EECA TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY

[redacted]

17 October 2022

Dear [redacted]

Re: Official Information Act request – Community Energy Projects

Thank you for your email on 8 September 2022 in which you requested information under the Official Information Act. Your request was rescoped on 19 September in which you requested:

- *A copy of EECA's Ministerial Briefing on Community Energy (dated 21 October 2019); and*
- *Any research papers produced to feed into the preparation of the Ministerial Briefing above.*

The following material falls within scope of your request:

Item	Date	Description	Decision
1	21 October 2019	*Briefing to the Minister of Energy and Resources: Advice on EECA's potential role in community energy*	Release in part
2	24 September 2019	*Draft report: Strategic Project on Community Energy* This draft report was not finalised as the author had to leave urgently for personal reasons. However, the report was sufficiently progressed to inform the development of the briefing in Item 1.	Release in full

The documents listed in the above table are subject to information being withheld under the following sections of the OIA, as applicable:

- Personal contact details, under section 9(2)(a) – to protect the privacy of natural persons, including that of deceased natural persons.

You have the right to seek an investigation and review by the Ombudsman of this decision. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

Please note that it is our policy to proactively release our responses to official information requests where possible. Our response to your request will be published shortly at https://www.eeca.govt.nz/about/news-and-corporate/official-information/ with your personal information removed.

Yours sincerely

Andrew Caseley
EECA Chief Executive

Ministerial Briefing

TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY
EECA

To	**Hon Dr Megan Woods, Minister of Energy and Resources**		
Title of briefing	**Advice on EECA's potential role in community energy**		
Date	**21 October 2019**	Response required by:	**11 November 2019**
EECA reference number	EECA 2019 BRF 029	EECA priority	Routine
Consultation	MBIE (Energy Markets Policy), Electricity Authority		
Appendices	• Appendix 1: Arguments for and against civic ownership of renewable energy generation assets • Appendix 2: Barriers and policy gaps for community energy in New Zealand • Appendix 3: Statement from the Electricity Authority outlining ongoing work to remove barriers to Distributed Energy Resources		

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Information withheld under section 9(2)(a) of the Official Information Act 1982

Purpose

1. This paper responds to your request, set out in your Letter of Owner's Expectation for 2019/20, for advice on the role EECA could play supporting community energy projects in New Zealand.

2. EECA welcomes the opportunity to discuss the contents of this briefing with you.

Executive Summary

Community energy encompasses a wide range of energy activities that are managed in an open and participative way, and generate local and collective benefits. These activities range from community-based energy audits and efficiency initiatives, to locally owned micro-grids, to utility-scale shared ownership generation projects.

In your 2019/20 Letter of Expectations you requested advice on the role that EECA could play in supporting community energy. We have identified that community energy projects could support the following objectives:

a. Building social license for, and engagement with, renewable energy and climate change mitigation and adaptation

b. Contributing to a greater share of renewable energy generation and/or reducing energy-related emissions

c. Contributing to alleviation of energy hardship

d. Increasing community resilience, both in terms of energy supply resilience and local social and economic benefits, and

e. Enabling the piloting of novel applications or functional integration of internationally commercially available end-user technologies that may contribute to the objectives (a-d).

This advice distinguishes between three different categories of community energy projects: (a) Utility-scale (>10MW) shared ownership projects; (b) Medium-scale (50kW to 10MW) grid-tied generation projects and peer-to-peer virtual trading on existing networks; and (c) energy efficiency projects, self-consumption and embedded network/micro-grid projects.

a. **Utility-scale (>10MW) shared ownership projects** are most likely to deliver renewable electricity at the lowest per-unit system cost. While there may be some consenting barriers to these projects, these are the subject of MBIE proposals in its forthcoming discussion document on renewable energy.

   EECA should take a limited role in this space given the scale and commerciality of these projects. However, there may be scope for EECA to work with MBIE towards promoting and facilitating shared ownership (i.e. with local communities) as a means to deliver local benefits and social licence for renewable energy. This might, for example, involve producing guidance on principles, business models and community engagement processes for shared ownership.

b. **Medium-scale (50kW to 10MW) grid-tied generation projects and peer-to-peer virtual trading projects on existing networks,** primarily face barriers related to electricity market arrangements, which are not within EECA's mandate. While some of these issues are subject to ongoing work streams by the Electricity Authority, further work is required to assess the extent to which these barriers materially constrain projects on the ground, and whether cost and benefits merit policy intervention. Some of the projects in this category may also face consenting barriers, which as above are the subject of MBIE proposals in its forthcoming discussion document on renewable energy.

The impact of EECA activity in this space, in terms of facilitating replicable projects and widespread uptake, is likely to be limited until these regulatory and market barriers are addressed. EECA's view is that priority should be given to addressing these barriers, before significant resource is dedicated to overcoming any informational, capability, coordination, or financial barriers. **EECA should adopt a limited role in this space until the Electricity Authority and MBIE have progressed the suite of work underway to address these barriers.**

The Electricity Authority has provided us with some advice on these barriers which is attached as Appendix 3.

c. **Energy efficiency projects, self-consumption and embedded network/micro-grid projects** are much less likely to face barriers relating to electricity market arrangements and consenting. These are therefore more likely to be viable in the current context. EECA could play a role facilitating such projects, primarily by providing information, raising awareness, facilitating local capacity building, and matchmaking projects with parties providing technical, legal and financial services, and/or facilitating access to finance.

EECA is currently working with MBIE to develop a budget bid for supporting community energy pilot projects of this kind, to understand their barriers and potential benefits. The scope of this support is still to be finalised, and is subject to the budget process. [BUDGET SENSITIVE]

While small-scale distributed electricity generation may contribute to decarbonisation of New Zealand's electricity grid, in most cases it will displace other lower-cost renewable generation. It is generally a higher-cost option to address energy hardship than alternatives such as energy efficiency retrofits or ensuring consumers are on the appropriate power plan. Unless made widely accessible or tailored specifically to provide low cost electricity, distributed generation also raises risks that additional system costs (related to network costs, or balancing and reserves) are shouldered by non-participants, some of whom may themselves be in energy hardship.

EECA's view is that any role supporting community energy – outside energy efficiency projects – would be limited to piloting niche projects that are likely not to be widely replicable or scalable. **If EECA does pursue a role in supporting community energy projects, energy efficiency will be a key focus to ensure households and communities select cost-effective solutions that best address their situation.** In most cases we anticipate that energy efficiency measures and retrofits will be the first-best solution to realise wellbeing benefits at the household and community level.

The Electricity Price Review recommended establishing a network of community-level service providers to support households in energy hardship, and a dedicated fund to support energy efficiency retrofits. EECA is currently working with MBIE to develop the response to this recommendation. **EECA recommends considering how the Government's response to the Electricity Price Review could align with your interest in demonstrating community-level solutions to energy hardship.** We will discuss this further with you and with MBIE.

Recommended actions

EECA recommends that you:

Utility-scale community energy

a. **Note** utility-scale (>10MW) community energy projects may face consenting barriers, which are subject to MBIE proposals in its renewable energy discussion document

b. **Note** EECA does not consider it has a role in supporting utility-scale community energy given the scale and commerciality of these projects, but there may be scope for MBIE and EECA to encourage shared ownership in utility-scale projects, such as providing guidance on shared ownership models, principles and processes

Medium-scale community energy and peer-to-peer on existing networks

c. **Note** for medium-scale (50kW to 10MW) grid-tied generation projects and peer-to-peer virtual trading projects on existing networks, preliminary evidence points to barriers around electricity market arrangements

d. **Note** EECA and the Electricity Authority will jointly review whether, how, and to what extent ongoing projects address the range of barriers in electricity market arrangements, and identify any that may be addressed in the medium term

e. **Note** that EECA intends to adopt a limited role regarding medium-scale community energy projects, and peer-to-peer virtual trading projects on existing networks, until the Electricity Authority and MBIE have made further progress in addressing these barriers

Smaller scale community energy

f. **Note** that EECA could play a role in supporting community energy efficiency projects, self-consumption projects, embedded networks, or micro-grids in the current context, by providing information, guidance, and/or facilitating access to finance

g. **Note** that EECA is working with MBIE to develop a budget bid for supporting these types of community energy pilot projects at your request [BUDGET SENSITIVE]

h. **Note** that in EECA's view the impact of such a role would be limited to piloting niche projects that are not widely replicable or scalable, and should focus on energy efficiency first to deliver the most cost-effective solutions to energy hardship and/or decarbonisation

Next steps

i. **Note** that EECA has been collaborating with MBIE in the preparation of a community energy chapter in the renewable energy discussion paper, which will provide an opportunity to test the advice set out in this paper with stakeholders

j. **Note** there may be alignment between your interest in community energy and the Government's response to the energy hardship recommendations of the Electricity Price Review

k. **Agree** to discuss this briefing with EECA at its next meeting with you on 11 November 2019

Agree / Disagree

Andrew Caseley
CHIEF EXECUTIVE

Hon Dr Megan Woods
MINISTER OF ENERGY AND RESOURCES

Context

1. In your Letter of Owner's Expectations 2019/20 you stated:

> *"With its expertise and relationships with community, consumer and energy groups, EECA could play a role in supporting communities to understand and select the most effective energy solutions for their circumstances and to develop renewable energy projects.*
>
> *In line with the government priorities of developing a renewables strategy and transitioning towards 100 per cent renewable energy, I would like EECA to consider the role it could play in the future, in supporting community renewable energy and energy efficiency projects. I would like to receive your advice on this, prepared in consultation with MBIE, in particular, considering any activities that could be carried out from 2020/21."*

2. EECA has undertaken an initial assessment of community energy in New Zealand, seeking to understand its potential benefits and barriers, and how EECA might play a role in supporting it where appropriate.

3. Some of the matters canvassed in this advice are not within EECA's mandate. If pursued these would need to be discussed further with the relevant agency (i.e. the Electricity Authority, Ministry for the Environment, or Ministry of Business, Innovation and Employment (MBIE)).

Objectives

4. In preparing this advice, EECA has assumed any role it plays in this space would need to align with some or all of the following five objectives:

   a. Building social license for, and engagement with, renewable energy and climate change mitigation and adaptation

   b. Contributing to a greater share of renewable energy generation and/or reducing energy-related emissions

   c. Contributing to alleviation of energy hardship

   d. Increasing community resilience, and

   e. Enabling the piloting of novel applications or functional integration of internationally commercially available technologies that may contribute to the objectives (a-d).

5. Note that (c), (d) and (e) above do not directly align with EECA's statutory purpose or strategy. Instead, these would involve leveraging our existing technical and commercial expertise in the energy sector to achieve these government priorities.

Background

What is community energy?

6. Community energy is any energy activity that is a) managed in an open and participative way, and b) demonstrates local and collective benefits.

7. It can encompass heat and power generation; demand side management; energy storage; clean transport; and/or energy efficiency. This broad definition captures a wide variety of technologies; scales of deployment; finance; ownership and delivery models; legal and organisational structures; and local needs and motivations. It includes both communities of place (defined geographically), and communities of interest (defined by shared interest).

8. Examples include:

    a. Community organisations providing energy audits, advice and energy efficiency services

    b. Microgeneration to heat or power community facilities (such as marae, club houses, or schools)

    c. Locally owned grid-tied or off-grid micro-grids integrating standalone renewable heat and electricity generation, battery and/or EV technology

    d. Neighbourhood-scale microgeneration projects involved in peer-to-peer virtual trading of electricity on the existing electricity network

    e. Medium to large scale co-operatively owned battery, solar PV, wind, hydro-electric or biomass Combined Heat and Power plants, and

    f. Joint ventures between community organisations and public or commercial enterprise on any of the above.

9. Projects undertaken by grassroots or social enterprises come with unique advantages and disadvantages – compared to commercial developments – that influence the risk profile and viability of projects. These characteristics make the widespread uptake of community energy, especially among less well-resourced communities, comparatively more dependent on a supportive policy context.

Potential benefits of community energy

10. The potential benefits of community energy are wide ranging but case specific. These are canvassed below based on a survey of international experiences – how well these translate to the New Zealand context will vary.

    a. **Economic benefits** – Community projects are more likely to procure locally and spend a higher proportion of revenues locally, generating multiplier effects in income and employment. In remote areas across Europe and North America, large projects have indirectly opened up markets for new products and services and secured local livelihoods, contributing significantly to counteracting rural socio-economic decline.

Local and community energy has been used to test novel applications or functional integration of existing technology, drive technological learning and support nascent clean technology industries to scale.

In the longer term, participation of a wide variety of new entrants in the electricity market can increase competition and lower overall wholesale prices in the electricity market.

b. **Social benefits –** Community energy can provide a platform for individuals to engage with complex environmental problems, and through that process establish positive local relationships, and contribute to community wellbeing.

   In remote areas on low voltage networks, islands, or locations that have ample low-cost wood fuel supply, community energy can improve energy access and energy affordability, with associated health benefits.

   Projects can facilitate knowledge and skills development across a range of areas and result in organisations replicating projects, implementing larger more ambitious projects and/or becoming handholding organisations that facilitate projects across the region or country.

c. **Environmental benefits** – Internationally, community energy has accelerated investment in clean technology. It could contribute to domestic low emissions scenarios by providing additional renewable electricity capacity; short-term flexibility and ancillary services; and reducing peak loads, and provide renewable dispatchable alternatives to gas.

   Trusted relationships and tailored approaches enable enhanced participation, energy savings outcomes and energy literacy, building local capacity for consumer facing pilot projects on a wide range of energy issues, ranging from energy efficiency to smart appliances, to EV uptake and utilisation. In specific contexts community energy supports sustainable lifestyles beyond energy.

d. **Technical benefits** – Community energy can contribute to local energy supply resilience and network stability. In specific contexts, a local or distributed energy generation project may offer an alternative to new transmission or distribution build, thereby reducing the system cost of delivered electricity.

   In cases where community energy projects are able to use waste heat locally, such biomass or geothermal based CHP, system efficiency increases substantially.

e. **Social license benefits** – Wind energy projects led by members of a community are less likely to trigger local opposition. Positive perceptions associated with local ownership can place more emphasis on benefits and result in less negative perceptions of shadow flicker, noise, visual impacts and bird strikes. Community energy also facilitates trust and improved reputation of energy utilities, and support for government climate change and renewable energy policy.

Drawbacks of community energy

11. Community energy projects can suffer from diseconomies of scale, with associated concerns that the public should not subsidise cost-inefficient development of energy assets. There is precedent for large community projects delivering energy at lowest cost, but they have largely been joint ventures (i.e. community groups in partnership with local authorities or commercial enterprise).

12. Inclusive management with input from the wider community can generate trust and local buy-in, but can also slow decision-making. This puts the onus on skilled organisational leadership and internal decision-making processes, leading to longer development timelines and higher costs.

13. In absence of policy frameworks enabling widespread participation, support for community energy may lead to unequal capability of communities to partake and benefit. This may lead to perverse outcomes for example, it can place the burden of whole energy system costs disproportionately on consumers who do not have the capacity or capability to engage in community energy schemes.

14. A table setting out common arguments for and again widespread civic ownership of renewable energy (generation) assets is attached in **Appendix 1**.

Barriers to community energy in New Zealand

15. EECA has identified a range of barriers to community energy in New Zealand. **Appendix 2** sets these out in full, showing corresponding agencies, ongoing work programmes and policy gaps.

16. Electricity market arrangements are in many cases fundamental to operational and financial viability of projects. Electricity market arrangements are not within EECA's mandate.

17. Barriers in this category affect grid-tied projects in the 50kW to 10MW range and peer-to-peer virtual trading projects on existing networks in particular. Some of these issues are subject to ongoing work by the Electricity Authority (see **Appendix 3**). Others are indicative and require further analysis as to the extent to which they materially constrain the development of projects:

    a. Practitioners have expressed concern that not all networks have the necessary incentives, data and know-how to identify and promote non-network distributed energy solutions and engage with community actors.

    b. There are currently no established market incentive systems to remunerate distributed generation for the range of (ancillary, capacity, demand response) services they can deliver to the network.

    c. Practitioners and academics raise concerns that independent power generators have in specific instances faced high risk and poor terms and conditions in securing power purchase in current market context. There may be ways to facilitate more liquid corporate PPA markets, such as a PPA market place, and/or complement long term power purchase by means of futures market.

d. Inconsistent terms and conditions have been applied for distributed generation to connect to the network.

e. It is currently difficult for consumers to grant access to consumption data with (non-retail) third parties, or be serviced by peer-to-peer and retail service providers simultaneously. The EA expects to make a decision on amending rules to better facilitate third party access to consumption data and enable simultaneous service providers in November.

18. Other barriers include:

a. A lack of consensus and consistent messaging on the role and benefits of community energy across government agencies and industry

b. Lack of networking and knowledge sharing across operational community energy projects, and lack of 'sector identity'

c. Lack of local capacity and resources to identify viable projects and bring them to implementation, including land, seed finance, capital finance and, in some cases, relevant legal, technical and financial expertise

d. Lack of regional facilitation and in some cases arduous resource consenting procedures. This is part related to the lack of popularisation of community energy as an opportunity with local benefits, and

e. Lack of data and evaluation to identify local impacts and successes to justify community-based approaches, and inform decisions about how to support replication, for both community generation and energy efficiency.

19. As a result of these barriers, community energy projects face long timelines and high failure rates.

Comment

Establishing policy alignment and addressing regulatory and market barriers should be a priority

20. EECA's view is that priority should be given to addressing regulatory and market barriers to community energy projects, before significant resource is dedicated to overcoming any informational, capability, coordination, or financial barriers.

21. There is scope for more co-ordinated and enabling policy and market settings to facilitate community energy. There is currently no strategic policy alignment on community energy across EA, ComCom, MfE, MBIE and EECA. There is some interest across relevant agencies to facilitate community energy. However, there is a lack of co-ordination and limited resources being applied to the issue specifically.

22. Guidance and facilitation of shared ownership projects is likely a cost-effective route to achieving both community benefits and social licence for renewable energy.

23. EECA notes that MBIE is currently developing a discussion document on renewable energy and process heat, which explores policy options for support of biomass CHP, and whether national environmental standards and/or national policy statements could better facilitate development of new renewable electricity generation in New Zealand. This work will include explicit consideration of how any proposals might facilitate consenting processes for community-scale renewable energy.

EECA could play a role to facilitate projects viable in the current context

24. A range of community energy projects are likely to be viable in the current context. Based on the evidence available, these are likely to include:

    a. Community-level energy efficiency initiatives

    b. Community facility microgeneration, and

    c. Embedded networks or remote micro-grids (with peer-to-peer trading)

25. EECA could play a role in the short term to facilitate such projects, primarily around building a positive narrative, supporting local capacity, providing matchmaking and facilitating access to finance, and collecting data on the impacts of community-based approaches (See Appendix 2).

26. EECA could consider the following roles, in ascending order of ambition:

    a. **A limited role**, monitoring developments in community energy and revisiting our role as the context changes.

    b. **Information provision, advisory and reporting role**, in which EECA engages in networking and awareness raising, provides high level guidance, and reports on barriers to community energy – but does not undertake resource intensive direct support measures in the short term.

    c. **A pilot project handholding and evidence building role**, in which EECA directly supports a number of pilot projects that are viable in the current context. This could be used:

        i. To lift the profile of community energy, trial and test our approach to handholding projects, and build an evidence base to support the development of an enabling regulatory and market environment (primarily by MBIE and the EA), and

        ii. To establish trusted relationships with community organisations, and build local capacity to engage with communities on a wide range of energy issues, ranging from energy efficiency to smart appliances, to EV uptake and utilisation, and collect data on tailored approaches for enhanced participation, energy savings outcomes and energy literacy.

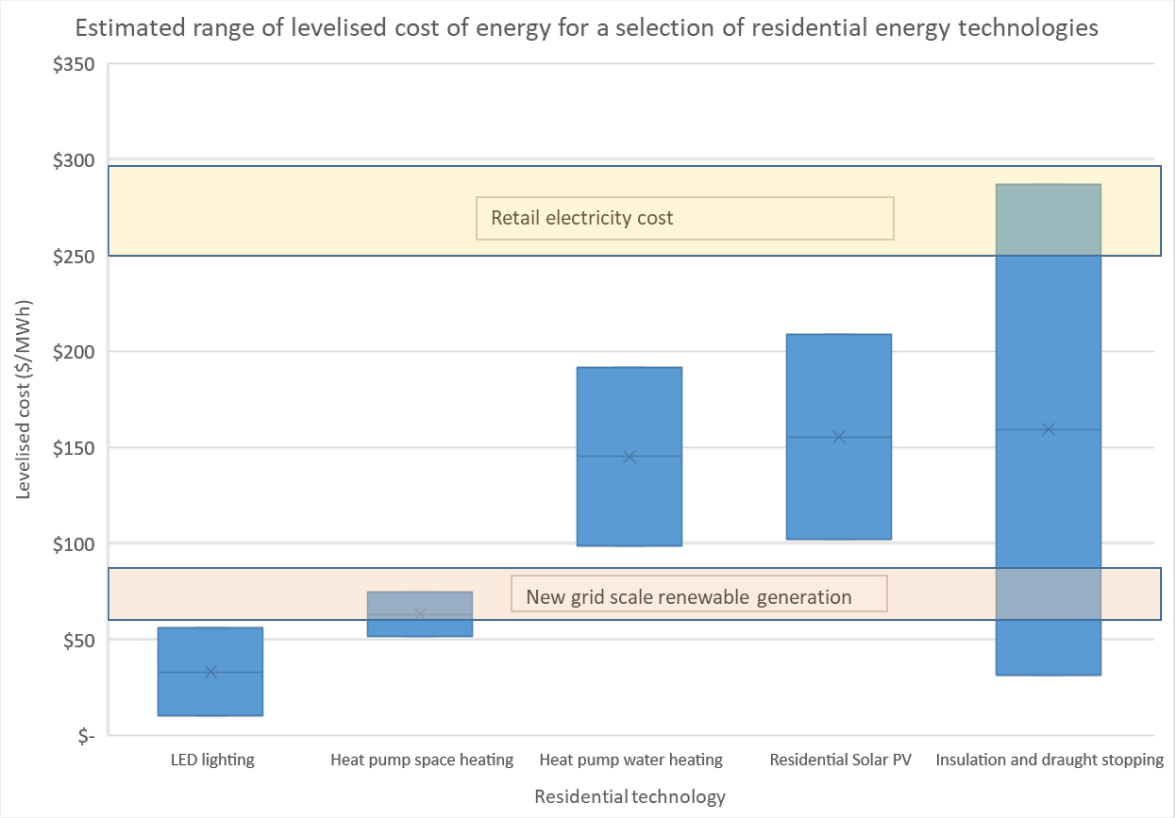
27. EECA's view is that within the current regulatory and market context, options (b) and (c) above would have limited impact in terms of facilitating projects that are replicable and scalable across the country (i.e. they would be niche applications).

28. Once further progress has been made to resolve market arrangement barriers in the medium term, this may generate scope for wider uptake and replication of projects and more diverse community energy models.

Energy efficiency should come first

29. If EECA does play a role in supporting community energy now or in the future, it would be important to ensure that any programme was designed to link closely to the objectives set out at the start of this paper.

30. Energy efficiency generally offers the lowest-cost opportunity to meeting renewable energy goals. In the community energy context, it will also likely deliver significant energy cost reductions at a lower cost than new generation (whether distributed or large-scale), thereby contributing to alleviation of energy hardship. To illustrate, the graph below illustrates that LEDs and heat pumps for space heating (replacing electrical resistance heaters) are the lowest-cost technologies, delivering electricity to the household at far below retail cost (and in the case of LEDs, often at negative cost).



31. If EECA pursues a role in supporting community energy projects, it anticipates that projects focused on delivering energy efficiency improvements are likely to be considered favourably against alternative projects.

32. EECA notes the Electricity Price Review (EPR) recommended the Government establish a network of community-level service providers to advise households in energy hardship, as well as an energy efficiency hardship fund to support retrofits recommended by these providers. It would be worthwhile to consider how the Government's response to the EPR and

your interest in supporting community energy could be aligned. EECA welcomes the opportunity to discuss this further with you and with MBIE.

Any EECA role in this space would require new resourcing

33. Implementing any role or programme from 2019/20 would require additional resourcing to ensure EECA has the relevant capacity and capability to fulfil it.

34. In parallel with this advice, EECA is working with MBIE to scope a budget bid for the purpose of providing support to community energy pilot projects including energy efficiency initiatives, microgeneration, embedded networks and/or remote micro-grids. [BUDGET SENSITIVE]

Appendices

Appendix 1: Arguments for and against civic ownership of renewable energy (generation) assets

Appendix 2: Barriers and policy gaps for community energy in New Zealand

Appendix 3: Statement from the Electricity Authority outlining ongoing work to remove barriers to Distributed Energy Resources

Appendix 1: Arguments for and against civic ownership of renewable energy (generation) assets

	Proponents	Opponents
Political	• Facilitates a positive public perception and buy-in for renewable energy, conducive legislative reforms and more rapid energy transitions	• Concern that public might subsidise cost-inefficient development of assets.
Social	• More extensive local engagement (than in commercial or public projects) • Enables local control over aspects including technology scale, siting and orientation • Facilitates social cohesion and community empowerment	• Exacerbates socio-economic inequality where there is unequal access to finance and policy support. • Requires high degree of outreach, engagement and training around the management of new niche technologies.
Economic	• Contributes to rural development, local employment. • Can reduce cost of energy in rural areas. • Can defer expensive upgrades and extensions of the transmission network. • Can produce low cost heat.	• Requires higher transmission capacity and cost for a given power output as well as reinforcement costs in the distribution network. • Additional cost of system balancing and ancillary infrastructure. • Higher subsidies required to finance remaining transmission infrastructure. • Higher LCOE because civil projects do not achieve economies of scale in construction and operation. • Higher administrative cost. • Support incentives increase cost of electricity for consumers, decreasing purchasing power and indirectly generating job loss.
Environmental	• End-user engagement can generate energy awareness, absolute reductions in energy demand and demand GHG emissions. • Ability to use waste heat raises system and GHG- efficiency.	• Larger-scale centralised renewable energy deployment can be implemented more rapidly and more cost-effectively at scale to achieve higher GHG savings.
Technical	• Scale and quality of energy generation is matched to load, preventing transmission losses. • Creates 'islands of stability' and voltage stability. • Increased reliability of electricity for community buildings in rural areas. • Improved system efficiency if able to use waste heat locally.	• Distributed generation increases the per-unit cost of transmission infrastructure (and thus cost of delivered energy) • Installing must-take generators requires additional system balancing and ancillary technology, such as transmission and storage infrastructure, active network management, as well as additional centralised base-load and dispatchable peak load generators.

Appendix 2: Barriers and policy gaps for community energy in New Zealand

	Specific barriers	Responsible agencies	Measures under development	Unexplored interventions	International practice
ENABLING MARKET ACCESS	Risks securing power purchase contracts for independent power generators	MBIE (EA)	N/A	• Low risk market integration mechanisms • Regulated buy back rates, net metering • Advocacy / matchmaking / support for joint ventures with peer to peer service providers, retailers or aggregators. • Market place for commercial Power Purchase Agreements	Nova Scotia Com-FIT; Regulated buy back rates OECD; Local Energy Scotland
	Inconsistent cost/ complexity of grid connection requirements	MBIE (EA)	Guidance on determination of connection charges	• Standardising terms and conditions of grid connection agreements across EDB's.	UK
	Lack of signalling / remuneration / co-operation for non-network solutions and ancillary services on local networks	MBIE (EA)	Heat maps (Equal and Open Networks) ; Guidance on what is and is not an appropriate activity (Emerging contestable services) ; Time of use pricing (pilots)	• Level playing field for network v. non-network solutions • Guidance/independent review on business case analysis for network versus non-network solutions, procurement choices, ccompetitive tendering • Development of market mechanisms for small-scale DSR, capacity, ancillary services	Dynamic pricing Denmark, peak reduction incentives Sweden
	Lack of ability for consumers to access / share consumption data with (non-retail) third parties	MBIE (EA)	Automated data access authorisation ; third party meter management (ACCESS)		Netherlands
	Lack of ability for consumers to be serviced by peer-to-peer and retailers simultaneously	MBIE (EA)	Altering ICP connection data API to include new data fields (ACCESS)		Meter management Netherlands
BUILDING A POSITIVE NARRATIVE	No consensus on role of community organisations in energy decarbonisation	N/A	N/A	• Unified community energy strategy backed by all relevant agencies • National targets for community energy	Australia, Scotland, England
	Benefits of community energy projects not widely known and accepted across government, industry and wider public	N/A	N/A	• Work with first movers to realise 2-3 trail blazer projects. • Collect data on benefits of ongoing case studies or pilots so that we build an evidence base that supports the case for community energy. • Promote case studies (video, regional workshops, etc.)	Community Energy Scotland; Local Energy Scotland; Hier Opgewekt (NL)
	Lack of willingness to accommodate community energy projects (OSH, insurance, etc.).	N/A	N/A	• Promote benefits • Promote opportunity for local government across LGNZ targeting core business • Guidance for local government	UK, Denmark, Netherlands
BUILDING LOCAL CAPACITY & RESOURCING	Long development timelines, high failure rates	N/A	N/A	• National or regional handholding and facilitation of projects • Project viability appraisal • 'How to' guidance • Matchmaking / tendering with service partners	Local Energy Scotland One-Stop-Shop
	Lack of local capacity & expertise ("don't know where to start")	N/A	N/A	• Guidance on viable blueprints • Matching with technical, legal, financial expertise • Guidance, voluntary/ mandatory shared ownership	UK, Netherlands, Denmark, Mexico, South Africa
	Lack of networking & knowledge sharing across operational projects	N/A	N/A	• Networking, promoting case studies, building sector identity.	Scotland, England
	Struggle to acquire local sites for development	N/A	N/A	• Working with DOC/ Crown / Local authorities to negotiate terms of access to land	Forestry Commission Scotland

ACCESS TO FINANCE	Newly established organisations struggle to finance feasibility/ resource consent	N/A	N/A	• New fit for purpose low risk seed public loan programme	Scotland, England
	Difficulties engaging with funding mechanisms	N/A	N/A	• Explore consistency of GIF, Impact Investment Fund, PGF with community energy	
	Large upfront capital costs; newly established organisations will struggle to access commercial debt	N/A	N/A	• Innovation grant programme • Demonstrate/improve bankability of projects • Underwrite loans • Work with third parties to develop generic crowdsourcing/community shares platforms to raise debt/equity from citizens.	Scotland, England, Australia
SUPPORTIVE LOCAL AUHTORITIES	Non-uniform treatment, retroactive changes; substantial delays and costs associated with resource consenting and re-consenting for small-scale hydro and wind	MfE	NPS REG; RMA revisions; Community benefits or local social and economic impacts as material to resource consent; regional energy planning	• Support resource consent applications through funding/expert guidance • Making local authorities aware of the local benefits of community energy projects. • Site pre-feasibility mapping.	Germany, Denmark
	Lack of expertise, resources, champions/facilitators at regional/council level	LGNZ	LGNZ decentralisation and localisation project	• Promote local benefits of community energy projects, especially core business (transport, housing). • Promote opportunity for local government (e.g. LGNZ)	Germany, Denmark

Appendix 3: Statement from the Electricity Authority outlining ongoing work to remove barriers to Distributed Energy Resources

The Electricity Authority recognises the role Distributed Energy Resources (DER), including community energy, will play in New Zealand's energy future. Efficient investment in DER can make a contribution to:

- Providing consumers with greater choices and benefits
- Electricity system resilience and reliability
- Managing the cost of delivered energy to New Zealanders
- Electrifying New Zealand, as contemplated in various proposed responses to climate change: see for example the Productivity Commission's August 2018 Low-Emissions Economy report.

The Authority recognises the importance of reducing potential barriers to DER. In November 2017, the Authority sought advice on equal access to distribution networks from its Innovation and Participation Advisory Group. The April 2019 advice from IPAG was comprehensive, and focussed on barriers to DER. The Authority has since responded by launching its open networks development programme.

The Authority welcomes the opportunity to work with EECA to further understand and address the potential barriers to community energy. The Authority already has a range of work in progress that addresses aspects of the potential barriers to DER raised in EECA's paper. These include:

- Improving the transparency of network data, especially in relation to opportunities to provide alternative solutions to network issues: open networks development programme
- Developing connection standards for DERs connecting to distribution networks: open networks development programme
- Making it easier for parties to participate in the wholesale electricity spot market: real time pricing project, dispatch-lite
- Improving access to consumption data, including:
    - Access for third parties that consumers trust (to allow them to provide new and innovative services): ACCES programme
    - Access for network companies to help them plan for future investments: default distributor agreement project.

The Authority recognises other concerns raised by community energy groups. To some extent there is an inherent tension between the expectations of people or groups seeking to install and operate DER, and operating the electricity market efficiently, to produce the lowest aggregate cost of energy for New Zealanders. For example, people installing solar panels and batteries argue that they should receive a very substantial discount on their electricity bills because they are now producing the majority of their own power. This argument needs to be balanced against the cost and value for these consumers of maintaining a connection to the electricity network, ie, that connection guarantees consumers can access electricity at any time they want to, including at night during winter when their solar panels are not producing any power, and their batteries are fully discharged.

This tension will continue with the increasing availability and uptake of new technologies. That's why it is important to reform network pricing.

The Authority recognises the benefit of efficient network alternatives, but seeks to ensure that network pricing reflects the (mostly fixed) costs of being connected and having access to the network, and does not encourage installation of DER that simply shifts network costs to other consumers (who may be less able to afford those costs), and adds costs to the system overall.

Note: This report is a near-final draft. The report was not finalised as the author had to leave EECA urgently for personal reasons. However, the report was sufficiently progressed to inform the development of advice to the Minister of Energy and Resources.

Strategic Project on Community Energy

Final Report

August 2019

Anna L. Berka

Image by MegaWattPuur, Belgium.

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Executive Summary

There is large interest among New Zealanders to contribute in meaningful ways to climate change mitigation. Community renewable energy, which has emerged globally since the 1980's, is perhaps one of the most prominent ways in which citizens are collectively engaging in climate change mitigation, marrying tangible local socio-economic needs with global and national climate change policy objectives, and strengthening community relationships. These three stranded objectives - social capital, local development, and climate change - align with the resurgence of contemporary papakainga on whenua Maori, with growing interest in fostering regional development and local resilience through social enterprise, and resonates with many New Zealanders seeking to engage locally in New Zealand's transformation to a low emissions economy. However, in order to foster projects that are viable and deliver emissions savings in domestic context, community energy projects need to be carefully designed to suit New Zealand's market arrangements and the specific emissions saving opportunities created by the electricity mix and emission profile. This means that they are likely to look different from first generation community energy projects in Europe and North America.

Grassroots or social enterprises offer unique advantages and disadvantages compared to commercial development. These influence the risk profile and viability of any given community energy project and make the wider diffusion of community energy, in particular among less wealthy or resourced communities, relatively dependent on a supportive policy context. Supportive policy contexts internationally have developed through strategic policy alignment across agencies to ensure the operational and financial viability of small or shared ownership projects, access to finance, key inputs and services, and ability to obtain resource consent. It has also involved the widespread promotion of renewable energy as something that can deliver community benefits, and popularisation of community energy as an opportunity for local organisations to meet their objectives and have positive impact.

At the heart of policy co-ordination, facilitation and resourcing of community energy lies an acknowledgement from key stakeholders in industry and government of the inherent public value of citizen engagement in low carbon innovation. These projects deliver a variety of positive local impacts, and help to distribute the benefits of climate change policies widely across society, generating public support for energy and climate change policies. They also offer an opportunity to reveal behavioural, legal, regulatory, technical barriers of end user technology projects, and to adjust business models, practices, market design and regulation in response to these experiences in order to enable replication and scaling. This directive and experimental approach to low carbon policy making is not widely accepted in New Zealand, in part because of a hands-off policy culture, lack of precedent and demonstrable pay-offs. A track record of failed community energy projects have made public officials wary of the risks and

shortcomings of community energy proposals, which often leads to proposals being dismissed as misguided or naïve outright. Outside of a small industry and practitioner body, there is largely no appeal to the possibilities and the potential impacts of these projects. As such, any community energy programme would have to think carefully about how to deconstruct this narrative and foster a more balanced and more positive narrative that can take account of both the operational and financial feasibility of projects, and their benefits, many of which are difficult to valuate and monetise.

To date, there has been little effort to document barriers and ensure the interests of distributed energy actors are met within existing programmes at ministry or agency level. There is currently no strategic policy alignment on community energy across EA, ComCom, MfE, MBIE and EECA. This is in large part due to New Zealand's legacy in large-scale hydropower and electricity market composition, which has not lended itself to facilitation of widespread distributed generation. Correspondingly, community energy in New Zealand is in its nascency. Despite this, there are some uniquely resourced operational community energy projects. These projects are owned and operated by a wide variety of organisations, including grassroots and iwi organisations, local authorities and consumer – trust owned EDB's.

There are a range of barriers to community energy in New Zealand, many of which are not within EECA's mandate. The barriers include market settings, risks around securing power purchase and grid connection, lack of consensus and consistent messaging on the role of community energy, lack of local capacity, resources and access to finance, as well as a lack of regional facilitation and sometimes arduous resource consenting procedures. The most significant barriers are electricity market arrangements, as they are fundamental to the operational and financial viability of projects. Some of the issues in this category, such as access to consumption data by third parties, are subject to ongoing work by the Electricity Authority and MBIE. Others, such as the reconciliation of network and grid charges for distributed generation, or the development of market mechanisms for network and ancillary services, will require EA to obtain further funding and are not likely to be resolved within the next three years. It is possible for EECA to work around these barriers to some extent by facilitating projects that work in the current market context. However, these projects on their own are likely to represent niche applications and result in relatively exclusive uptake.

There is some interest across relevant agencies to facilitate community energy – however there is a lack of co-ordination and limited departmental leadership and resources being applied to the issue. If market arrangements and resource consenting barriers were resolved in the medium term, this would generate scope for wider uptake and replication of projects and more diverse community energy models. In summary, there is ample scope in principle for policy intervention and a more co-ordinated policy strategy to facilitate community energy in order to complement and socialise New Zealand's predominantly utility-led energy decarbonisation pathway. There are a

range of policy gaps EECA could address in the short term, aimed at building a positive narrative, building local capacity and matchmaking, and enabling access to finance. On the one hand, it may be prudent to limit EECA's actions/resources in this space until it secures commitment from relevant agencies to address market and regulatory barriers. To this end however, there is currently no indication that any other agency would assume leadership on this issue. On the other hand, EECA may want to use a number of publicly supported pilot projects as a vehicle to push for policy leadership, better policy co-ordination, and popularisation of a positive narrative. Supporting projects directly may provide the impetus to learn and advocate how projects can be better facilitated on the ground through appropriate market and regulatory arrangements.

Acknowledgements

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Akina, Auckland City Council, Awarua Synergy, Blueskin Energy, Coastal Energy, Contact Energy, Community Energy Network, Eastern Bay Energy Trust, Eastland Group, Electricity Authority, EMHTrade / P2 Power, Enercon, Energise Otaki, Energy Centre (University of Auckland), EnergyLink, EnergyShare, ENA, Front End Solar, Genesis, Greenpeace New Zealand, Healthier Homes, Hiringa, IEGA, Infratec, IPAG, Iwi Chairs Forum Climate Change, MBIE, MfE, MOE, Ngati Tuwharetoa Settlement Trust, Northpower, NZWEA, Otago University, OurEnergy, Paekakariki Housing Trust, Palmerston North City Council, Pioneer Generation, PowerCo, PowerIt Forward, PowerTechnology, Roaring 40's Wind Power, Scanpower, Silk Advisory & Innovation, SolarCity, Sustainability Trust, SEANZ, Sustainable Taranaki, Massey University, Transpower, The Connective, TrustPower, Vector, Victoria University of Wellington, Waipa Networks, WEL Networks.

Acronyms

DG	Distributed generation
EA	Electricity Authority
EECA	Energy Efficiency and Conservation Authority
ENA	Electricity Networks Association
EVCF	EV Contestable Fund
IEGA	Independent Electricity Generators Association
IPAG	Innovation and Participation Advisory Group
LCE	Local and community energy
MBIE	Ministry of Business Innovation and Enterprise
MFE	Ministry for the Environment
MOE	Ministry of Education
NZWEA	New Zealand Wind Energy Association
SEANZ	Sustainable Energy Association New Zealand
WKH	Warmer Kiwi Homes

Background to this report

The Minister has asked EECA to consider its role in supporting community renewable energy and energy efficiency projects and to produce advice on support measures EECA could take, prepared in consultation with MBIE, in particular considering any activities that could be carried out from 2020/21.

This report was designed to provide a basis for EECA to set out proposed policy objectives, identify appropriate strategies and support measures for community energy, as well as a preliminary assessment of how each measure is likely to perform against criteria for policy support. It has focussed on the barriers and opportunities in power generation and demand side response, where there is international precedent and emerging domestic opportunity for community energy, rather than areas where EECA has established programmes in place (heat, energy efficiency and clean transport).

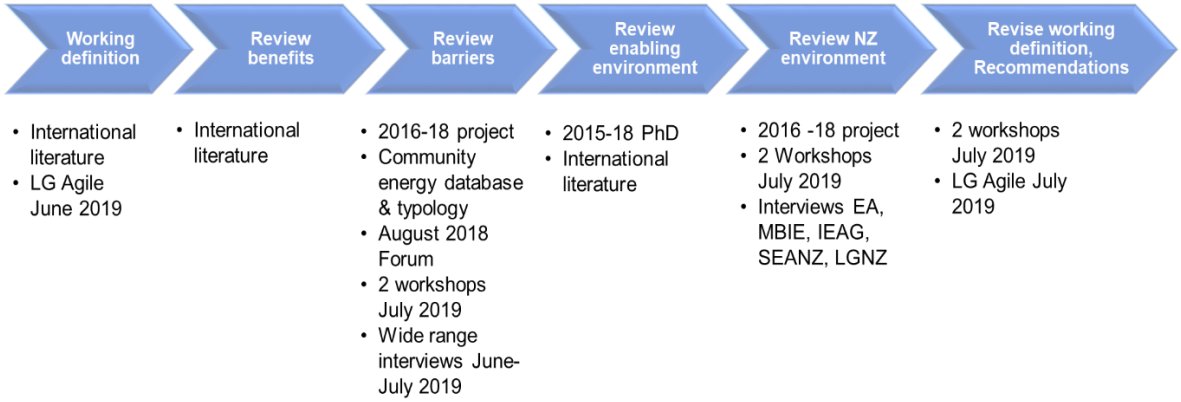
This report is structured as follows. Section 1.1 sets out what local and community energy is, providing a definition that can be used for policy development. The report then outlines the benefits and drawbacks of community energy, compared to conventional commercial development (Section 1.2), and provides a summary overview of market settings, regulatory environment and policy support mechanisms that have enabled the adoption and diffusion of community energy elsewhere (Section 1.3). Section 2 provides a helicopter view of existing community energy initiatives in New Zealand, and the barriers and opportunities facing them in the current legislative, regulatory and market context. It concludes by setting out key policy gaps against support measures that have not yet been explored in domestic context, with reference against international best practice. Section 3 concludes by setting out community energy growth scenarios and associated policy implications, building on an understanding of key features of New Zealand 2030 and 2050 energy scenarios and the current barriers faced by different types of organisations. It outlines strategies and measures for EECA, drawing on internal strategy documents, programmes, and exploratory focus groups and interviews with staff members to identify EECA's potential role in overcoming barriers, given its expertise, resources and mandate, and highlights any barriers to community energy that are best addressed by other agencies.

Methodological Approach

This report is largely based on academic articles published for submission of a PhD throughout 2016- 18, as well as a number of academic papers and policy briefs published since, the latter written by myself in collaboration with others at the University of Auckland. It is in no way a robust or quantitative analysis of the growth prospects for community energy – in part because this is a nebulous area with many potential applications. This report is therefore based on existing published peer-reviewed and grey literature, as well as a wide range of interviews with community energy practitioners, EDB's, industry actors and public agencies, and two workshops, held in Wellington and Auckland in July 2019, as well as a Community Energy Forum held in August 2018.

This report focusses on domestic barriers to community energy, with explicit reference to support frameworks that exist in energy systems quite different from the energy system in New Zealand. As such, it primarily takes the perspective of community energy practitioners.

The timeline and approach taken is summarised below:



1. Introduction

Historically the first electricity network and service companies in New Zealand and elsewhere were often community owned. Community energy has re-emerged worldwide since the 1980's following nationalisation and deregulation as a means to giving citizens the tools to engage with climate change mitigation, strengthen community relationships and marry tangible local socio-economic needs with global and national environmental public policy objectives.

Evidence from around the world suggests that the extent and the ways in which newly established grassroots organisations can engage with energy initiatives is shaped by organisational capacity, human resource, social cohesion, access to key inputs (such as land) and technical resource potential. While many of these factors are preconditions for success that might apply to any start up or small organisation irrespective of ownership, there are also unique aspects to grassroots organisations that offer both advantages and disadvantages compared to commercial development and that influence the risk profile and viability of any given community project (Table 1). Newly established grassroots organisations often rely on volunteers, are often more dependent on outsourcing legal, financial and technical services to consultants, often have a smaller portfolio of investments over which to distribute risk, and may have a negligible credit history with little cash reserve[1]. Projects are often designed around a single unique local site that presents itself as an opportunity for development[1]. Grassroots organisations are often managed democratically with input from members and/or the wider community[2]. While this can generate trust and local buy-in, it can also slow down decision making and puts more onus on skilled organisational leadership, internal decision-making processes and conflict resolution strategies. In concrete terms, it can lead to longer development times and higher project management costs[1].

All these factors makes the development and continued success of community energy more dependent than a typical commercial enterprise on the wider political, regulatory and infrastructural setting and the resources it provides them, in particular in the first high risk stages of a project (Table 1). Beyond grant-funded pilot or demo projects, the wider diffusion of community energy, in particular among less wealthy or resourced communities, is heavily dependent on a supportive policy context.

[1] Berka, A., Harnmeijer, J., Roberts, D., Phimister, E., & Msika, J. (2017). A comparative analysis of the costs of onshore wind energy: Is there a case for community-specific policy support?. Energy Policy, 106, 394-403. DOI: 10.1016/j.enpol.2017.03.070. URL: http://hdl.handle.net/2292/34213

[2] Wellens, L., Jegers, M., 2014. Effective governance in nonprofit organizations: a literature based multiple stakeholder approach. Eur. Manag. J. 32 (2), 223–243.

Table 1: Cost components and risk profile for a typical community wind project at different phases of development (adapted from Berka 2012, Berka et al., 2017).

Cost category	Project stage				
	Capital cost (CAPEX)			Operating cost (OPEX)	
	Feasibility	**Consent**	**Pre - construction**	**Operation**	**Decommissioning**
Management	Group formation; organisational incorporation; Project management; legal fees	Project management; Legal fees	Project management	Project management; revenue earmarking and distribution.	Project management
Technology	Grid appraisal	Utility upgrades, transformers, protection, metering and wiring; Design engineering	Turbine and tower acquisition and transport; wiring to turbine base; Turbine erection	Insurance & Warrantee, Operation and Maintenance	Technology decommissioning and transport, turbine sale.
Scoping, design and permission	Technical feasibility study	Environmental Statement / Impact assessment and planning fees			
Other material inputs		Land acquisition	Construction contracts, construction of access roads and foundation; land lease	Land lease	
Financing			Interest, equity returns, financing fees	Interest, equity returns, financing fees	
Risk level	VERY HIGH	HIGH	LOW	VERY LOW	VERY LOW
Risks	Lack of viable project sites; erroneous pre-feasibility assessment	Consent rejection; Grid connection queues; poor terms of Power Purchase Consent	Landing delays; delays in commissioning; changes in policy support.	Down time resource variability; electrical losses; wake effects	

1.1 What is community energy?

'Community' means different things to different people, and a wide variety of organisations have laid claim to the term 'community energy'. There is no single definitive definition for this term. However, research has been done to understand what the general public view as the distinguishing characteristics of community energy projects vis-à-vis commercial projects[3,4,5]. From this work, the most widely and internationally used definition of community energy, is: ***Any clean energy activity that is i) managed in an open and participative way, and ii) that has positive local and collective outcomes***.

This definition encompasses a wide variety of technologies, scales of deployment, finance, ownership and delivery models, legal & organisational structures, local needs and motivations, and includes both communities of place (defined by the place they live in), and communities of interest (defined by shared interest). It ranges from microgeneration to heat or power community facilities (such as marae, club houses, or schools), locally owned grid-tied or off-grid microgrids, or co-operatively owned solar PV, wind farms or biomass CHP, as well as joint ventures between community organisations and public or commercial enterprise.

For purposes of policy development, this definition:

i. Places no restrictions on ownership or legal status, instead putting the onus on participants to demonstrate inclusivity and local benefits;
ii. Encourages participation across a broad range of organisations not traditionally engaged in clean energy solutions, or not traditionally engaged in energy projects involving substantial community engagement;
iii. Encourages new forms of collaboration between electricity distribution businesses (EDB's), local authorities, housing and renewable energy developers, and community organisations that allow us to pilot and test business models emerging from digitalisation and disruptive technologies in the energy sector;
iv. Encourages initiatives across a wide range of technologies, scales of deployment, finance and delivery models, legal & organisational structures, community needs and motivations, ranging from energy efficiency, heat and power generation, to demand side management and clean transport.
v. Enables exclusion of projects on the basis of non-additionality or private gains, for example exclusion of school solar projects, landowners collectively investing in wind, or EDB's investing in rural area power solutions. However, because both

[3] Hoffman S. et al. (2013). Public values and community energy: lessons from the US and UK, Sustainability 5: 1747-1763.
[4] Walker, G., Cass, N., (2007). Carbon reduction, 'the public' and renewable energy: engaging with socio-technical configurations. Area 39, 458–469.
[5] Walker, G., Devine-Wright, P. (2008). Community renewable energy: What should it mean? Energy Policy 36, 497–500. doi.org/DOI: 10.1016/j.enpol.2007.10.019

inclusivity / participation and local benefits sit on a sliding scale, a judgement call will still have to be made on where a project sits with respect to the threshold for eligibility.

Internationally, local government acts to handhold and facilitate route to market for community-driven projects or implement state-imposed policy support mechanisms. Local authorities and other public service entities (hospitals, schools) also collaborate directly with community organisations in joint ventures, and invest in wholly publicly owned renewable energy projects, some (not all) of which feature high degrees of citizen participation and local benefits. In reviewing community energy in New Zealand and its barriers, this preliminary scoping document takes an inclusive approach, including public entities, consumer trust owned lines companies and established iwi trusts in its definition of local and community energy. It does this with a view that eligibility criteria for any future support measures can be tailored as to address the specific characteristics or barriers faced by different types of organisations. For example, not all types of organisations will have difficulties financing feasibility studies or acquire project finance; if this was a barrier that EECA could address, it could design eligibility criteria to exclude organisations with formidable cash reserves and credit history, in addition to using explicit criteria for open membership or demonstrable widespread community benefits and/or participation.

1.2 The benefits and drawbacks of community energy

The benefits of community energy are wide ranging but very case specific. They depend on project design and the extent of wider community engagement. Below lists the benefits in turn and briefly outlines what we know about the context in which these benefits occur.

A. Economic benefits

Local multipliers

Local and community energy has been used as a vehicle for local economic development in Europe and North America, particularly in rural areas, where it has been shown to generate economic multipliers that are greater than commercial projects[6,7]. This is because the direct employment impacts of renewable energy projects are generally small when compared to the direct and indirect economic

[6] Callaghan G, Williams D. (2014) Teddy bears and tigers: how renewable energy can revitalise local communities. Local Econ 29:657–74. doi.org/10.1177/0269094214551254.

[7] Okkonen L, Lehtonen O. (2016). Socio-economic impacts of community wind power projects in Northern Scotland. Renew Energy 85:826–33. doi.org/10.1016/j.renene.2015.07.047.

impacts generated by project revenues[8][9]. Community projects tend to procure locally, and to spend a higher proportion of project revenues locally - this in turn generates further spending and employment. Revenues of LCE in the UK and Germany have been reinvested in a wide range of local public goods, ranging from health and social care, housing, culture and heritage, local services and amenities, education, sport and recreation, forestry, recycling, energy efficiency, or further renewable energy projects[10,11]. However, investment decisions of community organisations are very context dependent; they depend on the organisational mission and legal status, as well as the investment incentives available to the organisation in question. Local capital investment by community members, for example in the form of co-operative shares, also increases total local GDP impacts, compared to projects relying on commercial debt[12].

Reversing socio-economic deprivation

In socio-economically deprived areas, medium to large scale projects can generate multiplier effects that make local and sustained provision of new products and services viable, open up markets for local natural and waste resources, and secure local livelihoods, contributing to a reversal of structural socio-economic deprivation. In countries like Scotland and Canada that have uneven development and lagging rural areas, community energy has become integral to regional development programmes. For example, medium to large scale community energy projects in several remote rural locations in Scotland and Wales, such as, Gigha, Islay, Eigg and Awel Aman Tawe, have been attributed as contributing materially to the reversal of structural economic decline by diversifying income streams, supporting local industry in terms of training as well as demand stimulus, and enabling provision of (more affordable) essential

[8] Berka A. & Creamer E. (2018). Taking stock of the local impacts of community owned renewable energy: a review and research agenda, Renewable and Sustainable Energy Reviews 82: 3400-3419.

[9] An exception to this rule may be bioenergy projects, for which continuous feedstock supply generates higher direct employment impacts.

[10] HIE (2015). Capturing Our Impact. Highlands and Islands Enterprise, www.hie.co.uk/community-support/strengthening-communities-and- fragile-areas.html

[11] Walton M. (2013). Social and Economic Benefits of Community Energy. Report for the National Trust, Available online: www.sharedassets.org.uk/wp-content/uploads/2013/10/Report -Social-and-Economic-Benefits-of-Community-Energy.pdf, 1-13.

[12] Entwistle G, Roberts D, Xu Y (2014). Measuring the Local Economic Impact of Community-Owned Energy Projects. Community Energy Scotland.

services, such as schools, transport and housing infrastructure[13,14,15,16,17]. In at least three cases this process has been associated with repopulation to above critical threshold levels in which rural communities can sustain themselves[18,19,17]. Little empirical research has been done in this area so far, but the potential for socio-economic regeneration is not likely to be restricted to the UK, nor to rural areas. For example, we see 'need-based' LCE initiatives that seek to play larger development roles in response to socio-economic deprivation or natural disasters in both rural and (peri-) urban areas elsewhere in the world – including in Christchurch following the 2010 and 2011 earthquakes [20,21].

Technological learning & demand for nascent domestic clean technology industries

In a number of countries (in Germany, Denmark and Spain in particular), local and community energy has been used strategically to support nascent domestic clean tech industries that had viable products but that were not yet market competitive due to small scale production, small-scale or immature products and a lack of established supply chains. Through demand-pull policies for wind and solar PV, including but not limited to investment incentives, government was able to leverage consumer capacity to drive technological learning and cost reductions in these industries, gradually nursing them to scale[22],[23]. This has generated successful export industries. While many factors including New Zealand's small market size preclude it from taking this industrial innovation strategy in general, it could nevertheless find benefit from

[13] Gubbins N. (2007). Community Energy in Practice. Local Econ 22: 80, doi.org/10.1080/02690940601121336.
[14] Slee B.(2015) Is there a case for community-based equity participation in Scottish onshore wind energy production? Gaps in evidence and research needs. Renew Sustain Energy Rev 41:540–9. doi.org/10.1016/j.rser.2014.08.064.
[15] Hain JJ, Ault GW, Galloway SJ, Cruden A, McDonald JR (2005). Additional renewable energy growth through small-scale community orientated energy policies. Energy Policy 33:1199–212. doi.org/10.1016/j.enpol.2003.11.017.
[16] Hinshelwood E. (2001). Power to the People: community-led wind energy – obstacles and opportunities in a South Wales Valley. Community Dev J 36:95–110.
[17] Callaghan G, Danson M, Whittam G.(2011). Community ownership and sustainable economic development. Scott Aff 74:1–22.
[18] Okkonen L, Lehtonen O. (2016). Socio-economic impacts of community wind power projects in Northern Scotland. Renew Energy 85:826–33. doi.org/10.1016/j.renene.2015.07.047.
[19] Gubbins N. (2010). The role of community energy schemes in supporting community resilience. JRF Brief Pap Community Assets:1–24.
[20] Hoffman S, High-Pippert A. (2014). Institutional and community based initiatives in energy planning. in: Fudge S, et al. Editors. The Global Challenge of Encouraging Sustainable Living Opportunities, Barriers, Policy and Practice, Journal of Environmental Policy & Planning; 2014, pp. 233–260. doi.org/10.1080/1523908X.2015.1020535.energy
[21] Carlton S, Valance S. (2013). An Inventory of Community-led and Non- governmental Organisations and Initiatives in Post- earthquake Canterbury. New Zealand: Natural Hazards Platform and GNS.
[22] Lauber V. & Jacobsson, S. (2015). The politics and economics of constructing, contesting and restricting socio-political space for renewables – The German Renewable Energy Act, Environmental Innovation and Societal Transitions. 10.1016/j.eist.2015.06.005.
[23] Fouquet D. & Johansson TB. (2008), European renewable energy policy at crossroads--Focus on electricity support mechanisms, Energy Policy, 36, issue 11, p. 4079-4092.

implementing this strategy at smaller scale to trial and incubate high-potential technologies, or new applications of technology, or for service innovation.

More diversity and competition in the electricity market

In a small market dominated by five big generator retailers (Figure 1), encouraging independent generators, retailers and generator-retailers can provide a necessary counterweight that will help in the medium to long term to increase competition[24], and lower overall wholesale prices[25].

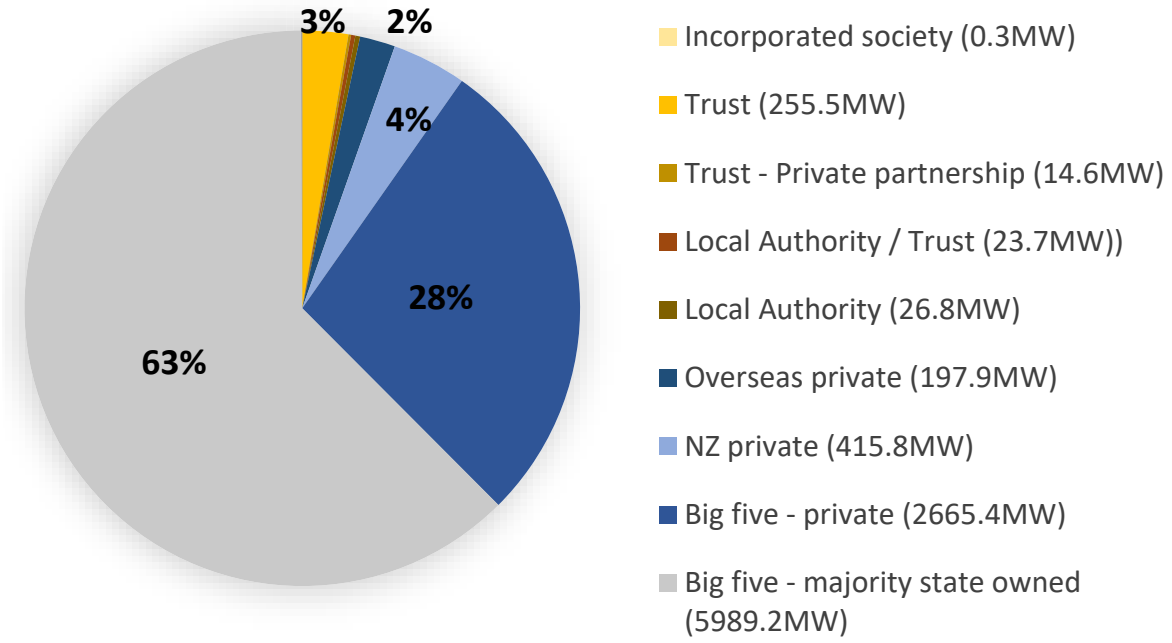


Figure 1*:* Generation capacity by ownership type, in % of total operational (Source: own data, Electricity Authority, 2015).

B. Social benefits

Community cohesion, cultural heritage, community empowerment and wellbeing

Much like any form of collective action, community energy can consolidate person-to-person relationships and result in new organisational forms and networks based on

[24] Poletti S. (2019). Market Power in the NZ wholesale market 2010-2016, www.auckland.ac.nz › business › our-research › docs › energy-centre

[25] Meade R. (2018). Preparing electricity regulation for disruptive technologies, business models and players in the long term interests of consumers, https://treasury.govt.nz › files › dispruptive-technologies-rmeade-24052019

shared values and interests, or even preserve cultural heritage[26,27,28]. Collective action and community energy specifically has been shown to provide a platform to deliberate and act on cultural, behavioural dimensions of complex environmental issues, and through that process find positive relations, purpose, self-acceptance and self-determination, contributing to psychological wellbeing [29,30].

Access to affordable energy

Most community-led energy efficiency projects and a small proportion of generation projects are driven by a desire to reduce energy hardship. Community based implementation of energy efficiency measures can leverage community relationships and expertise to increase participation, energy savings and/or demand reduction, compared to top-down 'fit and forget' programmes, but are generally also more costly[31]. This is because barriers to participation are often shaped by the unique characteristics and needs of the target community and benefit from tailored and targeted approaches and 'policy workarounds' that might otherwise be overlooked[32].

Generally in developed economies, only a small proportion of local and community energy generation projects are mobilised to improve energy access and energy affordability - these are generally remote areas on low voltage networks, islands where the alternative is to import oil or diesel, or locations that have ample low-cost woodfuel supply. Secure, clean and affordable energy access remains an issue in a number of remote areas and islands in New Zealand. A number of planned community energy projects in New Zealand fit in this category, such as the Parihaka Resistance to Climate Change project (Taranaki), Power It Forward (Northland) and Transforming Tai Tokerau For Good (Far North) (see for instance Case study 1 below). For generation projects, servicing energy poor consumers generally requires shouldering capital costs on behalf of the wider community, either through grant or loan programmes, revenues from a secondary activity (eg. housing), or using innovative

[26] Bere J, Jones C, Jones S. The Economic and Social Impact of Small and Community Hydro in Wales. Hydropower Stakeholder Group; 2015.

[27] Allen J, Sheate WR, Diaz-Chavez R. Community-based renewable energy in the Lake District National Park – local drivers, enablers, barriers and solutions. Local Environ 2012;17:261–80. doi.org/10.1080/13549839.2012.665855.

[28] Radtke J. (2014) A closer look inside collaborative action: civic engagement and participation in community energy initiatives. People, Place Policy 2014;8:235–48. doi.org/10.3351/ppp.0008.0003.0008.

[29] van der Horst D. (2008). Social enterprise and renewable energy: emerging initiatives and communities of practice. Social Enterp J 4:171–85. doi.org/10.1108/17508610810922686.

[30] Mock M. et al (2019). Something inside me has been set in motion": Exploring the psychological wellbeing of people engaged in sustainability initiatives, Ecological Economics,160, Pages 1-11, ISSN 0921-8009.

[31] Speers A., Powelka A., Wilson J. (2017). A national review of community-based energy efficiency program designs: finding trnasferable insights from 25 Unique programs, Opinion Dynamics Report 2017, retrieved July 2019: https://opiniondynamics.com/wp-content/uploads/2017/08/2017_IEPEC-Paper_A-national-review-of-community-based-energy-efficiency-program-designs_Speers.pdf

[32] Reames T. (2016). A community based approach to low-income residential energy efficiency participation barriers, Local Environment 21(12): 1449-1466.

finance measures to recuperate costs from end users gradually over time (for example using 'pay-as-you-save' models).

Case Study 1: Power It Forward

PowerItForward was set up by Keith Scoles, a long time industry specialist at Infratec with over thirty years of experience as a project engineer and manager in New Zealand, as well as in the Asia/Pacific on community size renewable energy systems. PiF has carried out extensive modelling to assess the viability of a community solar PV power sharing scheme, in which a host - be in a church, industrial unit, local business or community/farming land - houses a overcapacity solar PV installation and benefits from energy services, with remaining electricity exports and revenues used to provide tailored energy and energy efficiency services for households experiencing energy hardship. PiF aims to deliver these projects in collaboration with Community Energy Network, who bring in extensive community relationships and energy efficiency expertise. They are currently exploring a number of stakeholders for development of a pilot.

Knowledge and skills development

There is considerable evidence that active participation in LCE projects can facilitate the development of knowledge and skills across a range of areas, including organisational management and leadership, project management, problem-solving, community consultation and engagement, marketing and communication, business development, project finance and fundraising, legal services, as well as technical capacity around renewable energy technology and energy efficiency[33,34,35,36,37,38,39]. LCE projects also often draw out and utilise latent knowledge, skills and capacities existing within communities[40].

[33] Bere J, Jones C, Jones S. The Economic and Social Impact of Small and Community Hydro in Wales. Hydropower Stakeholder Group; 2015.

[34] Bauwens T, Huybrechts B. The Frog and the Ox, or How Hybrid Organizations Deal with Growth: The Case of Renewable Energy Cooperatives. Proceedings of the 5th EMES International Research Conference on Social Enterprise, 2015, pp. 1–31.

[35] Callaghan G, Williams D. (2014). Teddy bears and tigers: how renewable energy can revitalise local communities. Local Econ 2014;29: 657–74. http://dx.doi.org/10.1177/0269094214551254.

[36] Armstrong H. (2015) Local energy in an age of austerity: preserving the value of local and community energy. NESTA.

[37] Hicks J, Ison N. (2011). Community-owned renewable energy (CRE): opportunities for rural Australia. Rural Soc ;20: 244–55.

[38] Martiskainen M. The role of community leadership in the development of grassroots innovations. Environ Innov Soc Transit 2016:1–12. http://dx.doi.org/10.1016/j.eist.2016.05.002

[39] O'Connor H, Chisholm N, OShaughnessy M. (2004).The Contribution of Community Owned Renewable Energy to Sustainable Rural Development. Business and Development. Department of Food.

[40] Seyfang G, Park JJ, Smith A. A thousand flowers blooming? An examination of community energy in the UK. Energy Policy 2013;61:977–89. doi.org/10.1016/j.enpol.2013.06.030.

Community organisations have replicated projects, implemented larger more ambitious projects, and/or have become handholding organisations that facilitate community energy projects across the region or country[41]. Following experience in power generation and energy efficiency, some these organisations are now conduits for consumer facing pilot projects on a range of energy issues, including demand side management, storage, and clean transport. However, depending on the extent of wider community participation, knowledge and skills development can be limited beyond the individuals that actively lead and manage projects[42].

With regards to community energy efficiency, key benefits compared to conventional top-down programmes are increased community capacity, administrators improved understanding of needs, improved administrator-community relations and spill-over benefits (eg. readiness to participate in future programs)[43]. These benefits (community capacity, goodwill) are difficult to measure and not always captured in funding and programme evaluation frameworks; they have for instance not featured in past evaluations of EECA's residential energy efficiency evaluations[44]. In New Zealand, local government sometimes implement social procurement policies on the basis of local capacity building.

Finally, renewable energy projects in schools have been shown to increase perceived self-efficacy, pro-environmental attitudes and behaviours among students and staff [45,46].

C. Environmental benefits

Community energy in Europe and North America has accelerated investment in clean technology. However, the environmental impacts of community energy projects vary depending on the functionality (electricity generation, co-generation, energy efficiency, microgeneration, etc.), the technology in question, the emission profile of the electricity mix, project design, and levels of community engagement.

[41] Berka, A., 2017. A short history of community renewable energy in the United Kingdom: development and characterisation from 1870 to 2015. In: Holstenkamp, L., Radtke, J. (Eds.), Handbook on Energy Transition and Participation. Springer Verlag, Wiesbaden.
[42] Berka A. & Creamer E. (2018). Taking stock of the local impacts of community owned renewable energy: a review and research agenda, Renewable and Sustainable Energy Reviews 82: 3400-3419.
[43] Speers A., Powelka A., Wilson J. (2017). A national review of community-based energy efficiency program designs: finding trnasferable insights from 25 Unique programs, Opinion Dynamics Report 2017
[44] Grimes A. et al (2011). Evaluation of Warm Up New Zealand: Heat Smart, www.healthyhousing.org.nz/research/past-research/evaluation-of-warm-up-new-zealand-heat-smart/
[45] Tucket R. and Izadpanahi P. (2017). Live green, think green: sustainable school architecture and children's environmental attitudes and behaviors, Journal of Environmental Psychology 51: 209-216.
[46] Lay Y. et al. (2013). Assessing secondary school students' understanding of the relevance of energy in their daily lives, international Journal of Environmental & Science Education 8(1): 199-215.

There are a number of ways in which local and community energy could contribute to domestic low emissions scenarios in theory. They can provide additional renewable electricity capacity (through community-owned geothermal, wind and solar assets), short-term flexibility and ancillary services (through microgeneration, battery storage and high specification inverters in combination with home automation and peer-to-peer trading), renewable dispatchable alternatives to gas (through small scale biomass CHP), and can reduce peak loads (Table 2)[47]. Transpower and MBIE anticipate that a substantial amount of distributed solar needs to be part of the mix by 2050, with battery storage playing an increasingly important role[48].

Table 2: Opportunities for local & community energy to contribute to New Zealand's low emission scenarios

MBIE, BEC, Vivid 2050 low emission scenarios	**Opportunities for local & community energy**
Reduced peak seasonal lighting & heating loads	EE and self-consumption
20-50 TWh additional generation	Local / shared ownership in geothermal (8TWh) & wind (12-30TWh); solar (1-5TWh).
ST flexibility and ancillary services	Hydro (2-10TWh), demand response
Renewable dispatchable alternatives to gas	Small-scale biomass CHP

Energy literacy and environmentally benign lifestyles

A range of studies have suggested that the environmental gains from top-down 'fit-and-forget' residential energy efficiency and microgeneration projects are not always guaranteed; in many cases low carbon technology adoption can result in negative behavioural impacts such as increased energy intensive behaviour, use of additional appliances, or failure to adapt behaviour to suit the technology in question [49, 50, 51, 52]. In both energy efficiency and microgeneration projects, trusted relationships, user behaviour-oriented support and feedback from a local community organisation has

[47] Stevenson (2018). Transitioning to zero net emissions by 2050: moving to a very low emissions electricity system in New Zealand, Sapere Group, 2018.

[48] Transpower (2018) Te Mauri Hiko Energy Futures. Retrieved 21.11.18 https://www.transpower.co.nz/sites/default/files/publications/resources/TP%20Energy%20Futures%20-%20Te%20Mauri%20Hiko%20%2021%20May%2718%20-%20web.pdf. Transpower envisage total capacity increase of 61GW of which 16GW is distributed solar.

[49] van der Horst, D., 2008. Social enterprise and renewable energy: emerging initiatives and communities of practice. Social. Enterp. J. 4, 171–185. doi.org/10.1108/17508610810922686.

[50] Bergman N, Eyre N. What role for microgeneration in a shift to a low carbon domestic energy sector in the UK? Energy Effic 2011;4:335–53. http://doi.org/10.1007/s12053-011-9107-9.

[51] Bahaj A, James P. Urban energy generation: the added value of photovoltaics in social housing. Renew Sustain Energy Rev 2007;11:2121–36. http://doi.org/10.1016/j.rser.2006.03.007.

[52] Dobbyn J, Thomas G. Seeing the light: the impact of micro-generation on our use of energy. London: Sustainable Consumption Roundtable; 2005.

been shown to facilitate environmental gains vis-à-vis an equivalent top-down programme[53, 54].

Community-based electricity generation projects can result in energy savings if they are explicitly designed to do so; for example, returns on investment can be paid out in the form of savings on monthly energy bills and be packaged with community-based outreach and information. In this regard, the key advantage of community projects is that they can leverage a universal human tendency to model behaviour on those around us and a moral obligation to act in support of intra-group solidarity, which often trumps behavioural responses to factual knowledge about environmental problems [55, 56, 57,58,59]. Local connections and personal ties can serve to motivate and support individuals to engage with energy issues, discover and alleviate concerns around measures they can take through knowledge sharing and ideas development [60, 61, 62].

Not all community energy projects are aimed or designed to generate emissions savings. In remote areas and/or areas experiencing energy hardship, there is often a need to increase overall energy consumption at lower per unit cost. Depending on the nature of back-up power and the growth in demand, these projects may or may not result in net emissions reductions even where they partially replace diesel generators or boilers.

[53] Hamilton J. Evaluating the impacts and limits of community led approaches to energy reduction in Oxfordshire. Graduate School of the Environment. Centre for Alternative Technolgoy and Environmental Change Institute; 2011.

[54] Gupta R, Barnfield L. Evaluating the impact of low carbon communities on household energy behaviours. In: PLEA2013 - Proceedings of the 29th Conference, Sustainable Architecture for a Renewable Future, Munich, Germany: 2013, pp. 1–6.

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[56] Burchell K, Rettie R, Roberts TC. Householder engagement with energy consumption feedback: the role of community action and communications. Energy Policy 2016;88:178–86. doi.org/10.1016/j.enpol.2015.10.019.

[57] Jackson T. Motivating Sustainable Consumption: a review of evidence on consumer behaviour and behavioural change. Report to the Sustainable Development Research Network, January 2005:1–170.

[58] Bain PG, Hornsey MJ, Bongiorno R, Kashima Y, Crimston D. Collective futures: How projections About the future of Society Are related to actions and attitudes supporting Social change. Personal Social Psychol Bull 2013;39:523–39. doi.org/10.1177/0146167213478200.

[59] Jaeger C, Durrenberger G, Kastenholz B, Truffer B. Determinants of environmental action with regard to climate change. Clim Change 1993;23:193–211.

[60] Roberts S, Letcher M, Redgrove Z, Longstaff B, Inverarity A. Mobilising individual behavioural change through community initiatives: Lessons for tackling climate change. Cent Sustain Energy 2007.

[61] Cox J, Wilkins C, Ledsom A, Drayson R, Kivinen E. Environmental Action Fund (EAF): a Review of Sustainable Consumption and Production Projects (SCP2.2). London: Brook Lyndhurst DEFRA; 2009.

[62] The British Academy (2016). Cultures of Community Energy: Policy Report; Available online: www.britac.ac.uk/news/news.cfm; May 2016.

In specific contexts community energy has been shown to support environmentally benign lifestyles beyond energy [63,64,65,66]. This happens when there is active community engagement, projects explicitly target sustainable lifestyles (as opposed to specific activities or economic benefits) and are implemented consistently over a period of years, and involve participants that are new to sustainability discourse [67,68].

D. Technical benefits

Distributed generation can ensure local energy supply resilience, by supplying transformer and spur line capacity, security of regional supply, and increased reliability of electricity for remote community facilities[69,70,71]. These benefits are likely to become more important in the context of more frequent severe weather events. In New Zealand this has manifested itself in the form of reliance on distributed hydro plants on localised or transmission outages as a result of storms, such as the Amethyst Hydro case in February 2018[72]. A number of GXP's in New Zealand have been identified as requiring DG to meet energy security standards, where DG could potentially delay grid investment required to resolve these security[68]. This is the basis on which Transpower will assess and pay out Avoided Cost of Transmission payments to distributed generators, subject to EA approval[73].

Where DG allows the scale and quality of energy generation to be matched to load, it can prevent use of transmission network and prevent transmission losses. At the moment, DG in New Zealand pays network charges based on peak network cost, which incorporates network as well as transmission (grid) charges, irrespective of whether it makes use of the transmission grid[74]. This is because charging DG on the

[63] Rogers JC et al (2012). What factors enable community leadership of renewable energy projects? Lessons from a woodfuel heating initiative. Rlce 27:209–22. doi.org/10.1177/0269094211429657.
[64] Letcher M et al (2007). Mobilising individual behavioural change through community initiatives: Lessons for Climate Change. Final Report by Centre for Sustainable Energy for DEFRA, CLG, HM Treasury, DTI and DfT; February 2007.
[65] Heiskanen E et al (2010). Low-carbon communities as a context for individual behavioural change. Energy Policy 38:7586–95. doi.org/10.1016/j.enpol.2009.07.002.
[66] Tarhan M. (2015). Renewabl energy cooperatives: a review of demonstrated impacts and limitations, Journal of Entrepreneurial and organisational diversity 4(1):104-120.
[67] Middlemiss L, Parrish BD. (2010). Building capacity for low-carbon communities: The role of grassroots initiatives 38:7559–66. doi: http://dx.doi.org/10.1016/j.enpol.2009.07.003.
[68] Middlemiss L. (2011)/ The power of community: How community-based Organizations stimulate sustainable lifestyles Among participants. Soc Nat Resour 24:1157–73. doi.org/10.1080/08941920.2010.518582.
[69] Mitton ElectroNet (2017). Lower North Island Distributed Generation Impact Study, MELR331
[70] Strbac, Goran, Nick Jenkins, and Tim Green. 2006. "Future Network Technologies," April, 1–46.
[71] Hain, J et al (2005). Additional Renewable Energy Growth Through Small-Scale Community Orientated Energy Policies. Energy Policy 33 (9): 1199–1212. doi:10.1016/j.enpol.2003.11.017.
[72]Energy News (2018) Amethyst keeps Westpowers Light On, 2 February 2018.
[73] Electricity Authority (2016). Review of distributed generation pricing principles: Decisions and reasons. 6 December 2016.
[74] ENA (2016). New Pricing Options for Electricity Distributors: a discussion paper for industry feedback.

basis of network utilisation and actual contribution to network costs requires the development of more complex network pricing and reconciliation methods to determine cost causality based on location within the network, contributions to peak power flows, and profiles of power injection and withdrawal. The EA has now published high-level pricing principles to encourage pricing that "reflects the impacts of network use [and services] on economic costs" and expects these to be reflected in 2020/21 pricing changes, in some cases following trials with Time of Use pricing (Top Energy, Northpower) or EV/battery pricing (Wellington Electricity)[75]. Unfortunately, the Distributed Generation Pricing Principles review stops short of proposing pricing incentives that acknowledge the full range of network benefits and costs of DG; the consultation focusses on defensive pricing mechanisms to prevent adverse effects on network power quality of EV charging and reduced network revenues from consumption charge payments by households that have adopted residential solar PV[73].

DG can provide security of supply and network support for distribution networks, eg. in the form of voltage support, grid stability, and power quality[76,77]. These benefits appear in New Zealand regulatory discourse under the 'Avoided cost of distribution' and 'Emerging contestable services'; both relate to remuneration of DG for the benefits and avoided costs to distributors and local consumers in the form of non-network services. With one case of ACOD payment (by Eastland group), and one instance of third party tender for DG to relieve network constraints (PowerCo), market mechanisms for remunerating DG for these benefits is at early stages of development in New Zealand.

Other technical benefits apply in specific contexts. In rural/remote areas, generation powering community facilities can facilitate increased reliability of electricity[78]. In cases where LCE projects are able to use waste heat locally, such biomass or geothermal based CHP, system efficiency increases substantially[79].

E. Political benefits

[75] Electricity Authority (2019). More efficient distribution network pricing: principles and practice: Decision Paper, 4 June 2019.
[76] USDE (2007). The potential benefits of distributed generation and rate-related issues that may impede their expansion, www.energy.gov/oe/downloads/potential-benefits-distributed-generation-and-rate-related-issues-may-impede-its
[77] Steinhart et al. (2016). Local island power supply with distributed generation systems in case of large-scale blackouts, CIRED Workshop, Helsinki. Available at: https://ieeexplore.ieee.org/document/7861280
[78] Gubbins N. (2010) The role of community energy schemes in supporting community resilience. JRF Brief Pap Community Assets 2010:1–24.
[79] Strachan N. & Farrell A. (2006). Emissions from distributed versus centralized generation: the importance of system performance, Energy Policy 34(17): 2677-2689.

Increased local support for wind development

Local opposition to wind is nearly always fundamentally based on a perception of unjust distribution of costs and benefits of a given development. There is strong evidence to suggest that projects led by members from within a community built on a credible premise of local public benefits are less likely to trigger opposition to wind farms [80,81,82]. Positive perceptions associated with local ownership can place more emphasis on benefits and result in less negative perceptions of shadow flicker, noise, visual impacts and bird strikes[83]. Country comparative studies suggest that the effect of community ownership on public support for renewable energy is cumulative and manifests in higher overall wind deployment rates[84,85,86,87].

Better trust and reputation of energy utilities, authorities, climate and energy policy

Community energy is thought to increase public understanding of trade-offs in policy making, and enhance trust in energy institutions[88,89]. For instance, although renewable energy support mechanisms have driven up consumer prices in Germany and Denmark to among the highest in the world, survey data suggests the general public in both countries is largely supportive of the government's climate change and renewable energy policy, and supportive of renewable energy development [90]. This is in strong contrast to 2018 survey data in New Zealand, suggesting the New Zealand public do largely not believe its government capable of undertaking meaningful climate change mitigation action[91].

[80] Walker G, Devine-Wright P, Hunter S, High H, Evans B. Trust and community: exploring the meanings, contexts and dynamics of community renewable energy. Energy Policy 2010;38:2655–63. doi.org/10.1016/j.enpol.2009.05.055

[81] McLaren Loring J. Wind energy planning in England. Energy Policy 35. Wales and Denmark: Factors influencing project success; 2007. p. 2648–60. doi. org/10.1016/j.enpol.2006.10.008.

[82] Goedkoop F, Devine-Wright P. Partnership or placation? The role of trust and justice in the shared ownership of renewable energy projects. Energy Res Social Sci 2016;17:135–46. doi.org/10.1016/j.erss.2016.04.021.

[83] Musall FD, Kuik O. Local acceptance of renewable energy—A case study from southeast Germany. Energy Policy 2011;39:3252–60. doi.org/10.1016/j.enpol.2011.03.017

[84] Toke D, Breukers S, Wolsink M. (2008). Wind power deployment outcomes: how can we account for the differences? Renew Sustain Energy Rev; 12:1129–47. doi.org/10.1016/j.rser.2006.10.021.

[85] Wolsink M. (2007). Planning of renewables schemes: deliberative and fair decision-making on landscape issues instead of reproachful accusations of non-cooperation. Energy Policy 35:2692–704. doi.org/10.1016/j.enpol.2006.12.002.

[86] Breukers S, Wolsink M. (2007). Wind power implementation in changing institutional landscapes: an international comparison. Energy Policy 35:2737–50. doi.org/10.1016/j.enpol.2006.12.004.

[87] Bolinger M. Community wind power ownership schemes in Europe and their relevance to the United States. Lawrence Berkeley National Laboratory LBNL- 48357; Funded by U.S. Department of Energy under Constract no. DE-ACO3-76SF00098; May 2001:1–74

[88] Bauwens, T. (2017). 'Toward polycentric low-carbon transition: The roles of community-based organizations in enhancing the resilience of energy systems'. In Labanca, N. (ed), Complex Systems and Social Practices in Energy Transitions, London: Springer, pp.119-145.

[89] Ostrom E. (2002). Policy Analysis in the Future of Good Societies, The Good Society, Volume 11, Number 1, 2002, pp. 42-48.

[90] Clean Energy Wire (2019). Polls reveal citizens' support for EnergieWende, www.cleanenergywire.org/factsheets/polls-reveal-citizens-support-energiewende

[91] IAG-Ipsos Poll (2019). Kiwi Concern grows about climate change, www.iag.co.nz/latest-news/articles/Kiwi-concern-grows-about-climate-change.html

Shifting public narratives on climate change from short term costs to long term benefits
Distributed ownership of renewable energy has fostered buy-in for conducive legislative reforms and policy stability by changing the dominant public narrative from short-term costs to long-term social and economic benefits of climate change mitigation (Lockwood et al. 2016; Meckling et al. 2015). By marrying local social, economic and infrastructure needs and public policy objectives around energy poverty, climate change and energy security, community energy can contribute towards creating critical mass for more rapid and effective energy transitions (Kooij et al. 2017; Jacobsson and Lauber 2006; Strunz, Gawel, and Lehmann 2016).

F. Drawbacks and dominant counter-narratives

Critics of community energy argue they suffer diseconomies of scale, and unequal capability of communities to partake and benefit[92]. Community energy can fail to deliver on the benefits outlined above in absence of policy frameworks that can ensure widespread participation, legitimate forms of representation and accountability[93]. For example, if there is selective participation it can undermine universal access to energy by placing the burden of whole energy system costs disproportionally on consumers who do not have the capability to engage in community energy schemes[94,95]. This argument has been used in New Zealand to oppose policies or regulation to facilitate residential solar PV uptake[96].

Table 3 provides a summary of political, social, economic, environmental and technological arguments for and against community energy. In order for EECA to reconcile proponent and opponent perspectives on community energy within and across agencies, it helps to understand how different assumptions, knowledge, attitudes and worldviews shape these distinct views. They are fundamentally shaped by different assumptions about what drives the energy transition and scope of factors considered, but are also characterised by distinct risk appetite, trust in institutions and incumbents to deliver the energy transition, and the need for additional and accelerated investment in emissions abatement, stemming from higher prioritisation of action on climate change among proponents (Table 4). This debate is fundamentally

[92] Johnson V. & Hall S (2014). Community Energy and Equity: the Distributional Implications of a Transition to a Decentralised Electricity System, People, Place and Policy 8 (3): 149–67. doi:10.3351/ppp.0008.0003.0002
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[94] McKenna, R. (2013). The Double-Edged Sword of Decentralized Energy Autonomy, Energy Policy 113 (February). Berlin: Elsevier Ltd: 747–50. doi:10.1016/j.enpol.2017.11.033.
[95] Johnson V. & Hall S. (2014). Community Energy and Equity: the Distributional Implications of a Transition to a Decentralised Electricity System, People, Place and Policy 8 (3): 149–67. doi:10.3351/ppp.0008.0003.0002.
[96] Concept Consulting (2017). Electric cars, solar panels and batteries – how will they affect New Zealand's greenhouse gas emissions? www.concept.co.nz

intertwined with an ongoing technical debate over what level of decentralisation will incur lowest economic cost to society, factoring in foregone costs in transmission expansion, investment in power management control, and economies of scale derived from large scale storage, generation and demand side management consumers.

Table 3: Arguments used by proponents and opponents of widespread civic ownership of renewable energy assets

	Proponents	Opponents
Political	• Facilitates a positive public perception and buy-in for renewable energy, conducive legislative reforms and more rapid energy transitions	• Concern that public might subsidise cost-inefficient development of assets.
Social	• More extensive local engagement (than in commercial or public projects) • Enables local control over aspects including technology scale, siting and orientation • Facilitates social cohesion and community empowerment	• Exacerbates socio-economic inequality where there is unequal access to finance and policy support. • Requires high degree of outreach, engagement and training around the management of new niche technologies.
Economic	• Contributes to rural development, local employment. • Can reduce cost of energy in rural areas. • Can defer expensive upgrades and extensions of the transmission network. • Can produce low cost heat.	• Requires higher transmission capacity and cost for a given power output as well as reinforcement costs in the distribution network. • Additional cost of system balancing and ancillary infrastructure. • Higher subsidies required to finance remaining transmission infrastructure. • Higher LCOE because civil projects do not achieve economies of scale in construction and operation. • Higher administrative cost. • Support incentives increase cost of electricity for consumers, decreasing purchasing power and indirectly generating job loss.
Environmen	• End-user engagement can generate energy awareness, absolute reductions in energy demand and demand GHG emissions. • Ability to use waste heat raises system and GHG-efficiency.	• Larger-scale centralised renewable energy deployment can be implemented more rapidly and more cost-effectively at scale to achieve higher GHG savings.
Technical	• Scale and quality of energy generation is matched to load, preventing transmission losses. • Creates 'islands of stability' and voltage stability. • Increased reliability of electricity for community buildings in rural areas. • Improved system efficiency if able to use waste heat locally.	• Distributed generation increases the per unit cost of transmission infrastructure. • Installing must-take generators requires additional system balancing and ancillary technology, such as transmission and storage infrastructure, active network management, as well as additional centralised base-load and dispatchable peak load generators.

Given a longstanding emphasis on cost-efficiency as the primary criterion in New Zealand public policy, opponent views on community energy exist at high levels in all public entities interviewed for the purposes of this work, including some but not all staff members at LGNZ and the Electricity Authority. In order to support the development of a narrative in support of community energy, or a cross-agency community energy

strategy, it is worth stressing the following evidence, each substantiated by operational community energy projects both within New Zealand and overseas:

- Income or education does not need to be a barrier to participating in community energy projects; some models are explicitly designed to enable participation by low income households.
- Community energy projects are not necessarily small; they can and have presented both cost-efficient renewable energy investments at scale, albeit typically in the form of joint ventures.
- There are a number of ways in which community electricity generation projects can and have been designed to incorporate incentives for energy saving and/or load shifting, in a way that can provide both network benefits and emissions savings.
- Community energy projects can and have presented a test bed for novel applications of technology and for functional integration of DG / heat and transport, in the form of pre-commercial innovation projects.
- Community energy projects can and have generated returns for a wide array of non-utility actors, including local government, which can and has subsequently been used to finance a range of local public goods, including energy efficiency and low carbon/ climate resilient housing and local public infrastructure. This has been used to support socio-economic development in rural and remote regions where local authorities are not adequately resourced through rate payer / central government funding.

Given the diversity of projects, the variable emphasis on innovation, carbon savings and co-benefits however, it will be necessary to assess the benefits and the public value of any given community energy project on a case by case basis, in order to justify the allocation of public resources.

Table 4: Understanding how different assumptions, knowledge, attitudes and worldviews shape distinct views on community energy.

	Proponents	Opponents
Theory of change	Emphasis on social, cultural-behavioural change and public buy-in	Emphasis on supply side technological change
Scope	Emphasis on potential advantages of functional integration heat/power generation, DSM, appliances, EV's at consumer level	Emphasis on costs of single DE technologies at consumer level
Criteria used to justify projects	Financial viability, social, local economic impacts / co-benefits, equal access, social justice.	Least cost to NZ Inc.
Trust in institutions and incumbents to deliver the energy transition	Low	High

Risk appetite	High	Low

1.3 A stocktake of international policy instruments that support community energy

Community energy projects are impacted by a wide range of laws and policies, ranging from corporate and co-operative law, energy, planning, finance and social policies. These policies are typically embedded in a wide range of ministerial programmes, ranging from rural development and income diversification, cultural landscape protection, 'Third Sector' approaches to social policy, as well as regional or national climate, renewable energy or energy poverty strategies (Figure 1). As a result, ensuring that the policy mix works effectively to facilitate community energy typically requires inter agency strategic policy alignment policy co-ordination. There are five policy categories that are instrumental for widespread community energy uptake (Figure 1)[97]. Table 5 below lists specific policy instruments that fall under each policy category.

Figure 1 [1 – 3] - Fundamental to widespread community renewable energy uptake worldwide are low risk market access mechanisms, as well as demand guarantees and investment incentives that have ensured a level of risk and financial viability that has enabled access to commercial finance and uptake by a wide range of actors across society. Ranging from regulated buy-back rates above wholesale price to net metering and renewable heat incentives, these policy instruments are typically not specific to community projects. Community specific policies in these categories have included a Community Energy Feed-In-Tariff (Nova Scotia), where community renewable heat and power generation projects were eligible for fixed export tariffs for a period of 25 years[98], as well as a variety of tax privileges for social enterprise investment. From the perspective of community energy, it is important to ensure that co-operatives, charitable companies and any other preferred legal entities used by community energy groups are legally entitled to sell electricity directly to their members, obtain supply licences or be eligible for available support mechanisms that fall under this category. In New Zealand, policies in these areas are implemented by the Commerce Commission, MBIE and the Electricity Authority.

Figure 1 [4] - Public landowners, local authorities, and regional intermediaries have facilitated the resourcing of community organisations with necessary inputs, for instance by access to public land schemes for community energy, mapping regions for site feasibility, facilitating projects, or co-investing. Local authorities have also enforced specific provisions for community benefits on energy developments, such as

[97] Berka, A., 2018b. Communitarian approaches to sustainable development: the impacts, costs and governance of community energy, PhD Thesis, University of Helsinki. ISSN:1795-7389.
[98] Nova Scotia Department of Energy, Community Feed-in Tariff (COMFIT) Program, http://nsrenewables.ca/

binding community benefit funds, or ensuring that local social or economic benefits of renewable energy projects are material to resource consent. In New Zealand, local authorities are primarily responsible for processing resource consents under the RMA, while central government provide some direction on planning and consenting through national direction instruments issued under the RMA. Policy F of the National Policy Statement for Renewable Electricity Generation (NPSREG) provides that "regional policy statements and regional and district plans shall include objectives, policies, and methods (including rules within plans) to provide for the development, operation, maintenance and upgrading of small and community-scale distributed renewable electricity generation from any renewable energy source to the extent applicable to the region or district". However, the NPSREG does not prescribe detailed requirements for local authorities' plans in terms of how community energy projects should be facilitated. By comparison with overseas jurisdictions, however, public spending in New Zealand is relatively centralised, and borrowing and investment by local government relatively constrained by law[99,100]. This has limited the ability of local government to capitalise on climate change mitigation projects.

Figure 1 [5] - Targeted community energy policy, programmes and measures have generally focussed on financial and soft policy. These range from:

- (Revolving) seed loans or innovation grants for community energy. These have been widely used in Australia, Europe and North America to support the development of innovation pilots with a community component, or to support community organisations in developing bankable project proposals that can be used to obtain commercial finance;
- One-stop-shops disseminating technical, financial, legal guidance, matchmaking business proposals to expertise, and facilitating competitive contracting of services for community energy projects. In Scotland, these services are competitively contracted out by the Scottish Government to an organisation on a three year basis.
- Voluntary or mandatory guidelines for shared ownership, requiring commercial developments to put forward share offers for the local community. These exist in various forms in the UK, Netherlands, Denmark, Mexico and South Africa.
- National community energy strategies and targets. These are in place in Australia, Scotland and England, where they were used to signal that the government is committed to facilitating community energy, to generate exposure and public interest, to consolidate narratives supportive of community energy, and legitimise community energy projects.

[99] LGNZ (2019). Local government position on localism.
[100] Cheyne C. (2016). Local government in New Zealand: challenges and choices, Dunmore Publishing.

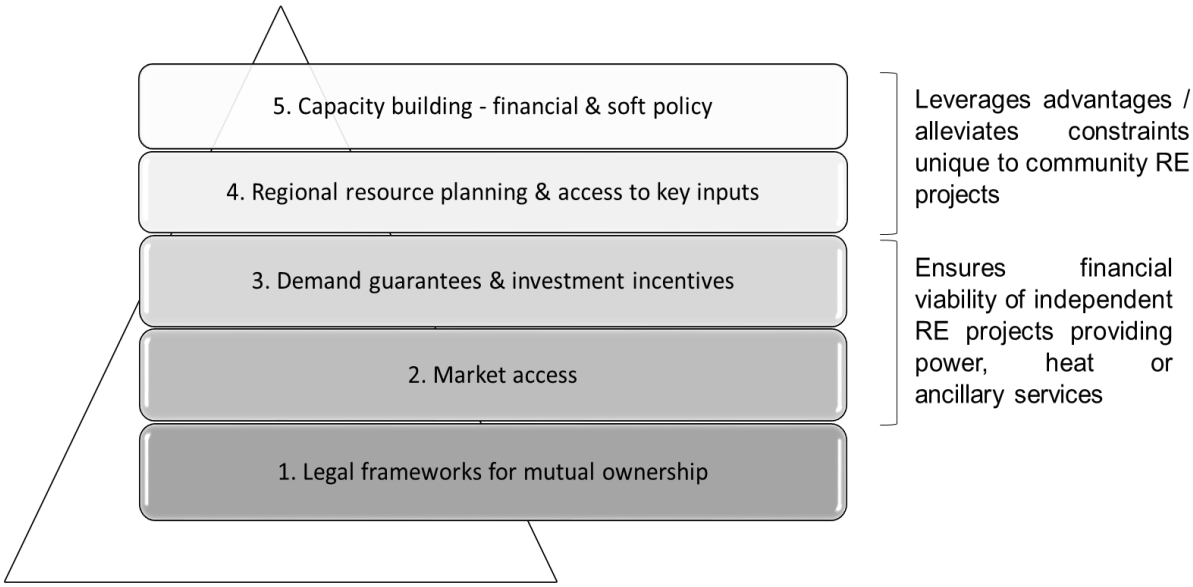

Figure 2**:** Policies impacting on community energy

Table 5: Overview of existing policy measures and programmes that support community energy internationally

Policy category	Policy instrument
Legal frameworks for mutual ownership	Ensuring that industrial provident societies and charitable trusts are eligible for policies shown under 2,3,4 and 5
Market access for independent power producers	Grid connection guarantees
	Net metering or billing
	Power purchase guarantees
	Regulated buy-back rates above wholesale price
	Cost distribution of grid upgrade & congestion management
Demand guarantees, market based investment incentives & access to finance	R&D grants
	Investment subsidies/ capital grants
	Public loans
	Feed-in-tariffs
	Premiums
	Renewable Heat Incentives
	Tax credits / exemptions
	Supplier mandates or obligations
	Quota based Renewable Certificates
	Auction systems (parallel to wholesale auctions)
	Incentives for small-scale DSR & ancillary services
Regional resourcing and facilitation	Regional investment incentives
	Direct investment by local authorities
	Regional energy demand and supply mapping and planning
	Local authority mediated site pre-feasibility mapping
	Procedures facilitating access to public or private land
	Preferential/ rapid planning procedures
Targeted community energy policy, programmes and measures	Community tariffs or premiums
	Community energy grants
	Public seed / capital loan programmes, loan guarantees
	Local ownership legislation / shared ownership legislation
	Tax privileges
	Service / knowledge exchange / capacity building platforms
	Integrated Civic Energy Strategy
	Community energy targets

2. Community energy in New Zealand

2.1 A stocktake of community energy in New Zealand

Previous work at the University of Auckland has compiled a New Zealand Community Energy Database, providing an overview of local and community energy in New Zealand[101]. It has identified distinct project profiles, where each profile presents distinctive characteristics in terms of mission, level of engagement, who benefits from the project, legal status, and energy function (generation, distribution, retail, energy efficiency)[102,103]. We believe this dataset to be a near complete and representative of the local and community sector in New Zealand, although it inevitably contains omissions and errors, especially with respect to older or unsuccessful off-grid projects[104]. Each of these profiles are described below, along with example case studies.

i. *Environmentally oriented grassroots organisations*

The share of projects by environmental charities and co-operatives engaged in local energy action is limited (22 projects). Over half of these organisations carry out energy efficiency or energy action more generally, including organisations such as Project LiteFoot (Auckland), the Sustainability Trust (Wellington), Community Energy Action (Christchurch), as well as energy groups within Transition Towns. EECA's energy efficiency subsidy programmes, as well as a variety of regional development funds and district council grants have variably been a lifeline for these organisations.

The majority of standalone generation projects by local energy co-operatives and charities are currently at early stages, inactive or 'in limbo', reflecting the difficulties of developing viable grid-tied generation projects within the current landscape. Examples include the Wellington Wind Group, a co-operative whose efforts were suspended after Meridian decided not to sell a turbine to the community, and the Blueskin Wind Farm (see **Case study 14** below). Others like the Otaki Solar Farm, have largely depended on grant funding (see **Case Study 2** below). This is typical of newly emerging community energy sectors worldwide.

[101] The New Zealand Community Energy Database was compiled by Dr. Julie MacArthur and Dr. Anna Berka as part of a Fast-start Marsden Grant obtained by Dr. MacArthur in 2016-2018. EECA has permission to use this data to support the development of their Community Energy Strategy, in collaboration with the researchers involved in this project.

[102] Berka A., MacArthur J., Gonnelli C. (resubmitted with minor revisions to Environmental Innovation and Societal Transitions). Energy transitions without grassroots niches? Understanding local and community energy in New Zealand.

[103] Hoicka, C.E., MacArthur, J.L. (2018). From Tip to Toes: Mapping Community Energy Models in Canada and New Zealand. Energy Policy 121, 162–174.

[104] See (See 'Data collection' section in Berka, MacArthur & Gonelli, 2019).

In response to lack of viable prospects for sizeable grid-tied generation projects, at least three grassroots new environmental initiatives are at the early stages of developing co-operatively owned solar PV/ battery installations that combine retail to members with wholesale market trade. Energyshare, Coastal Energy, and Carterton Solar Park all have plans to retail renewable electricity generated by co-operative members, following similar models in the UK, Netherlands and Sweden. However, there are formidable challenges to stepping from energy efficiency into generator retailer space. The only organisation that is currently operational in this space is Blueskin Energy Network, who is working with a third party company that provides both the trading platform and the retail service (see Case study 14 below).

Case Study 2: Energise Otaki Solar Farm

Energise Otaki is a charity that has been developing and implementing energy awareness, efficiency and microgeneration projects since 2011. It embarked on a solar farm proposal in 2015, working with experienced industry specialists who volunteered their time to for feasibility modelling and technical design. In July 2019 it received 408k grant funding from the Wellington Community Trust to install a 25kWp roof mounted solar PV system on Otaki College and a 141kWp ground mounted solar array at the Otaki waste water treatment plant, with power purchase contracts under negotiation with Otaki Collect and Kapiti Coast District Council. The main challenges were getting key stakeholders over the line, made possible through building a positive track record through other local energy projects. The system will be owned and operated by Energise Otaki. Project revenues go to the Otaki community investment fund which will go towards projects with a focus on alleviating energy hardship, sustainability education, and local employment in the energy industry.

ii. *Iwi organisations*

We documented 15 iwi energy projects. These are indigenous settlement trusts and charitable community development organisations, owned by particular Iwi, hapu or Runanga, involved in grid-tied geothermal generation, geothermal heat and steam supply for local industry, two off-grid microgrids and a number of microgeneration projects powering ‘marae’ (communal buildings used for ceremonies and social purposes). These are joined by iwi-lead energy efficiency initiatives, sometimes carried out as part of Māori and Pacifica-focussed energy poverty and social service operations, such as Awarua Synergy.

The development of geothermal is due in large part the historical use and expertise, Treaty settlements, and subsequent land access rights to many areas covering the geothermal fields. However, exclusive iwi ownership of geothermal fields is limited (see Case study 4 below).

All three off-grid projects demonstrate high degrees of community involvement in project design and implementation, and are politically motivated by a desire for self-sufficiency, supporting socio-economic development on ancestrally owned land, and sustainable use of Māori natural resources. Both integrated microgrids are at feasibility stage, where feasibility studies were supported by grant funded projects in partnership with universities. Both are embedded in longer term community development strategies aimed at generating local socio-economic opportunities for their iwi or hapu, reversing historical economic decline and restoring Māori way of life (see Case study 3 below).

Case Study 3: Parihaka Passive Resistance to Climate Change

Massey University and Parihaka Papakainga Trust successfully applied for a two year Vision Mataruanga Capability Fund project in 2014. The project objectives were to identify and assess the viability and suitability of energy efficiency, low energy housing, multi-modal electricity and heat generation, storage solutions that could contribute to the long term community development vision. This work has been completed and the following steps are to prepare resource consent and develop a suitable ownership model. The Parihaka Trust is in the middle of a reconciliation settlement with the Crown.

Case Study 4: Ngati Tuwharetoa Geothermal

The Kawarau geothermal fields (Bay of Plenty), which were developed through a settlement with the Crown obtained in 2005, is the only project 100% owned by Iwi through the Ngati Tuwharetoa (BoP) Settlement Trust (NTST). In the case of NTST, 1500 registered beneficiaries of the geothermal activities are entitled to a range of trust-administered benefits, from scholarships to study geothermal engineering (and other fields) at university, to living subsidies for those over 65. All registered adult beneficiaries are eligible to vote for seven trustees, two of whom (selected by the trustees) then go on to sit on the board of the asset companies. The trust owns two limited liability companies, Ngāti Tūwharetoa Electricity Limited and Ngāti Tūwharetoa Geothermal Assets Limited who return dividends to the trust, and has 11 employees. The trust is working with a newly hired local community engagement officer to understand the needs of the trust beneficiaries, create identity and pride in the land and jobs in the area.

Case Study 5: Transforming Tai Tokerau for Good

iii. *Commercial start-ups engaged in peer-to-peer projects*

A number of peer-to-peer service providers have been running pilots in New Zealand:

- In Dunedin involving residential solar with Blueskin Community Resilience Trust, OtagoNetJV and EMHTrade;
- In Auckland involving a new multi-tenant housing development with EMHTrade;
- In Lower Hutt involving a school and residential houses by OurEnergy;
- In the Far North involving a school and low decile homes, by SuperPowerTechnology and Trustpower;

These schemes offer residential solar generators between 8 to 25 cents/kWh and offer local consumers below retail rates for purchasing locally produced renewable electricity. Both EMHTrade and OurEnergy have contracts and capital investment in place for larger projects, offer peer-to-peer solar sharing services to existing retailers, and aim to work with community organisations, multi-tenant buildings, housing developments and retirement villages to replicate these projects.

Case Study 6: P2P & Blueskin Energy Network

Blueskin Energy Network is a solar sharing venture started by the Blueskin Resilient Communities Trust in 2017, run in collaboration with P2P (EMHTrade), who provide the retail service and trading algorithm. It operates across the Powernet network area in Otago. Since the project has gone online in April 2018, 60+ households have joined the project in order to buy local solar power below retail rates, or sell their solar power above wholesale price at half hourly intervals. A smart phone app PowerPal connects remotely to smart meters enabling monitoring of power usage, provides tips, gift and monetary incentives to use or not use power at certain times of the day, allowing users to participate in optimising grid function. The biggest challenge in getting the project up and running has been the lack of start-up funding. BRCT's longstanding community presence and experience in energy efficiency, wind, as well as its work with the University of Otago on energy innovation, the partnership with EMHTrade, and the simplicity of the system have all been key to the projects success to date. BEN are exploring data sharing and collaboration with PowerNet on network charging rates and battery storage.

iv. *Schools*

The Genesis School-Gen project, PowerTechnology, SuperPower Technology and Solar City have together installed solar PV in around 7% (200) schools to date. All of these programmes have developed parallel curriculum tools, ranging from energy literacy to data monitoring and analysis methods for science classes. MOU 2017 data suggests that out of 2500 schools nationally, 367 schools use coal fired boilers, and 363 schools use gas-fired boilers. Solar PV battery systems are generally not yet a competitive substitute for coal boiler powered space heating and lighting, although this is expected to change within the next five years. At least two school solar projects (in Lower Hutt, with OurEnergy, and in Kaitaia, with SuperPowerTechnology and Trustpower's Solar Buddies scheme) are involved in peer-to-peer power gifting or sales. Peer-to-peer power trading is anticipated to substantially improve the

economics of school solar schemes. In addition, once it becomes possible to easily switch and combine different service providers on an ICP and mechanisms are established to facilitate authorised access to historical consumption data, existing school solar PV installations may be able to plug into these emerging peer-to-peer services. Funding for school woodfuel boilers and solar projects has variably come from local councils, utilities, and charitable trusts, and savings.

Case study 7: Kaitaia College Solar Project

Kataia College and SuperPower Technology have jointly invested in a 101kWp rooftop solar scheme. The school purchased the system on finance, paying it off incrementally with the energy savings made, and aims to own the system after year 10. Surplus power is sold to the community at cheaper rates through Trustpower's Solar Buddies Scheme. The college is working with SuperPower Technologies and other community groups, including Muriwhenua iwi, to develop an integrated curriculum around renewable energy, and is planning to integrate energy monitoring within the junior curriculum, focusing on energy conservation.

v. *Consumer-owned former power boards in the form of consumer trusts and co-operatives (or charities that have divested but are derived from them).*

Power generation by locally owned EDB's is the leading form of locally owned generation. A substantial proportion of this generation capacity is existing hydro-power predating the Kyoto era. However, they are to varying degrees entering off-grid solar battery deployment, solar PV school projects, EV infrastructure development, and demand-side management innovation, including two virtual power plants for disaster resilience (see Case study 5 below). Smaller remote operators facing declining or volatile electricity demand in sparsely populated areas in particular are actively involved in consumer focussed demand side flexibility programmes or rural area power solutions, whereas other CEO's stated that these activities fell well outside of their legislated mandate. One rural operator, for instance, for example, is strategically offering solar- battery - diesel generator packages for customers on uneconomic or unreliable lines, but also has ambitions for larger co-operative microgrid systems to overcome network constraints and replace diesel back-up generators. Although operators are clearly engaging in novel activities in the form of pilot projects, their current scope of activity falls short of a central co-ordination role around facilitating widespread distributed generation, storage and ancillary services that we see distribution network operators assuming internationally[105]. In select cases, they invest directly in local industry. Interviews suggest that all the activities in this category are predominantly motivated by a desire to cut costs, and maintain a robust and

[105] Fame D. et al (2018). Innovation in regulated electricity distribution networks: A review of the effectiveness of Great Britain's Low Carbon Networks Fund, Energy Policy 118: 121–132.

functioning grid for residents, while bringing additional secondary socio-economic benefits.

All EDB's are commercially run, with board members recruited from the private sector, and with no or limited active engagement of consumer trusts or local authorities in operational or investment decisions, and with limited consumer engagement or sense of ownership. Interviews suggested that there was considerable variation in management culture across both distribution network operators and consumer trusts, including in the perception of the ability or authority of consumers or Trustees to influence decision making in the distribution companies they owned, the perceived responsibilities and role of operators in enabling consumer or community engagement with energy, or in local development more generally. Organisational management and rights of beneficiaries differ in significant ways. For instance, some trust deeds stipulate that if assets are sold, the community needs to receive half the profits, whereas others stipulate returning assets to local councils at set dates. The trust deeds also set out what the relationship to beneficiaries are, whether an annual rebate, as in the case of Entrust in Auckland, or in the form of lower power or rates bills as in Invercargill, or whether revenue is pooled and set aside for community development, as in Eastern Bay Energy Trust. Revenues from distribution operators are currently largely channelled to consumers in the form of rebates, discounted power, or rates rebates, rather than being pooled and earmarked for low carbon innovation projects with community benefit.

Case Study 8: Virtual Power Plant, Contact Energy and Wellington City Council

Two areas in Wellington under network constraints were chosen to pilot a virtual power plant that could power essential communication services in the event of an earthquake. Solar battery systems were installed in 30 homes and batteries are remotely controlled by Contact. Homeowners in the trial have agreed to share their stored power with neighbours in the event of a disaster or prolonged outage. A mobile app shows 10 minute analysis of electricity used, solar energy generated and energy sent to and used by the battery, as well as the batteries' current state, encouraging customers to shift consumption to match the solar power generated. The installations provide around one quarter to one third of household electricity usage. Customers taking part in the trial received an LPG bottle as an additional source of fuel for cooking, lighting and hot water heating in a power outage, are supplied with a 200lt water storage tank and a home energy audit to identify opportunities that will help them further reduce their energy bills. Wellington City Council funded solar panels and Contact energy funded the batteries.

vi.*Local authority initiatives*

We documented 71 local authority initiatives, mostly focussed on energy efficiency and energy literacy, but also collaborations with EDB's on a variety of solar/battery projects and historically municipally owned hydro-power plants. Even where council climate change strategies extend to district scale power generation and supply, such

as Auckland City Council, there are few power generation projects. Outside of major urban areas, local authority staff consistently expressed that they do not have the resources for direct investment in energy projects, or to put in place support mechanisms for local and community energy (or indeed any other form of emission mitigation). Energy projects are by and large not seen as activities that can generate revenues for councils and support local socio-economic development. In some councils, there is scepticism about climate change and/or resource allocation towards emissions mitigation, often coupled with a wariness of state-led directive policies, which are often seen as misguided policies at best, and cost-shifting measures at worst. Councils also benefit from low electricity rates, which has historically made self-consumption projects financially unviable, and existing operational solar rooftop schemes, such as in Palmerston North, have not delivered the projected returns. As a result, most councils have focused on energy awareness and energy efficiency projects.

Larger city councils have dedicated staff facilitating external low carbon behavioural change projects, working with tenants, landlords, home owners, providing free assessments or home energy audit kits and financial support for insulation measures. These councils will often have social procurement policies in place, in which they contract local organisations to carry out work on the basis of local capacity building and indirect benefits. Smaller councils focus their activities on reducing internal footprints and producing guidance on adoption of best-practices. A number of spin-off initiatives lead by local boards suggest larger local authorities (Wellington, Dunedin, Auckand City Council) have recently started taking on intermediary roles, working with local boards to embed energy efficiency projects into longer term local community platforms and strategies. In Auckland and Wellington, local authorities work in innovation projects with distribution network operators by providing educational components or part-financing technology in residential and school peak-shaving solar battery projects respectively (see Case study 9 below).

2.2 Barriers and opportunities for community energy in the current legislative, regulatory & market context

Barriers that were identified in interviews and workshops could be classified into four categories, summarised below.

2.2.1 Market settings, power purchase and grid connection

Current settings

Buy-back rates in New Zealand are not legislated, and retailers offer microgeneration wholesale prices for any electricity exported to the grid, encouraging microgenerators to maximise self-consumption (Table 6). This has largely limited financial incentive

and uptake for microgeneration in New Zealand to facility buildings with high day time consumption, and microgeneration/storage solutions, where electricity can be discharged during peak morning and evening hours, such as in schools and businesses. Incentives and benefits of microgeneration are set to change in the next 3-10 years with the emergence of peer-to-peer service providers and with declining battery costs (Table 7).

Table 6: The changing value stream of solar PV

	Residential solar	**Peer-to-peer solar**
Economic	Savings on electricity bill; 8c/ kW on exported power 6-25 year payback period	Savings on electricity bill; 16 – 25c / kW on exported power
Social	N/A	Sense of belonging; community empowerment; wellbeing.
Environmental	Negligible to negative emissions savings under 'normal' time of use.	Energy literacy; emissions savings through load shifting & energy saving.

Independent generators with installations larger than 10kW have to either obtain the capability to operate on the wholesale market and sell directly to the clearing manager, or, negotiate power purchase contracts with an existing gentailer, retailer, or aggregator to provide these services. Generation above 10MW must be traded on the wholesale market.

Under schedule 6.4 of Part 6 of the Electricity Industry Participant Code there is an obligation on distributors to recognise the benefits and costs associated with DG. While many EDB's are becoming involved in distributed generation (DG) to alleviate less remunerative parts of the network and pre-empt competition in DG, currently only one lines company recognises Avoided Cost of Distribution benefits and makes associated ACOD payments (Eastland to EGeL, Waihi & Gensets), and one has gone to market to alleviate a capacity constraint (PowerCo). There is consensus among EDB's that systems for remunerating DG for technical services will develop over time. EDB's are aware of vulnerability and constraints in their network and likely to be able to point to areas where they could potentially benefit from DE, but have stopped short of advertising these, encouraging and remunerating third party investment. In many cases, network options are still seen as more future proof and robust than DE, because they contribute to capex (not opex) and to unregulated network revenues. However, at the moment there is no standardised way in which the business case for network versus non-network solutions is evaluated, and through which non-network solutions could be priced and tendered out in the form of ACOD. In part this is because there has been no need for a unified approach to date; lines companies are not flooded with grid connection queries, network constraints are not a widespread problem (ie. in many networks there is ample capacity), so there has not been proactive development of information, for example in the form of heat maps or of commercial arrangements to facilitate DE remuneration. In networks where lines companies do not have access to meter data, they may have little data to go on to assess viability of DE.

Table 7: Buy back rates available to microgenerators (2019)

Retailer	Buy back rates	Max System size
Contact	8c/kWh +gst	Up to 10kW
Mercury	8 ¢ / kWh (With the exception of a couple of networks) or 12 ¢ / kWh (Only for newly supplied Mercury Solar customers that enter in a 3yr contract)	Up to 10kW
Trust Power	7 ¢ / kWh, + GST (Or peer to peer rates you negotiate via Trust Power's Solar Buddies Scheme - view details here)	Up to 10kW
Meridian	8 ¢ / kWh +GST	Up to 10kW
Genesis	8 ¢ / kWh excl. GST	Up to 50kW
Ecotricity	12.2 ¢ / kWh + GST	-
Nova Energy	7.4 ¢ / kWh: + GST	Up to 10kW
P2 Power	16 ¢ / kWh excl GST (Only for the first 50kWh exported each fortnight) 8 ¢ / kWh excl: GST (Thereafter) (You may be put on a waiting list to receive the 16:¢ / kWh rate)	Any size
Powershop	8¢ / kWh: + GST (Residential customers only)	-

There are a number of remote areas in which there is likely to be good resource potential, where the public socio-economic and environmental benefits of DG in terms of improving access to secure and affordable electricity can potentially be significant, and which are currently relatively poorly serviced at high cost to EDBs. These include the Far North, Eastern Cape, but also localised pockets within predominantly rural networks.

At the moment, DG in New Zealand pays network charges based on peak network cost, which incorporates network as well as transmission (grid) charges, irrespective of whether it makes use of the transmission grid. This is because charging DG on the basis of network utilisation and actual contribution to network costs requires the development of more complex network pricing and reconciliation methods to determine cost causality based on location within the network, contributions to peak power flows, and profiles of power injection and withdrawal. The EA has now published high-level pricing principles to encourage pricing that "reflects the impacts of network use [and services] on economic costs" and expects these to be reflected in 2020/21 pricing changes, in some cases following trials with Time of Use pricing (Top Energy, Northpower) or EV/battery pricing (Wellington Electricity). However, the Distributed Generation Pricing Principles review stops short of proposing pricing incentives that acknowledge the full range of network benefits and costs of DG; the consultation focusses on the merits of defensive pricing mechanisms to prevent adverse effects on network power quality of EV charging and reduced network revenues from consumption charge payments by households that have adopted residential solar PV.

The DG Pricing Principles review has relegated Avoided cost of Transmission (ACOT) payments to Transpower and the Electricity Authority; they will no longer be dealt with by lines companies.

Barriers to community energy

Small-scale generators face substantial risks around securing power purchase that influences the financial feasibility of projects. Community organisations whose primary goal is community development are unlikely to aspire to operate on the wholesale market. This is because you need considerable administrative capacity, skills and resources, access to hedging contracts, and a 20-25 year commitment to operating as a utility on a daily basis. This is not the case under a power purchase contract, where resource allocation following construction and commissioning of a project is largely limited to operation and maintenance. However, independent generators have a weak bargaining position in terms of negotiating terms of finance and power purchase price. There have been instances where gentailers have been shown to have little bandwidth and/or incentive to collaborate on smaller-scale independent generation projects. This has resulted in the stranding of projects (see Case study 9) and the sale of projects to larger gentailers (see Case study 10). However, several community energy practitioners suggest there is ample interest among newer emerging retailers who are seeking to hedge against high wholesale prices and secure customers.

Case Study 9: Sustainability Trust
In 2013 an Anglican Church Solar PV project in Wellington was to sell solar power to co-operative members at a slightly higher price retail prices, in collaboration with the Sustainability Trust and PowerShop. It stranded when PowerShop calculated that compliance costs associated with holding payments of co-operative members due to the Anti-Terrorism Act made the project unviable.

Case Study 10: Flathill wind farm
This project was originally developed by Energy3 and sold to Pioneer because Energy3 could not obtain a power purchase agreement.

Grid connection charges are regulated but lines companies have power of discretion to drive up grid connection requirements and costs; in specific instances this has driven up cost and/or complexity of small-scale generation.

The extent to which EDB's engage with and facilitate community energy depends on the attitudes of chief engineers. While many EDB's are proactively engaging with local communities on wide range of activities, including peer-to-peer, facilitating DG and community outreach on energy literacy, there are also instances where EDB's have proven non-co-operative when approached by community organisations with specific proposals. Clearly, this is in part because they have powers of discretion - there is no mandate or unified direction that encourages or requires EDB's to advertise,

encourage and remunerate third party investment in non-network solutions on a lowest cost to consumer basis.

What levers might be available to address this?

- Community organisations can be encouraged to engage with lines companies at an early stage to identify viable projects. EDB's can do more to identify viable project opportunities in under capacity areas. Currently much of this information is public within network asset management plans. The Electricity Authority is exploring heat maps (similar to the Australian Renewable Energy Mapping Infrastructure Map[106]) to act as an initial guide to candidate development sites.
- EDB's can be encouraged/mandated to justify the business case for network investment more transparently, and to tender out non-network solutions.
- The Electricity Authority is taking steps to enable easy authorisation of access to historical consumption data and rapid and flexible switching between providers on a single ICP, allowing consumers to acquire services from peer-to-peer and retailers simultaneously.
- Terms and conditions of grid connection agreements vary widely across New Zealand. Standardising terms and conditions of grid connection agreements across network companies would enable support agencies to produce lists of technical information required from suppliers to connect to the network.

In the longer term, there may be scope for MBIE and the Electricity Authority to explore the following measures:

- Lines companies could be required to develop long term DE strategies that incorporate trends in demand and uptake of new technology, supply resilience, grid stability and power quality - and make them publicly available. This would serve as a guide for feasible DG projects and make ACOD payment provisions more transparent. CE stakeholders argue that these strategies and underlying calculation methods need to be inclusive and peer-reviewed to ensure they are seen as legitimate and representing the interests of consumers, rather than subservient to EDB interests.
- The Electricity Authority is exploring initial guidance on contestable services through the Emerging Contestable Services project. In the longer term, we may seek to develop country-wide market mechanisms to capture value and remunerate non-network solutions.
- The Electricity Authority is exploring an easy access channel for dispatchable demand into the wholesale market (Dispatch Lite) through its Real Time Pricing project, which might enable broader demand-side participation. However, this is likely to benefit dispatchable plants over 20MW only.

[106] https://nationalmap.gov.au/renewables/

- Elsewhere, EDB's are given financial incentives for peak-shifting, giving them a direct incentive to engage in non-network solutions.

2.2.2 Lack of consensus and consistent messaging on the role of community energy

While there is overwhelming latent interest in community energy on the ground, there is no consensus within government, industry and community organisations about what community organisations can and should be doing to contribute to energy decarbonisation. In part, this is because the benefits of community energy projects are not widely known and accepted across industry, government, or the wider public.

The notion that local third party actors can and should facilitate and develop projects to address tangible local needs while simultaneously engaging in greenhouse gas mitigation is at best new and poorly conceptualised and at worst opposed within a wide range of public agencies. The most common arguments underlying this view are:

- Small-scale social enterprises engaging in power generation are "simply not [economically] viable"; because if it delivered benefits, it would be happening already.
- Civic engagement in mitigation is largely a concern for well-off urban citizens. Outside of Auckland and Wellington, higher priority concerns dominate the public and political agenda. Any policy measures to engage the public in climate change mitigation represent a central government out of touch with the realities on the ground.
- Allocation of resources to carbon mitigation in New Zealand is unwise, because New Zealand's contribution to the global emissions budget is insignificant, making New Zealand a "climate taker". As such, New Zealand ought to allocate all of its resources to climate change adaptation.
- Allocation of resources towards climate change mitigation in the (non-transport) energy sector is unmerited, because New Zealand's carbon emissions profile dictates that our carbon mitigation efforts should go towards mitigating transport and agricultural emissions.

These arguments are all used to rationalise a more fundamental opposition against directive policy making at central government level among local government and industry. This lack of consensus is clearly reflected in the lack of a unified strategy or guidance on distributed energy or community energy. A number of case studies show how this has translated into a lack of willingness of key stakeholders such as councils and gentailers to accommodate community energy projects, particularly where it is seen to conflict with peripheral legislation, such as health and safety. As a result of this and other barriers, it takes community organisations unnecessarily long to go from project conception to a viable business plan, sometimes in the order of 6-12 years.

A number of existing community microgeneration and standalone projects report instances of local opposition (sometimes violent), health and safety concerns, or concerns around the effectiveness of the technology, many of which are unsupported by empirical evidence. This suggests there is widespread lack of public support and awareness of the benefits and opportunities provided by renewable energy, which is partly because there is little precedent of successful and operational community projects where benefits are flowing into the community.

What levers might be available to address this?

- A national community energy strategy would provide useful direction setting for stakeholders to be able to refer to, especially if legitimised by input from all relevant agencies, and community energy groups. Ideally, this strategy would be embedded in energy sector decarbonisation projections and be directive, for instance by setting a national target for community energy.

2.2.3 Lack of local capacity, resources and access to finance

A number of community organisations have faced protracted feasibility periods and/or are not getting their projects off the ground. While some community organisations may not initially have all the necessary skills and expertise, in other cases there is rich expertise community organisations can draw on. A number of stakeholders observe a large number of community members and organisations who want to do something but don't know where to start.

There is no precedent for community energy, and very little networking beyond community-based organisations involved in energy efficiency ('lots of groups are doing things but nobody knows what's going on'). There is little sharing of knowledge across existing operational community owned or shared ownership projects, and virtually no 'handholding' organisations who can support community organisations by facilitating route to market.

Community organisations struggle to find appropriate local sites for development and are often very dependent on one for few willing local landowners.

Newly established organisations without credit history generally struggle to finance feasibility assessments and resource consent applications, and/or access commercial debt. Some organisations have expressed difficulties engaging with Provincial Growth Fund applications, which place large emphasis on direct employment impacts.

What levers might be available to address this?

- There are various ways to handhold and facilitate community energy projects. In order of increasing cost, this could entail:
  - A contact person who can support feasibility assessments, provide a 'how to' guide for early project stages, provide a number of blueprints that are likely to

be remunerative in current market context, provide an overview of available funding resources and associated eligibility, terms and conditions.
    - A vetting system to identify high-potential proposals that are viable for the lifetime of the asset, and that meet community objectives/ deliver social and economic benefits, and/or that can capture network value.
    - Regional energy hubs or a single national one-stop-shop that matches community organisations with technical expertise and service partners and disseminates guidance.

- Handholding and facilitation is likely to be most effective in combination with a finance scheme. In the first instance, it is worth establishing whether existing funding schemes, the Green Investment Fund in particular, are likely to be accessible to community energy projects. If not, a fit-for-purpose low risk public loan programme can help to finance high-risk project stages and encourage the development of viable and bankable business proposals. Other options are innovation grant schemes or underwriting loans, and working with third parties to develop generic trading platforms or developer-owned crowd-sourcing platforms that enable community organisations to raise debt or equity region or country-wide from citizens.

- In addition, a promising and low policy cost avenue to facilitate community ownership is to foster a shared ownership culture in the energy industry; where commercial projects with substantial expertise engage in a joint venture or offer local communities a stake in a given renewable energy project. For example, EECA could work with MBIE in order to issuing guidelines for shared ownership of commercial renewable energy projects.

- Finally, there may be avenues to work with crown and local authorities on land access programmes to negotiate terms of access to DOC, crown and/or local authority land, likely in collaboration with MfE. The IEGA has initiated early stage discussions along these lines with DOC.

2.2.4 Lack of regional facilitation and arduous resource consenting processes

Local authorities have no mandate to facilitate community energy and have generally not taken measures to facilitate DG or community energy, with a lack of apparent champions or facilitators at regional or council level. Much of this is likely to be an issue of resourcing and direction setting (see Case study 11).

A number of case studies suggest environmental impact assessment and consent requirements for small-scale DG can present administrative hurdles, processing times and costs that are burdensome for small operators, and/or are disproportionate in relation to risks posed. In some instances, project developers have raised concern that there has been burden of proof on impacts that are not relevant to the technology

at hand, delays on consent processes due to council staffing issues, resulting in legal disputes over processing costs (see Case study 12). This suggests that there is likely lack of expertise as to the specific impacts of any given energy technology at council level. These problems seem very case dependent, suggesting non-uniform treatment of projects across cases and/or across local authorities.

What levers might be available to address this?

- EECA is working together with MBIE to feed in to the ongoing comprehensive review of the resource management system, as well as the review of the National Policy Statement on Renewable Electricity Generation. These reviews could result in proposals that would help facilitate community energy projects from a planning and consenting perspective.

- EECA could potentially work with MfE to promote the problem and the benefits of community energy projects across local authorities. Kapiti District council for example has made community renewable energy projects under 5MW non-notifiable. In addition EECA could support resource consent applications through funding and/or expert guidance, following similar efforts carried out under 2007-2010, which led to the first National Policy Statement on Renewable Electricity Generation.

- With regards to regional facilitation, LGNZ represents the national interests of councils and is actively lobbying for increased decentralisation and resourcing of local authorities, but has indicated not all councils are supportive of allocating resources to climate change mitigation projects. LGNZ suggests progress on this front is best made by working with first-movers and setting precedent.

Case study 11*:* Blueskin Wind Farm
The Blueskin Charitable Trust is involved in a range of energy (transport, energy efficiency and low carbon housing) initiatives in Dunedin and has been developing New Zealand's first community led wind farm since 2006. It was motivated by a desire to address the impacts of climate change and natural disasters and develop community capacity and resilience. After a seven year feasibility and planning process, resource consent was denied in 2016 on the premise of local opposition to the project and an appeal rejected in the Environment court in 2017. The project lead suggests lack of resourcing, regulatory challenges, and 'the complacency or invisibility of the [CE sector] in New Zealand' were key issues for the project. This is despite the fact that Meridian, Trustpower and Wind Flow Technology supported it with wind testing masts and support for measurements, while a wide range of other community energy actors contributed to the legal fees for the appeals process.

Case study 12: **Raetihi Hydropower station**
New Zealand Energy Ltd went through a 19 year re-consenting process to refurbish and repower its pre-existing Raetihi Hydropower station (500kW) near Ohakune with Horizon Regional Council. The process involved multiple delays, a legal dispute over resulting processing costs and changes in the resource management plan, resulting in additional consents for discharge of water at the weir that were not required at the time of construction or at the time of original submission, two hearings in environmental court, and one in the High Court, before consent was ultimately granted in 2018.

2.2.5 Scaling community based approaches to energy saving, energy literacy and peak shaving

Community based approaches to residential insulation, energy efficient lighting, power saving, microgeneration, and DSR technology can leverage community relationships and expertise to increase participation, energy savings and/or demand reduction, compared to top-down 'fit and forget' programmes. However, these tailored approaches are generally also more costly. Benefits of community-based approaches such as community capacity, goodwill, or incremental changes in participation or savings, are difficult to measure and rarely captured in funding and programme evaluation frameworks.

Consumer outreach on energy is set to continue beyond EE and microgeneration, to EV's, smart charging, smart appliances, markets for contestable services and community energy. Outreach on these issues via community organisations provides an alternative, more direct channel to work with consumers on these issues that can complement EECA's media campaigns.

What levers might be available to address this?

- Data collection, and evaluation methods to explore whether criteria or programmes for community- based implementation have merit, to demonstrate the benefits/well-being impacts of energy interventions that are not captured in a return on investment. Potentially working with universities to do this.
- Adjusting or expanding existing approaches to energy efficiency, in particular in hard-to-reach households, on the back of those lessons. This might also involve rethinking the language we use; eg.talking about energy and energy efficiency as a well-being issue, ‘filling the trough’ rather than ‘peak shaving’.

Table 8: Barriers, policy gaps and unexplored measures

	Specific barriers	Responsible agencies	Measures under development	Unexplored interventions	Reference / best practice
ENABLING MARKET ACCESS	Risks securing power purchase contracts for independent power generators	MBIE (EA)	N/A	• Low risk market integration mechanisms • Regulated buy back rates, net metering • Advocacy / matchmaking / support for joint ventures with peer to peer service providers, retailers or aggregators.	Nova Scotia Com-FIT; Regulated buy back rates OECD; Local Energy Scotland
	Inconsistent cost/ complexity of grid connection requirements	MBIE (EA)	Guidance on determination of connection charges	• Standardising terms and conditions of grid connection agreements across EDB's.	UK
	Lack of signalling / remuneration / co-operation for non-network solutions and ancillary services on local networks	MBIE (EA)	Heat maps (Equal and Open Networks) ; Guidance on what is and is not an appropriate activity (Emerging contestable services) ; Time of use pricing (pilots)	• Level playing field for network v. non-network solutions • Guidance/independent review on business case analysis for network versus non-network solutions, procurement choices, ccompetitive tendering • Development of market mechanisms for small-scale DSR / ancillary services (ACOD)	Dynamic pricing Denmark, peak reduction incentives Sweden
	Lack of ability for consumers to access / share consumption data with (non-retail) third parties	MBIE (EA)	Automated data access authorisation ; third party meter management (ACCESS)		Netherlands
	Lack of ability for consumers to be serviced by peer-to-peer and retailers simultaneously	MBIE (EA)	Altering ICP connection data API to include new data fields (ACCESS)		Meter management Netherlands
BUILDING A POSITIVE NARRATIVE	No consensus on role of community organisations in energy decarbonisation	N/A	N/A	• Unified community energy strategy backed by all relevant agencies • National targets for community energy	Australia, Scotland, England
	Benefits of community energy projects not widely known and accepted across government, industry and wider public	N/A	N/A	• Work with first movers to realise 2-3 trail blazer projects. • Collect data on benefits of ongoing case studies or pilots so that we build an evidence base that supports the case for community energy. • Promote case studies (video, regional workshops, etc.)	Community Energy Scotland; Local Energy Scotland; Hier Opgewekt (NL)
	Lack of willingness to accommodate community energy projects (OSH, insurance, etc.).	N/A	N/A	• Promote benefits • Promote opportunity for local government across LGNZ targeting core business • Guidance for local government	UK, Denmark, Netherlands
BUILDING LOCAL CAPACITY & RESOURCING	Long development timelines, high failure rates	N/A	N/A	• National or regional handholding and facilitation of projects • Project viability appraisal • 'How to' guidance • Matchmaking / tendering with service partners	Local Energy Scotland One-Stop-Shop
	Lack of local capacity & expertise ("don't know where to start")	N/A	N/A	• Guidance on viable blueprints • Matching with technical, legal, financial expertise • Guidance, voluntary/ mandatory shared ownership	UK, Netherlands, Denmark, Mexico, South Africa
	Lack of networking & knowledge sharing across operational projects	N/A	N/A	• Networking, promoting case studies, building sector identity.	Scotland, England
	Struggle to acquire local sites for development	N/A	N/A	• Working with DOC/ Crown / Local authorities to negotiate terms of access to land	Forestry Commission Scotland
ACCESS TO FINANCE	Newly established organisations struggle to finance feasibility/ resource consent	N/A	N/A	• New fit for purpose low risk seed public loan programme	Scotland, England
	Difficulties engaging with funding mechanisms	N/A	N/A	• Explore consistency of GIF, Impact Investment Fund, PGF with community energy	
	Large upfront capital costs; newly established organisations will struggle to access commercial debt	N/A	N/A	• Innovation grant programme • Demonstrate/improve bankability of projects • Underwrite loans • Work with third parties to develop generic crowdsourcing/community shares platforms to raise debt/equity from citizens.	Scotland, England, Australia
SUPPORTIVE LOCAL AUHTORITIES	Non-uniform treatment, retroactive changes; substantial delays and costs associated with resource consenting and re-consenting for small-scale hydro and wind	MfE	NPS REG; RMA revisions; Community benefits or local social and economic impacts as material to resource consent; regional energy planning	• Support resource consent applications through funding/expert guidance • Making local authorities aware of the local benefits of community energy projects. • Site pre-feasibility mapping.	Germany, Denmark
	Lack of expertise, resources, champions/facilitators at regional/council level	LGNZ	(LGNZ decentralisation& localisation project)	• Promote local benefits of community energy projects, especially core business (transport, housing). • Promote opportunity for local government (eg. LGNZ)	Germany, Denmark

3. Key opportunities and policy gaps

Because of its unique resource base, market design and composition, and culture of hands-off governance, New Zealand does not have the impetus and appetite for the regulations and policies that have opened up the energy market to small-scale DG elsewhere (Table 9). Nevertheless, there is clearly new momentum at ministerial, agency and industry level that indicate that we can carve out a space for distributed energy and community energy within that utility-led scenario. In this scenario, community energy is likely to consist of utility-scale joint ventures that can operate on the wholesale market but that have a community shares component, distributed generation and energy savings programmes that can provide essential network services and/or are used for self-consumption.

Table 8: Policy scenarios and dominant community energy activities

SCENARIO	OUTCOMES	POLICY SETTING	DOMINANT CE ACTIVITY
Inclusive	*DG takes up a substantial proportion of the 20-50TWh additional generation*	Power purchase guarantees, legislated buy-back rates make DG widely viable	EE; DG for grid export; service providing DG; self consumption DG.
Utility – led	*DG is facilitated to the extent it can support 20-50TWh additional utility-scale generation*	Service providing DG is made viable through ACOD/ACOT/contestable service payments; resource consent issues are ironed out in NPS amendments.	EE; utility-scale RE with community shares component; service providing DG; DG for self-consumption
Business as usual	*DG unfacilitated*	BAU = High risk for independent power generators; long incubation and high failure rates for CE	EE + DG for self-consumption

In order to realise this however, this report suggests that there are a range of barriers that would need to be addressed, many of which are not within EECA's mandate. Given that there are few operational community energy projects that have successfully overcome the range of challenges that present themselves at different project stages, it is difficult to make claims about the relative severity of barriers described here (Table 8). With reference to international development of community energy sectors however, the most significant barriers are likely to be electricity market arrangements, because they are first and fundamental to the operational and financial viability of projects. Some of these barriers, such as enabling access to meter data,

are subject to ongoing work by the Electricity Authority and MBIE. Others, such as reconciling network and grid charges for distributed generation, and the development of markets for ancillary services, will require EA to obtain further funding and are not likely to be resolved within the next three years.

It is possible for EECA to work around these barriers to some extent by facilitating projects that work in current market context, such as utility scale wind or solar plants with a community share component, peer-to-peer projects on new housing developments, and self-consumption projects on schools and community facilities. The Electricity Authority has already indicated willingness in principle to make exemptions to allow for pilot projects to go ahead. However, given barriers around securing power purchase, lack of market mechanisms to capture ancillary services, challenges accessing meter data, and lack of ability to be serviced by multiple providers on an ICP, currently viable projects are likely to represent niche applications and any support for community energy is likely to result in relatively exclusive uptake.

Were these barriers to be addressed by MBIE and EA in the medium term, this would generate scope for wider uptake and replication of projects and more diverse community energy models. In this respect, it is striking that at ministry or agency level, there has been little effort to date to document barriers and ensure the interests of distributed energy actors. There is ample scope for a policy advocate to ensure strategic policy alignment across EA, ComCom, MfE and MBIE.

Support measures that are currently not being explored by any agency or organisation within New Zealand fall under building a positive narrative, building local capacity and matchmaking, and access to finance (Table 8). These are all roles that EECA fulfils in other and past programmes, making it well placed to fill these policy gaps in principle (Annex I). However, it may be prudent to limit EECA's actions/resources in this space until it secures commitment from relevant agencies to address market and regulatory barriers. On the other hand, if EECA were confident there was inter agency commitment towards facilitating community energy, EECA may want to use publicly supported pilot projects as a vehicle to push for policy leadership, co-ordination, and popularisation of a positive narrative. Table 11 outlines three strategies and associated measures that EECA should consider.

Table 9: Potential strategies and associated support measures for EECA

Strategy	Description	Associated support measures	Outcomes
Watching brief / limited role	EECA sees a limited role and ability to resource this as a priority	• EECA submits a report to the Minister that points to market arrangements / rules and consenting as critical barriers that could be addressed by other agencies.	• Outcome dependent on actions of other agencies. • No uptake in the short term.
Advocate, advisory & reporting role	EECA engages in networking and promotion, reports on barriers to community energy, but does not undertake more resource intensive direct support measures in the short term, based on an understanding that structural barriers will be resolved by respective agencies.	• Reporting on barriers and state of the community energy sector • Facilitating networking & knowledge broking eg. an annual Community Energy Forum • Direction setting & awareness by identifying 'champions', assessing impacts and promoting benefits, and developing a positive narrative for community energy • Work internally and externally to leverage and align existing potential finance • Appoint contact person for community energy practitioners • Data collection and reporting on projects, barriers and impacts (in partnership with universities).	• Outcome dependent on actions of other agencies. • Not likely to contribute directly to uptake in the short term.
Project handholding & strategic policy alignment role	EECA directly supports a number of projects in order to set a precedent, trial and test a support framework, and uses those experiences to engage in strategic policy alignment.	• Establish new fit-for-purpose financial support mechanism to get 1-3 trail blazer projects up and running • Provide information, guidance and/or matchmaking, eg. guidance/ expert assistance on viable business models, brokering collaborations, 'how to' guidelines for initial project stages. • Engage with other agencies to resolve barriers eg. a cross-agency working group that sets out guidance on shared ownership, a national community energy strategy, pursues relevant legislation. • Identify and resource project handholding organisations to build capacity at regional level.	• Tangible results but exclusive uptake in the short-term: likely joint ventures, self-consumption models, and uniquely resourced projects. • Wider uptake, more scope for replication, and more diverse community energy models over the medium to long term. • EECA builds regional capacity to engage indirectly with communities on EV (charging), smart appliances, demand side flexibility.

Annex I: Support for community energy under EECA's current and past programmes

EECA's current consumer facing roles focus on handholding energy efficiency measures for large energy consumers, subsidising service providers to undertake residential energy efficiency measures, and priming a domestic EV market by co-funding demonstration projects. EECA does not make any distinction between commercial or community providers within the Electric Vehicle Contestable Fund, the TechDemo fund, Warmer Kiwi Homes or its predecessor, Warm Up New Zealand, which ran from 2009 to 2015. Table 9 below shows the extent to which community organisations have featured across these programs in relation to eligibility and assessment criteria.

TechDemo

While co-benefits are included in assessment criteria for TechDemo projects, TechDemo has not supported any community energy projects to date. In part, this is because TechDemo is aimed at large energy users and promoted through EECA's other programmes, through EECA's warm leads, whereas EECA is not networked to the same extent across community organisations. TechDemo has received a total of 5 enquiries from community energy organisations since inception, but these projects were eliminated before formal submission of an application on the basis of technology choice, as TechDemo does not fund solar PV, hydro, wind technologies. TechDemo has however funded feasibility studies for district heating schemes in Invercargill and Dunedin. Community energy project proposals to date were deemed as scoring poorly on innovation of the technology, on replication potential as well as payback period and in some cases energy or carbon emissions savings.

The EV Contestable Fund

Out of six rounds of the EVCF and 91 projects completed or in progress, 5 project (5.5%) were community organisations, with a further 3 from district councils, and 7 by consumer trust owned EDB's. The team regularly sits down with potential applicants to guide them through what EECA seeks from projects and applications, and has put in place an assessment procedure for due diligence for small actors without credit history. Community participation in the fund is expected to decline as the investment focus of the fund adjust to higher domestic uptake of private EV vehicles and LEV procurement projects no longer present value for money.

Warmer Kiwi Homes & WUNZ

Pilot projects for energy efficiency with community organistions such as Blueskin Resilient Communities Trust originally helped to EECAs thinking and design of WUNZ.

WKH and WUNZ work with supplier panels, in which suppliers are given four year contracts to install insulation, source products to specified standards, lead generation into poorly serviced areas, and acquire third party funders. Suppliers were selected on the basis of weighted non-price attributes, ranging from ability to deliver, safe and track record of high quality installations, customer service, effective, reliable administration systems, and community and social benefits (Table 9). Small suppliers delivering less than 100 planned installations a year were eliminated. Funding was then allocated to providers on the panel on the basis of price and ability of the provider to source support for free or low-cost insulation installations. Within WKH, five not for profits operate as providers (out of 13 in total delivering insulation retrofits), all five have existed longer than WUNZ or WKH. WUNZ started with 63 providers but had 90 odd providers delivering insulation over the term of the programme, of which 8 were not-for-profits, and of which 3 went into liquidation.

2008-2010 Distributed Energy Feasibility Fund

EECA's DG Fund was set up to identify and support non-traditional market participants to develop DG projects that were close to financially viable but could not attract investment as a result of undue barriers, as well as identify cost-effective niches and build up a body of real-world evidence and knowledge about barriers to the uptake of cost-effective DG. EECA funded up to 75% of a feasibility study cost, with a max. of 20K.

- Round 1 resulted in 17 feasibility studies, of which 9 projects representing 25MW DG were shown to be cost-effective. Participants included Wellington Regional Council (micro hydro), Energy3 (Wind, Marlbourough Lines) and Taihape Community Development Trust (hydro).
- Round 2 resulted in 14 feasibility studies, of which 5 were shown to be cost-effective. Participants included Blueskin Resilience Communities Trust, Te Mapoupa Papakainga Trust, Pukeroa Oruawhata Trust, Porirua City Council, The Haven Trust, and Dep Cover Outdoor Education.

This project was deprioritised by the Minister in 2010, despite internal evidence at EECA suggesting that a number of barriers remained and that there was value in public support. EECA has not evaluated this project with respect to how many of these projects were actually constructed.

Table 10: Overview of EECA's past & existing support for community energy

Programme	Eligibility/ assessment criteria for service providers	Community organisations as a % of total	Example of community participants
Warm Up New Zealand /	Providers selected on the basis of: ability to deliver (30%); safe & high quality installations (30%);	38% (5/13, WKH);	Awarua Synergy, Blueskin Resilient Communities Trust, Community Energy Action, Sustainability Trust.

Warmer Kiwi Homes	customer service (20%); administration systems (10%); and community and social benefits (10%). Funding distributed across providers on the basis of: price and committed third party funding.	13% (8/63, WUNZ)	
TechDemo	- Innovation of the technology - Replication potential - Carbon savings and cost per tonne for emission reduction - Payback period - Co-benefits - Cost of energy savings - EECA cost of energy savings - EECA funding leverage - Technical delivery capability.	0	District heating schemes in Invercargill, Dunedin (feasibility studies)
Electric Vehicle Contestable Fund	- Value for money (public benefits, innovation, additionally) - Ability to deliver (expertise, resources, relationships, commitment, track record, identification of risks, speed of delivery) - Fit with investment focus (innovation, high visibility uptake, fleets and public transport, key gaps in infrastructure, support service development) - Contribution to objectives of the fund (Increasing availability of LEV's, improving availability of servicing/charging infrastructure, innovative products to take ad)	5.5	YMCA Invercargill; co-funding to purchase 2 second-hand EV's to use for community programmes. Ohomairangi Trust; co-funding to purchase six EV's for staff whanau visits.
DG Fund	- Capability of developer - Cost-effectiveness - Project status - Energy Output kWh p/a - Economic potential - Demonstration value		Taihape Community Development Trust; Blueskin Resilience Communities Trust, Te Mapoupa Papakainga Trust, Pukeroa Oruawhata Trust, Porirua City Council, The Haven Trust, and Dep Cover Outdoor Education; Wellington Regional Council.

Annex II: Guidance for a Strategic Case Document

Objectives for policy support

Based on the benefits, potential drawbacks, barriers and emerging opportunities around community energy documented in Part I of this report, the objectives of any community energy programme would primarily be to:

- Facilitate effective engagement of citizen collectives in energy sector decarbonisation,
- Generate local social and economic benefits, ranging from social cohesion, alleviation of energy hardship and wellbeing, to knowledge and skills development, and economic multiplier effects.
- Ensuring that projects are financially viable over the lifetime of the asset.

While secondarily,

- Supporting innovation in the energy industry and nascent domestic cleantech industries;
- Encouraging diversity and competition in the electricity market;
- Providing enhanced energy efficiency through local utilisation of heat, or securing local energy supply resilience, providing ancillary services for local networks, and preventing transmission losses;
- Increasing local support for wind development, and enhancing trust and reputation of energy utilities;
- Shifting public narratives on climate change from costs to benefits;
- Enhance public trust and support for the government's climate change programme.

Strategic fit

Strategically from EECA's perspective a community energy programme would:

- Expand its network to consumer facing local and regional organisations;
- Build local capacity and openings with which to engage with consumers on a wide range of energy issues going forward, across its various programmes (EV's, smart appliances, low carbon housing etc.),
- Establish more direct channels through which to popularise energy literacy and behavioural aspects.

This programme would align with:

- EECA's new strategic focus areas around government leadership and engaging hearts and minds.
- The wider government's Climate Change Response (Zero Carbon) Amendment Bill;
- The wider government's regional development goals,

- ICCC’s Recommendation 6: ‘Ways to ensure community participation [..] to realise social benefits (ICCC Accelerated Electrification report).