable Energy Zone (REZ) and transmission planning and consultation issues.

[1] Australia's Long-Term Emissions Reduction Plan, Powering Australia

Recommendations

The following key recommendations are proposed to ensure the benefits of renewables to the agricultural sector and regional Australia are fully realised.

Introduce a plan

1. Include in a national climate change and agriculture policy a plan to deliver on-farm renewables, including:

- Setting a target for agricultural renewable energy use.
- Implementing the recommendations identified throughout this report.

Provide Incentives

2. The Federal Government address the high capital costs of on-farm renewables and increase knowledge sharing by:

- Introducing renewable energy incentives for farmers, supported by a national energy audit program, to increase rapid uptake on farms and reduce input costs.
- Subsidising on-farm batteries, funded from the National Reconstruction Fund within the Powering Australia policy, making them financially viable by reducing payback periods.
- Establishing an agricultural program within the Australian Renewable Energy Agency (ARENA) to fund demonstration and knowledge sharing projects for renewable energy and battery solutions on farm.

Reform regional distribution networks

3. Ensure the distribution network is a valuable asset for regional people:

- Establish mid-scale community and farmer 'informal REZs' (outside of declared REZs) which identify under-utilised hosting capacity in the network and encourage dispersed 1-5MW solar developments.
- Trial the carving out of a community energy component within a large scale REZ helping to develop and sustain social license for large scale investments. Some design accommodation within the transmission infrastructure is needed to enable a small collection of 1-5MW projects to tie into the otherwise dedicated REZ infrastructure.
- Eliminate export limits which prevent farmers from exporting more renewable energy to the grid.
- Broaden the Australian Energy Regulator's framework beyond a population density calculation, in determining infrastructure upgrades for the distribution network.
- Develop a plan that identifies areas to prioritise upgrades from Single Wire Earth Return (SWER) to three-phase across regional Australia.

PHOTO: KARIN STARK

4. Prioritise and fund localised, regional renewables-based initiatives that contribute to economic development in rural Australia:

- The Federal Government fund pilot small-scale renewable powered hubs that share infrastructure and supply a local region with products and services such as green ammonia to urea processing.

Ensure large-scale renewables benefit regional communities

5. Improve accessibility and fairness for farmers and regional communities in transmission and REZ planning, including:

- State and Federal Governments provide a mechanism for improved benefit sharing arrangements for transmission hosts and communities, including higher annual payments to hosts, payments to impacted neighbours, and funding for community benefit programs.
- REZ's currently being rolled out should have support available for farmers and communities with independent advice provided in the contract negotiation stage of renewable energy developments.

6. Community ownership / equity shares in large-scale renewables:

- The Federal Government should introduce additional measures to those set out in the Powering Australia policy to support community renewable energy by adopting programs similar to those suggested by the Local Power Plan. These could be implemented by ARENA and Clean Energy Finance Corporation (CEFC).

Combine energy and farming through agrivoltaics

7. Demonstrate that agriculture and renewables can complement one another:

- The Federal Government allocate funding to establish an agrivoltaics research and knowledge sharing program to boost farm profitability and show communities that agriculture and energy production can co-exist.

Introduction: A vision for future farming

In Australia, and globally, food and energy systems have reached a turning point. Growing populations and demand for clean, green energy and food is placing pressure on systems to decarbonise. These food and energy systems can take advantage of the changes ahead if the right decisions are made today. As the International Renewable Energy Agency stated in its report *Renewable energy for agri-food systems*[2], the opportunities for these two systems lie in their pathways to transformation being deeply entwined.

This report outlines a vision for the future of farming, should farmers be supported to embrace these opportunities. This vision sees most of agriculture's energy coming from renewable sources at minimal operational cost, encouraging new ways of operating farming businesses and producing food, with lower costs. Possible examples include areas where current high energy costs limit growth, such as in vertical farming, or desalination processes that provide water security. Technological advances that are energy intensive and costly now could see wide adoption in the future, with more robotic dairies and self-driving electric tractors charged through on-farm energy sources.

Farmers could become traders of energy, reshaping their role in rural areas and supporting their communities to access local, renewable energy. Enabled by a modernised and participatory distribution network, the farm enterprise of tomorrow could be a multi-income stream proposition. As the energy grid continues to modernise, broadening beyond centralised sources of generation, farmers and communities will be able to trade energy with each other, rather than relying solely on energy sources hundreds, or thousands, of kilometres away.

Individuals will be able to source their energy from local generators, be it other residents with solar and batteries, or mid-scale generators on farms. With the ability for more farmers and regional people to produce and sell electricity, the benefits and influence are spread more widely than just a few centralised corporate players.

At the local level, towns could be powered by regionally based mid-scale solar developments, reducing the need to import power from energy producing regions thousands of kilometres away. Regionally, farmers could sell their waste to power bioenergy hubs, supplying towns and industries and providing on-demand energy. Again retailers could aid these developments, financially rewarding farmers for the creation of low-carbon energy and a modernised distribution network can ensure that power is circulated locally to where it is needed the most, whether within a physical microgrid or a local energy market.

Small and large-scale hydrogen hubs could produce green ammonia and urea, supporting agricultural regions with locally produced fertiliser from renewable energy sources, increasing security of supply, and reducing cost volatility. Food processing facilities could run on cheap green energy in regional areas where food is grown, reducing the need for transport within the supply chain.

Large-scale wind and solar farms and transmission lines, delivered with active involvement from the agricultural sector, could bring new sources of income to rural economies and provide employment and demand for services that contribute to the prosperity of regional centres.

[2] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Nov/IRENA_FAO_Renewables_Agrifood_2021.pdf

BENEFITS OF RENEWABLES FOR FARMERS AND THE REGIONS

Perhaps the greatest opportunity for Australian agriculture is the building of farm resilience as an outcome of this symbiotic relationship with renewable energy production. Australian farmers manage significant variability, such as an increasingly unpredictable climate and volatile commodity prices. These factors generate substantial variation in farm output and incomes, more than experienced by farmers overseas and more potent than those experienced by business owners in other sectors of the Australian economy.

Resilience is crucial for farmers in an increasingly unpredictable climate, so electrification and adopting renewables can help build this: reducing costs (and their volatility) and supply chain risks, creating redundancies, and generating income streams.

REDUCING COSTS

Renewable energy can dramatically reduce costs for farmers by up to 85%, as demonstrated by the case studies in this report.

To illustrate the impact rising electricity costs are already having on agriculture's productivity, in Queensland many primary producers have switched to dryland farming as electricity prices become unaffordable. Alarmingly, the number of irrigating farm businesses in Queensland fell by more than 42% between 2009/10 and 2015/16, resulting in a substantial loss of productivity in the sector.[3]

> The cost and affordability of electricity from the grid is an issue for our members. Around renewables, they are worried about diminishing feed-in-tariffs. We recently conducted a survey of our members and the high priority issues included transparency of tariff pricing, the need for a tariff that reflects and enables agricultural productivity, energy bill transparency, data access, smart meter upgrades and affordability, energy sharing/Virtual Power Plants and meter consolidation.
>
> **MADISON STURGESS,**
> **Queensland Farmers Federation**

[3] https://www.smh.com.au/business/the-economy/we-re-in-trouble-australia-risks-food-insecurity-expert-warns-20220803-p5b6u3.html

> Reliability is the number one issue for dairy farmers around energy. If they lose power and milk spoils, there's the lost income from losing that milk but they also need to dispose of milk which requires an Environmental Protection Agency permit. Some farmers have resorted to diesel generators for backup because supply of power is so important, and many are on SWER lines or on the edge of the grid so reliability isn't guaranteed.
>
> DAIRY AUSTRALIA

RELIABILITY

Some farm businesses more than others are dependent on a reliable supply of energy. Backup power for when the grid fails, either due to natural disasters, maintenance or due to ageing poles and wires, helps buffer businesses against costly losses. Dairies and wineries in particular require consistent power, to prevent operational issues or spoiling resulting in significant loss of income. Battery storage will play a progressively more important role in providing back-up power to farming operations, control over when and how excess energy is used, and reduced need to export of excess power to already constrained networks.

Australia only has about five days worth of perishable food in the supply chain, according to a report from the Australian Security Leaders Climate Group.[4] Access to cheap and reliable renewable energy sources could attract new food processing plants to the regions, which in turn will strengthen food security. Thermal energy storage such as being used by pet food processor Mars Petcare in Wodonga will be the first of its kind, displacing some of the factory's use of gas.[5]

DIVERSIFYING INCOME STREAMS

The opportunity to grow clean, green, low emission agricultural produce for export will position Australian farmers well to attract premiums on their products and enable continued and potentially new access to global markets. Building mid-scale solar developments with storage on the distribution network to export to the grid could also provide a secondary income to primary producers. Australia could also be a major exporter of clean energy with farmers positioned well to host solar and wind developments and supply the power needed to realise this potential.

[4] https://www.smh.com.au/business/the-economy/we-re-in-trouble-australia-risks-food-insecurity-expert-warns-20220803-p5b6u3.html

[5] https://www.abc.net.au/news/2022-08-04/graphite-battery-will-be-first-commercial-thermal-energy-storage/101295350

A plan to make renewables work for farming communities

This report identifies a range of opportunities to make the shift to a renewable energy system work for farming communities. We need a plan to ensure these opportunities are captured.

The interconnected nature of food and energy systems requires greater collaboration between farmers, researchers, governments and industry. A coordinated and long term regulatory and policy framework that is farmer focused, is essential to position Australian agriculture to grasp the opportunities ahead.

RECOMMENDATION:

1. Include in a national climate change and agriculture policy a plan to deliver on-farm renewables, including:

- Setting a target for agricultural renewable energy use.
- Implementing the recommendations identified throughout this report.

Powering the farm - behind the meter renewables

Opportunities by agriculture sector

Renewable energy presents immense opportunities for agriculture and can play a critical role in meeting the sector's needs for electricity, heating, cooling and transport - while also exporting energy for use in other sectors. Early adopters are already reducing costs, increasing energy security and reducing carbon emissions.

An Australian Farm Institute report from 2018 estimated that the agriculture sector spends $5.85 billion on energy annually across the entire supply chain (inputs, production, transport and post-farm processing). Fuel costs agriculture $2.5 billion annually, and electricity costs $2.4 billion. Direct energy costs are estimated at $1.4 billion on fuels and $1.2 billion on electricity annually.[6] Energy prices have spiked since then so the sector's energy spend is likely to be significantly higher.

Intensive industries such as piggeries, poultry, and dairies tend to use higher volumes of energy and hence offer particular renewable energy opportunities such as converting manure waste to energy. Horticulture that requires year-round irrigation can suit solar water pumping, whereas the seasonality of irrigation for cotton heavily relies on a grid that allows the exporting of excess solar in the winter months for the business case to stack up. Other industries such as beef and sheep production, which are more extensive in nature, tend to have low on-farm energy use but higher energy use in the processing part of the value chain. There are options for this sub-sector in hosting mid- to large-scale solar and wind, depending on their location and hosting capacity of the grid, which offers important and substantial income diversification. This section outlines the energy demands for key sub-sectors of agriculture, touches on what the renewable energy opportunities could be and provides illustrative case studies.[7]

[6] https://www.farminstitute.org.au/product/the-impacts-of-energy-costs-on-the-australian-agriculture-sector/

[7] Broadly speaking, a lack of energy data exists for the agricultural sector. Older figures and reports have been used for this report and it is important to recognise the need for more up to date figures. The below information may not reflect the dramatic reductions in the prices of renewable energy technology, in particular solar over the last five years, while in parallel the price of fuels and electricity have risen significantly. This leaves farmers exposed to international markets that can be extremely volatile.

Irrigated agriculture has a crucial role to play in feeding the nation, but relies on cheap, reliable power for pumping and hence this sub-sector benefits greatly from renewable energy. According to the National Irrigators Council, 93% of fruits, nuts and grapes, 83% vegetables, 100% of rice, 53% of sugar, 85% of cotton, and 48% of dairy is produced from irrigation.[8]

PORK

Energy is a significant and growing cost for pork producers with most energy used in feed production(46.8%), piggery energy use such as heating and lighting (23%), feed milling (16.2%) and meat processing (14%).[9] Piggeries tend to have high energy use if using intensive indoor setups. Energy use can also be high if feed is grown on site.

Specific to piggeries, there are bioenergy opportunities which convert high levels of manure to energy while addressing odour emissions. Solar is also an option due to the constant energy demand throughout the year.

[8] https://www.irrigators.org.au/

[7] https://www.farminstitute.org.au/product/the-impacts-of-energy-costs-on-the-australian-agriculture-sector/

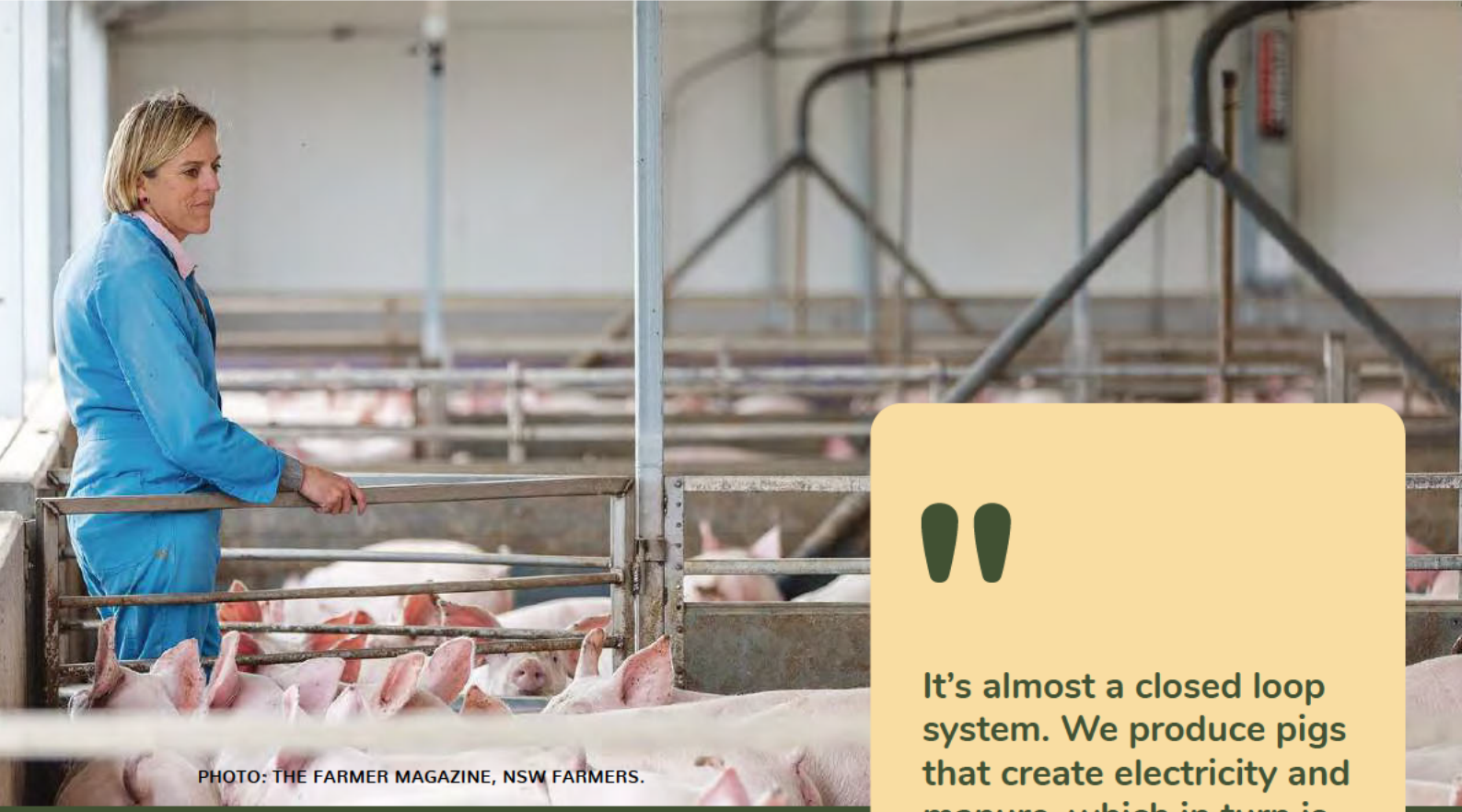


PHOTO: THE FARMER MAGAZINE, NSW FARMERS.

CASE STUDY: PIG POO POWER

Edwina Beveridge and her family run Blantyre Farms, a piggery in Young, NSW. They have 2,000 sows and up to 20,000 pigs at any one time. The farm is split into breeder and grower sites.

In 2010 energy was their fourth largest cost, spurring them to invest in a methane digestion system that captures gas from manure, and generates enough power to run their farm operation and export excess to the grid. At the piggery, pigs are housed on top of slats so manure can be flushed out from sheds and be captured. Once the manure drops into the pit, it is flushed into covered anaerobic ponds (CAPs). These hold 15 million litres of pig poo, with gas collected to convert to power. The system has been successfully producing renewable electricity from the poo for 10 years and the manure that comes out of the effluent system is dried out, and used on paddocks to grow grain to feed pigs.

> **It's almost a closed loop system. We produce pigs that create electricity and manure, which in turn is used to power the site and grow crops to feed the pigs. We produce enough power to supply the whole farm and some is exported to the grid. We've been able to generate and sell carbon credits from not releasing methane into the atmosphere, for the last 10 years. We were the first farming project in the Emission Reduction Fund, so I call us the first carbon farm in Australia, Our biggest saving comes from not buying power from the grid. I think we save about $250,000 in electricity costs each year.**
>
> **EDWINA BEVERIDGE**
> Blantyre Farms

POULTRY

Approximately 70% of operating costs at a broiler poultry operation fall into four key areas; labour, electricity, gas and bedding.[10] Poultry farms can be large users of energy when hens are housed in climate-controlled sheds due to ventilation fans, lighting, feed and water lines. Feed production for layer hens and pullets also uses high amounts of energy. Solar can be an effective solution, as the timings of solar generation mirror peak energy use because sheds are often required to be cooled in the middle of the day.

As a variant of solar panels, solar thermal technology also sees applicability for poultry through energy intensive heating/cooling processes. This technology transforms solar energy into thermal energy (heat) that is stored in liquid or gas form and is more efficient that solar panels. Although not common in Australia, poultry sheds and horticultural greenhouses requiring temperature regulation are prime candidates for this technology.[11]

Similar to piggeries, Anaerobic Digestion (AD) converts biodegradable organic matter to energy.[12] The resulting biogas from this process is made up of methane and carbon dioxide and could be used as a fuel for heating and electricity. The residue left behind, known as digestate, is semi-solid and could be repurposed as a liquid or solid fertiliser. The high upfront capital costs of AD systems however limits their use to larger operations that benefit from economies of scale.[13]

CASE STUDY: RIVERLANDS FREE RANGE CHICKEN FARM, SLASHING ELECTRICITY BILLS WITH AGRICULTURE'S MOST EXTENSIVE SOLAR AND BATTERY SYSTEM

One of Australia's largest free-range chicken-meat farms has reduced its reliance on the grid by 70% through the adoption of renewables and storage. Riverlands Free Range chicken farm in South Australia raises 10 million birds a year in 42 sheds. The farm's energy bills were nearing $1 million before the renewable energy system was installed. This expense plus the volatility of electricity prices were starting to impact profits, which drove the business to invest in 1.4MWs of solar, installed on the farm sheds, as well as five large batteries. The $5 million investment has seen the farm slash its costs and reduce emissions by 1,500 tonnes per year.[14]

[10] https://www.nuffieldscholar.org/sites/default/files/reports/2016_AU_Ben-Edser_Renewable-Energy-Technologies-And-The-Broiler-Poultry-Industry-Cost-Reduction-And-Income-Diversification.pdf

[11] https://www.pwc.com.au/infrastructure/powering-the-global-food-bowl-july-2019.pdf

[12] https://www.nuffieldscholar.org/sites/default/files/reports/2016_AU_Ben-Edser_Renewable-Energy-Technologies-And-The-Broiler-Poultry-Industry-Cost-Reduction-And-Income-Diversification.pdf

[13] https://www.nuffieldscholar.org/sites/default/files/reports/2016_AU_Ben-Edser_Renewable-Energy-Technologies-And-The-Broiler-Poultry-Industry-Cost-Reduction-And-Income-Diversification.pdf

[14] https://www.poultryworld.net/poultry/clean-energy-slashes-costs-at-australian-poultry-farm/

"We are Australia's first registered uncooked, raw cheese producer, so product quality and safety are vital. With the renewable energy system that's been installed, we're no longer using LPG. It's amazing to be electrified. The upgraded power system safeguards our production and lets us sleep well on stormy nights,"

MICHAEL CRESSIDA
Pecora Dairy

DAIRY

The dairy industry in Australia contributes $4.4 billion in farm gate value and is the fourth largest rural industry in Australia.[15] Dairy farmers are high users of energy, due to electricity needed for milking, pumping, cooling, heat for pasteurising, irrigation, and lighting. Robotic dairies can use 50% more energy than traditional operations.

Milking shed effluent and concentrated manure scrapings could be used to create biogas through AD, common overseas but not yet in Australia, largely because most dairies use pasture-fed systems making collection of high amounts of manure difficult. CAPs would be the most economical AD system for dairies, with the biogas used to fuel a generator producing electricity, the most common use for the gas.[16] The capital cost of a biogas-fuelled generator large enough to power a milking shed (50kW) ranges from $30,000 to $120,000. In addition, several thousand litres of hot water (90°C) per day could be recovered from the biogas generator engine coolant and exhaust gases.[17]

Unless paired with a battery, the opportunities for solar can be limited due to milking generally having to be done twice, 10 to 12 hours apart, often not in daylight hours. Other renewable energy options include waste heat from milk cooling, solar pumping for irrigation of pastures, solar plus batteries or solar hot water units. Microgrids such as that being undertaken at Nowra with 18 participating dairy farms will create biogas for the farm's use and to export to the grid. Hydrogen could be a potential future energy source well suited to dairy's energy profile.[18]

CASE STUDY: SOLAR AND BATTERIES AT PECORA DAIRY

Michael and Cressida Cains run Pecora Dairy, a sheep dairy and boutique cheese producing business in Robertson, NSW. Unreliable energy supply and an insecure supply of LPG threatened processing operations leading to the installation of 28kW of solar, a 40kWh flow battery system and a new heat pump to replace the LPG boiler. The solar and battery will also form part of a peer-to-peer trading market so the couple can sell their excess power and buy from others on the platform.[19] The solar and batteries are saving them approximately 82% on energy costs.

[15] https://www.agriculture.gov.au/agriculture-land/farm-food-drought/meat-wool-dairy/dairy
[16] https://www.dairyingfortomorrow.com.au/wp-content/uploads/0781_Biogas-technology-A4-report-summary_160726.pdf
[17] https://www.dairyingfortomorrow.com.au/wp-content/uploads/0781_Biogas-technology-A4-report-summary_160726.pdf
[18] https://www.nowrabioenergy.com.au/
[19] https://extensionaus.com.au/energysmartfarming/pecora-dairy-energy-efficiency-solutions-pilot-project/

PHOTO: SUNFARMING

HORTICULTURE

Horticulture is an extremely diverse sector, covering everything from nuts and potatoes, to flowers, fruits and vegetables. Horticulture's energy demand can be relatively consistent as fruits and vegetables are irrigated and cooled in storage ready for transport, all year round.

Limited energy-use data is available for the overall industry. However some work for orchards has been undertaken, where energy has been found to account for a large proportion of production costs and is a major financial burden for fruit businesses.[21] Apple and Pear Australia Limited conducted a 'Watts in your Business' program which audited 30 representative packhouses and orchards across Australia. It found 64% of energy was used for refrigeration, 18% in irrigation, 8% on grading equipment, 6% on controlled atmosphere, and 3% on lighting.[22]

Protected cropping is one of the fastest-growing areas of food production in the country, with almost 30% of all Australian farmers growing produce in some form of a soil-less culture system, according to peak vegetable industry body Ausveg.[23] The impacts of natural disasters like flooding can be minimised with use of indoor growing environments such as greenhouses. But these systems tend to use more energy, with an energy intensity 10 – 20 times higher per kilogram of product than that of the same crops grown in open fields.[24]

Typically, solar for irrigation and for running refrigeration can be beneficial. Battery storage can further optimise excess solar enabling use behind the meter in non-daylight hours rather than exporting power for a very low feed-in-tariff or to an already saturated grid. Biogas produced by breaking down horticultural waste through AD also presents an opportunity, however additional data is required to understand the business case more thoroughly.

Agrivoltaics, where panels are placed over protected horticultural crops such as berries and fruit trees can result in increased yields, and in fact studies have shown these crops benefit from up to 30% shade.[25] See section on Agrivoltaics below for more detail.

Renewable energy business Akuo Energy provides greenhouses with solar roofs, at no cost to farmers, helping them manage their production cycles, control yields, and limit the use of chemicals.[26] These dual use systems generate clean energy and produce food, and could reduce land use conflicts and increase community support for regional renewables.

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[21] https://www.energy.gov.au/business/industry-sector-guides/agriculture#:~:text=Energy%20use%20in%20Australian%20orchards,second%20largest%20cost%20after%20labour

[22] https://apal.org.au/watts-in-your-business/

[23] https://www.abc.net.au/news/rural/2017-07-13/farmers-turn-to-greenhouses-meet-growing-demand/8702386

[24] https://www.agrifutures.com.au/product/benchmarking-energy-use-on-farm/

[25] https://link.springer.com/epdf/10.1007/s13593-022-00783-7?sharing_token=jtnO0pm7RyKWz896JpNZHPe4RwlQNchNByi7wbcMAY6te6X-eQr46Rhcrn6FfBnn5qwJvPy4RyEMktGoo8tz38TCr6VCCwP6nkwytdkbh1uPSCxhdBjelJgJRKmjxMmq7xFRE2VWgNaS87LrcQOKjXqknJf1ByuFpDo_ywBPIX-tY%3D

[26] https://www.akuoenergy.com/en/agrinergie

CASE STUDY: USING SOLAR IRRIGATION TO REDUCE COSTS AND IMPROVE SLEEP

Organic vegetable grower Wayne Shields runs Peninsula Fresh Organics on the Mornington Peninsula, Victoria. He also runs a second site on the Murray River in Barham, NSW.

Wayne produces organic broccoli, broccolini, lettuce, kale, leeks, silverbeet, and Asian greens all year round, on a total of 140 acres (40 acres Mornington Peninsula and 100 acres in Barham).

Before investing in renewables, Wayne would irrigate and pump water at night to use the cheaper off-peak tariffs from the grid. This watering schedule was not optimal for the vegetables, as it increased the risk of mildews and rots; organic farms can't use fungicides due to certification.

The farm installed a 40kW solar system to run the pumps and a 30kW solar system to run the cool room on the Murray River property, and a 30kW solar system to run the pumps and cool room on the Mornington Peninsula property. These enabled Wayne to start irrigating during daylight, which was much better for vegetables and for his sleep.

"By using solar, we have seen our pumping and cooling costs reduce significantly. Now we feel the biggest payback will be in the future once our loan is paid back. There's also the social licence to consider, from using renewables. We supply to Coles, Woolworths, and numerous others, and they're wanting to know how we're reducing emissions as a business."
Wayne explains.

"The margins in producing vegetables are thin, so if you get a large power bill, it wipes out your profits for the month."

CASE STUDY: SUNDROP FARMS - NATURE AS A PARTNER NOT A SUPPLIER[27]

Sundrop Farm, in South Australia's semi-arid zone, uses the sun's energy to desalinate water from the nearby Spencer Gulf, producing fresh water to irrigate truss tomato crops, and to produce electricity to heat and cool the growing environments within their greenhouses.[28]

The farm's greenhouses act as a natural barrier to pests and diseases more prevalent in open field farming, and protect against excessive heat, hail, and frost. This method of sustainable, closed-loop horticulture utilises energy created through concentrated solar thermal technology and has allowed Sundrop to achieve energy security, at the same time as reducing running costs by displacing over two million litres of diesel annually.[29]

[27] https://www.sundropfarms.com/our-difference/
[28] https://www.sundropfarms.com/our-technology/
[29] https://www.pwc.com.au/infrastructure/powering-the-global-food-bowl-july-2019.pdf

CASE STUDY: COTTON GROWER USING SOLAR TO CUT COSTS

The property 'Burgorah', owned by Anne and Ian Brimblecombe, is located just outside St George, 500km west of Brisbane, Queensland. When water is available, the couple grow and irrigate 320 hectares of cotton.

Local network constraints, a non-competitive energy market, and unsuitable tariff schemes have meant Ian has had to install numerous meters and solar installations to keep energy for irrigation affordable. They invested significantly in nine solar installations totalling approximately 344kW with an average payback of three to four years. Ian estimates he saves about $60,000 a year because of his solar ($30,000 income from feed in tariffs and $30,000 savings on not buying electricity from the grid).

Ian says "We know that burning fossil fuels is heating the planet and each of us has to stop that as quickly as we can and come up with other ways for getting power for what we need."

"My dream is to run my whole operation with renewables as I only pump for one month a year so for the other 11 months, my solar is not doing anything. In that time, I'd like to be making hydrogen or ammonia and be using that ammonia to run tractors and as fertiliser. That is my goal."

Ian's operation is constrained by the inability to share solar energy between various pumps and other loads on his property, which is not permitted under current distribution network rules. He's keen to see changes in some of the network rules around the sharing of energy on farms.

COTTON

Due to irrigation pumping requirements, the cotton industry can be large users of energy. For river irrigators, pumping accounts for 45% of all energy that is directly used on-farm while it can be as high as 75% for farmers using bore irrigation. Diesel use in tractors and machinery is the next largest energy use on cotton farms.[30]

Using solar to partly power irrigation pumps is the main renewable energy opportunity for irrigators. However, one of the difficulties is the industry's seasonality of energy use, with high demand over summer and very low demand in the remaining months. If grid connected, some solar can be exported to receive a feed-in tariff depending on network capacity in the local area, but for off-grid, solar power could effectively be sitting idle when the pump is off. The sharing of energy across properties with energy requirements at different times via microgrids could help with creating more viable solar pumping scenarios in the future.

[30] https://cottoninfo.com.au/energy-use-efficiency
[31] https://www.youtube.com/watch?v=9GloGliMVQ4

CASE STUDY: TECHNICAL CHALLENGES FOR BLENDING SOLAR AND DIESEL AT A NARROMINE COTTON FARM

Jon Elder grows cotton, barley and wheat on his farm in Narromine in Central NSW. Prior to 2018, Jon and his family were spending over $300,000 a year on diesel to pump their bore water licence. Keen to look for alternatives, Jon along with ReAqua, a solar pumping business, decided to install the country's largest solar diesel hybrid pump. The business case was strong with a payback of five years. The existing diesel-powered CAT C-9 engine was replaced with a WEG 250kW electric motor and a 500KVA CAT diesel-powered generator was installed along with 500kW of solar on one hectare of land with associated inverters, variable speed drives and control systems.

The promise had been to seamlessly blend diesel with the available solar power, enabling the pump to run on overcast days when the solar arrays were unable to maintain their maximum power. The first year saw the family reduce their diesel costs by 40% and emissions by 500 tonnes a year. However, the system exposed two persistent problems.

Firstly, the challenge of blending solar and diesel is revealed where sudden reductions in solar power occur; typically during intermittently cloudy days. In these instances the generator fails to 'ramp up' quickly enough to supply the power shortfall and power to the electric motor sometimes falls below a level that triggers a shutdown of the bore.

The second problem relates to the sizing of the diesel-powered generator. During cloudy days, or, during the mornings or evenings, the shortfall in solar energy often requires only small inputs of power from the diesel generator, and as such it spends an amount of time working at capacities below that specified by the manufacturer. In effect the generator is 'glazing', or not working hard enough, causing damage to the engine itself.

"While we can see the potential for solar to help irrigators like ourselves reduce reliance on diesel, we don't believe the technology is quite there yet. A battery could be the ideal solution but the costs are prohibitive so we are continuing to seek solutions and hope to have this resolved soon."

JON ELDER

WINERIES

Wineries have been estimated to spend approximately 40% of their total expenditure on electricity.[32] Of that 40%, refrigeration and tank storage in particular can be responsible for the vast majority of the energy consumption at a winery.

Solar and battery technology have the potential to reduce costs and emissions at wineries in Australia. Microgrids that share solar energy around the farm, for example between the cellar, pumps, homestead, cool rooms and processing sheds, holds promise for reducing costs and emissions in the future, but there are still obstacles to be overcome in this area (see Microgrids section below).

CASE STUDY: A CARBON NEUTRAL WINERY IN THE HUNTER VALLEY

Alisdair Tulloch is a fifth generation winemaker, and runs Keith Tulloch Wines with his family. Their 20 hectare property includes 10 hectares of vineyards and was the first carbon neutral winery in the Hunter Valley.

With an understanding of climate change and its impact on viticulture, Alisdair worked out the farm's carbon footprint in 2017/18 to be 660 tonnes of CO2 equivalent. They then looked at where those carbon emissions were coming from and identified 145 tonnes were from electricity use. They were spending $30,000 on electricity a year for processing, picking and harvesting, heavy machinery, and refrigeration.

In 2018, they spent $100,000 to construct a 65kW solar array which met 72% of the farm's power needs and had a four year payback. They saved $25,000 a year and reduced their emissions by 100 tonnes of CO2 equivalent.

Alisdair explains "We've tried to electrify as many processes as possible. We purchased a new refrigeration system which was more efficient and we tried to use more energy during daylight hours. If the sun is hitting your property, you may as well capture it and use it."

"Electricity is one of the major assets you have on your farm. When the electricity goes out, you're pretty hamstrung. We have so much going on in the food processing side of our business, that if we lose electricity, our products could spoil within days or hours if we're within the vintage period."

"Having a carbon neutral product we sell direct to the public, we also noticed a strong increase in sales as customers look for more sustainable products. If your product has a low carbon foot-print, it also has a competitive advantage."

[32] https://aemo.com.au/en/newsroom/energy-live/wineries-electricity-management

GRAINS

The majority of grain produced in Australia is grown using a rainfed production system. The energy use of this sector is relatively low, with direct energy used in tractor fuel, electricity for pumping if irrigated, and heat for drying (LPG and gas).

Interest is building around the value and use of residual straw stubble to create biofuels, biogas, hydrogen, and renewable fertilisers. There are ongoing studies in Victoria around the use of pelletised straw to generate energy.

BEEF

The beef industry contributes $18 billion annually to Australia's Gross Domestic Product through production, processing and sales, according to a report by the Australian Farm Institute in 2018.[33] The same report found that the combined cost of energy along the red meat industries value chain was approximately $1.58 billion annually.

The highest users of energy tended to be diesel use on-farm, red meat processing and on-farm embodied energy (energy associated with producing a product).

Energy costs are significant for abattoirs and meat processors, ranging from $100,000 to more than $10 million a year. Up to 90% of the energy used comes from steam and hot water production as well as refrigeration.[34] Solar livestock pumps are increasingly being used to replace diesel pumps for remote watering stations, improving water security for cattle and sheep and cutting costs and time for farmers.

Beef farmers are not large users of energy on farm, however opportunities exist for cattle farmers located close to transmission in windy areas to host wind turbines to earn a secondary guaranteed income. In areas of the distribution network able to host more solar generation, small 1-5MW solar plants could be initiated on 10 hectares of land, primarily for export.

[33] https://www.farminstitute.org.au/product/the-impacts-of-energy-costs-on-the-australian-agriculture-sector/
[34] https://www.victorianenergysaver.vic.gov.au/energy-advice-for-business/managing-your-energy-consumption/farms-and-business-case-studies-and-guides/abattoirs-and-meat-processing

Challenges for on-farm renewables

HIGH UPFRONT CAPITAL COSTS

High upfront capital costs continue to impede adoption of on-farm renewables, especially for technologies like storage batteries and infrastructure to raise solar panels to allow production below. In the three years leading up to 2020, the CEFC provided low interest loans to the farming sector of over $100 million for 417 grid-connected and 20 off-grid solar power projects, more than any other single sector. These projects were also on average larger than other sectors, with loans averaging $250,000, almost seven times more than the average across all sectors.[35] These figures demonstrate the high capital costs faced by farmers.

Battery storage costs in particular are prohibitive for most farmers, with the payback period being much longer than for installing solar PV panels. Storage provides multiple benefits for farmers, consumers and the grid including:

- enabling better use of renewable energy by storing power and hence extending daylight hours (for solar)
- reducing input costs for food production
- reducing emissions
- reducing the need to export to the grid
- increasing business resilience by providing back up power during outages
- providing potential future income streams from providing grid firming services.

The seasonal variation in farm profits as well as droughts and floods risks mean many farmers are reluctant to take on more debt. Other than farms taking on commercial loans to adopt on-farm renewables, there are few grants or subsidies available to help manage the costs and risks. Where such programs do exist, consultations suggest that funding criteria may not be adequately targeted towards the agricultural sector. For example, pre-commercial renewable on-farm projects have struggled to attract investment from existing government renewable energy funding bodies such as ARENA.

> "I've looked into renewables in the past, we all want to do the right thing by the environment but it comes down to what you can afford at the time. The dairy industry has had a tough time over the last few years, with price pressures and fluctuations. It can make it hard to plan."
>
> **PETER MULHERON**
> **Dairy Farmer, Swan Marsh, Western Victoria.**

[35] https://www.qff.org.au/projects/renewable-energy-on-farm/

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LACK OF AGRICULTURE-SPECIFIC SKILLS AND KNOWLEDGE IN THE RENEWABLES SECTOR

The business case for many on-farm renewable energy solutions is poorly understood, and there is a lack of regional expertise to assist a farmer's decision making. While farmers are increasingly looking to adopt renewable solutions, a lack of working examples reduces visibility and peer-to-peer knowledge sharing.

While many renewable energy solutions are well known, their application to farming may be highly specific. For example, energy use by irrigators is often seasonal in nature, causing peaks in energy demand at certain times of the year and at other times very low demand. On the other hand, the dairy industry typically uses the most power before sunrise and after sunset. Technology suppliers and installers need to understand the operations of farming better, as well as how behaviour and operations changes could influence the design of smart systems that integrate the needs of the farm with the various energy management and renewables components. We will require a highly skilled workforce if agriculture is to decarbonise.

"We have made calls that ARENA and CEFC have a focus on implementation of renewable technologies in regional and rural areas, as the problem is no longer the lack of viable technologies, the problem is adoption."

ASH SALARDINI,
National Farmers Federation

RECOMMENDATIONS:

2. Federal Government to address the high capital costs of on-farm renewables and increase knowledge sharing:

- Introduce renewable energy incentives for farmers, supported by a national energy audit program, to increase rapid uptake on farms and reduce input costs.
- Subsidise on-farm batteries, funded from the Powering Australia policy, making them financially viable by reducing the payback period.
- Establish an agricultural program within ARENA to fund demonstration and knowledge sharing projects for renewable energy and battery solutions on farm.

Other farm opportunities

LOW EMISSION FARM VEHICLES

Agriculture relies heavily on diesel, for farm vehicles and plant and equipment such as irrigation pumps, depending on the operation. The Australian Bureau of Statistics (ABS) in 2017- 18 found that more than 80% of energy consumption in Australian agriculture was diesel.[36] This level of reliance leaves farmers exposed to fuel price hikes like those experienced this year due to supply chain issues and global upheaval in energy markets following the invasion of Ukraine.

In the first six months of 2022, more than 100,000 new utes were bought in Australia, none of which were electric.[37] Companies such as General Motors and Ford are making electric utes (the Hummer EV, the Silverado EV pickup and the F-150 Lightning), as is Tesla (the Cybertruck – production expected to start in 2023) but they are yet to make it to Australia's shores.[38] EVs can be considered large flexible loads that are intermittently connected to the grid. As with behind-the-meter batteries, a properly managed EV or farm vehicle fleet could provide low voltage (LV) management services to the grid.

There is growing interest from farmers in alternative vehicles and low emission tractors. Manufacturers are starting to respond to this interest. The Polaris electric side-by-side is already available in Australia and has sold out in some branches. The battery powered, electric Fendt e100 will begin series production in 2024 and John Deere plan to bring electric tractors to Australia in 2026. A US based start-up, Monarch Tractors had planned to have their autonomous e-tractors in Australia shortly but this has been postponed.

New Holland has a hydrogen prototype tractor, the NH2 tractor but this is yet to be released in Australia. The company has also developed the first 100% biomethane powered tractor which can be powered by agricultural and animal waste. The tractors are promoted to have the same power as their diesel equivalent but with a 30% lower running cost and a reduction in CO2 of 10% and overall emissions of 80%.[39] A prototype is expected in Australia in early 2023.

Hydrogen has been suggested by some in the industry as more technically capable for the high horsepower requirements of agriculture when compared to their electric counterparts, however

[36] -Australian Bureau of Statistics, 46040DO0006 Energy Account, Australia, 2017-18
[37] https://thedriven.io/2022/07/29/football-meat-pies-efficiency-standards-and-electric-utes-can-we-have-it-all/
[38] https://thedriven.io/2022/07/29/football-meat-pies-efficiency-standards-and-electric-utes-can-we-have-it-all/
[39] https://agriculture.newholland.com/eu/en-uk/equipment/products/agricultural-tractors/t6-methane-power
[40] Discussion with Nathan Gore Brown, Mov3ment Jul 22

the current price of producing and transporting hydrogen means it could be years before this becomes a feasible option.[40] The running cost of hydrogen tractors is also likely to be higher than for electrified farm vehicles.

Low emission farm vehicles are still a few years off supplying the Australian market. This possibly presents an opportunity domestically for development of a low emission, bridging fuel industry such as renewable diesel, if the right policy settings are in place.

A number of challenges will need to be overcome before Australia can embrace low emission farm vehicles and tractors. These predominantly relate to high potential purchase costs, technical capability and knowledge, confidence, and policy settings. Australia currently lacks fuel emission standards meaning there are no incentives for manufacturers to send their low emission vehicles to Australia adding to the supply chain issues already being experienced.

CASE STUDY: GRID INTEGRATION WITH EVS AT A WINERY

Joseph and Sue Evans run Ballycroft Vineyard and Cellars, north-east of Adelaide. The couple will use their new electric Nissan Leaf vehicle as a mobile battery, after their vehicle-to-grid and vehicle-to-home converter is installed. The two-way charging capability of their Nissan Leaf will save the vineyard $1,700 in power costs a year. The car will be charged by solar panels on the cellar door roof during the day, and 'plugged' into the house at night so power can be drawn from the vehicle rather than the grid.[41]

[40] Discussion with Nathan Gore Brown, Mov3ment Jul 22
[41] https://thedriven.io/2022/07/26/australian-winery-readies-to-power-cellar-door-with-nissan-leaf-and-v2h/

"On a farm scale, there could be great benefits if farmers were able to share power across meters on their property, or net their power off (without paying the standard transmission and network charges)."

ANDREW CHAMBERLIN,
Queensland Farmers

Powering the community: regional scale initiatives

In the future, rural and regional communities could become energy 'prosumers', producing energy and trading their excess in local energy markets facilitated by the distribution network service providers (DNSPs). In this future vision, DNSPs have also evolved to provide services to farmer-owned microgrids, maintaining poles and wires specifically to meet reliability and safety obligations. The cost of energy is lower for regional people given that energy is produced and consumed locally, and so is not subject to the same network charges.

This vision could be supported by retailers providing a higher feed-in tariff that rewards small-scale generators. More batteries in the network help shift exports to parts of the day when demand is high and hence attracts a higher value for feed-in-tariffs. With lower connection costs and quicker processing times, mid-scale renewables in the regions will flourish.

In this future vision, smart grids are commonplace, enabling two-way communication between the network and customers. Controllers, automation, and new technologies working together enable the grid, customers, and renewable energy sources to respond quickly to changes in demand and supply of power. For example, where areas of the distribution network are constrained, demand response programs pay farmers to reduce their use of power at peak times, all automated using artificial intelligence (AI) and smart controls. Sophisticated Frequency Control Ancillary Services (FCAS) markets are creating lucrative secondary revenue streams for farmers.

In this vision, DNSPs have upgraded lines and transformers in physically constrained areas, where population growth is predicted or intensive agriculture is clustered, enabling the continued uptake of renewables and export to the grid and to trade with others in the locality.

DNSPs have progressively identified areas of under-utilisation, and nominated several community and farmer REZs across the Eastern Seaboard. Farmers have responded, initiating hundreds of mid-scale (1-5MW) solar developments in response, on marginal parts of their land, and partnering with developers to secure a guaranteed income not dependent on the weather. New land for consideration has been opened up over high-value crops like vineyards and berries as agrivoltaic systems become more commonplace, demonstrating that energy generation and farming can successfully co-exist. Mid-scale renewables enjoy a higher degree of community acceptance because locals have greater ownership and share of profits over energy production.

Enabling regional power through distribution network reform

Transmission networks are high voltage networks consisting of towers and wires that transport the majority of energy, produced by large generators, to major demand centres like cities or industries. Transmission network service providers (TNSPs) own, build, maintain, and operate networks in Queensland (Powerlink), NSW (Transgrid), Victoria (Ausnet), South Australia (ElectraNet), and Tasmania (TasNetworks). These interconnected networks form the National Electricity Market (NEM), the longest interconnected power system in the world, with a distance of around 5,000km. Western Australia is not connected to the NEM.

It is through this network that large-scale solar and wind developments connect to send their energy back into the grid. The high voltage electricity from the transmission network is converted to lower voltage at substations where it is then transported to businesses, farms, and homes via the distribution network — the poles and wires beside local roads.

It is through the distribution network that excess power from small and mid-scale on-farm renewables (installed for the primary purpose of reducing a farmer's diesel or electricity use) can be exported to the grid. This is also the network that farmers could connect mid-scale solar farms (1-5MW) to, solely for export purposes.

STATE OF PLAY OF THE DISTRIBUTION NETWORK

The way energy is produced and transported in Australia is changing. The rapid uptake of rooftop solar in Australia, assisted by various incentives, has resulted in many Distributed Energy Resources (DER) being connected to the electricity network by energy consumers. In the future, this trend will be accelerated by people buying and installing batteries, whether installed in the home or alternatively in an EV. EVs are, in time, expected to have vehicle-to-grid (V2G) capability, greatly increasing the potential for energy exports to the grid. The distribution networks must therefore now cater for 'reverse flows' of energy, particularly during the middle of the day.

When 'penetration' of solar and other DERs was low, the impacts on the grid were minor. However, as deployment costs of solar and other DERs have reduced, many parts of the electricity network have reached their hosting capacity and are now called 'constrained', meaning that consumers installing DERs are being limited in their energy exports. Many prospective owners of small to mid-scale solar farms are also finding it increasingly likely that the distribution network they wish to connect to will limit their energy exports to the grid, either to a set maximum, or to a flexible maximum controlled by the network. The significant reduction in the costs of DERs has seen many electricity customers installing and using their own energy on site, becoming more active participants in the

PHOTO: ARNPRIOR SOLAR, EDF RENEWABLES

"It would be great to see networks provide discounts for local energy sharing."

MADISON STURGESS, Queensland Farmers Federation

energy market. There's a growing desire to trade and sell excess energy back to the grid, as well as to others ('peers') in the local network

However DERs, mostly solar, are causing issues for a grid designed to send electricity one way. Customers are continuing to install solar for the first time and add to their existing solar installations. They then export excess power, often during low demand periods such as in the middle of the day (the so-called 'Duck Curve') when large-scale solar farms are also generating at maximum capacity. This can cause issues such as voltage rise on the network, causing power quality issues for all consumers. This excess can result in concerns with thermal and stability limits for assets in the distribution and transmission network. The 'legacy' voltage regulation and protection schemes on the electricity network were not designed for two-way flows, and hence must be upgraded or replaced.

Cumulatively, these issues have started to cause reduced power quality, involuntary reduced solar generation (curtailment), and DNSPs such as Essential Energy in regional NSW or PowerCor in Victoria refusing, delaying, or limiting exports from prospective solar or other DER connections.

Limited visibility of distribution network hosting capacity and static export limits is preventing uptake of small- to mid-scale renewables in regional areas. The annual reports prepared by the various DNSPs contain the details of any planned investment to address these concerns; these Distribution Annual Planning Reviews (DAPRs) are large and complex documents.

Rules effectively prevent the sharing of energy between customers in close proximity as all energy which flows through a national meter indicator (NMI) (customer meter) incurs the full transmission and network costs. There is no broad provision for peer-to-peer trading even within the same property, using a Local Use of System (LUOS) mechanism

> There are no definitive solutions that address equitable price tariffs across NSW. From a pricing scheme point of view, there are three options that need to be worked through. Firstly, where the rules could be changed so that the overall network (and hence all customers) pays for certain areas to be upgraded if we can show this is beneficial for all customers (i.e. there is not a limited benefit gained by one or group of customers). Secondly, if moving to LUOS, those in REZs could benefit, but this could inadvertently result in other rural customers, further from large renewable generators, paying more in network charges as cross-subsidisation is removed. Thirdly, the current system, 'customer pays,' means if the customer wants to increase the capacity to export energy, they pay to upgrade the system. A working group between networks, communities and Governments could be established to work through the principles of equity and decisions that drive the best outcome.
>
> JOSH HARVEY,
> Essential Energy

DISTRIBUTION NETWORK CHALLENGES

Energy development and investment in Australia is largely driven by corporate entities. There is limited opportunity for communities to play a role. The current distribution network was designed for large centralised facilities. A distribution network built for DERs will unlock many opportunities for agriculture and regional communities.

Currently, there are limited opportunities for installation of small to mid-scale dispersed solar, and therefore this limits the numbers of farmers benefiting from the energy transition and secondary incomes these developments secure. Only those farms with existing access to large size 11kV and 22kV three-phase lines are likely to host a 1-5MW Solar Farm (e.g. Grong Grong Community Solar Farm).

Farmers are at times unable to build or host 1-5MW solar farms because of a culmination of factors including:

- the area is constrained by existing DER
- high connection costs
- upgrades to existing lines needed
- export limits
- complex connection application processes with unclear wait times
- uncertainty connection will be granted.

For example, pumping for irrigation is often seasonal, so pumps are often only used for a few months of the year. This makes the use of solar financially unviable unless energy can be exported or sold to neighbours (or local processing plants) at non-pumping times. Irrigators also have peaky energy use which sometimes creates high demand charges that are applied across the entire month.

> DNSPs could undertake the business case for the role of small and mid-scale renewables as an alternative to infrastructure upgrades and then share any cost savings with the farmer.
>
> **ASH SALARDINI**
> **National Farmers Federation**

UNDER-UTILISATION OF SOME PARTS OF THE GRID

The electricity network is designed to cater for 'peak' demand times – be that mid-winter evening peak (heating and cooking) or mid-summer afternoon peak (air conditioning) – that may only occur on 6-10 days per year for a few hours at a time. At all other times the network is operating below its maximum capacity – typically 40% to 60%. In the case of rural networks and transformer utilisation this can be as low as 20%. Whilst there is ample current capacity in the existing network, rural networks are generally 'voltage constrained', particularly the high voltage single phase and SWER networks (widespread across Victorian and Queensland farming areas and in western NSW) due to the long distances involved. Managing DER connected to these 'thin' networks is particularly challenging for DNSPs. In NSW, up to one quarter of electricity costs now comes from infrastructure that sits around waiting for demand spikes that occur for less than 40 hours a year.[43]

> Just in NSW there are approximately 140,000 substations. If just 10% of these were available to connect 5MW solar developments to the distribution network, there would be enough power to power the Eastern seaboard. These enormous assets are already there, but they are failing to be seen by governments. The medium voltage network isn't just about electricity, it's about continued economic and regional development and sustainability. We need to stop the huge cash exodus from regional areas into the cities and use mid-scale renewables owned by locals to keep the profits local.
>
> METHUEN MORGAN,
> co-founder Meralli Solar

[43] https://d3n8a8pro7vhmx.cloudfront.net/solarcitizens/pages/1202/attachments/original/1461023115/Homegrown_Power_Plan_Full_Report.pdf?1461023115

CASE STUDY: CHALLENGES IN CONNECTING A 4.99MW SOLAR DEVELOPMENT IN DUBBO

Tom Warren, a farmer in Dubbo NSW who also hosts an 18MW solar development on his property, recently partnered with a developer to propose a second development of 4.99MW on 15 hectares of his land. This would connect and export to the distribution network, earning him an income from the lease of his land. Initial investigations identified the line had a hosting capacity of 7 or 8MW. Unfortunately for Tom, another 4.99MW project was approved first by Council, impacting the viability of Tom's project. They were asked to re-assess the line capacity and if needed, put in mitigation measures to deal with congestion, including monitoring and measuring power flow on the network. If the project had gone ahead, they could have faced curtailment depending on congestion and whether power flows were exceeded. The developer was also responsible for the cost of upgrading the line to accommodate the new project, with no buy-in from the DNSP.

Essentially the asset would be developer/customer funded, and gifted back to the DNSP. The issue in Tom's case is the cost of the upgrade for the distance of 2-3 kilometres from the zone substation, estimated at $1 million would include capacity beyond what was needed for their specific project. If the upgrade had taken place, other customers, loads or generators could also use this increased capacity. The DSNP, Essential Energy, however do have a Pioneer Scheme so that the proponent who upgraded the network can be reimbursed for a period of time if others make use of the new works.

> **I'm a huge supporter of the need for renewable energy, but unless these sorts of smaller developments can be enabled in a Renewable Energy Zone, where demand for power is increasing locally, I don't see much advantage for regional people living in a REZ.**
>
> TOM WARREN

PHOTO: DESTINATION NSW

CASE STUDY: UPGRADING LINES AND TRANSFORMERS TO ENABLE A VIABLE RENEWABLES SYSTEM

Fig, olive, and wine producer Sam Statham of Rosnay Organic, partnered with QuantumNRG project management services to design and implement a renewable energy system. The property, on the 'edge of the grid', was grid power-connected through old SWER lines that suffered from occasional power outages and impacted operations. Rosnay received matched funding from the NSW Department of Primary Industries (DPI) which helped pay for solar and batteries and, importantly, helped to move them from a thin single line to a new 3 phase connection and newly installed underground cables. This moved the farm from a maximum of 3kW to unlimited export and allowed increased production capacity while reducing overall energy costs. The final benefit was replacement of an ageing diesel-powered generator source that did not fit with the company's green philosophy.

The new transformer and three-phase cabling upgrade was costly, at approximately $60,000. There were also delays to the project, with the DNSP changing internal protocols at the last minute which, if implemented, would have added significant project design and implementation costs. The upgrades have allowed the sharing of energy from the new 30kW of solar to multiple outbuildings and in the future will allow sharing to an existing community bore.

"Putting in solar and batteries and upgrading our transformer helped with some of the limitations of our ageing infrastructure and power supplies. If it weren't for DPI's funding, the project would have had a 20 year payback, and wouldn't have been something we would have undertaken ourselves. With the grant, it's a 10 year payback, but not everyone will have access to the funding we did," says Sam.

Aidan Moore, Founding Director at QuantumNRG commented: "This was a really interesting project, needing careful coordination of multiple contractors. Rosnay now has a modular, resilient green power source that can meet current and forecast growth plans."

CONNECTION APPLICATION UNCERTAINTY

The report *Irrigators – The flow on benefits of regionally embedded generation*, completed by the Institute for Sustainable Futures, indicated that farmers had grid connection applications for solar returned from DNSPs, where export limitations were rescaled several times without explanation or the provision of alternatives. In some other instances, applications were only approved after lengthy assessment and subject to costly upgrades.[44]

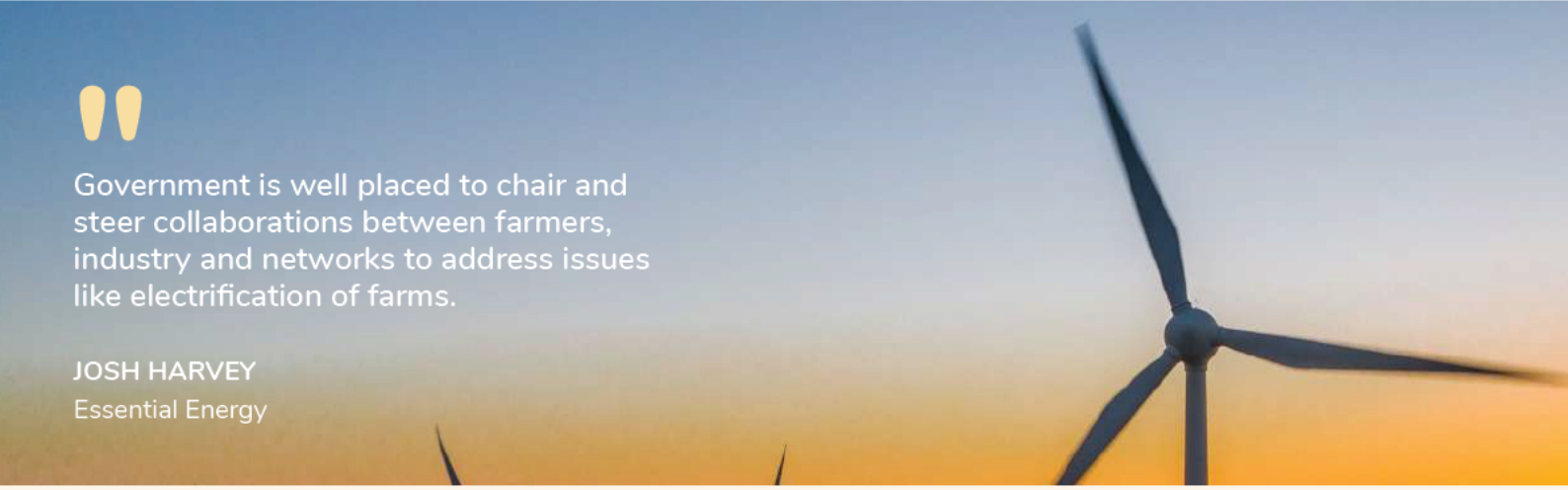
> When we first started building mid-scale solar plants (under 5MW), the slowest part was the construction phase. Now the slowest part by far is negotiating the connection agreements with the network and dealing with Councils. The lack of visibility around who else is applying for a connection can be frustrating and as it's a first come, best dressed situation you can spend tens of thousands if not hundreds of thousands on assessments and then your project is knocked back. The secrecy is difficult to manage.
>
> **PETER MAILLER,**
> cattle and grains farmer in NSW and contractor for Meralli Solar

INCOMPATIBLE POLES AND WIRES

Single phase and SWER lines physically cannot accept higher levels of solar energy into the grid from farmers' properties. The largest single-phase and SWER distribution transfers in common use are 50kVA each. These rural lines have long spans of high-resistance steel conductors and increasing their capacity requires additional poles and new conductors – effectively a complete rebuild.

> A key contributor to energy infrastructure regional disadvantage is the outdated approach of the Australian Energy Regulator which uses population density metrics as the sole consideration of value in its consideration of infrastructure upgrades on the distribution network. This creates a strong bias to serving metropolitan communities.
>
> **NATALIE COLLARD,**
> Food and Fibre Great South Coast

[44] https://www.qff.org.au/wp-content/uploads/2019/03/Barriers-Final-Report.pdf



> Government is well placed to chair and steer collaborations between farmers, industry and networks to address issues like electrification of farms.
>
> JOSH HARVEY
> Essential Energy

EXPORT LIMITS

Blanket export limits imposed across areas prevent excess power being sold to the grid when not being used on-farm, extending out the return on investment for on-farm solar. Batteries that store excess power to dispatch behind the meter, during non-daylight hours, could reduce export to an already saturated grid, however current storage costs mean most systems are financially unviable.

ELECTRICIFICATION

Future electric tractors will have large power requirements and big batteries. There is a lack of clarity and discussion on how to enable electrification with most farmers on SWERs. There could be a role for powering tractors and farm equipment by solar, hydrogen, and bioelectricity, but work needs to start now to address these future issues. Future agtech could require high volumes of energy and rely on a grid that can deliver the electricity needs of farmers.

MICROGRIDS

Microgrids often don't stack up financially due to the inability to share energy without having standard network and transmission charges apply; there are also complex technical and social issues to be overcome in the operation of microgrids. Current network rules don't support brownfield microgrids – with the exception of remote towns and villages where reliability imperatives make them viable. If farmers take over their high voltage network and become High Voltage Customers, this is seen as problematic due to insurance concerns and access to Authorized Contractors to perform switching and maintenance on the HV assets.

STAND ALONE POWER SYSTEMS

For farmers located on the 'edge of the grid', reliability of electricity can be an ongoing issue. Stand Alone Power systems (SAPs), off-grid systems operating independently from the main network, can increase farm energy resilience. SAPs consist of a renewable energy supply such as solar panels, battery storage and a backup generator, making them completely self-sufficient power units.[45] They reduce outages, which are extremely detrimental during harvest and vintage periods for climate controlled environments like poultry sheds, or for dairy farm's daily milking, heating, and cooling requirements.

A study by Energy Networks Australia suggests SAPs could be beneficial and economic to reduce the impacts from natural hazards and disasters. The study suggests a rule change request should consider broadening the considerations that a DNSP is able to use in determining whether to transition existing customers to a SAP to include improved resilience.[46]

According to another report by Energy Networks Australia and CSIRO, new regulatory arrangements will be required to allow innovative service delivery for up to 27,000 new rural connections expected to occur by 2050.[47] Almost $700 million could be saved by supplying these connections, usually farms, with a SAP system, yet current regulations would mandate a conventional 'grid connected' service.[48]

[45] https://www.westernpower.com.au/our-energy-evolution/grid-technology/stand-alone-power-system/
[46] https://www.energynetworks.com.au/resources/reports/2020-reports-and-publications/opportunities-for-saps-to-enhance-network-resilience/
[47] https://www.energynetworks.com.au/resources/reports/unlocking-value-microgrids-and-stand-alone-systems/
[48] Ibid

RECOMMENDATION:

3. Enable on-farm and mid-scale renewables through distribution network reform.

- Establish mid-scale community and farmer 'informal REZs' (outside of declared REZs) which identify under-utilised hosting capacity in the network and encourage dispersed 1-5MW solar developments.
- Trial the carving out of a community energy component within a large scale REZ helping to develop and sustain social license for large scale investments. Some design accommodation within the transmission infrastructure is needed to enable a small collection of 1-5MW projects to tie into the otherwise dedicated REZ infrastructure.
- Eliminate export limits which prevent farmers from exporting more renewable energy to the grid.
- Broaden the Australian Energy Regulator's framework beyond a population density calculation, in determining infrastructure upgrades for the distribution network.
- Develop a plan that identifies areas to prioritise upgrades from SWER to three-phase across regional Australia.

Attracting energy-intensive industry to the regions

The decentralisation of energy is characterised by the production of energy close to where it will be used, such as on farms 'behind the meter', allowing for more optimal use of renewables and new business opportunities. For the purposes of this report, decentralisation also refers to the development of emerging small-scale industries and manufacturing, powered by locally generated renewables that supply a local region, increasing economic development and prosperity for rural people.

The tariffs for power produced under this decentralised model are expected to be cheaper because the power doesn't have to travel so far. Therefore, these cheaper tariffs should attract manufacturers and new industries to locate in the regions to take advantage of cheap, renewable energy sources.

The technology suited to produce decentralised renewables depends on a region's competitive advantage. For example regional liquid biofuel hubs may work where abundant waste feedstocks from farms can be transported short distances to a central point and the biofuel sold back to local farmers. Alternatively in areas with high solar resources, industries such as green hydrogen or ammonia to urea processing may be established to supply the region's agricultural communities.

Producing ammonia is a highly energy intensive process, contributing to 1.8% of global carbon dioxide emissions, similar in scale to the aviation industry. [50]

These new industries can provide regional development through long term employment opportunities and could increase fuel and fertiliser security while decarbonising agriculture's supply chains.

> **As an organisation, Riverine Plains recognises we don't want to be reliant on international inputs such as urea and prices have also been only going up. Being a not for profit, we also want to provide value to our members so investigating a renewables-powered ammonia urea plant could be a fantastic start. Our average member would spend $500,000 on fertiliser a year and given we're in one of the sunniest spots in Australia it just makes sense to be looking at these sorts of opportunities. We just have no idea where to start.**
>
> CATHERINE MARRIOTT,
> CEO, Riverine Plains

[50] Pilbara to get Australia's first large-scale hydrogen plant - Energy Source & Distribution (esdnews.com.au)

CASE STUDY: HYDROGEN FROM WHEAT STRAW IN CENTRALISED REGIONAL HUBS

HydGene Renewables has developed a process that uses the sugars from waste biomass sources (such as barley and wheat straw) and converts these to hydrogen using an engineered biocatalyst technology.

It's the transport and storing of hydrogen that drives up its costs, but HydGene believes it will be possible to make hydrogen on-site and on-demand. They are currently also investigating centralised processing facilities. Working with the Grains Research and Development Corporation they identify that globally there is enough wheat straw stubble available which could be used to replace up to half of today's fossil fuel derived hydrogen.

"Today, if you took 100 tonnes of straw stubble, you can extract nearly 40 tonnes of sugars which can produce about 1 tonne of hydrogen. That's nearly enough energy to power 1,000 houses for a day," explains Louise Brown from HydGene.

"We want to work towards larger regional plant systems in the future. We modelled there is about 100kt of straw stubble available annually from approximately 20 average grain farms that can be used to produce up to 10 tonnes of hydrogen each day in a regional centralised plant with our biocatalyst technology."

"A regional plant making up to 10 tonnes of hydrogen per day could be used to power up to 10,000 homes or provide fuel for nearly 10 refuelling stations."

HydGene recognises the benefits of leaving straw in the paddock for soil carbon and moisture needs, so plan to leave up to 15 centimetres of stubble behind, depending on what individual growers need.

On a regional scale, technology to create green ammonia and urea for local farmers' use from renewable energy sources such as hydrogen has not been demonstrated and there is little understanding of the opportunity, costs (local small scale production compared to industrial scale production), and benefits (job creation, transport cost reductions, and security of supply).

RECOMMENDATION:

4. Prioritise and fund decentralised, regional renewables-based initiatives that contribute to economic development in rural Australia.

- Fund pilot small-scale renewable powered hubs that share infrastructure and supply a local region with products and services such as ammonia to urea processing.

Other regional opportunities

WASTE TO ENERGY OPPORTUNITIES FOR AUSTRALIAN AGRICULTURE

Agriculture creates millions of tonnes of waste a year and can form a fundamental building block for a viable bioenergy sector in the future as well as be a key end user. Bioenergy is a form of energy generated from the conversion of biomass into heat, electricity, biogas and liquid fuels. Biomass includes organic waste products from poultry, dairy and piggeries, cereal straw crop stubble, crops grown specifically to produce biofuels, and horticultural waste like tomato vine residue. There are some industries like food manufacturing or brick works that require high volumes of heat, which currently cannot be met by commercially available electrictrification options. Bioenergy can fulfil this role.

> "Secure energy sources underpin regional economic growth and the security and sustainability of the existing industries we have here in Shepparton. We remain the second largest dairy production region in Australia, we are home to almost a quarter of Australia's milk processing capacity, and we produce almost half of Victoria's fruit. What we want to understand is how we can use the waste from these industries and convert it to energy to strengthen our region as we have never had secure energy given we're on the edge of the grid."
>
> **LINDA NIEUWENHUIZEN**
> CEO Committee for Greater Shepparton

According to ARENA, bioenergy currently provides only 3% of Australia's total energy consumption but has the potential to provide up to 20% by 2050 and up to 26,000 new jobs.[51]

Biogas technologies produce methane by AD of animal and crop waste presenting an opportunity for better waste management, reduced emissions and improved regulatory compliance for agriculture. The outputs are biogas and digestates (soil products in liquids and solid form). The biogas can produce on-demand heat and electricity for use in engines, microturbines or fuel cells.

> Goulburn Valley Water is in a strong position because we are co-located with a high concentration of manufacturers and food processors and we have significant wastewater resources from those industries. We also have a lot of agriculture nearby producing thousands of tonnes of wastes and residuals a year. We are still understanding what those waste profiles are and what the best technology in the bioenergy industry is for producing the biogas to supply our processing and manufacturers. We're keen to understand what a direct supply arrangement could look like from the wastewater treatment plant to the manufacturers and processes and want to secure these industries long term commitment to staying in the Shepparton region.
>
> **SARAH THOMSON**
> Goulburn Valley Water

Waste from Australia's livestock, biosolids, food, and water processes, used to generate biogas, has the potential to become a $2.24 billion per year industry.[52] The country's livestock population of 29 million cattle, over 2 million pigs, and 101 million poultry in addition to about 24 million people generating biosolids and 290 kilograms of food waste per year, the potential for biogas is approximately 7.5 million m3. This could significantly contribute to achieving a cleaner on-demand electricity supply.[53]

[51] https://www.sustainability.vic.gov.au/news/news-articles/record-breaking-bioenergy-investment-in-victoria
[52] http://www.worldbiogasassociation.org/wp-content/uploads/2018/07/Australia-International-Market-Report.pdf
[53] http://www.worldbiogasassociation.org/wp-content/uploads/2018/07/Australia-International-Market-Report.pdf

CASE STUDY: SOUTHERN MEATS ABATTOIR (SHEEP)

Southern Meats, an abattoir in Goulburn, NSW were facing power bills of $100,000 a month for their operations slaughtering 4,000 sheep a day. The abattoir also produces a lot of effluent creating an environmental challenge for the business.

Southern Meats installed a bioenergy system, supported by ARENA, at a cost of $5.75 million. Effluent is piped into covered anaerobic lagoons, where biogas is produced. This gas is transported through an underground pipeline to a gas fired generator where it's converted to electricity. The system produces approximately 4,000 MWh of electricity a year, about half of what the abattoir consumes.[54]

[54] https://arena.gov.au/blog/goulburn-bioenergy-project/

Powering the country: large-scale renewables

THE DEMAND AND THE OPPORTUNITY

Energy generation has historically been a major economic opportunity for regions such as the Latrobe Valley and Hunter Valley. The future energy system will continue to see these regions deliver renewable energy, capitalising on existing transmission infrastructure. At the same time, energy generation opportunities will open up for other regional communities around the country, which have some of the world's best solar and wind resources. Rural and regional Australia will be at the heart of this development boom and with appropriate planning and policy support, it has the opportunity to reap significant rewards.

As fossil fuel power plants reach the end of their lives and Australia moves towards a net zero emissions electricity sector the urgency of this shift is accelerating. Across the eastern seaboard the Australian Energy Market Operator's (AEMO) Integrated System Plan (ISP) models huge growth in electricity generation infrastructure by 2050:

- An almost doubling of the electricity delivered to homes and businesses every year, facilitating the electrification of our transport, industry, office and homes.
- Coal-fired generation withdrawing faster than announced, with 60% of capacity withdrawn by 2030.
- The need for 9 times the utility-scale wind and solar developments.
- The need for nearly 5 times the solar PV capacity, and substantial growth in battery storage.
- The need to treble firming capacity to support variable renewables.[55]

The ISP's optimal development path also identifies 10,000 kilometres of new transmission lines to connect these developments and efficiently deliver firmed renewable energy to eastern seaboard consumers.

[55] https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp https://www.abc.net.au/

To increase the efficiency of this investment, the ISP envisages a series of REZs, where new renewable energy generation projects are clustered together to fully utilise existing and new transmission links. The majority of investment will be in rural and regional Australia.

This should not be simply an opportunity for the electricity industry. An actively involved rural sector can see new diversity of income for farmers who host large-scale infrastructure, increasing resilience to seasonal variations. Energy generation facilities bring new jobs and throw an economic lifeline to regional towns, especially smaller towns that are seeing population decreases. Community funding can be provided from energy projects, and this can make a material contribution to the fabric of rural and regional towns. Community ownership of energy infrastructure could see profits stay in regional areas. As regional Australia becomes a more attractive place to site large-scale electricity generation, new energy-intensive industries can establish themselves in regional centres, bringing new job opportunities.

The key to securing these opportunities is ensuring that regional communities are well informed, and can be active participants in the renewable energy boom. While some of these opportunities are already being delivered throughout regional Australia, widespread community ownership and new energy-intensive industries will require new government frameworks to support their development.

If we do this well, large-scale renewables can support the growth of our agriculture sector. As long as rural Australia has access to cheap and reliable sources of energy, agriculture can confidently progress on its way to the National Farmer Federation's goal of becoming a $100 billion industry by 2030.[56] The renewables build-out can allow agriculture to grow and open new opportunities, ensure a cheap, reliable and clean electricity grid for the farm sector into the future, and deliver additional benefits that strengthen the long term prosperity of rural and regional Australia.

SECONDARY INCOMES FOR RURAL LANDHOLDERS

For over 20 years, landholders in rural and regional Australia have been diversifying their farming income with lease payments from hosting wind turbines and, later, solar panels. The quantity of these payments has grown steadily as the proportion of wind and solar power has climbed to contribute 16% (wind) and 10% (solar) respectively of the generation capacity in the NEM.

Wind turbines take up only around 3% of leased land allowing farmers to derive additional income as they continue their core business of producing food and fibre.[57] In many cases, farmers have been able to accommodate wind turbines on less productive hill country, increasing the overall productivity of their land.

[56] https://nff.org.au/policies/roadmap/
[57] https://ldcinfrastructure.com.au/wind-energy-lease-explained/

Payments to those who host wind turbines are typically made through annual lease payments that are made for the life of the wind farm. Across Australia's windiest regions, a new, reliable, long term source of income now helps to support farming communities.

In 2019, it was estimated wind farms were paying an estimated $17.5 - $20 million to host landowners each year.[58] This figure has increased significantly to around $50 million in 2022.[59] These payments have been critical for many families, delivering year-in, year-out on-farm income and helping them ride out extreme weather and commodity prices. These income streams also help families with the tricky problem of succession, making the farm business more attractive to the next generation and providing extra breathing space to make the right decision for those involved.

There are several hundred farmers across Australia who now enjoy annual payments over a 25-year life span of a typical wind farm. When farmers hire staff, purchase supplies, repair equipment and invest in new machinery this pumps money into local businesses to the benefit of the whole town. That's a big boost to the resilience of a lot of rural towns and businesses who have to struggle year to year with the ups and downs of agriculture.

Across all 41 NSW REZs, EnergyCo estimates that "landholders hosting renewable energy generation projects could be expected to receive an estimated $1.5 billion in lease payments by 2042."[60]

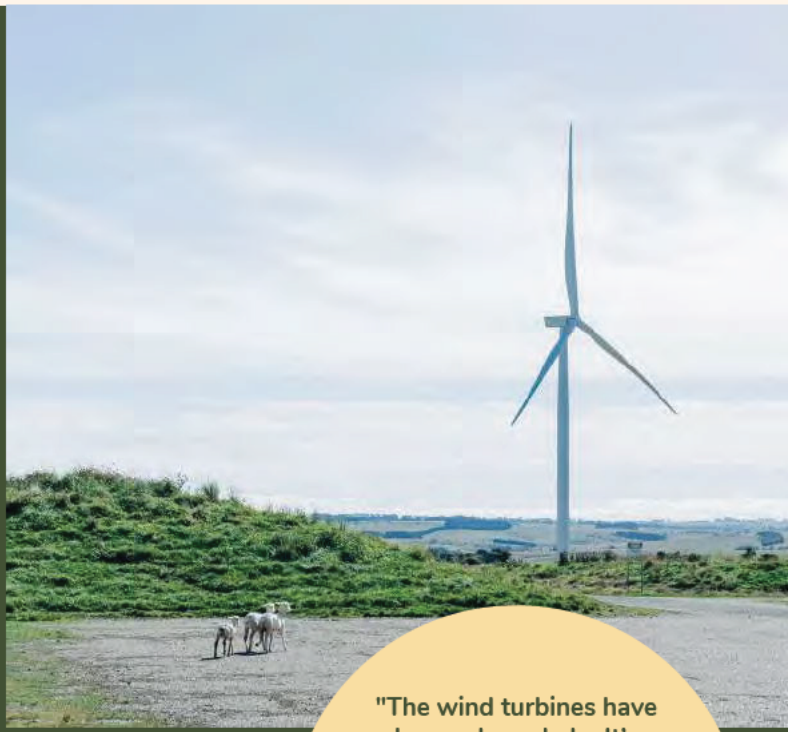
It should be noted that the above payments are for host landholders. Neighbours are often impacted by changing visual amenity and construction phases of projects but often aren't included in sharing the wealth these solar and wind projects create. There have been instances where erosion has occurred on neighbouring properties to solar developments during construction due to changes to the layout and hydrology of the land.

Best practice renewable energy development includes providing payments to neighbours who are impacted by renewables developments whether visually or otherwise. These payments are not mandatory however and are far from uniform across different projects.

CASE STUDY: WIND TURBINES PROVIDE SECONDARY INCOME FOR BEEF AND SHEEP FARMER

Simon Barton is a sheep and cattle farmer, running a property on the Mudgee Road near Wellington, NSW. He is one of a number of hosts for the Bodangora Wind Farm, earning a secondary income through leasing his land. Simon explains how their family were forced to cut back on production during the drought in 2018-2020. He says the conditions were some of the hardest they've ever struggled through.

"We had to de-stock quite a lot. I went from 220 cows down to about 80 during the drought. Sheep numbers were also down, not as much as the cattle, but one of our first cross-breeding enterprises was halved."



"The wind turbines have been a huge help. It's rained a lot since but we're in a financial drought now and it's taking a while to re-stock so the income from the wind turbines is helping drought proof us and keep us viable for the future."[61]

[58] Building Stronger Communities-Wind's growing role in regional Australia
[59] Re-Alliance internal figures based on on Building Stronger Communities, 2019.
[60] https://www.energyco.nsw.gov.au/renewable-energy-zones/what%E2%80%99s-involved-in-a-renewable-energy-zone
[61] https://www.wellingtontimes.com.au/story/5939334/wellington-farm-turns-to-wind-turbines-to-stave-off-effects-of-drought/

LEVELLING THE PLAYING FIELD

Farmers living and working in areas that have seen renewable energy development in the last two decades know that the process is far from straightforward. Often out of the blue, project developers get in contact to offer contracts to lease land. If the land is in a highly sought after position with, for instance, high winds or close proximity to a transmission line, a farmer might be approached by multiple developers. Contracts are complicated, requiring knowledge and experience that farmers may not have. Access to professionals with these skills is often hard to find in regional areas, where the local solicitors and accountants are likely to have limited experience in these kinds of developments. While developers are experts in all the financial, technical and planning details of these negotiations, in most cases, farmers are coming off a standing start.

The end result is that, without asking for any of it, landholders have to make complex decisions that will have long-standing implications for the future of their farm business.

Because farming communities are close-knit, with neighbours who are often relatives or family friends over generations, these decisions have impacts that extend well into the surrounding community. These situations are potentially very stressful and differences within families and between neighbours can arise. While large projects inevitably bring some disruption, poor behaviour from some project developers in the past[62] has put many communities on high alert.

There are also obstacles for landholders and communities living in a REZ that need to - and can be -addressed by State Governments. These can be around housing shortages, shortages of skilled tradies, increased trucks and road usage, and visual impacts. It is important that these challenges are acknowledged and the right mechanisms put in place.

The starting point is access to information. Guides like NSW Farmers Landholder Guide[63] are an excellent resource for landholders who need to understand the development process.

[62] https://www.abc.net.au/news/2018-03-18/controversial-wind-farm-application-withdrawn/9560698
[63] https://www.nswfarmers.org.au/NSWFA/Content/IndustryPolicy/Resource/Renewable_Energy_Landholder_Guide.aspx

A FAIRER DEAL FOR FARMERS AND COMMUNITY AROUND NEW TRANSMISSION LINES

> "The biggest concern we're hearing about from farmers around energy and renewable energy is around large-scale renewables and associated infrastructure (transmission lines)."
>
> ASH SALARDINI
> National Farmers Federation

Much of the new transmission infrastructure needed to meet the ISP will be developed on new easements over land that may be owned by farmers. There will also likely be impacts on publicly owned land and land owned by Traditional Owners.

Local regions along planned transmission routes must be respected in the development of the lines and not be expected to simply tolerate the impacts without benefit. Landholders and neighbours must be treated as key stakeholders for deep consultation on social, cultural and environmental impacts around transmission route location.

There are ways to improve the transmission development process for the immediate benefit of the local region, including the following:

- Investment in high-quality engagement that results in better local social, cultural and environmental outcomes as locals holding knowledge about their region are treated as primary stakeholders.
- Higher annual payments for host landholders to ensure they benefit as though they were hosting a wind or solar farm.
- Payments for impacted neighbouring landholders based on proximity to the line, such as is practice in the wind industry.
- Payments for landholders in study corridors for proposed lines, to cover time that may be taken away from farming businesses to understand and provide feedback on the potential placement of the line.
- Community benefit programs, co-designed with local communities to support local projects, such as access to cheaper local electricity. [64]

Transmission companies could contribute to the reasonable costs of community benefit sharing and community partnerships, with only a modest impost either recovered from electricity consumers or potentially contributed by Government. Transmission companies can recover benefit sharing related costs from electricity consumers through existing market mechanisms.

There is a lot that can be done by transmission companies and by state governments. However, the new Federal Rewiring the Nation policy, and review of the Regulatory Investment Test for Transmission which have been promised by the Federal Minister for Energy presents even greater opportunities for more equitable sharing of costs and benefits in the development of our grid.

[64] https://d3n8a8pro7vhmx.cloudfront.net/vicwind/pages/2616/attachments/original/1628044697/RE-Alliance_July_21_Building_Trust_for_Transmission_Earning_the_social_licence_needed_to_plug_in_Australia's_Renewable_Energy_Zones-compressed.pdf?1628044697

Landholders affected by new transmission lines often call for the undergrounding of some or all of the new transmission infrastructure. Undergrounding is appropriate in some circumstances, for instance two of Australia's largest interconnectors Murraylink and Basslink have been built underground. It is important to remember however that the costs of undergrounding transmission lines are much greater than above ground options. Transgrid recently released a study into the costs of undergrounding the new Humelink transmission line between Wagga Wagga, Bannaby and Maragle. It will connect the pumped hydro project Snowy 2.0 to Sydney, Newcastle and Wollongong, where the power is most needed.

The report found that the cost of undergrounding the HumeLink transmission lines is estimated to be $11.5 billion (for Option 2A-1, high voltage direct current lines), which is at least three times more than the entire project's current cost of $3.3 billion. In addition, this option is expected to take seven years to build, compared to four to five years for the overhead option. It is also the case that there are significant environmental impacts associated with trenching for underground projects.[65]

The current regulatory arrangements overseen by the AER only allow for the recovery of efficient costs from consumers. Options costing significantly more will not be approved by the AER.

RECOMMENDATIONS:

5. Improve accessibility and fairness for farmers and regional communities in transmission and REZ planning, including:

- State Governments provide a mechanism for improved benefit sharing arrangements for transmission hosts and communities, including higher annual payments to hosts, payments to impacted neighbours, and funding for community benefit programs.
- REZ's currently being rolled out should have support available for farmers and communities with independent advice provided in the contract negotiation stage of renewable energy developments.

CONSULTATION WITH FIRST NATIONS COMMUNITIES

Appropriate consultation must be undertaken with impacted First Nations communities on all projects. This is explored in greater depth by other organisations more appropriately placed to address these issues. For example, guidance on working with Aboriginal Communities is provided in the *NSW Government's First Nations Guidelines*[66] and in the *Australian National University's Clean Energy Agreement Making on First Nations Land: What do strong agreements contain?*[67]

[65] Undergrounding Humelink would triple the cost, Transgrid report finds available at: https://www.re-alliance.org.au/undergrounding_humelink_report

[66] NSW Government 2022, First Nations Guidelines available at: https://www.energy.nsw.gov.au/sites/default/files/2022-08/first-nations-guidelines-increasing-income-and-employment-opportunities-from-electricity-infrastructure-projects.pdf

[67] O'Neill, L., Riley, B., Hunt, J., & Maynard, G. (2021). Clean energy agreement making on First Nations land: What do strong agreements contain?, Centre for Aboriginal Economic Policy Research, Australian National University. https://doi.org/10.25911/ VHH3-F498

Our business sees massive potential from community driven mid-scale renewables to deliver long term economic development for regional Australia. Approximately $12 million flows out of the Uralla Local Government Area, to the city each year in electricity costs (into the hands of Origin, AGL, Essential Energy etc). If the community owned a renewable energy generator, this could shift this economic dynamic with power produced and used locally, resulting in that money being retained in the Local Government Area itself.

METHUEN MORGAN
co-founder Meralli Solar

COMMUNITY OWNERSHIP OR CO-INVESTMENT

The most direct way for regional communities to gain a sense of ownership over renewable developments is by becoming co-owners or co-investors in the project. Under a co-investment model, the community owns some part of the profit associated with the renewable energy development, but does not have any decision-making power or control over the operation of the asset. Co-ownership involves more direct control as the community ownership allows an active role in decision making.[68] Co-ownership allows participants to generate income from the asset, develop skills and capacity locally and build long-term trust with the community.[69]

In Europe, co-ownership and community co-investment are much more common than they are in Australia. In Denmark in 2011, the Danish government mandated new wind farms must be at least 20% community-owned.[70] In parts of Europe this model has proved very successful and popular with local communities. For example, in 2013, 46% of Germany's 63 GW of renewable energy was locally owned.[71]

There are many benefits of co-ownership, including:

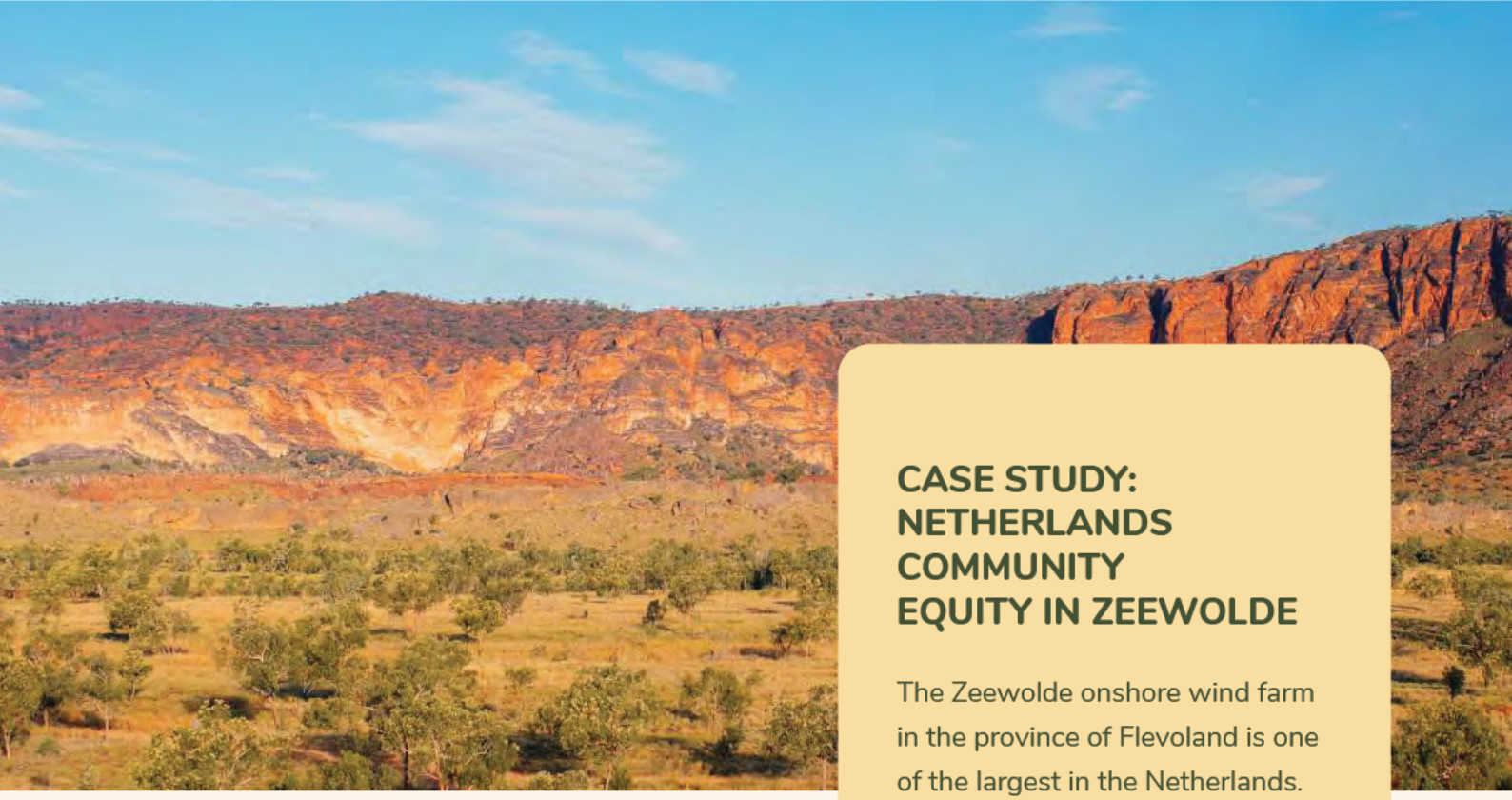
- allowing generation of income that can be re-invested locally;
- providing jobs, training and business opportunities;
- reversing economic decline of an area by attracting investment;
- allowing better stewardship of local assets because the community owns and uses them;
- instilling a renewed sense of pride and confidence in the community; and
- providing local people with a meaningful stake in the future development of the place in which they live and / or work.

[68] Lane, T. and Hicks, J. (2017) Community Engagement and Benefit Sharing in Renewable Energy Development: A Guide for Applicants to the Victorian Renewable Energy Target Auction. p 26. Available at: https://www.energy.vic.gov.au/__data/assets/pdf_file/0027/91377/Community-Engagement-and-Benefit-Sharing-in-Renewable-Energy-Development.pdf and Community Benefits Handbook: How Regional Australia can Prosper from the Clean Energy Boom p. 25 available at: https://assets.nationbuilder.com/vicwind/pages/2631/attachments/original/1630471142/RE-Alliance_Community_Benefits_Handbook_WEB_01v1_%281%29.pdf?1630471142

[69] Benefits of community ownership available at: https://dtascommunityownership.org.uk/community/community-asset-transfer/getting-ready-asset-transfer/benefits-community-ownership

[70] Communal ownership drives Denmark's wind revolution available at: https://www.greeneconomycoalition.org/news-and-resources/people-power-denmarks-energy-cooperatives

[71] Farrell, J. (2013) Half of Germany's 63,000 megawatts of renewable energy is locally owned. Available at: https://ilsr.org/germanys-63000-megawatts-renewable-energylocally-owned/ and Community Benefits Handbook: How Regional Australia can Prosper from the Clean Energy Boom p. 25 available at: https://assets.nationbuilder.com/vicwind/pages/2631/attachments/original/1630471142/RE-Alliance_Community_Benefits_Handbook_WEB_01v1_%281%29.pdf?1630471142



Local communities may also partner with Traditional Owners. For example Canada has developed the Locally Owned Renewable Energy Projects that are Small Scale renewable energy procurement program, which has driven partnerships with First Nations peoples.

Australia's biggest community-owned renewables project comprises two turbines in Hepburn, which took a huge effort over many years by the Hepburn community. There have also been a number of projects on First Nations land – such as Ramahyuck Solar Farm,[72] which is currently in development and will be Victoria's first Aboriginal owned and operated solar farm – but Canadian examples show that there is a lot of room for improvement.

Many community groups lack the expertise to develop a renewable energy project. The cost to engage a consultant to assist with feasibility studies and connection applications can be extremely high before a project is known to be viable. Added to this are legal costs in developing the right structures to finance a community owned energy project and the time commitment from volunteers to run meetings, assess contracts and engage others in the community. Programs like those set out in the Local Power Plan (see below) would empower communities to engage in the process of developing local energy with confidence.

CASE STUDY: NETHERLANDS COMMUNITY EQUITY IN ZEEWOLDE

The Zeewolde onshore wind farm in the province of Flevoland is one of the largest in the Netherlands. Despite the opposition of some of the inhabitants, the authorities of Zeewolde proceeded to its inauguration. Other residents in the community could see the benefits of the project, as they could obtain equity in the project and receive a portion of the revenues.

The onshore wind farm of "Windpark Zeewolde BV" has a capacity of 320 MW. In addition, this allows it to supply electricity to approximately 300,000 homes. Its construction is part of the Dutch energy strategy to increase its share of renewable sources. Regina de Groot, owner of an organic farming business in the vicinity of the wind farm, said:

"People are sometimes not happy about wind turbines. But if wind turbines are owned by everyone and everyone can benefit from them, then I think people will look at them in a more positive light".[73]

[72] https://theconversation.com/how-can-aboriginal-communities-be-part-of-the-nsw-renewable-energy-transition-181171

[73] Energy News - Zeewolde Wind Farm inaugurated, available at: https://energynews.pro/en/zeewolde-wind-farm-inaugurated/?utm_source=facebook&utm_medium=social&utm_campaign=ReviveOldPost

THE LOCAL POWER PLAN

The Local Power Plan (LPP) was developed in consultation with regional communities and aims to capture opportunities for local ownership of renewable energy assets, so that these benefits can be shared with the community locally.[74] This includes programs to install solar PV on community buildings and locals getting together to fund community batteries. The LPP was costed by the Parliamentary Budget Office at $483 million over 10 years to 2030-31.

The LPP is comprised of three schemes:

1. The **Local Power Scheme**, to support local power hubs which would assist communities to develop their own energy projects;
2. The **Underwriting New Community Investment scheme**, which would underwrite locally-owned mid-scale projects;
3. The **Community Renewable Investment Scheme**, which would enable local communities to co-invest in large-scale projects.

The **Local Power Scheme** would establish 50 local power hubs to support renewable energy projects in regional communities. Each Hub would provide technical and project support to community energy groups, and work with them to access a new $310 million Local Power Fund to provide strategic development capital. Over 10 years, the Local Power Scheme was intended to catalyse thousands of small-scale projects across Australia. Each hub would be provided $500,000 a year for 5 years for establishment and administration costs. These hubs would also receive administered funding each year, for 10 years.

The **Underwriting New Community Investment Scheme** (UNCI Scheme) would have guaranteed a minimum return for eligible community-owned renewable energy generation and storage projects for up to 10,000 gigawatt hours each year for 10 years.

The eligible energy projects for this scheme are those that: can generate or store from 1 to 10MW of electricity, are at least 51% community-owned through local individuals, organisations or councils, are community-driven, have broad local support, and deliver tangible benefits to the region and which demonstrate technical benefits to the grid consistent with the ISP.

The **Community Renewable Investment Scheme** (CRIS) would require any new large-scale renewable development to offer 20% of the project equity to local communities within 30 kilometres of the project. To administer this scheme, the Australian Local Power Agency would be provided ongoing funding to develop guidelines for the scheme, assess whether developers meet those guidelines and award approvals once developers have completed co-investment funding rounds.

The Australian Local Power Agency Bill 2021 and Australian Local Power Agency (Consequential Amendments) Bill 2021 were introduced to the Federal Parliament in 2021 to begin implementing the LPP. They were referred to the House of Representatives Standing Committee on the Environment and Energy, who considered that the creation of another new agency, with all the costs and administration that entails, would not be of benefit to Australians. The Committee considered that the ARENA and the CEFC are appropriate agencies to undertake the work of providing support to renewable energy projects in Australia.

[74] Local Power Plan, available at: https://www.localpowerplan.com/_files/ugd/c2035c_89f382e44d71418f85683cea9bcfaa89.pdf

RECOMMENDATION:

6. The Federal Government should introduce additional measures to those set out in the Powering Australia policy to support community renewable energy by adopting programs similar to those suggested by the Local Power Plan. These should be implemented by ARENA and CEFC.

CASE STUDY: SAPPHIRE WIND FARM COMMUNITY CO-INVESTMENT FUND

In 2019, after a two year co-design process with the local community[75], the 270MW Sapphire Wind Farm, 18 km west of Glen Innes, opened a co-investment fund.[76] The Fund allows local community members to invest directly and share in the profits of a large-scale operational renewable energy asset. Shareholders committed $1.8 million of their own funds for a fixed 6% annual return payable across the fund life of 9.5 years. Based on community feedback, a low minimum investment amount of $1,250 made the Fund a realistic option for anyone who was interested.

The impetus for the fund came from the ACT Government's 100% Renewables program, which awarded Sapphire Wind Farm a long term power purchase agreement. Bidders in the tender process were assessed on community engagement and local investment benefits.[77]

While other wind farm projects are planning similar programs,[78] clearer expectations around the need to offer them, such as those envisaged by the Local Power Plan may be necessary to see them become more widespread.

[75] https://assets.cleanenergycouncil.org.au/documents/events/Benefit-Sharing/CEC-Benefit-Sharing-Andrew-Dickson-CWP-Renewables.pdf
[76] https://cwprenewables.com/assets/main/PDFs/Bango/Minutes/Sapphire-Wind-Farm-Community-Co-Investment-Fund-booklet.pdf
[77] https://www.environment.act.gov.au/__data/assets/pdf_file/0007/987991/100-Renewal-Energy-Tri-fold-ACCESS.pdf
[78] https://goldenplainswindfarm.com.au/community-investment/

PHOTO: ARNPRIOR SOLAR, EDF RENEWABLES

COMBINING SOLAR AND AGRICULTURE WITH AGRIVOLTAICS

Renewable energy developments have undergone massive expansion over the last five years and this expansion will continue as we decarbonise our electricity supplies. Renewable energy developments are now being planned to be predominantly in new REZs. These REZs are located in regional communities, many of which support high levels of agricultural production.

Farmers are uniquely positioned to make the most of the roll-out of large-scale renewables being developed in the regions, while continuing to produce food and fibre on the same parcel of land.

Agrivoltaics (or agri-solar) forms part of this opportunity and refers to co-locating agricultural activities with large-scale solar developments. In practice, this could be activities under or between panels such as grazing sheep or cattle, cropping, horticultural crops, creating pollinator habitat or establishing free range chicken farming. Combining farming and solar in agrivoltaics presents a powerful path forward, increasing social licence for renewable energy developments and allowing ongoing agricultural use of productive land. Examples of co-location of agriculture and solar generation in Australia are identified in the Clean Energy Council's Agrisolar Guide.[79]

[79] Clean Energy Council: Australian Guide to Agrisolar for Large-Scale Solar - For proponents and farmers, March 2021 available at: https://assets.cleanenergycouncil.org.au/documents/resources/reports/agrisolar-guide/Australian-guide-to-agrisolar-for-large-scale-solar.pdf

PHOTO: SUNFARMING

BENEFITS FOR FARMERS OF AGRIVOLTAICS INCLUDE:

- Ability to continue to graze animals beneath panels; increasing the productivity of the land Studies have indicated less water consumption for sheep and lambs under solar panels than in exposed sites.
- Secondary income from leasing their land.
- For solar grazing, higher 2 metre cyclone wire fences provide protection against wild dogs and foxes.
- For cropping and horticulture, panels can offer protection from hail and sun.
- Reduced irrigation requirements by up to 20%.[80]
- Increase in some crop yields such as tomatoes as shown by a study in Arizona in the US.
- Certain crops such as berries and fruit trees, increase yield with up to 30% of shading.[81]
- Temperatures up to 5 degrees lower during heat waves.[82]
- Reduced risk from spring frosts as night time temperatures under solar can be between 1 degree and 4 degrees higher.
- Reduction of water use/stress under solar of between 12% and 50% reducing the need for irrigation.
- Reduced loss of productive land.
- For vineyards, improved aromatic and phenolic quality. Up to 2% less acidity and increases of between 9% and 14% anthocyanin.[83]

BENEFITS FOR SOLAR DEVELOPERS INCLUDE:

- Demonstrate commitment to valuing agricultural land.
- More options to site projects.
- Reduced costs for mowing and chemical input to keep weeds down when grazing continues under panels.
- Higher panel efficiency through better convective cooling.

BENEFITS FOR GOVERNMENTS INCLUDE:

- Ability to achieve net zero targets with increased support from regional communities and farming groups.
- Smaller more dispersed new land-siting opportunities for solar.

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[80] Elamri, Y. & Cheviron, B. & Lopez, J.-M. & Dejean, C. & Belaud, G., 2018. "Water budget and crop modelling for agrivoltaic systems: Application to irrigated lettuces," Agricultural Water Management, Elsevier, vol. 208(C), pages 440-453.available at: https://ideas.repec.org/a/eee/agiwat/v208y2018icp440-453.html

[81] Laub, M. & Pataczek, L. & Feuerbacher, A. & Zikeli, S. & Högy, P. Contrasting yield responses at varying levels of shade suggest different suitability of crops for dual land-use systems: a meta-analysis. Agronomy for Sustainable Development (2022) 42:51 https://link.springer.com/epdf/10.1007/s13593-022-00783-7?sharing_token=jtnO0pm7RyKWz896JpNZHPe4RwlQNchNByi7wbcMAY6te6XeQr46Rhcrn6FfB-nn5qwJvPy4RyEMktGoo8tz38TCr6VCCwP6nkwytdkbh1uPSCxhdBjeIJgJRKmjxMmq7xFRE2VWgNaS87LrcQOKjXqknJf1ByuFpDo_ywBPlXtY%3D)

[82] Sun'Agri website available at: https://sunagri.fr/en/farmer-project/

[83] *Ibid*

CASE STUDY: SOLAR AND SHEEP

A farmer in the Central West, NSW Tom Warren hosts an 18MW solar farm and runs about 250 merino ewes and wethers on 54 hectares of land. Tom believes that as well as earning a secondary income from leasing his land, the solar panels have increased the carrying capacity of the block by about 25%. This was important during the drought in 2018, as water condensed on the solar panels in the mornings and trickled down below to keep strips of pasture green for his sheep to feed on. This resulted in him only needing to buy feed for them for three months of the two year drought.

"Hosting an 18MW solar farm was a great opportunity for me to supplement my agricultural income. I was very keen from the outset that I would get the opportunity to graze my merino sheep beneath the panels. The company agreed and it's been a win-win ever since. I've noticed the sheep's wool is relatively clean, without burrs, without dust. There's very, very little contamination of the wool and they're protected from the sun as well."

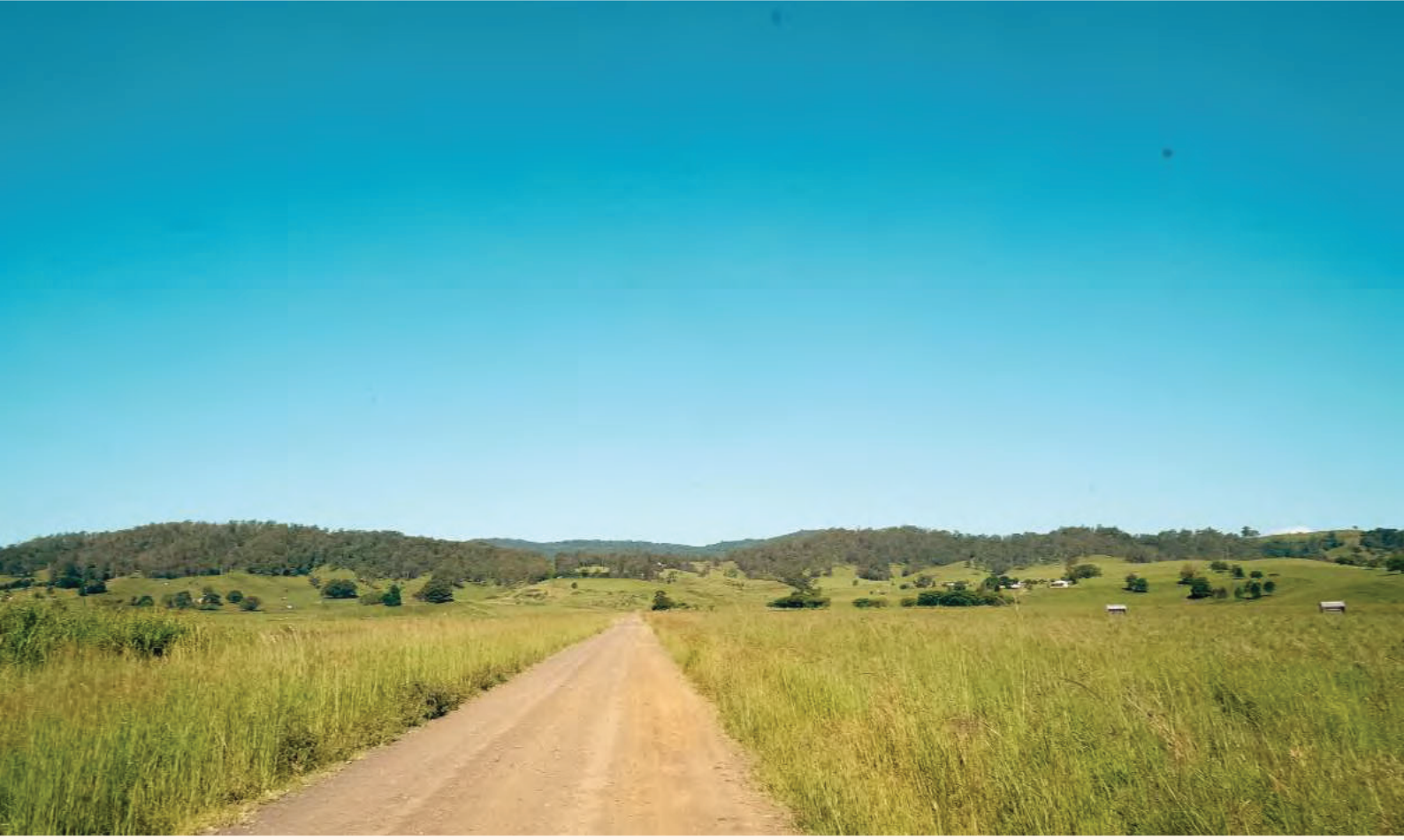
Adoption of agrivoltaics in Australia has been slow. Knowledge gaps, technical and economic impediments, poor planning and a lack of clear policy guidance at the development stage have hindered uptake.

While there are no current legislative barriers to agrivoltaics in Australia, the set up costs, particularly for cropping and horticulture projects, is higher than for conventional solar developments. This is due to the additional materials needed to increase the height of the structures and the increased land that can be needed.

RECOMMENDATIONS:

7. Support the combining of energy and farming through agrivoltaics by demonstrating that agriculture and renewables can complement one another.

- The Federal Government allocate funding to establish an agrivoltaics research and knowledge sharing program to boost farm profitability and show communities that agriculture and energy production can co-exist.



Conclusion

We are living in extraordinary times and with this comes extraordinary opportunities. We have the opportunity to revitalise the regions and embed sustainable farming into our society. Not getting this right means a huge missed opportunity for long term regional economic development.

The adoption of on-farm renewables means reducing emissions, reducing input costs and building business resilience, just some of the many benefits to be grasped. A sustainable farming sector benefits all Australians; keeping food affordable and allowing agriculture to continue to access export markets overseas.

Importantly communities need to be empowered and involved in the energy shift that is occurring. Australia has some of the best renewable resources in the world. Instead of power being held by a handful of entities, dispersed mid-scale renewable energy developments owned by farmers and communities could mean building a generation of shared prosperity. But we need to create supportive policies and programs for this to happen.

Australia's energy and food systems have reached a critical moment in time where every step we take now as a society will either set us up to succeed or to fail. New ways of thinking and operating are needed to foster meaningful and lasting benefits for regional communities and our farmers.

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October 2022

COMMUNITY BENEFITS HANDBOOK

How Regional Australia Can Prosper From The Clean Energy Boom

RE ALLIANCE

CONNECTING PEOPLE TO POWER

RE-ALLIANCE

CONNECTING PEOPLE TO POWER

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RE-Alliance (the Renewable Energy Alliance) works to secure meaningful benefits for regional Australians from the transition to clean power. We do this by listening to the needs and concerns of local residents, facilitating collaboration across the industry to achieve social outcomes and advocating for improved regional benefits at a policy level.

This report has been prepared predominantly on the lands of the Gadigal, Wiradjuri, Wailwan and Kamilaroi peoples. RE-Alliance wishes to acknowledge them as Traditional Custodians and pay our respects to their Elders, past and present. We wish to extend that acknowledgement and respect to all Aboriginal and Torres Strait Islander people whose knowledge and connection to Country is integral to our resilient, sustainable futures.

Contents

Foreword: What Will A REZ Mean For Our Region?

Comments from local residents in the Central-West Orana region, where the pilot REZ for NSW is beginning to attract renewable projects.

"In my view the Dubbo - Wellington area is standing at the dawn of a new age when it comes to the potential of skilled new jobs thanks to the massive investment of hi-tech money which will flow into this region as the first Renewable Energy Zone in Australia. This investment should create pathways for local youth to train for future jobs and work in skilled industries without having to move to Sydney."

— **John Ryan**, Dubbo Photo News, news editor, Dubbo Regional Councillor

"The transition to renewables demonstrates the maturing of Australia's energy sector. The Central-West Orana REZ offers my community the chance to showcase the enormous capability of our local energy service providers. Partnering with local communities to deliver the REZ will leverage the significant skills and talent on offer here. The REZ will support the expansion of local businesses, including renewables recycling and remanufacturing initiatives, which will provide local jobs and benefit my community into the future. I'm excited to be here in Dubbo at this pivotal moment in Australia's energy transition."

— **Megan Jones**, Entrepreneur and Renewable Energy Advocate

"I live on a property in Wellington in the heart of the first REZ being established in the Central-West of NSW. Currently our locality is host to one wind farm and two solar farms (one still under construction), with at least 2 further wind farms under proposal as well as another two solar farms being considered.

As a host landholder to several wind turbines as well as being a member of the Community Consultative Committee I have seen the benefits that these projects have in the community. Not only do they provide a large employment project during construction as well as ongoing employment these companies that own and operate these projects are putting money back into the community each year as well as to the local council to maintain infrastructure. All of this helps our local businesses as well as our sporting clubs, arts, environmental interests, fairs, schools and many other community groups.

On a personal level the money we receive from hosting these turbines has drought proofed our property which is very current after our last big drought. We have had a good season now for 18 months grass wise but we are still in a financial drought. I have just in the last week had my first income from livestock sales in 19 months so the returns from hosting the turbines has kept us financially viable over this period."

— **Simon Barton**, Farmer

Benefits of renewables for regional communities

Direct Benefits

All the direct forms of payment and compensation transfered to others as the renewable company does business

Direct jobs in renewables

Business for local contractors

Lease payments to farmers and landholders

Neighbour payments to nearby properties

Indirect Benefits

Positive local side-effects of the renewable energy transformation

Boost in hospitality industries to service construction workers

Local procurement and contracting for project delivery

Education & Tourism

Community Benefit Schemes

What can be achieved when communities and renewable companies work together for the benefit of the region

Community Funds

In-kind contributions

Neighbourhood improvement schemes

Co-investment and co-ownership

Employee volunteerism

Regionwide community funds

First Nations benefits

Unique & emerging benefit-sharing models

1. Introduction

The need to significantly reduce emissions this decade presents a great challenge for us in making the transition from fossil fuels to cleaner and cheaper renewable energy. Regional communities see the effects of this change, both positive and negative, whether from the widespread benefits of wind & solar farms or the closure of old power industries.

With so much noise and political point-scoring around emissions targets it can be easy to miss the strides that have been taken by state governments, renewables investors and local communities preparing the way for our future grid. Investment in clean power can give regional Australian families certainty that there will be prosperity, economic growth and job opportunities in their local communities for decades to come.

Renewable Energy Zones, (REZs) will be the power stations of the future. Distributed over a region, solar, wind, pumped hydro and battery projects will collectively provide a steady supply of clean power that can be delivered to the National Electricity Market via high voltage transmission lines. Using existing lines as much as possible and then building new lines to projects concentrated in REZs is the most efficient and cost effective way to bring this clean power online.

Each state's energy department looks after REZ development. Exactly what a REZ entails will be different between states. Even within a state, each REZ will look very different to the next depending on local geography, existing industry and demographics.

Local communities themselves will, if they choose, play a massive role in determining what each REZ will look like and what local benefits they will deliver. The next couple of years will be critical for REZ communities in articulating what they would each like to see come out of the influx of renewable energy investment in their region.

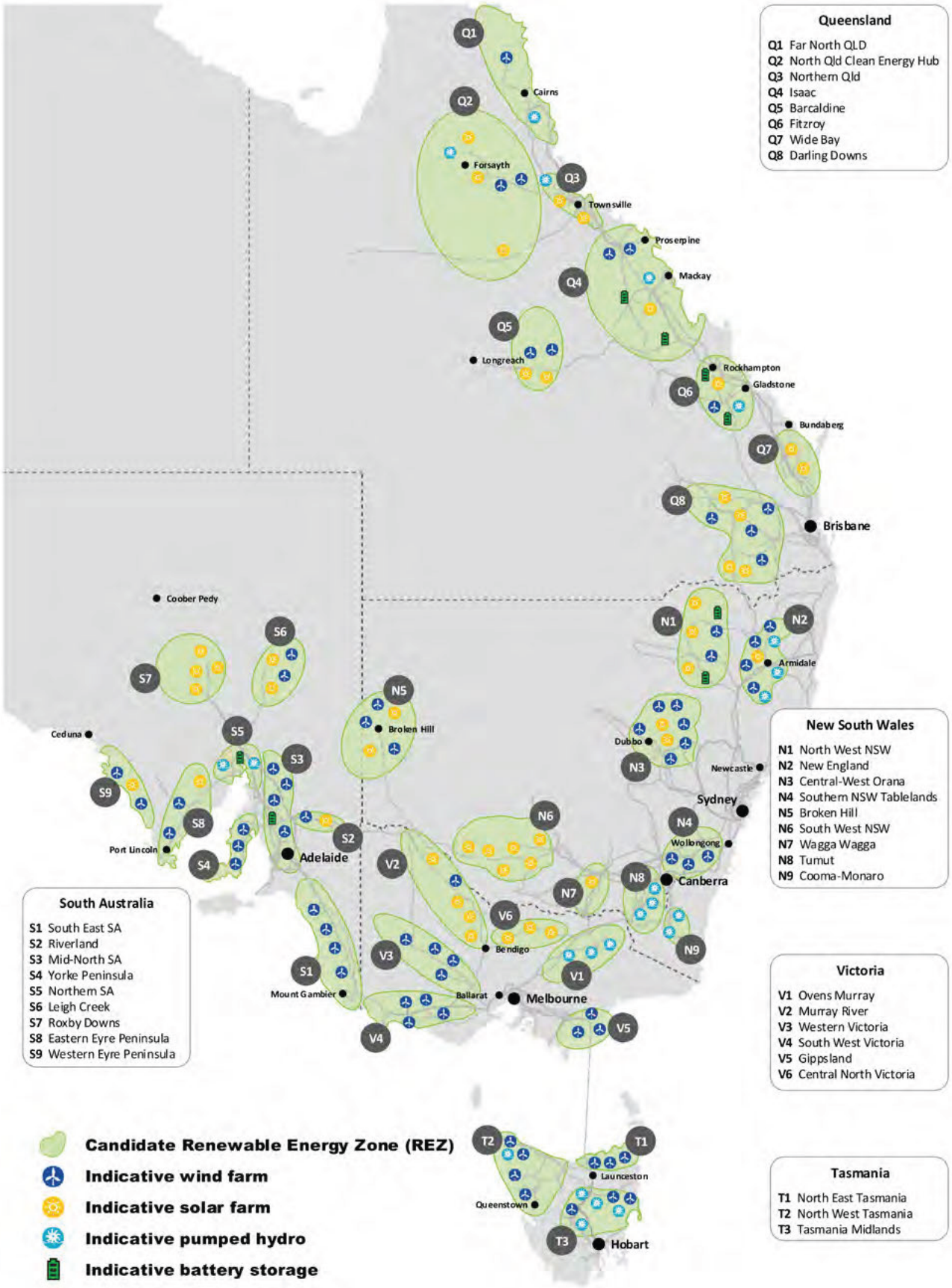
Regional communities can have valid concerns in regards to the establishment of new large-scale infrastructure projects, including renewable energy. In our own work, the typical complaints that we have heard include:

- Visual amenity impacts
- Noise concerns
- Property price concerns
- Lack of genuine consultation and access to decision-making
- Changes of project ownership
- Disruption of community cohesion
- Land-use conflicts (real or perceived) with agriculture

These complaints align with those reported annually by the Australian Energy Infrastructure Commissioner [1].

Renewable companies can vary in terms of the quality of their local engagement, communication, and community benefit programs. All of the above concerns can be addressed at the company level, however there is a role for governments to prioritise community concerns as they regulate industry practice and issue licences for grid connection.

[1] Australian Energy Infrastructure Commissioner Observations and Recommendations. Available at: https://www.nwfc.gov.au/observations-and-recommendations



Identified candidate Renewable Energy Zones (REZs) for assessment in developing the optimal development path in the NEM. © AEMO 2020.

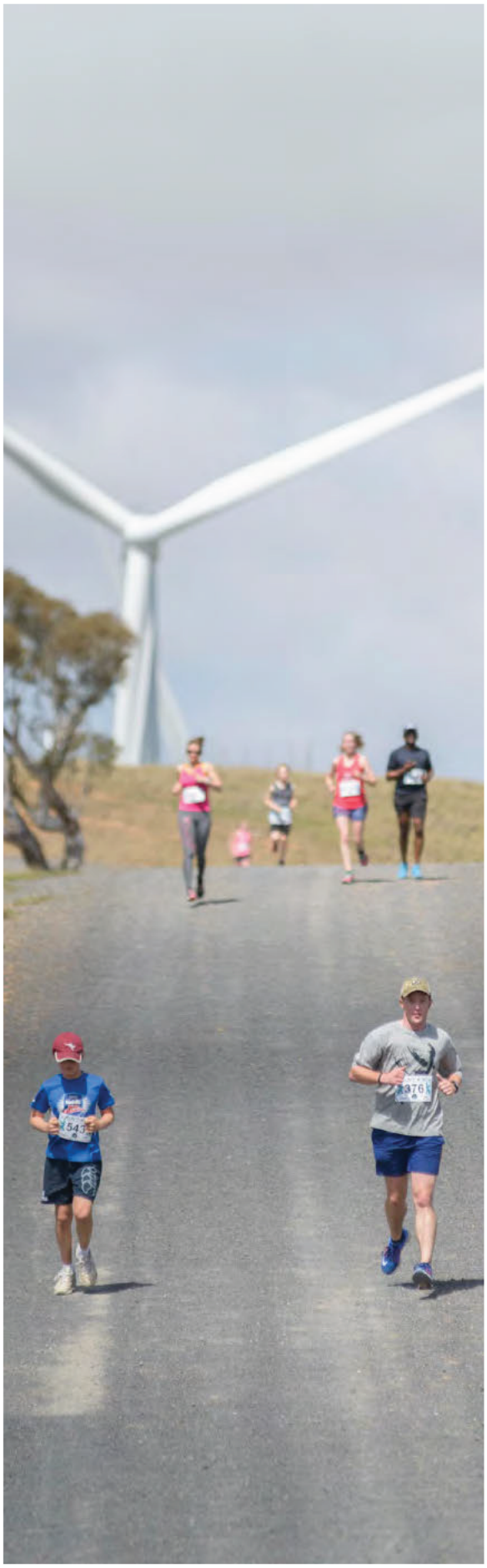
Companies should be striving to outdo each other in terms of community engagement practice, especially as the market becomes crowded and as they jockey for a position in a REZ.

The purpose of this handbook is to equip local community leaders with information and ideas to get started thinking big about how to leverage the renewables boom into local opportunities that address local needs and desires. It covers what kinds of benefits regional communities are already seeing in different parts of the country from large-scale renewables and begins to picture what these might look like on a bigger scale with industry investment concentrated across a region.

Types of benefits locals are already seeing include:

- Direct payments to farmers for hosting wind and solar, often drought-proofing agricultural businesses
- Neighbour payments
- Direct and indirect jobs created in construction, electrical work, manufacturing and maintenance
- Procurement of local goods and services
- Neighbour benefit schemes (road upgrades, tree planting)
- Funding for local community groups, schools and not-for-profits via community enhancement funds
- Community investment and ownership opportunities in renewable projects
- Renewable energy tourism
- Agricultural benefits such as improved carrying capacity of grazing land with solar panels providing shade for grass and sheep

However, we shouldn't stop there. The cumulative benefits of multiple projects across a locality created by the REZ system means we can dream big about projects that will have a legacy for decades into the future.



2. Local Decision-Making Power

Naturally, regional people are the ones who care most about where they live and have the strongest desire to contribute to the future of their region. This local connection and passion should be harnessed into ensuring that regional communities strongly benefit from the establishment of REZs.

Community engagement protocols used by government and industry are often designed using the below trajectory designed by the International Association for Public Participation:[2]

INFORMING > CONSULTING > INVOLVING > COLLABORATING > EMPOWERING

Many regional communities will be familiar with what are often seen as 'tick-box' approaches to large-scale infrastructure projects that rarely go beyond the informing and consulting stages.

REZ community engagement could go beyond these 'tick-box' approaches and instead collaborate with and empower local communities. Research shows that community engagement needs to move beyond managing or avoiding negative public responses and move towards a more proactive approach, recognising the importance of listening, engaging and encouraging participation[3].

[2]Public Participation Spectrum International Association for Public Participation. Available here: https://iap2.org.au/resources/spectrum/
[3]Aitken et al. 2016, "Practices and rationales of community engagement with wind farms: awareness raising, consultation, empowerment" available at:

Every Australian region is unique, and every town or village within each region has its own distinct character. If locals are involved in the development of REZs from an early stage, then community issues, desires and ideas can be identified much earlier in the REZ design process than currently occurs. Ideally, we will see a process being established that allows for host communities to collaborate with government and industry on aspects of REZs to ensure local empowerment, pride and a sense of ownership over the REZ.

There should not be a one-size-fits-all approach to the roll-out of REZs, and the right approach to local engagement, collaboration and empowerment will necessarily vary across the different REZs, and across the communities within each REZ.

We know that locals know best. Local knowledge on land-use, community needs and regional priorities is valuable, useful information that could drastically improve the outcomes from REZs. We also know that regional communities are connected communities with deep networks of pre-existing relationships that would be beneficial to any major project being established in the region.

There are many aspects in the roll-out of REZs where collaboration and empowerment of the local community would significantly enhance the REZ model. REZ decisions that could be made stronger with participation of the local community include:

- Site selections
- Tourism and education programs
- Measures to enhance or mitigate visual impacts
- Target priorities for community funds
- Solar panel arrangements that can allow for different types of crops or grazing around the panels
- Code of conduct for projects
- Co-investment or co-ownership models
- Community benefit sharing models

However, without people in the regions raising their voices, the opportunity for local communities to collaborate on and help to shape the future of REZs could sail past. Now is the time to talk to your neighbours, colleagues, family and friends. Let's make REZs something regional Australians are proud to host!

Case Study: Co-design in Walcha

MirusWind (now WalchaEnergy) began engagement with the local community of Walcha almost twenty years ago, in 2004. In the years following that early engagement, MirusWind embarked upon a journey with local landholders to co-design aspects of the Winterbourne Wind segment of the Walcha Energy Project. Host landholders collectively negotiated a code of conduct for the project, were involved in project site and turbine site selections, and designed an innovative co-ownership and benefit sharing model, that is further discussed in the section of this report on Co-Investment and Co-Ownership.

Case Study: Collaboration & empowerment: community benefits for the New England Solar Farm

UPC/AC Renewables Australia recognised the importance of collaborating with the impacted community when establishing a Community Benefit Sharing Initiative (CBSI) for their New England Solar Farm project. Through the establishment of a Community Reference Group, UPC/AC was able to co-design their CBSI based on input from the reference group on how the funds should be spent, where the funds should be spent geographically, and legal and governance arrangements for the fund.

A second Community Reference Group has since been established to implement the CBSI during the life of the project—more on this in the Community Enhancement Fund section of this report.

Case Study: Collaborative future-planning in the Latrobe Valley

In 2016 the Government of Victoria established the Latrobe Valley Authority. In part due to regional advocacy, the Government recognised the importance of a local, coordinating vehicle for managing the complex and multifaceted array of issues and opportunities that arise out of regional industry transformation. In responding to the decline of fossil-fuel industries in the Latrobe Valley, the Authority draws on local research, ideas and actions to build a resilient and robust future for the Latrobe Valley. They identify their fundamental frameworks as[4] :

- Locally-owned ideas
- Coordinated effort
- Outcomes focused
- Action oriented
- Genuine partnerships

A similar community-led organisation could feasibly be established in each of the five designated REZs in NSW.

[4]Cain, K. 2019 A just transition for the Latrobe Valley. Available at: https://www.climate-transparency.org/wp-content/uploads/2019/03/17.Karen-Cain-Latrobe-Valley-Authority-February-2019.pdf

3. Community Enhancement Funds

The most straightforward action energy companies often take to create benefits in host communities is to carve out a stream of profits for that purpose. Many wind farms and a growing number of solar farms in Australia have Community Enhancement Funds (CEFs)—voluntary payments made by renewable energy companies for distribution to community groups, programs or projects. CEFs are currently the most common avenue through which regional communities have sought to benefit from renewable energy projects located in their backyards.

While urbanisation and a changing climate can threaten the livelihood of regional and rural townships, REZs present an enormous opportunity to invest in regional economic sustainability and growth. However for this opportunity to be realised, people in regional communities need to get involved in the creation, governance and decision-making processes for these pools of funds. We know that locals have a deep understanding of where an influx of funds could best be spent in the region, and getting involved in administering a CEF is a great opportunity to direct funds to worthy local projects.

Over the years, hundreds of community applications have been made and granted. Local not-for-profits, Country Women's Associations, climate action groups, Landcare groups, golf and bowling clubs, local schools, theatres, men's sheds and progress associations are just some of the many organisations that have replaced equipment, run projects, built community infrastructure and supported their communities through CEF grants. Overwhelmingly, CEFs have supported the volunteer-led organisations that underpin country towns.

Community projects that have been realised as a result of renewable energy project CEFs range from small scale such as Indigenous and community gardens, workshops for resilient living and health initiatives, food coops, local tourism marketing materials, through to more substantial 'legacy' type projects such as community microgrids, solar arrays for hospitals and large scale revegetation projects. You name it, somewhere, a local community has found a way to fix it, upgrade it or make it happen with the support of wind or solar farm CEF funding.

CEFs should be based on local needs, co-designed with the local community, and form part of the genuine community engagement, collaboration and empowerment discussed earlier in this report. And for that to happen, locals need to get involved.

[5]Inverell Times (2018) Sapphire Wind Farm construction in the Community Projects planned for Inverell and Glen Innes, New England. Available at: https://www.inverelltimes.com.au/story/5434613/sapphire-wind-farm-legacy-to-live-on-through-community-projects/

[6]Geraldton Newspapers (2014) Putting a whoosh into tourism. The West Australian. Available at: https://thewest.com.au/news/gascoyne/putting-a-whoosh-into-tourism-ng-ya-256408

[7]AGL Energy (2019) Working in Silverton, for Silverton, available at:

Recipients of Taralga Wind Farm CEF grants for 2018 recognised for their work. © Adam Chandler, Pacific Hydro

CEF GOVERNANCE

Commonly, a set amount of funding per year is made available to local communities during the operational life of the project. The funding amount is typically based on installed megawatts with different methodologies across different technologies and capacity factors, and is typically CPI linked. In many cases, funding grants are made through an application process and in accordance with guidelines or terms of reference determined by the management committee to achieve fairness and transparency.

There are currently no federally legislated requirements for CEFs in Australia, although there are often state-based norms, which has led to enormous diversity in the form, function and size of funds from region to region and project to project.

Ideally, the shape and workings of the CEFs in Australia reflect the community hosting the renewable energy project. For instance, some CEFs are managed by the project company, with input from community representatives. Some CEFs are managed by community representatives with input from the project company. In NSW, CEFs are commonly run by S355 Council-managed committees comprised of a range of Council and community stakeholders; some CEFs are entirely managed by community representatives.

[8]Spark Infrastructure 2021 "Bomen Solar Farm commits $500,000 to long term partnership with Mount Austin High School in Wagga Wagga" available at: https://static1.squarespace.com/static/5de5eaa02625a4608a274e37/t/606419b95487fa23c0bf3fcf/1617172923568/BSF+Media+Release+-+31+March+2021.pdf

[9]Ibid

[10]Republished from RE-Alliance 2019 Building Stronger Communities, p.9 . Available at: https://www.re-alliance.org.au/bsc2

IN-KIND CONTRIBUTIONS

An example of innovation in the community enhancement space is the provision of in-kind contributions.

At Sapphire Wind Farm in the Northern Tablelands of NSW, for example, project owners wanted to make a contribution to the local community during construction of the project, and approached their construction team, and the local community for assistance to discuss how to realise long term benefits. The result was their legacy program "Construction in the Community," which saw the wind farm construction team work on small to medium sized infrastructure projects for local organisations. [5]

Wind turbine blades have been reimagined as tourist attractions and donated to local communities, such as at Mumbida Wind Farm in Western Australia.[6] In sunny Western NSW, Silverton Wind Farm offered 5kW solar PV systems to the residents of Silverton. [7]

Case Study: Spark Infrastructure & Westpac Support Mount Austin High School

$1 million of the profits made from the Bomen Solar Farm located in Wagga Wagga have been allocated to a decade-long community benefit fund.

Spark Infrastructure, in partnership with Westpac, will contribute $500,000 over the next decade to two programs aimed at high school students from Mount Austin High School. The partnership with Westpac is through a Power Purchase Agreement (PPA) between Spark Infrastructure and Westpac. Their co-funding of this program highlights the opportunity for both project owners and PPA partners to contribute meaningfully to host communities.

Across the next decade an annual contribution of $25,000 will be granted to the 'Girls @ the Centre' program, which "supports female students to stay in school and complete Year 12, and provides opportunities to enhance students' career options.[8]"

Similarly, $25,000 annually, for the same time period will be granted towards the 'Transition Program', a pre-existing program that aims to support "as many students as possible to transition from school into the wider society".

Anthony Marriner, Head of Renewables at Spark Infrastructure said of the contributions:

> *"We are delighted to have finalised this donation to two very important programs at Mount Austin High School. We have one of the largest solar farm community funds in Australia and are pleased to be giving back to the local community .[9]"*

Case Study: Over a hundred projects and counting: Snowtown's Lend-a-Hand Foundation

> *"It's helping the community, and not just Snowtown, but all the towns in sight of the wind farm."*

The Snowtown Wind Farm Lend a Hand Foundation has been operating for as long as the wind farm—almost ten years. Alan Large, a Snowtown resident, has sat on the foundation committee since it was formed and has a lot of stories to tell about what the foundation means for his community.

[11]Neoen 2021 Bulgana Green Power Hub available at:

> *"In the last two years we've provided funds for a weather station for the Snowtown Country Fire Service, supported the Bute Men's shed, and contributed to the Brinkworth history group for their museum and a reprint of their centenary book through grant funding. In the past, we've helped the Brinkworth bowling club paint their building; the Bute Lions club and primary school plant trees and paint telegraph (stobey) poles and the Snowtown football club upgrade their changing rooms."*

In 2017 the Lend a Hand committee contributed $15,000 to get the Snowtown primary school Barunga Gap school bus route up and running again. The government-run bus route had been cut because of dwindling student numbers and the school was looking for money to continue the school run with a new bus. For families of out-of-town preschool and primary school students, the bus was a critical service.

The school was able to leverage Lend a Hand funds to raise additional funding from other avenues, and now has the school bus route running again.

Snowtown also has a community bus which the foundation supported a few years back—which any community group can hire.

> *"At the end of the day, almost ten years on, we still manage to spend all the money each year—we still get plenty of application forms. The foundation is good for the community."*

Case Study: Bulgana Combined Wind & Battery brings local benefits to the Northern Grampians

Neoen's Bulgana Green Power Hub is injecting an extra $120,000 to the Northern Grampians economy each year through their Community Benefit Fund for the combined wind and battery project. Like similar schemes, the fund provides grants for local community groups including environment groups, sports clubs and schools.

Established in 2018 the project has provided grants ranging from $1,500 to $20,000 to local initiatives including Grampians Community Health, Concongella Primary School, Stawell Senior Citizens, St Arnaud Sports Stadium Association and the Great Western Future Committee.

> *"We applied for a grant to install a wind turbine & solar panel array at the school. The purpose was for the students to understand the different streams of energy production. It was a very simple application process." — Kristie Miller, Principal, Concongella Primary School*

Case Study: New England Solar Farm Uralla Grants Program

UPC/AC's New England Solar Farm in Uralla, NSW has established Uralla Grants which is a part of the Community Benefit Sharing Initiative for the project[12]. The program will be funded through annual contributions of $250 for every MW of power generating capacity for the project. The grant program commenced in 2021, with $50,000 already allocated to local initiatives, and another $50,000 set to become available in the second half of 2021. **Crucially, UPC/AC made the decision to start allocating grant funding prior to project construction.** This allowed for benefits to the community to be seen prior to construction disruptions.

[12]UPC/AC Australia Uralla Grants available at:https://www.newenglandsolarfarm.com.au/urallagrants-information

Students from Kairi State School in Far North Queensland, at their Kairi Kitchen Garden sustainable garden project, funded by Mt Emerald wind farm's community fund. © RATCH Australia.

The program is independently run by a Community Reference Group that was established in 2020 following public expressions of interest and nominations. Reference Group member Sandra Eady said the Uralla Grants program is the first step in what will be an exciting range of initiatives, conceived and developed by the local community for the local community.

> *"The grants could support a range of projects from facility upgrades, local sporting or education programs or energy efficiency or beautification projects. We hope to see a broad range of proposals that provide maximum benefit to different parts of our local community and encourage potential applicants to get working on their proposals. Our community has faced the impacts of the drought, bushfires and now COVID-19 over the past 12 months. These grants will make a positive contribution back into our community."*

Importantly, the initiative acknowledges that piecemeal community initiatives requiring funding could feasibly drop off after the first few years. UPC\AC Renewables has stated that they

"will consider other opportunities for using the available funds, which includes employment of a Community Coordinator to help organize local events and administer the CBSI. The funds may also be used towards establishing a revolving low-interest loan to support residents fund energy saving activities."

Case Study: Big Battery providing big local benefits

The Hornsdale Power Reserve—or SA's 'Big Battery'—as it's more commonly known provides $60,000 annually to the community of Jamestown and surrounding areas in the form of a community benefit fund[13]. Administered by the Northern Areas Council, local community groups can apply for grants that range from $1000 to $8000.

The fund is linked to community growth focus areas that include environmental sustainability, health and wellbeing, arts and culture, strong connected communities, sports and recreation, and skills, education and training.

Previous grant recipients have included Mid North Suicide Prevention Network, Jamestown Country Women's Association, Jamestown Mural Festival, Tarcowie Landcare, Spalding Cricket Club and Gladstone History Group.

[13]Neoen 2021, Hornsdale Power Reserve: Local Benefits, available at: https://hornsdalepowerreserve.com.au/local-benefits/

4. Regional Enhancement Funds

One of the beauties in hosting a REZ is the potential for bigger and better benefits than individual projects alone can provide. **The volume of potential community funding from industry over time in REZs presents an opportunity to fund ambitious and strategic local ventures if a percentage of those funds are coordinated.** One avenue through which this could be achieved is with the establishment of regional enhancement funds (REF). REFs, with community control, could open the opportunity for greater and longer-lasting benefits to reach REZ communities.

Both this opportunity and need was also identified by the Australian Energy Infrastructure Commissioner[14].

> *"Some regions of Australia are experiencing increased clustering of proposed and approved wind farms which may result in multiple wind farms infiltrating and 'surrounding' communities. As a result, there is both the need and opportunity for individual project developers to communicate more effectively with each other and better coordinate engagement with the affected community. This could range from combined initiatives by wind farm developers through to coordination of construction programs in order to minimise cumulative impacts on residents and townships. Developers should also be aware of other key infrastructure projects that may be taking place in a region and ensure that project schedules are planned and coordinated to minimise impacts to communities."*

Regionwide Fund:
If local community funds choose to join forces across a region they can have a greater impact

1. Wind and renewable projects join forces to strategically fund major projects across the region
2. Community groups can think big about the projects they want to see, informed by Council and government plans
3. Funding is directed by a local community-led committee
4. Trusted third party handles admin and governance
5. If new projects join the region and contribute, the pooled fund can increase its impact

[14]Australian Energy Infrastrastructure Commissioner Community Engagement available at: https://www.nwfc.gov.au/observations-and-recommendations/community-engagement

The NSW Victorian, Tasmanian and Queensland governments have all indicated an intention to coordinate community funds across a REZ. However, **we'll need to make the voices of regional Australia heard to ensure that local communities have a say in how the funds are allocated and spent.**

A coordinated fund that operates across a number of projects must be able to demonstrate capacity to deliver planned outcomes, must draw on local knowledge, and must demonstrate transparency and legitimacy in the eyes of the local community. REFs are not designed to replace the more localised, targeted CEFs, and must allow for CEFs to continue delivering for their local communities.

REFs should act as a vehicle which can facilitate cooperation to deliver larger community projects that can have economic, social, health or environmental outcomes. Examples of potential outcomes outlined in the Clean Energy Council's *A Guide to Benefit Sharing Options for Renewable Energy Projects*[15] which go beyond grants include:

- Building a community solar project for a local business or developing a micro grid for a portion of the community
- Allocating the profits from a portion of the project to go into a revolving fund that can operate in perpetuity
- Creating a targeted legacy community benefit initiative for at-risk populations in the local community (this could have a medium to long- term scope to address particular social issues)
- Working with a local partner to roll out a bulk buy program for solar and heat pumps in the local area
- Tourism and education programs in the region, which could also act as additional income generation
- Electric vehicle charging station at viewing location of the generator to encourage engagement

[15]Lane, T and Hicks, J (2019) A Guide to Benefit Sharing Options for Renewable Energy Projects, p.21 Clean Energy Council available at: https://assets.cleanenergycouncil.org.au/documents/advocacy-initiatives/community-engagement/guide-to-benefit-sharing-options-for-renewable-energy-projects.pdf

Examples of potential outcomes that have been identified by community members within the CWO pilot REZ include :

- Working with local landcare groups to fund environmental and biodiversity projects, including re-vegetation, creek rehabilitation and wildlife corridors
- Providing accommodation and medical facilities to attract permanent GPs to towns with doctor shortages such as in Wellington, NSW
- Electric vehicle charging stations at local tourist attractions and town centres
- Partner with local or government bodies to fund adequate retirement villages
- Partner with heritage organisations and landholders to fund heritage restoration
- Establish a revolving fund for new businesses to access to help with start up costs and addressing legal requirements such as wheelchair ramps.
- In-kind support from solar farms - they order 1% more panels then needed and donate this to Council, public schools, houses or community owned projects etc
- Enhancing rural internet - adding optic fibres onto transmission towers
- Fund a battery storage project for the region - in Wellington reduce use of combustion wood stoves, which is causing air pollution and encourage electric heating.

RE-Alliance has been working with renewable energy proponents in Moyne Shire in Victoria on a model to coordinate Community Enhancement Funds across multiple projects that we hope can be replicated in NSW REZs.

Case Study: Moyne Regional Fund

RE-Alliance is leading efforts in wind and solar farm communities to develop mechanisms that coordinate the increased community funding on offer in REZs in a way that delivers strategically for local communities.

Our work in Moyne Shire in South West Victoria aims to bring together Council, wind farm developers and operators, and communities in a collaborative approach that delivers best practice community benefit sharing. One challenge faced by funds that have run for a number of years is identifying projects across the full 25 year operational life of a wind farm after the most pressing initial projects are complete.

We've been working with seven of the region's growing number of wind farms on a joint fund which, when completed, will allow the local committees to fund larger projects that could improve the lives of everyone across the region. Mental health services, disability support, conservation projects and parks are just some ideas of what a region-wide fund could achieve.

In Moyne, the seven local community funds could grow up to $700,000 annually, amounting to over twenty million dollars over the next thirty years. Although the funds will each have their own mandates and processes, portions of the joint pool of funds could be leveraged to make an even bigger impact if used for seed funding, to support larger government grants, or secure a loan. The community has a massive opportunity to pull together behind projects that will leave a lasting legacy.

As part of our process to date we have considered and worked through many of the key issues around how cumulative benefits and legacy projects can be coordinated . Some of those issues include governance, stakeholders, timing, branding and potential outcomes.

[17]RE-Alliance 2021 "Proposed Community-Driven Fund for Moyne" available at: https://www.re-alliance.org.au/moyne_community_controlled_joint_fund

5. Empowerment of First Nations Communities

TRADITIONAL CUSTODIAN BENEFITS

The theme for NAIDOC week 2021 was 'Heal Country.' For many of us interested in the clean energy transformation, we see the replacement of coal mines and gas wells with wind turbines and solar farms as vital to moving towards more green, regenerative futures. We have witnessed fossil fuel corporations get it wrong time, and time, and time again. And each time we shout "this is another reason why we need renewable energy!"

However, the transition to renewable energy will not automatically align with the healing of Country that is being advocated for by First Nations communities during NAIDOC 2021. We can all commit deeply to advocating for and contributing to a renewable energy future that has healing of Country at its heart.

First Nations-led organisations including Original Power and Aboriginal Land Councils are working broadly on ways in which Land Rights can be central to the transformation to renewable energy, and how Traditional Custodians can share in the benefits of renewable energy projects. The First Nations Workers Alliance, an affiliate of the Australian Council of Trade Unions, is reportedly developing resources to assist Traditional Custodians and industry to "establish what best practice engagement and involvement of Traditional Custodians in major projects—including renewable energy projects—looks like."

As the renewable energy transformation continues to build steam, we should be looking to create a renewable energy industry that has Healing Country at its heart. Part of this could be considering what benefits specifically for Traditional Custodians and Land Councils can be built into the roll-out of Renewable Energy Zones that is occurring in NSW, VIC, QLD and TAS.

A positive example of proactive engagement with local Traditional Custodians is the Hornsdale Wind Farm's relationship with the Ngadjuri and Nukunu people. Trust was built through engagement conducting the Cultural Heritage Management Plans resulting in the first wind farm towers featuring Indigenous art as outlined in the Clean Energy Council's Guide to Benefit Sharing Options for Renewable Energy Projects[18]. The Chair of the Ngadjuri Nations Aboriginal Corporation Quentin Argus said "Recognition towards our people and to the both groups — the Ngadjuri and Nukunu — it's been a long process but a good one" and "anything to do with renewable energy which leaves a lesser footprint on the land is good for us all, so we welcome the development"[19].

Some of the priorities that have already been identified in relation to the renewable energy industry include:

[18]Lane, T and Hicks, J (2019) A Guide to Benefit Sharing Options for Renewable Energy Projects, p.12 Clean Energy Council available at: https://assets.cleanenergycouncil.org.au/documents/advocacy-initiatives/community-engagement/guide-to-benefit-sharing-options-for-renewable-energy-projects.pdf

[19]Fowler,C (2017) "World's first wind farm towers featuring Indigenous art unveiled in South Australia's mid-north" available at: https://www.abc.net.au/news/rural/2017-02-17/sach-wind-farm-art/8248950

murals on the two wind turbines created by Ngadjuri and Nukunu artists. Photo credit Siemens Australia

- Establishment of engagement protocols that uphold free, prior and informed consent
- Inclusion of First Nations representatives in project design and planning
- Partnerships between Local Aboriginal Land Councils and renewable energy proponents for the leasing of land holdings for generation or transmission infrastructure
- Ensuring benefits of projects flow to First Nations, and consulting with Traditional Custodians on what they believe this should look like
- Identifying and maximising employment opportunities for Aboriginal & Torres Strait Islander workers in both the construction and operations phase of renewable energy including the development of targeted apprenticeship/ traineeship programs
- Commitment to guarantee ongoing access to sites of significance once the project is underway.
- Commitment to employing local Aboriginal or Torres Strait Islander people to restore the land at the end life of the project[20].

There are many pre-existing projects from which to take inspiration. The Centre for Appropriate Technology, an Aboriginal and Torres Strait Islander-controlled business, ran a program called 'Bushlight' from 2002 to 2013. The program saw over 130 stand-alone renewable energy systems installed in remote communities across the Northern Territory, Western Australia and Queensland, providing reliable and affordable power to Aboriginal communities[21]. The Valley Centre, an organisation focused on supporting sustainable, resilient futures has developed the Indigenous Solar Rolling Fund to enable Indigenous communities to install solar and potentially batteries in their communities. Beon Energy undertook a targeted training and employment program in the construction of a solar farm, resulting in the training and employment of 38 Aboriginal workers[22].

[20]Ibid, p.32
[21]Centre for Appropriate Technology Ltd. (2021), Bushlight Energy Archive, available at: https://cfat.org.au/bushlight-archive
[22]Beon Energy Solutions (2020) Bomen Solar Farm providing clean energy for homes and businesses, available at: https://beon-es.com.au/latest-news/bomen-solar-farm-providing-clean-energy-for-homes-and-businesses/

6. Neighbour Benefit Schemes

One often-reported source of discord around renewable energy developments over the years has been that lease payments only accrue to host landholders, and that immediate neighbours, who may also live in close proximity to wind turbines, solar arrays and transmission lines are not accommodated. In recent years, agreements have been increasingly offered by renewable energy project proponents to neighbouring landholders to address this perceived inequity. Research using an Australian wind farm as a case study found that the local host community perceived there to be "winners and losers'' from the project - with the 'winners' being host landholders who would receive an annual income and the 'losers' being neighbouring landholders who would be impacted but receive no direct benefits .

In NSW, the State Government's 2016 Wind Farm Guidelines encouraged consideration of neighbour (or negotiated) agreements as a form of benefit sharing. The Australian Energy Infrastructure Commissioner has also encouraged developers to consider neighbour agreements as a component of community consultation plans, highlighting that

> *"developers have not always understood the importance of consulting and working with neighbours in proximity to a project ."*

The NSW Electricity Infrastructure Roadmap states that landholders in the CWO REZ are expected to receive $430M in lease payments up to 2042, and rightly, presents this as a benefit for the local community . The roadmap also highlighted that 'this additional income for landholders will help farmers supplement their income and drought proof their businesses ." The establishment of neighbour agreements, particularly those that include financial benefits or co-investment, would similarly represent a drought-proofing avenue for neighbours and a stimulus to the local economy.

As with other community benefit initiatives, neighbour agreement structures differ from project to project; and while this diversity can reflect the diversity of regional communities, the methods used to determine a fair and equitable agreement is important. It should be noted that in some cases the local region will not be impacted at all due to topography and/or small population and therefore a neighbour benefit scheme may not be appropriate. The agreements are typically negotiated on the basis of proximity to a renewable energy project and/or in relation to impacts associated with the project. **Agreements can take the form of direct annual or one-off payments to landowners and can include in-kind contributions to a landowner, such**

[23]Gross, C. 2007, "Community perspectives of wind energy in Australia: the application of a justice and community fairness framework to increase social acceptance" p. 2733, available at: https://doi.org/10.1016/j.enpol.2006.12.013

[24]NSW DPIE 2016 Wind Energy Guideline, p.16 available at: https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/wind-energy-guideline-for-state-significant-wind-energy-development-2016-12.ashx

[25]Australian Energy Infrastructure Commissioner "Neighbour Consultation and Agreements" available at: https://www.nwfc.gov.au/observations-and-recommendations/chapter-2-neighbour-consultation-agreements

[26]NSW Electricity Infrastructure Roadmap Detailed Report NSW DPIE 2020, p.9. Available at: https://energy.nsw.gov.au/sites/default/files/2020-12/NSW%20Electricity%20Infrastructure%20Roadmap%20-%20Detailed%20Report.pdf

as tree planting to screen the view of solar arrays or wind turbines, or include other mechanisms such as neighbour investment or a gift of equity.

It is RE-Alliance's view that neighbour agreements should not include conditions that preclude recipients from voicing their opinion about a project, including formally objecting to the project in planning processes. They should be offers made to project neighbours in good faith, not a means of stifling objections.

One example of a neighbour agreement model is the Proximity Rent Model. The Proximity Rent Model was developed with the intention to "assist projects to achieve a social licence to operate." This model proposes a payment system based on land owned in proximity to wind turbines, transmission lines or solar arrays where landowners are paid per hectare within specific areas, rather than based on the number of wind turbines on their land. Other models currently being implemented are based on amenity considerations such as noise and visual assessments, while others still consider residences within distance zones from a wind farm or solar array.

Case Study: Tilt Renewables[32]

Tilt Renewables' Palmer Wind Farm in South Australia announced its intention to establish agreements with wind farm neighbours in late 2013. This project sought to enter into agreements with neighbours with property within one kilometre or a residence within two kilometres of a wind turbine, with a minimum payment of $2,000 per annum.

Tilt Renewables' Rye Park Wind Farm is currently in development in NSW. As part of the CBSI for this project they are again offering neighbour agreements. Tilt's website explains,

[27]NSW Electricity Infrastructure Roadmap Detailed Report NSW DPIE 2020, p.36. Available at: https://energy.nsw.gov.au/sites/default/files/2020-12/NSW%20Electricity%20Infrastructure%20Roadmap%20-%20Detailed%20Report.pdf

[28]Pyramus Pty Ltd (2014) A practical shared-benefit model for wind farms—The Proximity Rent model. Pyramus Pty

> *"We are inviting our closest neighbours to share in the financial benefits of the wind farm through neighbour agreements. These agreements are part of our commitment to being a good long-term neighbour, sharing benefits and contributing to the local community[29]."*

Case Study: Culcairn Solar Farm's Construction Disruption Payment[30]

Neoen's Culcairn Solar Farm, located in the South-West of NSW, is currently negotiating and finalising one-off Construction Disruption Payments with eligible neighbours. This payment seeks to compensate in part for the inconvenience and disruption experienced by neighbours of a large-scale solar farm, and is part of Neoen's response to community consultation.

In their June 2020 Response to Submissions Neoen explained,

> *"The Construction Disruption Payment was developed by Neoen in response to community concerns relating to the impact of dust, noise and traffic during the construction period. It was also proposed as a result of lessons learnt from previous projects, and feedback from neighbours living adjacent to the site & the construction traffic route. The one-off payment of $15,000 will be made at the start of construction to enable the residents to mitigate and address these construction-related impacts in whatever way they feel appropriate to their circumstances– for example through house cleaning or additional glazing [31]"*

Case Study: Golden Plains Wind Farm[32]

WestWind Energy's Golden Plains Wind Farm offered a range of incentives for neighbours of their project. This included a financial incentive project where owner-residents within 2km of a constructed wind turbine for the project are provided an annual financial incentive, which is based on the level of impact for each property.

The project has also implemented an electricity offset and energy audit scheme for residents within 3km of a constructed turbine. These residents are offered a payment equal to the amount of the average electricity bill of a Victorian home for the life of the project.

Finally, the project is planning to offer a community investment program whereby community members living within an approximate 10km radius of the wind project are able to financially invest in the project. This type of community co-investment is further discussed in the following section on co-ownership and co-investment.

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[29]Tilt Renewables 2021 "Rye Park Wind Farm: Community" available at: https://www.tiltrenewables.com/assets-and-projects/Rye-Park-Wind-Farm/community/

[30]Neoen 2021 "Culcairn Solar Farm: Local Benefits" available at: https://culcairnsolarfarm.com.au/local-benefits/

[31]Neoen & NGH Consulting 2020 Response to submissions: Culcairn Solar Farm, p.67 available at: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=EXH-2683%2120200604T055155.831%20GMT

[32]WestWind Energy 2020 Golden Plains Wind Farm: Community, available at:

Local landowners with a Sapphire Wind Farm turbine blade in New England

7. Community Co-Investment & Co-Ownership

Perhaps the most direct way for regional communities to develop a sense of ownership around a new industry, is to literally become owners through co-ownership or co-investment options. Co-investment describes a model in which a community buys rights to a portion of the earnings of the renewable energy project but has no decision-making power or control over the operation of the asset. Co-ownership, however, is where a community-owned vehicle owns a portion of the renewable energy development and plays an active role in decision making[33].

Overseas, community ownership, community co-ownership and community co-investment are commonplace for renewable energy projects, particularly wind farms, and these models enjoy high levels of community support[34]. For example, in Denmark in 2001, 86 percent of the wind turbines in the country were cooperative owned, and in 2013, 46 per cent of Germany's 63 GW of renewable energy was locally owned[35]. In the Danish private sector there has been a long established requirement of all new developments that a minimum of 20 per cent ownership is offered to the local community[36]. In general, the European wind industry found its feet through community investment and provides many examples of how the sector could be opened up in Australia.

[33]Lane, T. and Hicks, J. (2017) Community Engagement and Benefit Sharing in Renewable Energy Development: A Guide for Applicants to the Victorian Renewable Energy Target Auction. p 26. Available at: https://www.energy.vic.gov.au/__data/assets/pdf_file/0027/91377/Community-Engagement-and-Benefit-Sharing-in-Renewable-Energy-Development.pdf

[34]Rueter, G. (2012) The global boom in wind energy. Available at: http://p.dw.com/p/15NVm

[35]Farrell, J. (2013) Half of Germany's 63,000 megawatts of renewable energy is locally owned. Available at: https://ilsr.org/germanys-63000-megawatts-renewable-energylocally-owned/

[36]World Wind Energy Association, (2018). Policy Paper Series: Denmark. Available at: https://www.wwindea.org/wp-content/uploads/2018/06/Denmark_full.pdf

By their very nature, such projects deliver substantial benefits to their local communities, through ownership and decision-making roles. The support for and engagement with renewable energy projects that incorporate co-ownership or co-investment opportunities show that the benefits of renewable energy go far beyond a cleaner environment, and can be enjoyed by a wide cross-section of stakeholders when an emphasis is placed on inclusion of all stakeholders, and community led development.

There is increasing interest in co-ownership and co-investment in renewable energy projects within Australia. Developers around the country are actively working with communities on this model and we anticipate the interest will keep growing. Community co-investment and co-ownership options for generation, storage and transmission infrastructure could feasibly be offered through the REZ model, if this is something people in host regions wish to pursue.

Case Study: Sapphire Wind Farm co-investment

In NSW, the Sapphire Wind Farm has become the first commercial wind farm to make investment available via a public offer. 100 investors across NSW and the ACT have taken up approximately $1.8m in community shares and were eligible to be part of the project's Community Advisory Panel. The owner of Sapphire Wind Farm, CWP Renewables, has indicated they will make a similar offer available to the local community for their current Bango Wind Farm in NSW[38].

Case Study: Winterbourne Wind co-ownership

Winterbourne Wind near Walcha, NSW has embarked upon a community co-design process, resulting in an innovative co-ownership model for the project. Turbine host landholders, easement owners and selected neighbours will be invited to join an ownership stake in the project at no cost. The ownership vehicle, WalchaWind, will hold 5% ownership of the project. Of this 5% stake, 50% of the benefits will return to these community owners, with the remaining 50% being contributed to Walcha community projects.

> *"Engagement, transparency and benefit-sharing with the local community is critical to a successful project. Without a social licence to operate in the region, there can be no project."*

Case Study: Capital Battery Co-Investment

Neoen's innovative Capital Battery Community Co-investment scheme is in early stages of development, set to become one of the first battery co-investment schemes in the world. As described by project proponent Neoen:

> *"Community co-investment supports the ACT in achieving its Climate Change Strategy through community leadership, by involving and leveraging the power of community towards an emissions-free future...And as far as we're aware this is the first time this has been proposed for battery storage anywhere in the world.*

[37]CWP Renewables 2021 Sapphire Wind Farm, available at:https://cwprenewables.com/our-projects/sapphire-wind-farm

[38]CWP Renewables (2020) "Bango Wind Farm Community Consultative Committee Minutes of meeting held on Tuesday 18th August 2020", available at: https://cwprenewables.com/assets/main/PDFs/Bango/Minutes/Meeting-16-18-Aug-2020.pdf

[39]Winterbourne Wind (2021) Community Benefits, available

8. Direct & Indirect Jobs

One of the most impactful potential benefits that regional communities can access through hosting a REZ is the growth in direct and indirect jobs that arise as a result. Additional business activity in a regional town is generally welcome, which is why local training and jobs pathways are a key benefit host communities should be advocating for. Through working with government and industry on actions such as identifying training needs, ensuring training capacity, delivering apprenticeship programs, prioritising local employment and maximising local procurement and manufacturing, the potential for jobs and economic security is massive.

Host communities can start advocating that REZ contracts embed local capacity building and employment. Local upskilling through apprenticeships and training can be a great way to make sure there's a skill transfer to our regions, and a great way to retain young people in our regions.. Manufacturing is another area that can be supported through local procurement.

Several existing research reports published by experts in this field have already addressed the issue of jobs, procurement and content in the renewable energy industry. These reports include:

- Clean Energy Council's Clean Energy at Work Report
- Australian Council of Trade Unions: Sharing the benefits with workers: a decent jobs agenda for the renewable energy industry
- The Climate Council: The Clean Jobs Plan
- UTS Institute for Sustainable Futures: Renewable Energy Jobs in Australia
- The Australia Institute: Submission to Energy Security Board REZ consultation paper

The provision of safe, secure local jobs, local procurement and local content are vital to the success of REZs. These direct jobs would have an incredible impact on the host regional communities. However, it's not only direct jobs that could grow out of hosting a REZ - there can also be indirect jobs and growth in other industries. For example, in tourism.

TOURISM

The establishment of REZs opens up opportunities to value-add onto existing regional tourism industries and to drive new tourism opportunities, including educational tourism. Growth in regional tourism has been identified as a key project within regional renewal strategies. If the tourism opportunities that REZs offer are taken up, this could be a further avenue through which to contribute to the growth in the local economy.

Researchers in Europe have examined the viability of renewable energy as tourist attractions and have found that a wide range of visitors seek out renewable energy tourism due to education, sustainability and nature, technical fascination, emotion, leisure and fun . There's an important legacy in Australia of tourist attractions, tour programs, lookouts and education programs centred around coal mines and power stations. There's an interest and a need to do this for renewables now too. Not only can these initiatives bolster the local tourism industry, they also contribute to a greater sense of community pride in the local industry.

Case Study: Glen Innes White Rock Wind Farm

Glen Innes, a regional town in NSW's New England region, has recognised the tourism potential of hosting large-scale renewable energy projects. In 2018 a wind turbine blade that was damaged during construction of the White Rock Wind Farm was given to the local Glen Innes Severn Council and was installed as an artistic tourist attraction. The Council has since received a grant from the NSW government to more permanently display the blade and to build a picnic area, including a viewing platform.

> *"While the development of local wind and solar farms has generated jobs, it has also created a new tourism opportunity for our area, with visitors often saying to me how they intentionally detour from their trip down the New England Highway, just so they can see the turbines ."*
> — ***Glen Innes Severn Mayor Carol Sparks***

Case Study: Educational tours in Gullen Range

The co-located Gullen Range Wind and Solar Farm, North-West of Goulburn NSW regularly offers educational tours of the projects to the public, and particularly encourages children to visit.

[40]Lun (2019) The viability of renewable energy sources as tourist attractions in the Alps, available at: https://doi.org/10.1007/978-3-658-28110-6_13

[41]Glen Innes Examiner (2020) Wind farm viewing platform for White Rock at Glen Innes, available at: https://www.gleninnesexaminer.com.au/story/6669874/87000-to-build-viewing-platform-at-wind-farm/

Project proponent BJCE Australia has recognised the opportunity for the public to understand more about Australia's energy infrastructure. They announce on their website, "You will be able to see how our wind and solar farm works, learn about renewable energy and get up close to a wind turbine and a solar array ."

Case Study: Victorian Government 'Local Jobs First' Policy

The Victorian Government required projects applying to the first Renewable Energy Target (VRET) auction to adhere to a 'Local Jobs First' Policy. This policy required a local content target of 64 percent, a local operations target of 90 percent, and a local steel target of 90 percent. For VRET1, projects that exceeded these targets scored higher than projects that only met the minimum targets.

Case Study: Going above and Beon employment and training

Beon Energy Solutions has been leading the way for innovative training and employment initiatives in the Australian renewable energy sector. Working alongside SuniTAFE in 2018 Beon established a six-month Solar Industry Career Pathway program that linked targeted local traineeships to employment at the Karadoc Solar Farm in Mildura . The same project also saw Beon partner with Jobs Victoria Employment Network (JVEN), resulting in 40 of the over 200 workers hired for the Karadoc Solar Farm as part of the Mildura Regional City Council Employment Program . In 2020 Beon established a pilot program aimed at increasing the number of women working in the solar industry. Their 'Women in Solar' pilot program was linked to the Bomen Solar Farm in NSW and resulted in eleven women achieving training and employment for the project, including women who were Aboriginal, long-term unemployed and single parents .

A detailed case study of the Karadoc employment and training program can be found in the Clean Energy Council's Guide to Benefit Sharing Options for Renewable Energy Projects.

[42]BJCE (2021) Gullen Solar Farm: Wind and Solar Farm Tours, available at: https://www.gullensolarfarm.com/wind-and-solar-farm-tours/

[43]Victorian Department of Environment, Land, Water and Planning 2017 FAQ. Available at: https://www.energy.vic.gov.au/__data/assets/pdf_file/0023/391172/VRET_FAQ.pdf

[44]New program offers job pathway into Sunraysia's solar industry Beon Energy Solutions 2018. Available at: https://beon-es.com.au/latest-news/new-program-offers-job-pathway-into-sunraysias-solar-industry/

[45]Solar farm project providing local employment for the Sunraysia community Beon Energy Solutions 2018. Available at: https://beon-es.com.au/latest-news/solar-farm-project-providing-local-employment-for-the-sunraysia-community

[46]Award nomination for helping more women find work in solar Beon Energy Solutions 2020. Available at: https://beon-es.com.au/latest-news/award-nomination-for-helping-more-women-find-work-in-solar/

9. Agriculture & Renewables

WInd and solar farms can be seamlessly integrated with a host of agricultural land uses if they are planned well in accordance with host landholder's needs.

If done in partnership and collaboration with local landholders, government departments and farming peak bodies, REZs will become a value-add industry for the agricultural sector. The willingness of farming communities to host a REZ will depend on how much they believe renewable infrastructure will assist the farming economy on their farms and in their region. **There are myriad opportunities and almost endless possibilities for innovation in the renewables-in-agriculture sphere.** The Clean Energy Council recently released a report detailing some of the innovative practices already in place in Australia and globally. These include:

- Sheep grazing, growing food, beekeeping or biodiversity regeneration co-developed with ground-mounted solar panels
- Grazing, horticulture & viticulture co-developed with elevated solar panels
- Solar Greenhouses
- Floating solar panels co-developed with aquaculture systems

These practices offer a range of benefits for both farmers and renewable energy proponents, including increased productivity of land, reduction in operating costs, and contributing towards clean energy and a healthier environment.

However, these opportunities need to be communicated and demonstrated with the agricultural community early on in the REZ process. Currently there is a lack of understanding about these possibilities, and often renewable energy is seen by farmers as an industry in competition with agriculture for access to land. Organisations such as Farmers for Climate Action, events such as the Renewables in Agriculture conference, and reports such as the Clean Energy Council's Agri-Solar report are all contributing to the growth in knowledge and awareness of the opportunities that are available.

Although there are many opportunities for agriculture and renewable energy to harmoniously co-exist, the perception held by some that the two are incompatible has not arisen out of nowhere. There have been instances where renewable energy projects have failed to adequately address detrimental flow-on impacts for farmers. RE-Alliance is aware of issues throughout the country with contractors not shutting gates on farms, contractors diverting water streams and impacting on down-stream properties and projects that do not accommodate co-production of renewable energy and agriculture on their sites. There are also concerns within the community about obtaining fire insurance and the responsibility for fire management plans.

Due to the nature of solar, wind, battery and transmission infrastructure and where they are typically located, rural residents will bear the most direct impacts of these projects. Impacts and benefits should be balanced out, with initiatives to target those most directly impacted. Examples of benefits identified by residents in REZs that are targeted to rural landholders could include:

- Rural rubbish collection service,
- Biodiversity plantings along corridors across several landholder properties
- Upgrades to telecommunication to reduce issues with internet connectivity on many farming properties.

Case Study: Solar and sheep in Dubbo

There are already existing examples within the CWO REZ of agriculture and energy production co-existing. Tom Warren, a farmer in Dubbo, hosts an 18MW solar farm and grazes his merino sheep between the panels. Tom has stated that he believes the solar farm has increased the carrying capacity of his land and there are multiple benefits for his sheep from having shade in summer and wind protection in winter.

[47]Clean Energy Council (2021) Australian Guide to Agrisolar for Large-Scale Solar, available at: https://www.cleanenergycouncil.org.au/resources/resources-hub/australian-guide-to-agrisolar-for-large-scale-solar-1

10. Get Involved

GET INFORMED

A great initial step, and one you're already taking by reading this guide, is to equip yourself with knowledge. We know that energy policy can sometimes be an overwhelming arena to step into, which is why we've tried to take some of the work out of it for you.

Need to know

Just want the top level information that will help you on your journey to getting involved in your local REZ? These are the resources for you!

1. RE-Alliance Website
2. Energy NSW REZ Website
3. NSW Department of Planning, Industry & Environment REZ Fact Sheet
4. NSW Department of Planning, Industry & Environment REZ FAQ

Delve deeper

Love diving deep into policy details and discussions? Check out these more detailed resources:

1. Energy NSW Electricity Infrastructure Roadmap
2. RE-Alliance 'Building trust for transmission' report
3. RE-Alliance (2019), Building Stronger Communities
4. Australian Council of Trade Unions (2020), Sharing the benefits with workers: a decent jobs agenda for the renewable energy industry
5. Clean Energy Council, Best Practice Charter
6. Clean Energy Council (2019), A Guide to Benefit Sharing Options for Renewable Energy Projects
7. Clean Energy Council (2020), Clean Energy at Work
8. Clean Energy Council (2021), Australian Guide to Agri-Solar for Large-Scale Solar
9. Helen Haines (2020), The Local Power Plan

Host landholders

Have you been approached about hosting wind, solar, storage or transmission on your land? Host landholders are in a great position to advocate for strong local benefits at the individual project level. Here are some suggestions and resources for you:

1. The Australian Energy Infrastructure Commissioner has recently published a checklist to assist host landholders in negotiating commercial agreements with renewable energy proponents
2. NSW Farmers have a very comprehensive Renewable Energy Landholder Guide
3. Talk to your neighbours. Find out who else has been approached, whether your neighbours have any concerns and whether they could be alleviated through neighbour benefit programs.
4. Get in touch with landholders who already host renewable energy infrastructure and ask them about their experience. RE-Alliance can help to put you in touch with current host landholders.
5. Advocate for your neighbours and your community in your lease negotiations

Traditional Custodians

In the establishment of REZs, government and industry will be looking for ways in which First Nations communities can benefit. This will be a relatively new area for some industry and government stakeholders, however there are First Nations-led organisations that are thinking through what the relationship and benefits could be. Check out some of the following resources:

1. NSW Aboriginal Land Council Solar Power Factsheet
2. NSW Aboriginal Land Council Wind Power Factsheet
3. Original Power Clean Energy Campaign

GET INVOLVED

Now that you've equipped yourself with some information on REZs, it's time to get active in your local REZ.

Join us

RE-Alliance exists to help you ensure that your regional community benefits from Australia's clean energy transformation. We support you to secure tangible benefits for your local community.

You can **join us as a financial member, as a volunteer, donate, or simply sign up to our email list** to keep up to date with what's happening in your REZ.

Talk to your friends and neighbours

Knowledge shared is knowledge gained. Now that you've learnt more about your local REZ, a great next step is to start talking to your neighbours, friends and family in the region about what you've learnt, and what benefits you want to see come out of the REZ for your region.

If you're unsure how to approach the conversation, reach out to our team at RE-Alliance - we've been hosting conversations in REZ communities and have a range of resources available to help you.

Speak to your elected representatives

You've learnt a lot about REZs, you've shared your knowledge with your friends and neighbours, and you've started dreaming big about the benefits that hosting a REZ can mean for your community. A useful next step is to get in contact with your local, state and federal

representatives and request a meeting with them. If you can, go as a group and have a clear ask that you would like your representative to enact.

Keep an eye out for engagement opportunities

As both the NSW government and industry progress their plans for your local REZ, there will be a range of opportunities for you to engage with the REZ process. These include calls for submissions about REZ regulations, open-invitations to public consultation sessions, nominations for committees and more.

To help implement a more collaborative and empowering community engagement process for REZs, here are a few ideas for things to advocate for:

- Local voices for local decisions
- Early & genuine community engagement
- Openness, transparency and accountability

Nominate to join a project Community Consultative Committee (CCC) or Community Reference Group (CRG)

Most wind, solar, transmission and battery projects of utility-scale, such as those being built in REZs, will have some form of community committee. These typically take the form of a CCC or a CRG. For these committees, there is usually a nomination process for local residents to join the committee. One of the best ways you can get involved in governance of CEFs is by joining one of these committees. And the more passionate and creative local people who join these committees, the better the funded projects are likely to be. So when you see nominations open for your local CCC or CRG - don't hesitate to sign up and help bring meaningful projects to your region.

Apply for a grant to fund your project

Another great way to get involved in renewable energy Community Enhancement Funds (CEFs) is to apply for funding for a project or organisation you're involved in once the CEF opens to applications. Want to establish an art program for kids? Apply for a grant! Need new BBQ equipment for your local sporting team? Apply for a grant! Want to expand your Caring for Country program? Apply for a grant! The possibilities for what local projects can be funded through CEFS stretch almost as far as your imagination.

My Local Community Enhancement Fund (CEF) Is Run By The Council - How Can I Get Involved?

While there are some CEFs managed entirely by the local Council, this can lead to tensions where funding originally intended to benefit the impacted community is spent across the LGA more broadly.

Talk to your local Councillor/s

Councillors on your local council are there to represent you and your fellow constituents. When there is a local issue you have concerns with, particularly where council decisions are involved, your local Councillor is a great person/s to approach. Send an email detailing your concerns and request a meeting. Be polite and be prepared. Take a copy of the above mentioned research, bring along a copy of this guide, use case study examples of how other projects and other councils have organised the governance of their CEFs so that the local community has a voice, and decision-making power. If your neighbours and friends are similarly concerned, a united approach through a group meeting with your Councillor/s can be stronger than meeting as an individual.

Talk to the project manager

From the renewable company's perspective, a key role of CEFs is to ensure that the directly impacted community is receiving benefits from the renewable energy project. Council control of CEFs can negatively impact the purpose of the fund from the company's perspective, which is to build and maintain social licence in the community. If you're concerned that there is no community voice for your local CEF, this is an issue you can raise directly with the project manager. If the project manager similarly considers the lack of community voice to be an issue, they can also approach the Council to advocate for more community control over the CEF.

DREAM BIG

The opportunity for ambitious projects to be achieved in your region through REZ regional enhancement funds is one of the most exciting parts of the REZ model. Now is the time for your region to dream big, and make the most out of the opportunities heading your way.

Attend our events

RE-Alliance will be hosting events in NSW REZs to help local communities understand, envision and advocate for innovative, locally-desired benefits. Check out our events page to find out when your next local event is scheduled. Nothing scheduled? Get in touch and we'll see what we can organise!

Pitch a partnership

Are you a local business owner or work for a local community organisation? Do you see an opportunity where the goods & services you provide could better serve your community if you had access to more resources and project partners? Now is the time to start thinking about how your organisation could partner with the renewable energy sector and/or the NSW government to make the most of the influx of community benefit funds that come with hosting a REZ.

Plan a project

Is there a project you've had your eye on that you think would make an incredible difference to your local community? Does your organisation have a project for the local community that is ready to go, all it needs is some funding to get it started? Now is the time to envision big, bold, transformative projects - and be ready to snap up funding opportunities that arise through your community hosting a REZ.

RE-ALLIANCE

CONNECTING PEOPLE TO POWER

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