# Bringing community into designing resilient regional energy futures

## Perspectives from the NSW South Coast

Authors
Wendy Russell
Hedda Ransan-Cooper

Battery Storage and Grid Integration Program
An initiative of The Australian National University

SμRF

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- Dr Hedda Ransan-Cooper, Project lead
- Dr Bjorn Sturmberg, Project lead
- Dr Wendy Russell, Research Fellow
- Dr Kathryn Lucas-Healey, Research Fellow
- Dr Pierrick Chalaye, Research Fellow
- Dr Johannes Hendricks, Research Fellow
- Dr Paula Hansen, Research Fellow
- Ciska White, Project manager
- Irara Kittel, Project manager

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# Executive summary

**The Southcoast Microgrid (µ-grid) Reliability Feasibility (SµRF) project is a trans-disciplinary and community-based research project that has explored the feasibility of grid-tied microgrids in the context of energy resilience in the Eurobodalla shire on the NSW South Coast.**

As part of exploring social dimensions of feasibility, alongside consideration of techno-economic dimensions (*Exploring design challenges and opportunities for microgrids to improve resilience in the Eurobodalla)*, this study considered community perspectives and judgements on the usefulness of grid-tied microgrids in meeting local energy needs and aspirations. This involved a set of two deliberative workshops with a small, diverse group from each of two communities in the Eurobodalla. This is the subject of this report. These workshops followed a set of interviews with diverse community members and businesses across the region (*Community perspectives on microgrids and resilience in the Eurobodalla*) and an exploration of the perspectives of professional stakeholders (*Challenges and opportunities for delivering grid-tied microgrids for energy resilience*).

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While meaningful community engagement is important for all infrastructure, engagement is particularly important for local solutions that involve community energy resources and are intended to contribute to resilience, which is a function of the local context. While engagement is often left until solutions have been developed, and is focused on building social acceptance, we argue that early engagement in defining the problem is critical to designing solutions that meet local needs and concerns.

Discussion of resilience in the workshops highlighted the importance of social dimensions, particularly in the context of emergencies such as bushfires. While physical infrastructure plays a key role in mediating the impacts of emergencies, community connections and cohesion are critical for supporting people through disasters, and for recovery afterwards.

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In order to contribute to resilience, technical solutions need to be designed using a systems approach that integrates understanding of the social context and recognises the ways in which technical and social factors are intertwined. For example, focusing resources on an energy-independent emergency hub can create a social hub that provides information and support, as well as reliable power and physical resources. This may contribute more to wellbeing than solutions that keep people in their own homes, although this also depends on issues of safety, mobility and equity in accessing the hub.

When asked to consider an improved future energy system, community members aspired to an energy system that promotes equity, fairness and community, as well as reducing environmental impacts and providing reliable and affordable power. More detailed discussions about microgrids highlighted the trade-offs between these values, and the challenges of developing business models that would return benefits to the community. These discussions also highlighted the lack of trust that community members have in energy companies to serve their interests, which seemed to motivate an interest in community self-sufficiency. This interest was linked to a desire for climate action and to make use of surplus local energy, as well as a wish for more autonomy and control. Connected to this was a recommendation that community members need to better understand how the energy system works in order to make informed decisions and to feel in control. Participants appreciated the experience of learning from the SμRF project and from each other about the complexities of the energy system.

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There was a strong commitment to equity in both communities, but it became clear that people have different perspectives on what constitutes equity and fairness. For some, equality of access to benefits was what mattered, while others felt that more active support and provision for vulnerable groups was needed, given historical inequity and the fact that energy bills can exacerbate inequality. While defining and achieving equity requires ongoing negotiation, we feel that a 'care' approach, which pays attention to vulnerability and recognises that it can affect any and all community members, in different ways, may provide for greater community resilience. This approach highlights that while grid-tied microgrids might address some forms of network vulnerability, current models are not well suited to addressing social vulnerabilities.

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Despite the challenges, there was enthusiasm for grid-tied microgrids in the workshops, which mirrors broader observations that microgrids capture public imagination, seeming to offer a solution that symbolises collective climate action, local self-sufficiency and community building.

As above, this enthusiasm seems to respond to distrust in an energy system that is perceived as environmentally unfriendly, wasteful, overly complex and not serving community interests. Given that technologies like microgrids are often seen by the energy sector as providing a means to integrate community energy resources into the electricity network, this trust gap represents a key tension between sector and community visions. Moreover, for communities, it tends to obscure the benefits provided by a centralised grid, in balancing supply and demand, and effectively cross-subsidising access, particularly for regional communities.

The possibility of a microgrid providing power during extended outages associated with emergencies was, of course, appealing to participants (the South Coast lost power for up to 6 days during the fires of 2019-20). The technical and financial challenges of providing this back-up were more sobering, as participants learnt of the cost and requirements for a microgrid large enough to support their communities for more than a few hours. When participants learnt that reducing demand could significantly increase how long a microgrid could continue to provide power, this led to conversations about energy use priorities in these situations and how energy use could be governed in emergency times.

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There was a sense that the community should be involved in setting priorities, and that community members would pull together and 'do the right thing' in these situations to maintain power for the community. Such conversations could also raise awareness of energy use and more sustainable practices. Once again, community aspirations for use of a microgrid during emergency outages do not seem to be supported by the regulatory framework, which currently assumes that energy retail would continue as normal in islanded mode. We suggest that islanded microgrids could provide an experimental space for different energy use and governance arrangements within communities.

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When communities came to consider governance of microgrids overall, they were keen to explore community-run models, and asked for examples of successful models from elsewhere. It became clear that there were considerable obstacles, in terms of both financial feasibility, and capacity in communities to design and run such projects. Importantly, the current regulatory arrangements prohibit some of the benefits that community members were specifically looking for, such as energy sharing within the community and independence from energy retailers.

Moreover, other work in SμRF on business models suggests that microgrids provide potential benefits to a range of stakeholders, but that no single group is positioned to gain enough benefits to incentivise implementation of microgrids except under particular circumstances (e.g. where grid reliability is especially low).

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Considering the appetite but also the challenges for community control of solutions like microgrids, and the trust gap identified above, engaging community members in their development seems doubly important. Early engagement, together with transparency and good communication, will be important to ensure that designs meet individual community needs and that communities have confidence in such projects, and to avoid opposition.

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This engagement should involve understanding the lived experiences of individuals and households, including those from marginalised groups, but also deep and deliberative discussions with small but diverse groups, noting that different methods frame people in different ways (e.g. as householders vs community members) and therefore elicit different responses.

Deliberative workshops can inform conversations with deeper understandings of the energy system innovation, and tap into collective judgements. We hope that this research provides a model and some methods for such conversations.

Critically, this research has highlighted that early, local engagement is important but not sufficient, and is in fact premature in the case of grid-tied microgrids. There are still major uncertainties around what roles microgrids should play in decarbonisation of the grid, how these would support various public good goals, and what adjustments need to be made, technically and institutionally, to enable these roles. Resolving these uncertainties requires consideration of issues such as fairness, equity, sustainability and benefit-sharing. Developing general design criteria for microgrids in the energy system also requires public participation, but this is rarely done in a transparent and clear way when new technologies emerge in energy policy[1].

Yet these criteria shape the contributions such new technologies make to resilience and energy futures.Local, early engagement about local implementation should therefore be nested in participatory system planning processes.

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**These workshops did not explicitly consider the issue of engagement with First Nations people. This was addressed in a separate piece of work conducted by Jason Field, an Aboriginal man with connections to the Eurobodalla, *Aboriginal community consultations and analysis, South Coast microgrid reliability feasibility*.**

**Jason's report highlights additional engagement efforts and requirements in relation to local Aboriginal people and communities that are relevant to bringing community into infrastructure design. These include ensuring free, prior, informed consent from local Aboriginal people, considering their specific situations in relation to sharing benefits (and risks), and consulting them in ways that respect the multi-dimensional relationships Aboriginal people have with country and their rights to self-determination.**

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# Introduction

**The Southcoast Microgrid (µ-grid) Reliability Feasibility (SµRF) project is a trans-disciplinary and community-based research project that explored grid-tied microgrids in the context of energy resilience in the Eurobodalla shire on the NSW south coast. The feasibility study was initiated by a local community energy group and SuRF project partner (SHASA) in response to Federal funding.**

The timing of the funding followed devastating bushfires in 2019–2020, which resulted in extended power cuts across the region. As such, resilience was a major concern of the project from its inception. We hope findings from the project will be relevant to other regional communities seeking to boost energy resilience.

Grid-tied microgrids are a relatively new concept. They act as mini electricity grids, capable of keeping local energy networks powered when they are cut off from the main system. In contrast to Stand Alone Power Systems (SAPS) that always operate independently, grid-tied or 'islandable' microgrids are connected to the larger grid most of the time but can operate independently for finite periods. Thus, they have potential to provide a local community with a back-up power supply during blackouts upstream.

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In 2024, islandable microgrids are not a standard feature of the Australian energy system. This is because, while they show considerable promise, there are also significant challenges and obstacles to their implementation. As a whole, the SµRF project aimed to explore opportunities and challenges and provide insight and analysis for decision-makers and communities to better understand whether islandable microgrids could or should be part of a future energy system, and if so, what design, operational and governance considerations are important.

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From this broad perspective, assessing feasibility requires involvement of ordinary people, to understand the needs and aspirations that a technology such as a microgrid is designed to serve and the social conditions that will enable it to do so[2]. Engaging community members is also important for the effective implementation and governance of such technologies in particular locations. This part of the SµRF project was focused on how to involve communities at early and formative stages and to equip them to make decisions and take their own steps, rather than being consulted once key decisions have been made.

Other SuRF reports (available on our website) consider different aspects of feasibility including engineering dimensions, governance and system capability. The role of this report inside the broader project is to provide insight into community views on microgrids and their potential contributions to resilience and how communities expect to be engaged in the consideration and design of energy system resilience measures, including grid-tied microgrids.

We report here on a set of deliberative design workshops with two communities in the Eurobodalla. In these workshops, we invited a small, diverse group from each community to take a deep dive into energy system change, resilience, and islandable microgrids, and to consider together how they might connect with the needs, values and aspirations of their communities. This report starts with a background explaining our approach and connecting this project with academic literature. We then detail our methods. The third section describes the insights that emerged from the workshops and some of the implications for microgrid design and resilience. Finally, we present some brief conclusions. More information can be found in Appendices.

## Background

The workshops followed a set of 40 interviews (*Community Perspectives on Microgrids and Resilience in the Eurobodalla*) that considered the energy needs, values, concerns and expectations on households and businesses and their initial impressions about microgrids. These interviews revealed that people's attitudes to microgrids ranged from enthusiastic and ready to engage to interested but cautious and with various questions. The interviews did not provide detailed information about costs and benefits and thus captured ideals of what energy infrastructure could look like. Many interviewees expected that a microgrid should provide continuous power during any

prolonged outage to be a best solution for resilience, although many others could not see how, in practice, any of the microgrid solutions provided could in practice do this in their particular locality. They also felt that the benefits of the microgrid should be shared equitably across the community. Their top priorities were reducing energy bills, increasing sharing capacity and local control.

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As well as considering community views and preferences, there is a need to involve communities in infrastructure design, especially for community-based infrastructure like microgrids. Top-down approaches tend to marginalise some people and interests, including local environments, disadvantaged groups in the community and indigenous interests. Failing to address these gaps and the unequal power they represent has the potential to undermine infrastructure developments and their outcomes.[3] Lack of engagement can create resistance, in communities but also in industry and government.[4,5] Involving communities can make the technology more functional by taking account of people's needs and habits;[6] it may help to balance local supply and demand, increasing efficiency;[7] it can build trust and cohesiveness;[8] it recognises that people have a range of values and don't just respond to prices;[9] and it can help to overcome socio-institutional barriers.[10]

**Involving communities can make the technology more functional by taking account of people's needs and habits;[11] it may help to balance local supply and demand, increasing efficiency;[12] it can build trust and cohesiveness;[13] it recognises that people have a range of values and don't just respond to prices;[14] and it can help to overcome socio-institutional barriers.[15]**

It's useful to consider some terms here.

## Engagement

Engagement is not a well-defined concept, and can refer to transactional arrangements (billing, purchase of technology), customer research such as surveys, through to involvement in decision-making. Engagement is generally driven by proponents (external to communities)[16,17].

## Participation

Participation refers to involvement of everyday people in decision-making and planning, which can include resistance or protest. Participation is generally initiated by community members[18,19]. Because microgrids and similar initiatives are being driven by communities in Australia[20], bottom-up participation and decision-making, including community ownership, are especially relevant.

## Participatory governance

Participatory governance is assumed to be more democratic than engagement, but this is not necessarily the case, as grass-roots initiatives like community energy groups can be unrepresentative and not inclusive[21,22] and feasibility and capacity pressures can exacerbate this[23]. Ways to engage diverse community members at early stages are thus also important, especially for technologies that are new and not well understood. In particular, understanding hard-to-reach and vulnerable groups is a key aspect of effective community energy initiatives.

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A related form of participation is involvement in community energy projects like microgrids as customers or subscribers.[7] Because participation and consent of community members are essential to most microgrid models, participation in governance and decision-making is also important, to ensure the model meets the needs, requirements and acceptability of the community and to thus avoid opposition.[8] Engagement and participation may meaningfully involve people in decisions, but may also be used to gain social acceptance for new infrastructure, with a focus on changing people's sentiment, rather than designing technology in relation to people aspirations, concerns and ethical criteria.[24,25]

Researchers have studied

- community views of energy technologies such as micro-grids[26]
- engagement efforts of proponents[12],

and more rarely been involved in action research associated with the implementation of infrastructure such as micro-grids.[3]

An implementation project that exemplifies involvement of communities in design is the Bushlight program,[27] which installed off-grid microgrids in remote indigenous communities in central Australia. This community-centred program foregrounded participation of community members in community energy planning, taking full account of community needs and future planning.[28] Importantly, the Bushlight model – which is globally pioneering – provides insights into how deliberative conversations and energy supply arrangements might be structured to engage people in questions of what energy services can be sustainably supported through our energy systems.[6a]

Our study, as a feasibility study, does not represent an example of action research, but in involving community members in the consideration of feasibility, provides insights into how communities can be involved in such projects from an early stage.

Bringing local people into decision-making at the stage of deciding whether a technological solution aligns with local needs, challenges and aspirations is arguably the right time to involve community and crucially makes problem definition more inclusive and grounded. What became clear in this study, however, is that involving people in localised thinking, without a broader conversation about whether and how microgrids align with public values about energy futures at higher levels, creates complications and tensions. We return to this observation in the conclusions.

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Like site selection,[29] feasibility is often approached from a narrowly technical basis. There are few examples of community involvement in feasibility planning (e.g. scenario assessment in rural India[30]), or indeed in designing desirable energy futures.[31,32] The distinctiveness of the study is in considering community views as part of feasibility for an emerging energy technology. This enabled community views to be integrated into consideration of whether grid-tied microgrids are desirable in this context, and under what conditions it would meet community expectations. It also enabled exploration of alternative options.

Image: Eurobodalla Coast Tourism ©

Image: Eurobodalla Coast Tourism ©

# Methods:
# Workshopping energy resilience with community

**Given our interest in embedding values and perspectives into technology, we turned to methodologies that have this goal in mind.**

We drew on value-sensitive design (Friedman and Hendry, 2019), seeking to explore in more detail the values that emerged from the interviews and apply these to the challenge of energy resilience.

We also sought to unpack the connection between values and the broader context of transition,[26,28] through a lens of resilience. This drew on other work within SμRF on the complex nature of resilience as a system condition, and as relating to processes and outcomes. Thus, we understood resilience and not simply relating to secure energy supply, but to the way that the energy system interacts with other characteristics and processes within the community.

We also drew on principles from other technology engagement work[29] to develop deliberative designs, based on two workshops in series, that encouraged participants to consider technologies in relation to their lived experience and their understanding of community.

Our research questions were:

1. **What would a future energy system that supports resilience/flourishing look like or provide?**
2. **Do communities think microgrids have a role to play in this envisaged future system and if so, what (in islanded and non-islanded mode)? What could people imagine some of the main trade-offs to be?**
3. **How do the potential role/s of microgrids sit alongside other issues that people care about in the energy transition?**
4. **How can governance and design address these issues and support the positive contributions of microgrids? What roles do communities imagine playing in the design, operation and governance of microgrids?**
5. **How can we involve communities in microgrid design? What do the workshops tell us about how to do this well? Do they provide a model?**

Prior to the workshops, eight sites across the Eurobodalla were selected by the SuRF project for a deeper exploration of feasibility[i] (site selection details; article[24]). The ANU team then conducted research interviews with householders and small business across the region (*Community perspectives on microgrids and resilience in the Eurobodalla*).

[i] The eight sites were Bodalla, Broulee, Central Tilba, Tilba Tilba, Congo, Mystery Bay, Nelligen and South Durras.

The design workshops were intended to enable a deeper exploration of community values around microgrids and their potential role in supporting resilience. They followed on and built on the householder interviews, seeking to explore some of the issues that arose.

Another important dimension of the workshops, like the interviews, was to bring in diverse voices, to include the views of the 'usual suspects', i.e. those who have an existing interest in the topic, but also those of people who are less often heard from. We sought diversity in gender, age, household type and ownership of energy assets. This required a more extensive recruitment process. The workshop discussions were designed and facilitated to make sure that all participants had an opportunity to contribute.

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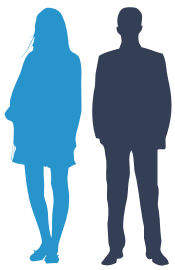
## Recruitment and workshop participants

Workshop recruitment involved an initial phase associated with the Surf householder interviews, in which engagement with the project was encouraged through partners' networks, community organisations, social media, local media and visits to the region. Interested people were asked to conduct an online survey, which asked for demographic information and consent to participate in various aspects of the project.

A second recruitment stage in Tuross Head and Nelligen involved making random selections based on demographic variables from those who had completed the survey and reaching out to invite these people to participate in the workshops. This was followed up with further contact with leaders and active community members, media and social media posts, and visits to both communities to seek participants, particularly from difficult to reach groups (youth, renters, families). Our aim was to invite 12–15 participants.

We were able to get enough interested people from Tuross Head, which has a population of over 2,000. However, in Nelligen, which has a population of only 400 people, and many retirees (the median age is 53), we were not able to recruit sufficient numbers and diversity of people to run a workshop. We therefore shifted our focus to nearby Broulee, which provided a contrast with Tuross Head, but a big enough population (close to 2,000), and through contacts and networks, we were able to get a big enough and diverse enough group to run the workshops.

Ultimately, there were 10 participants in the Tuross Head workshops (only two attended the first workshop), and 10 participants attended the Broulee workshops (eight people in each workshop including two people who were not able to attend the second workshop, and two new people who attended the second but not the first). There were six men and four women in the Tuross group (five men and three women in the second workshop) and four of each gender in the Broulee workshops.



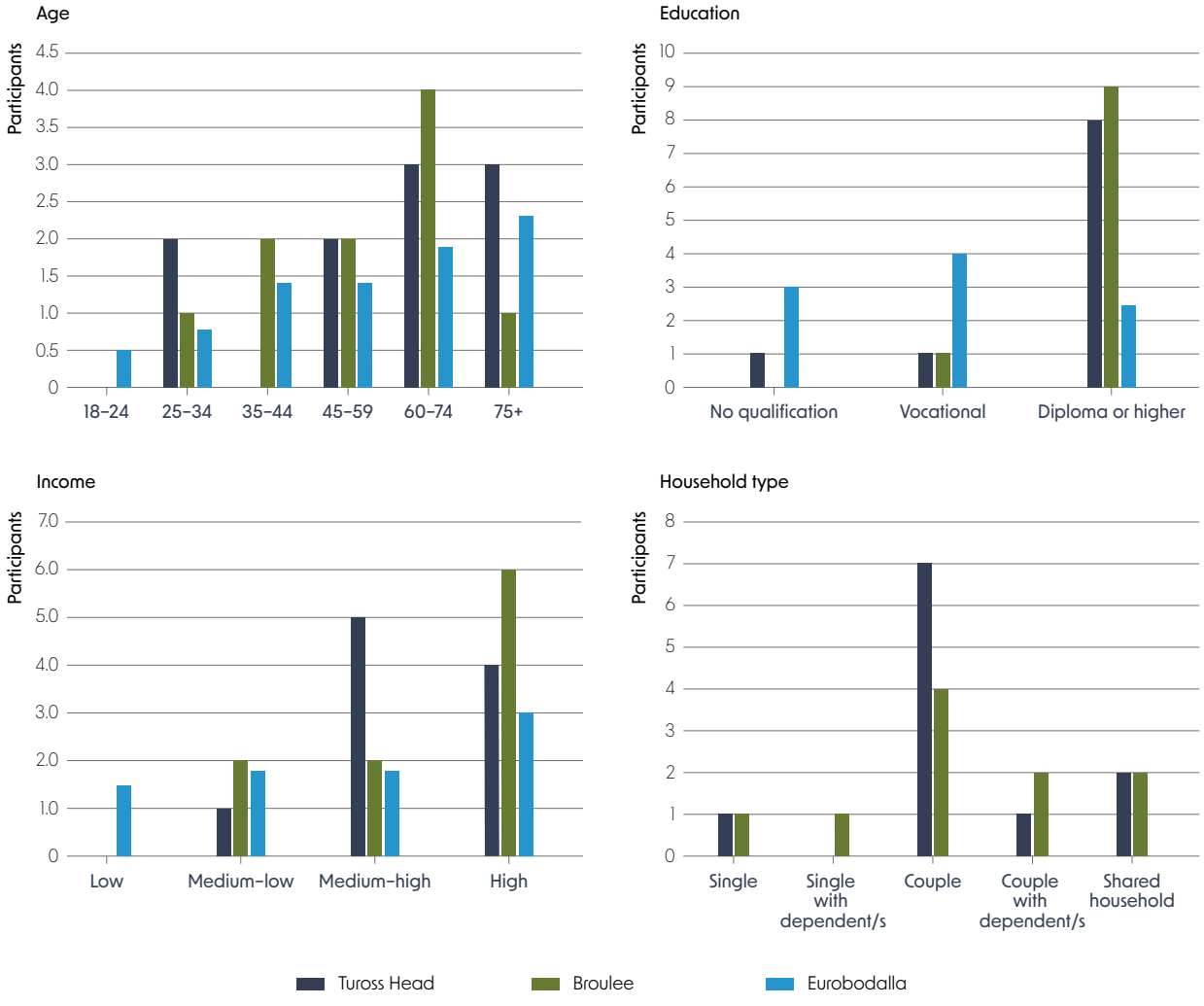
Other demographic variables are shown below and compared with the average for the Eurobodalla. All of the participants were full-time residents apart from two in Broulee who lived there part-time but with family connections.

The figures show that the sample was wealthier and more educated than the wider community, but there was reasonable diversity, particularly given the size of the group.

The participants from Tuross Head and Broulee attended two design workshops, about a month apart, with encouragement to learn more and discuss microgrids with family and community in between. The workshops were held in a local hall on a weekend and lasted about 4 hours, with a lunch break (lunch was provided).

Workshops were facilitated, with a lead facilitator coordinating the overall schedule and table facilitators to encourage and support inclusive discussion and ask questions to elicit elaboration from different people in the group. During the workshop, we had note-takers at each table taking notes from small group and whole group discussions, and participants also captured their own notes on post-it notes and butchers paper. We prepared presentations to provide information to participants (see Appendix). Each participant was provided with a $100 voucher for each workshop to partially compensate them for their time.

**Figure 1** Demographic variables for workshop participants at Tuross Head, Broulee and the wider Eurobodalla.



## Workshop aims

The aim of the workshops was to explore how microgrids might fit in with the values, needs and aspirations communities have for energy system change, particularly in the context of resilience. This type of approach is referred to as social embedding and involves integration of local knowledge. It involved drawing on participants' lived experience and knowledge of the local community, its needs, values, requirements and capacities.

Rather than taking the technology as a starting point, we framed the discussion in terms of resilience (particularly in the context of bushfires) and a 'future energy system' that would meet community needs. As well as considering microgrids, participants reflected on other resilience strategies and measures. We also asked them to reflect on governance of microgrids and what the community would require to trust and support a microgrid project (see workshop topics, Appendix).

The workshop format allowed individual community members to learn more about microgrids and consider their alignment with their needs and values in a deeper way (see Appendix). It also facilitated collective conversations and deliberation.

As well as deepening learning (participants learnt from each other and from talking things through), it also positioned participants as community members, rather than householders and brought to the fore community values. Participants were asked to reflect on the future in 30 years time, to bring an element of future thinking connected to current circumstances, trends and constraints. As well as seeking feedback during and after the first workshop, we re-designed the second workshop (in each case) in response to how the first workshop had gone and what interests and questions participants had, particularly in relation to providing information.

**As well as deepening learning (participants learnt from each other and from talking things through), it also positioned participants as community members, rather than householders and brought to the fore community values.**

A set of microgrid cards was used in workshops and participants were asked to take photos of their local community for a follow-up activity, but they chose not to participate. The workshop format reflected the kind of deliberation that communities would need to engage in if involved in a development like a microgrid. A 'meta' aim of this study was to develop methods to involve communities in the assessment and design of microgrids and other energy projects.

## Workshop analysis

We conducted surveys with participants before, between and after the workshops, asking them about their views and how they had changed, as well as seeking feedback about the workshops (see survey questions Appendix). The notes from note-takers and participants, as well as survey responses, were analysed using a qualitative approach using the software, NVivo. We used both inductive and deductive approaches, beginning with themes associated with our research questions and drawing out additional themes that emerged. This research received approval through the Australian National University Human Ethics process (protocol number 2022/102).

Image: Eurobodalla Coast Tourism ©

# What we learnt from the workshops

**We discuss our findings in four sections – resilience, future energy system, microgrids and governance – based on the different topics in the workshops. We also include a short discussion of the workshop process.**

## Resilience – features and challenges

When people spoke of resilience in connection with their experiences of bushfires and other emergencies in their local community, their focus was on social aspects of community that were important in coping and recovering. In particular, the helping and sharing that happened at neighbourhood and community levels not only enabled people, including the vulnerable, to get through the emergency physically, but also provided social and emotional support to cope and recover.

**When people spoke of resilience in connection with their experiences of bushfires and other emergencies in their local community, their focus was on social aspects of community that were important in coping and recovering.**

Existing social capital and cohesion, which was felt by many (but not all) participants to be particularly strong in small, regional communities, was a key factor. Social 'infrastructure', such as community organisations, schools, clubs and businesses, was important, but equally, relationships and general 'spirit' were key factors in the social capital that contributed to resilience.

> **"The main things were support of the community and having a central place to go to, just to go for a cup of tea."**

> **"There was this vague but collective sort of 'doing stuff together'... and that's translated into we've got solar panels and we've got a battery so whenever there's a power outage we just run cords from our place [to neighbours] and run off our battery until the power outage is gone, to pump water, you know. It's a sort of an automatic reaction not a thought-through thing; it's sort of cultural. And we just fitted in... and we felt, we've come to the right place."**

As well as recognising that social cohesion that exists in 'normal' times is important for resilience in emergencies, it was also acknowledged that emergencies can build social capital, as people practice helping, sharing and supporting each other. It seems that maintaining this community cohesion, and particularly tapping into it in the context of planning and preparing for emergency, can be challenging when people are busy with their lives in non-emergency times.

**As well as recognising that social cohesion that exists in 'normal' times is important for resilience in emergencies, it was also acknowledged that emergencies can build social capital, as people practice helping, sharing and supporting each other.**

It was also recognised – but much less emphasised – that emergencies could create new rifts or exacerbate existing divisions, including between new and long-time residents, and between residents and holiday home owners. Having said this, the concern that was expressed for the vulnerable suggests that social cohesion would help to ensure no-one 'fell through the cracks'. Moreover, there were stories of how historical conflict – unrelated to emergencies – could, in some cases, lead to learning and more social cohesion.

> **"There's also a lot of people who... have moved to Tuross in recent years, who aren't necessarily connected into any of those [groups]; I think there's a need to work hard on trying to bring those people into the community and also to have a safety valve for them."**

In the workshops, there was less discussion of the role of physical infrastructure in resilience, although losing power and communications was repeatedly spoken about as a major impact of the bushfires,[ii] reinforcing observations from the SμRF interviews. There was, however, a lot of discussion of community hubs/emergency centres.

Emergency hubs can be a critical focal point for provision of community physical needs, including safety, shelter, water and food, power for charging, fridges and freezers, but also a central point for information, communication, social organising and support. Establishing a well-provisioned emergency hub, that everyone in the community is aware of, was seen as an important part of planning and preparedness, which are also key aspects of resilience. There was a lot of interest in setting up energy self-sufficient emergency hubs using renewable technologies.

## Resilience – Implications

When discussing resilience from the perspective of lived experience, particularly positive experiences of resilience, participants focused strongly on social dimensions – sharing, caring and connection. Physical infrastructure clearly featured in thinking about the problem – losing power, losing communications, losing water – but understanding the importance of social dimensions emphasises that improvements to infrastructure are not enough on their own to build community resilience.

**When discussing resilience from the perspective of lived experience, particularly positive experiences of resilience, participants focused strongly on social dimensions – sharing, caring and connection.**

We need to think beyond what energy system changes do to keep electrical power flowing, we also need to pay attention to how these changes sustain social processes, connections and flows.[3] With this in mind, the institutional dimensions of change (new rules, arrangements, decision making, relationships) are just as important as the physical infrastructure. This broader lens is at odds with mainstream energy sector understandings of resilience (which sees it as an extension of technical reliability).

Emergency hubs became a focus for discussions about resilience because they brought together the physical (food and water, communications, charging, storage) and social dimensions (support, care, information). They remind us that physical dimensions are also important, especially when they are integrated with the social. Emergency hubs can be infrastructures for care.

**Emergency hubs became a focus for discussions about resilience because they brought together the physical...and social dimensions...They remind us that physical dimensions are also important, especially when they are integrated with the social. Emergency hubs can be infrastructures for care.**

[ii] In many small, regional communities, loss of power also means losing water or losing water pressure.

One of the most important social dimensions of resilience is caring for vulnerability. One could argue that a community is only as resilient as its weakest part. We focus on vulnerability here rather than 'the vulnerable' because everyone experiences vulnerability at times, even those we don't think of as vulnerable. For example, some participants pointed out that retirees with professional backgrounds lack practical know-how to prepare a house for a bushfire.

Also, there are vulnerabilities associated with social and physical infrastructure. Emergencies build social capital, partly because they bring this concern for vulnerability to the fore.

**One of the most important social dimensions of resilience is caring for vulnerability... We focus on vulnerability here rather than 'the vulnerable' because everyone experiences vulnerability at times, even those we don't think of as vulnerable.**

Vulnerability can itself build interdependence, which strengthens community. Thus a care approach is not necessarily aimed at fixing vulnerability, but is a practice of attending to it and increasing the capacity to cope and heal[30]. Care is not only social but also material[31] so physical things can be cared for, and they can enable care. Participants in Broulee pointed out that maintaining care, particularly in relation to equity and vulnerability at a community level, can be harder in 'normal' times.

**We wonder, is the emphasis on social dimensions of resilience particular to regional communities?**

**Do communities like these, in which most residents join by choice or through historical connection, have a stronger 'connective tissue'?**

**Can they model social dimensions of resilience for other communities?**

Image: Eurobodalla Coast Tourism ©

# Future energy system

Participants were asked about a future energy system that would meet the community's needs and be an improvement on what they currently have. They were also asked to think about who the system should benefit and how the system could support the community into the future. In response, they raised a number of values and benefits for an improved system that are summarised below. These are presented in roughly the order of importance.

## Equity and fairness

Vulnerable people might continue to miss out, this might affect health and wellbeing. Of concern were the elderly, people with medical conditions, people on low incomes, renters, apartment dwellers and young people.

### Need and opportunity

Care for the vulnerable, support to save energy and participate; redistribution, must benefit all.

### Example

Subsidies favour wealthy people but are paid for by everyone.

### Implications and questions

People can agree that equity and fairness are important, but what is fair and equitable? And how does local equity interact with higher levels? Is a care approach that attends to vulnerability in contextual ways useful?

## Community

Change should build and not erode:

- social capital
- social infrastructure
- community cohesion, and
- culture.

Energy system change could be an opportunity to share resources and plan together and thus build community and place

It's important to keep the hospital going and support local businesses

People want to build community but a market-based system makes this difficult. Is this the best way to build community?

## Environment

We all need to act on climate. Energy change should enable more renewables, less emissions, but not have additional impacts (local environment, waste).

Change needs to increase renewables and reduce emissions, and needs to have minimal environmental impact, including locally.

Local energy might lead to less waste; but what if there are impacts on the bush.

Action is nested at multiple levels and scales. There are different paths to transition. How does local action affect other levels?

## Accessible information and transparency

People don't understand the energy system or their role in it. It's hard to make good decisions for themselves or their communities if they don't know how things work and who decides.

### Need and opportunity

People need good information and understanding in order to be empowered, in their own choices, and in taking action as communities. Things need to be simpler and more transparent. This goes for info about climate and emergencies too.

### Example

Bills should be simpler so people can make better decisions. 'You'd get a sense of ownership, of what you're using, if you understood'.

### Implications and questions

Participants appreciated being given knowledge. They want to be empowered, especially women. This is an important aspect of transition. Does it also reflect distrust in government and industry?

## Reliability

Few outages and quick return to power is important in emergencies and in normal times, for health and wellbeing and business.

People need an electricity supply they can count on, and the flexibility to meet fluctuating demand. Perhaps a local energy system could be more reliable.

Energy supply needs to meet summer tourist demand.

A local energy system could provide back-up power but are people underestimating the reliability that comes from the grid, including redundancy? How can we understand and judge trade-offs?

## Affordability

When electricity prices rise, it affects people's access, which can affect their health and wellbeing. Price uncertainty is also a problem.

Changes need to improve affordability, to support access and wellbeing. New developments need to be cost-effective (may need to wait for prices e.g. batteries to come down).

There are many retirees in the community who are impacted by rising prices.

Affordability equals cheap electricity, but actually is variable across community (ill pensioner vs wealthy family). Does affordability (cheapness) address access/equity? What about environmental goals?

## Demand reduction and energy efficiency

When designing system change, if we don't consider reducing energy use, we may not reach emission reduction targets.

### Need and opportunity

We need to consider the range of strategies to reduce energy use before redesigning the system. This may require policy change.

### Example

There should be a focus on energy efficiency, especially of homes; people can change their practices (fans instead of air-con, use appliances during the day).

### Implications and questions

Reducing demand is not a priority for everyone and could give rise to tensions and conflicts. A microgrid with limited provision gets people talking about equity and reducing demand.

## Self-sufficiency

In the face of insecurity, distrust and uncertainty about the system, people feel scared and powerless. The idea of a self-sufficient town is very appealing.

Self-sufficiency could build community, give autonomy, insulate from shocks and uncertainties, allow people to reduce their reliance on energy companies and build local jobs and capacity.

It might provide local jobs and opportunities, and just give back a little bit of control.

Self-sufficiency is appealing, but difficult in practice and it creates new vulnerabilities, risks and responsibilities (reliable provision by the grid is underestimated). In a future system will all communities be self-sufficient? How would that work?

## Responsiveness

Things are changing and a new system needs to be able to respond to changes over different time scales (e.g. fluctuations in demand over the year, demographic changes, climate changes).

A new system needs to be flexible and adaptable to respond to community needs and change over time. This goes for social infrastructure (governance, regulations) too.

The system needs to respond to fluctuating demand, 'We need to be prepared for the way we're going to deal with the inevitable changes that are going to happen'.

How can energy infrastructure be more flexible, while maintaining reliability? (Is redundancy important?)

# Future energy system: Implications for designing energy resilience

## Equity and fairness

Equity and fairness was a priority for workshop participants, but it was clear that it meant different things to different people. For some, equity revolves around equal access to new opportunities and might be satisfied by a scheme that is open to everyone for the same up-front cost. For others, equity requires redressing historical inequity and redistributing opportunity, in the recognition that not everyone has had the same opportunities and privilege.

Once again, a care approach focused on vulnerability might provide a more useful lens for assessing the contributions and impacts of a new scheme. It's clear that as part of establishing the 'ground rules' for a community initiative like a micro-grid, it's not enough to make a commitment to fairness and equity, what is fair and equitable needs to be negotiated within the community, which includes people locally, but also needs to consider others outside the locality (e.g. renters who pay electricity bills, and therefore cover the costs of the network, tax-payers who support the energy transition in various ways, or indeed the workers that make the infrastructure itself).

**Once again, a care approach focused on vulnerability might provide a more useful lens for assessing the contributions and impacts of a new scheme.**

## Affordability

Affordability can likewise refer to equality of access, focusing on low prices for electricity. But the link that workshop participants made between affordability and health and wellbeing was important and actually emphasised the limitations of affordability as a measure of social good.

**...the link that workshop participants made between affordability and health and wellbeing was important and actually emphasised the limitations of affordability as a measure of social good.**

The ability to afford electricity, at whatever price, is hugely variable across the community, and the stakes are different as well. Affordability for a chronically ill pensioner looks very different from affordability for a wealthy couple looking to charge their second electric vehicle.

Affordability carries the suggestion that everyone should have access to cheap electricity, but low prices may be traded off against both equity and environment. Once again, a care frame can bring a stronger equity and environment lens to thinking about electricity pricing, but also the quality and accessibility of support that people may need to improve thermal comfort and meet other needs (e.g. to find a reliable tradesperson to install insulation and draught-proofing).

## Self-sufficiency

In discussing a future energy system in this workshop, participants expressed a strong interest in self-sufficiency, autonomy and being 'in control' locally. This connected to strong desires to build community, including governance capacity, sharing and caring, education and local climate action.

**In discussing a future energy system in this workshop, participants expressed a strong interest in self-sufficiency, autonomy and being 'in control' locally.**

It also connected with distrust of energy companies, particularly retailers, and to a lesser extent with government and the regulatory framework for energy. It also responded to global events like the war on the Ukraine and their effects on energy prices, and natural disasters affecting the energy system.

People seemed to feel disempowered in the face of this uncertainty and lack of trust and wanted to be more 'in control'. Regaining control over collective infrastructure was linked to building community for some, and yet for others was seen as creating potential for disagreement and disconnection. It would be interesting to know whether self-sufficiency is more valued by smaller, regional communities.

## Education

The issue of education was an important theme. Many social researchers have already pointed out that Australians are looking to contribute to, and better understand what is happening with the energy transition, and the role they can play in it, so this is unsurprising.

It reflects participants understanding of the complexity of energy system change as well as everyday household decision-making and the importance of households and communities learning about this in order to make good decisions. It also reflects the disempowerment described above, and the view that ordinary people understanding and engaging with the energy system is important for transition; information empowering people, particularly women.

**...the view that ordinary people understanding and engaging with the energy system is important for transition; information empowering people, particularly women.**

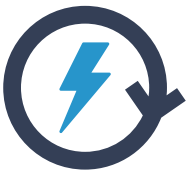
## Energy demand

Some people spoke passionately about the need to reduce energy demand. This was talked about in the context of community members experiencing vulnerability who need support to improve the energy efficiency of their homes and appliances, but also in the context of everyone needing to simplify and reduce energy needs as part of societal transition to a more sustainable way of life.

Part of the value of education (above) is raising awareness about responsible energy use. While there was little open disagreement, it was clear that reducing energy demand was not a priority for everyone, and there was some concern about how this should be enforced/communicated. People were clear that no one should be penalised if they didn't have the resources to change their consumption because of circumstances (e.g. poor housing stock quality).

The discussion about how a microgrid, as a finite resource, would be governed in emergencies led naturally to discussing priorities, including elevating the needs of the vulnerable, and how unnecessary uses could be curtailed. People seemed to think that in this context community members would 'do the right thing' suggesting that microgrid governance might provide a context for having these conversations about different households' energy use patterns.

**...a microgrid, as a finite resource, would be governed in emergencies led naturally to discussing priorities, including elevating the needs of the vulnerable...**



## Future energy system

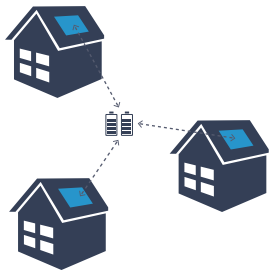
In expressing their desires for a future energy system – a system that is green, equitable, reliable and affordable – participants were not necessarily engaging with all the myriad trade-offs involved in building the system.

**In expressing their desires for a future energy system – a system that is green, equitable, reliable and affordable – participants were not necessarily engaging with all the myriad trade-offs involved in building the system.**

When faced with destining a real energy system with all its related infrastructure, all of these values can be understood as being in various degrees of tension with one another. A key example is that increasing reliability adds significantly to electricity prices. In addition, participants were specifically asked to focus on their community, so did not consider how these values should be achieved at higher levels – across the state or the region, for example.

The next section, which considers microgrids in detail, started to raise some of these trade-offs, particularly between cost and the other values. How local values connect with these same values considered at higher levels came up a little in the discussion, particularly when it was mentioned that the main grid would not support a microgrid in every town. This is an important issue we return to in the final section.

# Microgrids



## What hopes and expectations do people have of microgrids?

People arrived generally positive about micro-grids, and renewable energy technologies generally, although there was also some healthy scepticism.
In surveys before and after the workshops, most people thought microgrids were a good idea; some were undecided, and a few people's views changed, in different directions.

**People arrived generally positive about micro-grids, and renewable energy technologies generally, although there was also some healthy scepticism.**

Approval of microgrid developments was clearly contingent on how the project would be set up, through what process, and to whose benefit. Many of the questions people had in the workshops were around cost and business models – how it would operate, how people would be involved, and what the benefits would be. Some people wanted to step back and ask: What is it for and is a microgrid the right option?

There were also big questions about governance, including whether a community could run such a project, and how they could make decisions that would be fair and equitable across the community. Participants were interested in learning from other communities who had already undertaken this journey and were surprised that there were not many.

The workshops were framed around resilience, and participants were certainly interested in what a microgrid could do to supply back-up power, both for short-term outages and particularly in the case of long-term emergencies including extreme weather and bushfires.

**The workshops were framed around resilience...**

There was interest in self-sufficiency, agency and autonomy as described above, including empowerment through accessible information. People mentioned security and independence, being able to feel more confident and 'support ourselves', with an emphasis on supplying essential needs during emergency events, and also designing for future needs. They were also concerned generally about the ongoing reliability of the energy system and wanted to have some protection in the face of this. Some felt that a local microgrid might help the wider system too. For some, a microgrid project was seen as demonstrating a new type of sustainable energy which could inspire other communities.

**There was interest in self-sufficiency, agency and autonomy...including empowerment through accessible information.**

Participants were also interested in the role of a microgrid in building community connections. Participants felt that a community-controlled system, although challenging in terms of governance and bringing the community on board, would help to bring the community together, build participation, engagement, commitment and '*connective tissue*', and demonstrate that this kind of community endeavour can be successful. It could strengthen the community, building culture and sense of place. As well as pride and confidence, it could raise awareness and build engagement in a range of other environmental and community activities.

**Participants were also interested in the role of a microgrid in building community connections.**

> **"...a really good symbol of what can be achieved at a local scale"**

A role for microgrids in facilitating sharing within the community was of particular interest. The hope was that microgrids could give everyone access to renewable energy, including those experiencing vulnerability, such as the elderly, those with medical needs, people living alone, poor people, homeless people and renters, and other groups such as young people, young families, holiday makers, pets and future generations. The idea of sharing was particularly attractive in the context of surplus renewable energy that was generated locally but not currently able to be used, which people saw as a waste.

**...sharing within the community was of particular interest. The hope was that microgrids could give everyone access to renewable energy, including those experiencing vulnerability, such as the elderly, those with medical needs, people living alone, poor people, homeless people and renters, and other groups such as young people, young families, holiday makers, pets and future generations.**

This led to an expectation that energy shared would be cheaper and the financial benefits could also be shared (see below re affordability). Sharing locally was seen has having the potential to strengthen the community and build self-sufficiency.

Participants were interested in the environmental benefits that microgrids could bring, in increasing the amount of renewable energy in the energy supply, reducing reliance on fossil fuels, and reducing carbon emissions. Part of this was reducing waste by making maximum use of locally generated energy.

As above, it was hoped that people's involvement in the microgrid would also lead to other pro-environmental actions. At the same time, there were concerns about other environmental impacts microgrids might have, including for local ecology, but also in relation to rare mineral mining and waste from energy assets.

**Participants were interested in the environmental benefits that microgrids could bring, in increasing the amount of renewable energy in the energy supply, reducing reliance on fossil fuels, and reducing carbon emissions.**

Affordability was another benefit participants hoped microgrids would provide, and they initially expected that a microgrid would reduce electricity bills. They thought it could thus contribute to the local economy, supporting and attracting local business and residents (with lower energy prices), providing jobs and keeping money in the local economy.

However, cost turned out to be a sticking point, and to raise a lot of questions. There was a strong feeling that unless a microgrid lowered electricity costs or at the very least, kept them stable, it would not be accepted by the community.

**Affordability...cost turned out to be a sticking point, and to raise a lot of questions. There was a strong feeling that unless a microgrid lowered electricity costs or at the very least, kept them stable, it would not be accepted by the community.**

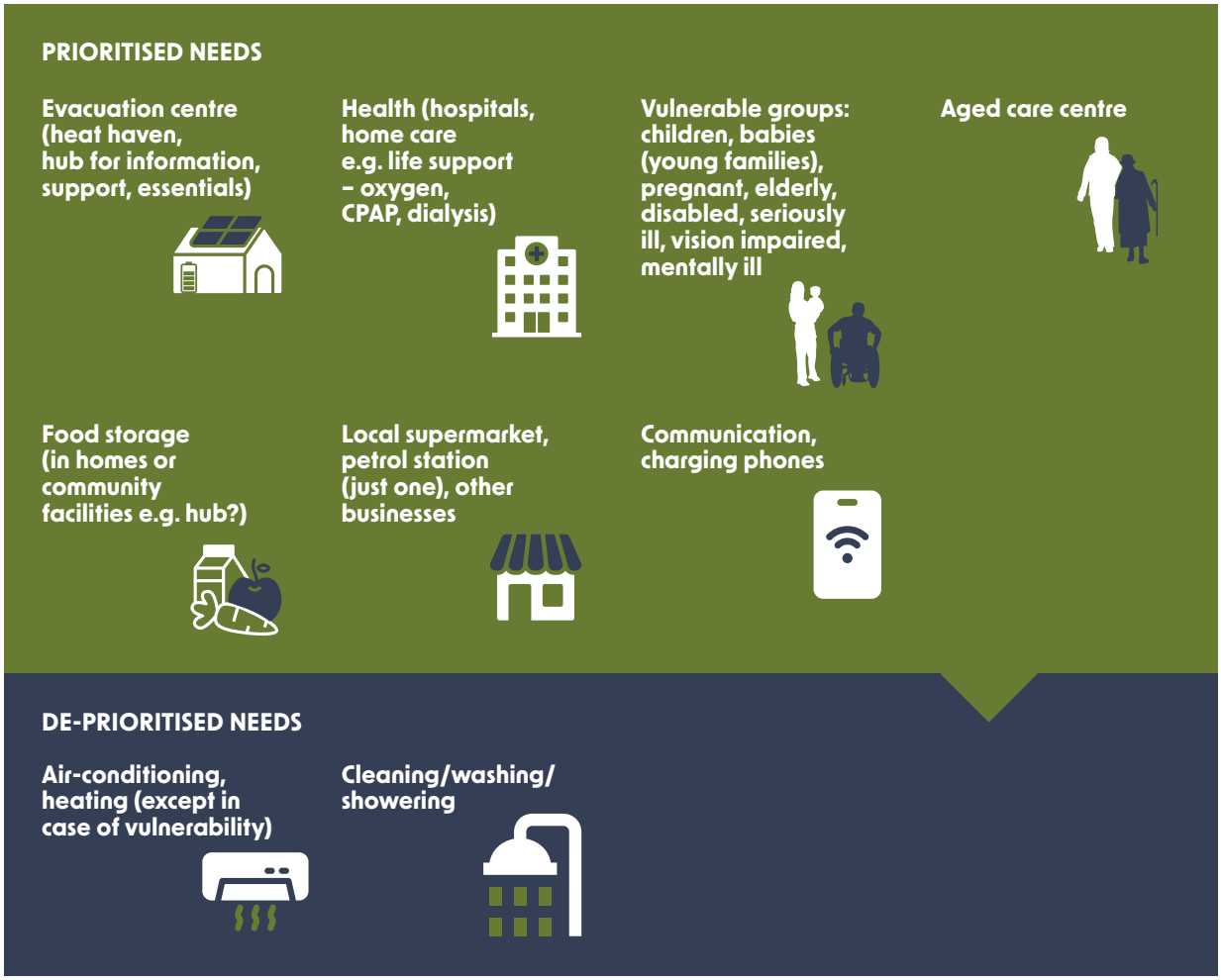
Image: Eurobodalla Coast Tourism ©

## Grid-tied microgrids in emergency times

In discussing emergency times, participants identified that particular needs should be prioritised, given the limited back-up power that could be provided by a microgrid in islanded mode.

Both Broulee and Tuross Head participants expressed similar priorities.

People also talked about the importance of planning, information and preparedness, how priorities should be decided in the community, and how they should be communicated/enforced.



## Can microgrids deliver? Challenges and questions

### Cost

The main challenge discussed was the cost of setting up and maintaining a microgrid. There is obviously a trade-off between cost and the size and capacity of the system, and people were surprised that the cost estimated in the SμRF feasibility study was so high for a system that would not supply back-up power for very long. For example, in Broulee, a small microgrid would provide power for, on average, half a day when islanded, and would cost more than $5.5 million. For Tuross Head, a large microgrid (including a solar farm) could supply the town for about two weeks in islanded mode, but would cost more than $18.6 million (*Exploring design challenges and opportunities for microgrids to improve resilience in the Eurobodalla*).

This led to questions about funding such a project, whether through government grants or investment from the community, but also how to gain revenue from the system in non-emergency times to support ongoing costs (including maintenance and replacing the battery).

**...funding such a project, whether through government grants or investment from the community, but also how to gain revenue from the system in non-emergency times to support ongoing costs**

Revenue might come from participating in energy markets, getting paid for network services, or installing an EV charger. However, there was uncertainty about all of these revenue streams and a lack of clarity about successful business models.

Participants looked to lessons learnt by other small communities, including nearby Bawley Point and the Cobargo feasibility study, and saw opportunities in government funding schemes and the expectation that battery prices would come down. In the face of these challenges, the issue of how to compensate household solar energy providers in the community connected with the second main challenge: equity.

### Equity

Equity was an issue in relation to how a microgrid would work, and how benefits would be distributed. While there was general enthusiasm for sharing and supporting the vulnerable, it was still felt that solar owners should be compensated for providing energy to the system. How this would be worked out fairly was not at all clear (see governance section), especially given the financial feasibility challenges described above, and technical questions about connection and metering.

There were also questions about how businesses and community facilities would be connected, and the balance between residents and holiday house owners. Some wondered if the community had the will to make it 'truly equitable'.

Equity issues connected to the challenge of governance, including in relation to emergency (islanded) use and normal operation. How decisions would be made, what governance model would be appropriate, and whether there was capacity and support to navigate these challenges were all questions that arose. There were also questions about regulatory barriers to setting up the kind of local energy system they imagined. Related to the governance challenges were challenges with community engagement, including how to communicate about such a project, get people on board and build trust. See Governance section below.

**Related to the governance challenges were challenges with community engagement, including how to communicate about such a project, get people on board and build trust.**

Participants identified other challenges such as distrust of energy companies. Some people were quite unhappy to hear that any microgrid model would require involvement of an energy retailer (for market participation and to handle billing). They felt that energy companies would not have the community's interests at heart. To some extent, this extended to the network company.

> **"...didn't know needed a retailer, benefit is being disconnected from retailer."**

## Local issues

In terms of local issues, land prices and availability (especially for a solar farm but also for a community battery) and local environmental impacts (trees, local ecosystems) were also challenges, as was keeping microgrid infrastructure protected from fire or other emergencies.

On the positive side, one of the communities felt that their isolated position, surrounded by forests and with only one line in, made them a good candidate for a microgrid because of their vulnerability to getting cut off. There were also strengths in both communities that would help a microgrid project, including an egalitarian, sharing culture, with (latent) social capital, and some knowledge and expertise about energy systems. One of the communities also had existing social infrastructure associated with a number of 'clusters' (private roads on which residents have joint responsibility for common infrastructure) including decision-making mechanisms and a sharing culture.

**There were also strengths in both communities that would help a microgrid project, including an egalitarian, sharing culture, with (latent) social capital, and some knowledge and expertise about energy systems.**

During the workshop we asked small groups to consider a grid-tied microgrid option in detail, suggesting four options: **1.** community-owned **2.** network-owned **3.** retailer or other third party-owned, and **4.** 'no microgrid'. They were also invited to explore other options and to discuss an option they were interested in (so not all options needed to be covered). In both Broulee and Tuross Head, the community option was most popular and both communities also chose the network-owned and no microgrid options.

# Community microgrid

In both communities, a community-run microgrid was seen as an opportunity for **autonomy and empowerment.**

> **Empowerment, a sense of agency, a buy-in at a much deeper level**

What appealed to participants was having the community make its own decisions, and to come together to solve a challenge. Both groups saw opportunities to build community and cohesion, to improve social equity, and to raise awareness about environmental and climate issues, potentially showcasing a more sustainable future.

There was an assumption/hope that the microgrid would improve resilience (reliability) and reduce electricity prices, and could respond to diverse needs (residents, holiday house owners, retirees etc) and changing needs in the future. Both communities were interested in whether a community organisation could gain a retail license and whether there were examples of this, and both considered integration of electric vehicles in microgrid design.

Both groups agreed that **governance would be critical**. A community-run microgrid would require a capable and representative governance group and social license from the wider community, based on a value proposition of benefit to the community and meeting their needs.

The communities considered existing social infrastructure, including organisations and decision-making processes (like the clusters) to draw on for governance and community consultation and participation.

One small group in Broulee discussed a **community-run business model**, envisaging a model encompassing the whole community (but some wondered about provision to opt in/out), and considering alternative revenue sources such as carbon credits. The model would need involvement of the network as a willing partner, buy-in from local and state government, and embedding in local emergency and climate adaptation plans.

Case studies of successful projects and courage would be needed to embark on this. There were mixed reactions to this idea, from enthusiastic to more sceptical.

The other group in Tuross Head felt that the model would only work if profit could be returned to the community/participants and were sceptical that this would be the case if an electricity retailer needed to be involved. They imagined that only a part of the community would be involved in the microgrid and discussed how this would work (see 'who's in' section). They felt there needed to be regulatory change to enable this kind of energy independence, including through peer-to-peer electricity exchange/sharing.

# Network microgrid

The two small groups in both Tuross Head and Broulee identified similar benefits in networks having **resources and competence to run microgrids** (money to invest, insurance, economies of scale, literacy, expertise, mechanisms for engagement with consumers) and being positioned to use them to best effect to balance and strengthen the network, also drawing on lessons from across the network.

As well as their own resources, networks might be able to access alternative funds like green investment or government grants. They felt that networks bring established standards and governance structures, that might avoid some of the challenges of community governance. The perceived downside was that the location would need to be of interest to the network.

The question of whether there is a network issue to be solved is considered to be a precondition for a grid-tied microgrid by energy professionals, (see *Challenges and opportunities for delivering grid-tied microgrids for energy resilience*)and priorities might change, impacting the longevity of the project.

In terms of the workforce, participants were unclear whether the network would bring staff in or provide local jobs. Land availability, especially for a solar farm, was a seen as a potential obstacle.

Both groups felt that there might be a **mismatch between the goals and expectations of the network and the community**, and that the benefits and rewards would also tend to go to the network (and possibly the wider customer base). Unless there were benefits to the community, there would be limited buy-in, and even pushback about the microgrid.

The network would need to be transparent about its offering and its goals in order to gain social acceptance. The network model would mean less community control, and potentially less opportunity to build community cohesion and community governance capability.

**In emergency times**, a network could manage energy demand priorities in the community, but this would require the community to decide on priorities, or at least agree on how the islanded system would run, and community members would have to be aware of this. The network could potentially control supply to household circuits (e.g. hot water systems), but this might be seen as 'big brother' if people did not feel adequately consulted.

# No microgrid

The no microgrid option was an opportunity for groups to think about other options for community resilience that could be adopted instead of a microgrid. These groups discussed a wide range of options and topics.

One group identified the **no microgrid option as community building**. Reflecting on how people came together during the fires, they discussed how shocks can lead to rethinking and changing the way people live. This group talked a lot about strategies to reduce energy use, including through better building design and changes in practices, including using energy during the day and resisting the urge to automate.

The benefits of this included **building social capital and community self-reliance as well as reducing environmental impacts**. They required education and awareness-raising, planning and communication. They discussed the costs and impacts of energy independence using technology such as a micro-grid, and the perverse outcomes that could arise (higher energy demand for example).

This group felt that an energy self-sufficient emergency hub would be a cheaper and better option for resilience in the face of a range of emergency events as compared to a grid-tied microgrid. For households, solar panels and household batteries could be invested in, and issues of maintenance and quality could be solved by networks owning these assets and providing them as a service.

The other group felt that microgrids are in an early stage of implementation, with a lot of uncertainty, so it might be better to 'wait and see'. However, they also talked about the costs of other options like solar and household batteries, and problems with them providing power during emergencies (reduced sunshine in fires, batteries unable to keep working once discharged).

They nevertheless suggested that investing in solar, including supporting those who could not afford panels, would help with **energy independence**. They discussed reducing energy demand, through insulation and more efficient appliances, and discussed the importance of raising awareness about this and building community in the process, including through ideas like community freezers and bulk buys on heat pump hot water systems. They also talked about the role of councils and the importance of planning for resilience.

## Microgrids – Implications

There were some shifts in opinion, but most participants were overall fairly positive about having a microgrid, even in the face of very serious challenges and questions that were raised during the workshops. This probably reflects a general enthusiasm for renewable energy technologies, but also the way that this kind of 'community technology' capture people's imaginations and connects with their aspirations and goals. It's worth noting that people emphasised that the microgrid should not lead to being worse off, recognising that a new system like a microgrid won't necessarily deliver all it promises.

**There were some shifts in opinion, but most participants were overall fairly positive about having a microgrid, even in the face of very serious challenges and questions that were raised during the workshops.**

The symbolic dimension of something like a microgrid was recognised by participants. As a visible, physical initiative, it could have power in galvanising the community, building pride and connection, and making place. Of course, the opposite is also true – if the implementation is not done well, it could be a powerfully negative symbol of people not being in control.

**The symbolic dimension... As a visible, physical initiative, it could have power in galvanising the community, building pride and connection, and making place.**

The idea of a microgrid as a collective or community initiative was also clearly powerful. Collective action in relation to something constructive seemed to be more appealing than action that is oppositional (like a protest movement), or remedial (like certain forms of charity or weeding for example). In the energy system, it shifts people from simply being consumers with behaviour to being active parts of the community and the system and having agency to change the system, instead of being, in some sense, passive recipients of it. Collective infrastructure was also seen as having the potential to open up community conversations about 'behaviours' i.e. energy practices in households, in contrast to individual household action.

**The idea of a microgrid as a collective or community initiative was also clearly powerful.**

Sharing is a ongoing theme in energy social science research. It reflects values of community generosity and care, and appears also to respond to the recognition that inequity is a major problem in our society and in our energy system. In the context of energy systems, it definitely seems to be linked to the surplus energy that community members with rooftop solar produce, and their reaction to this 'waste'.

**Sharing is a ongoing theme in energy social science research. It reflects values of community generosity and care, and appears also to respond to the recognition that inequity is a major problem in our society and in our energy system.**

It is particularly interesting given that the current market-based electricity system does not support sharing at all (in fact it is illegal in most contexts). To what extent sharing and surplus are coupled is not clear. There seems a possibility that if business models were developed that enabled people to exchange excess energy with their neighbours through the market system, that this would be based on trading rather than sharing. Will the desire to share diminish once the 'waste' energy has value? Or does sharing reflect a more robust desire for things to be different, and a discomfort with the prevailing market-based system?

Distrust in energy companies is another pervasive theme. Distrust was initially fairly indiscriminate. It took some time for participants to understand that Essential Energy, our research partner, is a regulated distribution network service provider (a DNSP), not a retailer, and that retailers and distributors are quite separate. They were also surprised to hear that Essential is a publicly-owned company. They were pleased to find out more and impressed with Essential's efforts to increase resilience, e.g. in installing fire-resistant composite poles. There was some talk about different retailers, but retailers were generally distrusted.

**Distrust in energy companies is another pervasive theme.**

Concern about the energy system came from its connection to global markets, including through multinational companies, but also through price shocks such as that caused by the Russian war on the Ukraine. There was a sense that the larger the scale of the energy 'system', in this broad sense, the more uncertainty and insecurity for local communities, who would be better off looking after themselves, insulating themselves from price shocks and, perhaps more importantly, 'being in control'. This extends to concern about the national grid (in this case, the NEM), and its susceptibility to disruptions (especially extreme weather events).

**Concern about the energy system came from its connection to global markets, including through multinational companies, but also through price shocks...a sense that the larger the scale of the energy 'system'...the more uncertainty and insecurity for local communities, who would be better off looking after themselves, insulating themselves from price shocks and, perhaps more importantly, 'being in control'.**

What seemed to be missing in this discussion was the reliability benefits that come with balancing supply and demand across larger areas and more people, and the cross-subsidisation that occurs across the network, which particularly benefits regional communities.[iii] The function of 'the grid' in providing a reliable essential service seems to be something that people associate with a by-gone era of public utilities. People seem to see a marketised system as a system that meets the needs of distant shareholders rather than local communities.

[iii] The term 'postage stamp pricing' is used to refer to the fact that all customers in a network pay the same basic network costs, despite the fact that the cost to service customers varies widely. In effect, city customers, because provision is cheaper in dense conurbations, subsidise regional and remote customer network access.

# Governance and the role of community

In workshops, discussions of governance included considerations for community-run models, but also other ownership models, including networks. We asked how proponents should involve the community, how community members should be engaged, and what would be required to give the community confidence in the project.

Many participants were keen on community control and ownership of a microgrid. Again, this was seen as an opportunity for community to be in control, look after itself, and build resilience through planning together and sharing resources. Community leadership or coordination would ensure it met community needs and goals. While a community model might not be profitable, the community might commit to it as a social good and a contribution to decarbonisation. At the same time in both communities, participants emphasised that it was difficult to engage people in local collective activities, whether in local progress association meetings or a bushfire information day, which provided an interesting paradox for conversation.

**Many participants were keen on community control and ownership of a microgrid... opportunity for community to be in control, look after itself, and build resilience through planning together and sharing resources. Community leadership or coordination would ensure it met community needs and goals.**

Other ownership models included the local shire council investing in a microgrid, or at least being involved in educating people and advocating for it, as they had investment capacity and staff to engage with the community. However, one participant pointed out how stretched councils were, having to do more with less, and suggested that the community needed to build its own capacity to develop solutions. There was also some talk of the network owning the microgrid, and this was explored further in the options assessment (above). Participants thought that retailers might want to own a microgrid, but felt that this should be part ownership and should not exceed 49%, reflecting their distrust of energy companies.[iv]

**Other ownership models included the local shire council investing in a microgrid, or at least being involved in educating people and advocating for it, as they had investment capacity and staff to engage with the community.**

The discussion about business and operational models was more speculative, with a great deal of uncertainty about how it could actually work.[v] People talked about a community not-for-profit organisation set up to run the microgrid and/or a community investment fund (like 'Community Chest'). There were questions about whether such a model would be financially viable including how it would cover ongoing costs, even if capital costs were covered by government grants. Possible sources of revenue included network services or an electric vehicle charger. Despite uncertainties, participants were optimistic that developing successful models would be useful in helping other communities who wanted to set up microgrids.

[iv] To put this in context, neither councils nor retailers have expressed interest in owning microgrids.

[v] Participants repeatedly asked for information about successful business models, which we were unable to provide, given the scarcity of relevant models in Australia.

**The discussion about business and operational models was more speculative, with a great deal of uncertainty about how it could actually work[v]...Despite uncertainties, participants were optimistic that developing successful models would be useful in helping other communities who wanted to set up microgrids.**

A big question about models was 'who is in' - whether community members would all be part of the microgrid, or if it would involve only a subsection of the community. The larger community, in particular, felt that the latter was more likely. Some questioned how this could work if the microgrid used existing infrastructure, whether it would be possible using smart meters, and whether the regulator would allow different tariffs for different customers within the town.

**A big question about models was 'who is in' - whether community members would all be part of the microgrid, or if it would involve only a subsection of the community.**

On the other hand, people were concerned about mandating involvement in the microgrid, and felt that people should be able to opt out. This led to discussion about how people could disconnect if they wanted to, what entry criteria might exist, and whether membership would transfer when houses were sold. There was discussion of who and what else would be covered by the microgrid, including small businesses, council facilities such as streetlights, and community facilities like community halls and commercial clubs. The 'who is in' discussions also led to speculation about what it would mean to sign up or buy in.

There was speculation about a subscription/investment model, a 'quasi-commercial' model run either by a community organisation or by an energy provider or contractor, in which community members signed up and received stated benefits. These benefits were generally understood as energy cost reductions. However, there was an added dimension of reimbursing community energy generators (those with solar panels), who felt they should get some recompense for their contribution.

**...speculation about a subscription/investment model, a 'quasi-commercial' model run either by a community organisation or by an energy provider or contractor, in which community members signed up and received stated benefit... generally understood as energy cost reductions.**

It was suggested that this could be based on cost recovery, but it wasn't clear if that meant covering costs of ongoing maintenance, or the capital cost of assets. There was a strong sense that the scheme should not make profit, or that any profits should be reinvested in the community, reflecting other social research which has found that the general public do not view energy as a for-profit commodity but rather an essential service (Temby et al., Ransan-cooper et al. 2022). Participants also raised questions about how non solar owners could 'buy in' and whether a solar farm might

provide an avenue for them to contribute to the microgrid. There were suggestions that holiday owners could invest in the scheme, installing solar panels and receiving returns, especially in winter when demand is high but occupancy rates are low.

One of the key tensions that arose in discussing business models was the regulatory framework. In particular, people did not realise that microgrid operation would require an energy retailer, both to facilitate market participation and gain revenue from the microgrid, and to interact with customers through billing. There were comments for example that disconnecting from retailers was – on its own – a benefit they had hoped for from a microgrid. There were questions about whether a community organisation could be licensed as an electricity retailer. There were also questions about whether the regulator would allow some aspects of suggested business models, for example, different tariffs for those who signed up and those who didn't. The ability of people within the microgrid to trade or share power was also something constrained by the regulations, which frustrated some. Someone commented that the only way to do the energy sharing they wanted was to not be connected to the grid.

**One of the key tensions that arose in discussing business models was the regulatory framework. In particular, people did not realise that microgrid operation would require an energy retailer, both to facilitate market participation and gain revenue from the microgrid, and to interact with customers through billing.**

> **"Although the community might be ready for a shared, renewables based sharing of power, the regulator is not."**

Regardless of the model, participants stressed a need for community governance, and community vision, so that the microgrid met community needs, including care for the vulnerable. This was most often discussed in terms of a governance group or committee, who represent a cross-section of the community or were selected by the wider community.

**Regardless of the model, participants stressed a need for community governance, and community vision, so that the microgrid met community needs, including care for the vulnerable.**

There was discussion about whether an existing group should be involved or whether a new group should be formed. It was recognised in both workshop locations that it was usually a small group of committed and resourced people who drove such initiatives. It wasn't clear whether these 'drivers' would be able to represent the rest of the community (see below). In any case, a governance group would need to communicate transparently and develop a clear constitution for the project.

> **A local energy system having self governing capacity, more control over energy producing service.**

An issue for community governance is capacity. People wondered whether there were enough 'doers', given other things going on in communities and in people's own lives. Particular skills and experience are needed, in managing the microgrid, but also in participatory governance and leadership. For example, capacity is needed to apply for grants, map the existing energy system including householder assets, work with community to develop a constitution with a statement of purpose, details of the financial arrangements and environmental goals, and establish governance rules and processes. Skills and experience might be drawn from existing governance models in the communities, such as the 'clusters' in Tuross.[vi]

**An issue for community governance is capacity. People wondered whether there were enough 'doers', given other things going on in communities and in people's own lives.**

Community governance would require quite a lot of collective action, which one person pointed out was "not all sweetness and light". Issues included agreement and conflict, decision-making strategies, representation, the time burden, continuity and whether meetings should be open or closed. There was a spectrum of views about whether community could work together in this way, but some optimism, partly influenced by the workshop conversations themselves.[vii]

## Microgrid governance during an outage

In emergency times, there were important decisions about community priorities for the limited power a microgrid could provide (see section above), both at a community level (prioritising an emergency hub, how to store and share food, what priority to give EVs), and for individual houses (switching certain functions like heating and cooling off). It was felt that the community should establish these priorities in planning for emergencies.

**In emergency times, there were important decisions about community priorities for the limited power a microgrid could provide...**

There was a discussion about how they could be enforced or upheld, particularly for households, and suggestions ranged from communications via text and social media reminding people of exclusions/rationing through to having particular household circuits shut down during emergencies. One person expressed concern that national emergency powers might give government access to energy stored in the microgrid, meaning it would be taken out of the community's hands.

In general, regardless of who ran a hypothetical microgrid, engagement and representation were important issues for participants. There were questions about whether everyone needed to be engaged/on board, but a sense that social license would likely depend on it. Some felt that consensus was important, others that everyone needed to be heard, and as above, some felt that community members should have the choice to 'sign up' to the microgrid.

[vi] These private roads have infrastructure jointly owned by residents and a kind of body corporate to make decisions.

[vii] It's worth noting that the workshops were facilitated by skilled professionals. Such constructive conversations are by no means guaranteed.

**In general, regardless of who ran a hypothetical microgrid, engagement and representation were important issues for participants.**

Participants discussed the various challenges of engaging and keeping community engaged, especially in 'normal' times. People raised 'quieter voices'; groups that are generally hard to reach, including young people, young families, disengaged community members, renters and indigenous community members. A particularly challenging group was holiday house owners, who are often away. Some of these are part-time residents who form connections with the community, while others are holiday visitors who are less able or willing to engage.

Communication was considered to be challenging given that people have limited time and personal energy, so things need to be kept simple and communicated well. At the same time, it was felt that people need to be educated to understand what a microgrid project might mean and how it would fit with their energy use and assets, and the value proposition of a microgrid would have to be made clear and aligned to community goals. Information should be accessible, sufficient to make good choices.

**Communication was considered to be challenging given that people have limited time and personal energy, so things need to be kept simple and communicated well...Information should be accessible, sufficient to make good choices.**

There was agreement that community conversations were important, including in relation to long-term planning and resilience, and confidence and trust need to be built up, but it's hard to get everyone 'on the same page'.[viii]

In terms of engagement methods and strategies, not many concrete ideas were discussed. A survey/questionnaire was considered a good idea. Some participants thought that scenarios would be a useful tool to discuss microgrid options and people's needs. People were clear that there need to be strategies to reach hard-to-reach groups, including going to where people are (e.g. clubs, recreation, community organisations) and working with peer leaders. A suggestion was that Council could lead the engagement.

## Governance – implications

The discussion of control and ownership, together with other work in the SμRF project, points to a major challenge for microgrids: not one of the ownership models makes a compelling case. In general, the problem is that the various values that microgrids could fulfil can't easily be monetised, and accrue to different parties, so no one stakeholder group is sufficiently motivated to invest (see *Challenges and opportunities for delivering grid-tied microgrids for energy resilience*).

**...major challenge for microgrids: not one of the ownership models makes a compelling case. In general, the problem is that the various values that microgrids could fulfil can't easily be monetised, and accrue to different parties, so no one stakeholder group is sufficiently motivated to invest**

[viii] A concern raised was that although such a project could raising awareness about energy consumption, it could potentially have a downside if people starting 'shaming' people in the community about energy use, especially via social media.

As this, and other research reveals, community ownership is attractive to people, but there are major challenges with community capacity, continuity, and finding workable business models under current arrangements. Capacity requirements include technical know-how, organisational and administrative skills and systems, leadership and engagement capability and capacity, as well as specific expertise such as financial and legal services and advice. On the technical side, there need to be partnerships or contracts for retailing, network connection, tendering and procurement, site preparation and construction, software, and maintenance, to name a few. It is a huge challenge for a community organisation to develop or acquire this capacity and maintain it for the 10–20 year lifetime of the microgrid.

**...community ownership is attractive to people, but there are major challenges with community capacity, continuity, and finding workable business models under current arrangements.**

Network ownership may be workable, as networks have most of the relevant capacity, but networks need to gain trust and social license from the community, either through a strong value proposition, which is difficult for networks to provide under current arrangements,[viv] or through extensive community engagement, which is a skills and capacity gap for many networks. As far as we can tell, no other parties (retailers, councils) have shown interest in investing in microgrids.

**Network ownership may be workable, as networks have most of the relevant capacity, but networks need to gain trust and social license from the community, either through a strong value proposition... or through extensive community engagement, which is a skills and capacity gap for many networks.**

The discussion in workshops about who is in highlights the constraints and uncertainties of microgrid models, and the fact that the electrical and financial flows are not closely connected. In physical terms, whether households are 'in' the microgrid or not is a function of the size and arrangement (topology) of the microgrid, i.e. which part of the network is encompassed by the control system.

**The discussion in workshops about who is in highlights the constraints and uncertainties of microgrid models, and the fact that the electrical and financial flows are not closely connected.**

There may be decisions at a street level about where the boundaries are, but not at the house level, and most likely these decisions will be based on infrastructure features like the location of feeder lines.

[viv] Because their network service costs and savings are generally distributed across their network.

In financial terms, participation in the electricity supply system happens for households through their meters and is managed by retailers. The tariffs (rates) that people pay (or are paid for solar exports) are transacted through the retail relationship. This may or may not be influenced by the existence of a microgrid. If a retailer gains some benefit from the microgrid (e.g. market participation through a solar farm or battery) or if the network saves money because of it (in deferred costs of upgrades, for example, or greater reliability), they can pass this on to their customers. However, this is unlikely to be based on the locality where the microgrid is sited, and much more likely to be distributed across the customer base (/the network). This means that subscription models, which are generally based on receiving a better electricity price (tariff), are unlikely to work for community microgrids.

For microgrids in islanded mode, i.e. when cut off from the grid, there is a great deal of uncertainty in the current regulatory framework about how rules and accounting should apply, and also who has responsibilities for power supply and quality (the network or the asset owner). Because the microgrid is not connected to the National Energy Market in this state, it could provide something of a 'blank slate' – an opportunity for more innovative models of trading, sharing and managing electricity to be developed. However, current advice from regulators suggests it's more likely that normal arrangements would apply, i.e. electricity retail will operate as if people were connected to the NEM.

**For microgrids in islanded mode...there is a great deal of uncertainty in the current regulatory framework about how rules and accounting should apply, and also who has responsibilities for power supply and quality...**

The limitations of available contemporary business models suggest that acceptance of a microgrid needs to extend across the community, as people can't simply 'opt out', and would likely need to be based at least partly on meeting environmental and social goals and on altruism. Our workshop findings suggest that this is not out of the question, but distrust in energy retailers is a clear obstacle.

For participants, it seems that the regulatory framework is working against their needs and aspirations, particularly in relation to sharing and self-sufficiency. For many, the privatisation of the energy system seems to pit the interests of big companies against those of communities.

**For participants, it seems that the regulatory framework is working against their needs and aspirations, particularly in relation to sharing and self-sufficiency.**

There was some discussion of when electricity was a public utility, and for many it seemed that electricity as an essential service should not be connected to profit-making. However, some aspects of the current regulations that make local self-sufficiency difficult are designed to make the provision of electricity more efficient and affordable across the network. This is particularly true of the aggregation and distribution of costs and savings by network companies through mechanisms such as postage stamp pricing, which are regulated by public bodies. Regulatory reform seems crucial to enable microgrids, but it needs to be guided by system planning, as well as responding to community needs and aspirations.

Regardless of the ownership model, it seemed clear that some form of community governance is important. Energy infrastructure that is sited within communities, especially if it makes use of community energy assets and

provides new local services (like back-up power in an emergency), requires involvement of the local community in decisions about how it works, what benefits are provided, and to whom. For discrete regional communities, this involvement is probably more important than within city suburbs, because of a stronger sense of community. There are challenges with this governance, some of which are described below. For energy sector proponents, the first is building trust. However, there are also benefits, in community development and place-making and in local engagement with, and sense of connection to, the energy transition.

A clear potential benefit of tangible local energy projects is building capacity for collective action. Despite scepticism from some, other participants felt that community could work together, and seemed to be encouraged by working together in the workshops. There were examples in the communities of collective governance and some had a sense that building this capacity was important and valuable in and of itself.

**A clear potential benefit of tangible local energy projects is building capacity for collective action...community could work together...**

It seems that the appeal of local energy projects is that they galvanise people in a particular way (they are positive and constructive, they solve private and public problems). However, it is important to ask: is this the best way to build social capital? The community benefits of projects like microgrids need to be highlighted in a context in which techno-economic considerations tend to be given more weight. But the community benefits of microgrids still need to be weighed against the techno-economic benefits, costs and risks, and in the context of broader policy and market governance. This weighing up should ideally involve community deliberation, at local scales, but also at a system scale with consideration of the criteria for where microgrids should be implemented versus other options.

It should also be recognised that there is finite 'social energy' in the community and it seems most likely that a small group of committed people would drive such a project. Thus although representation (e.g. a representative committee) is an ideal, it's not clear how this can be achieved, particularly in a small community. Engaging with the wider community in an ongoing way is important, but also a major challenge.

**...there is finite 'social energy' in the community and it seems most likely that a small group of committed people would drive such a project. Thus although representation...is an ideal, it's not clear how this can be achieved, particularly in a small community.**

It was recognised that managing the project would be difficult if community wasn't consulted and represented well. This requires resources and capability. The difficulties of engaging people in preparedness planning ahead of emergencies is quite possibly echoed in the case of new infrastructure, as people might be very hard to engage in planning stages, but then highly engaged once the infrastructure is in place, particularly if they're not happy with it. This seems perverse, but is simply a function of busy, complex lives and people juggling different priorities.

# Observations about workshop process

Overall, the workshops provided an informative space for people to learn more about microgrids but also to share their experiences and views on energy resilience and planning.

Our surveys revealed that participants came to the workshops with a diversity of views and interests in microgrids, but also with a willingness to learn and share. There was some surprise expressed about the community-mindedness and good will of the group. Some people had a great deal of knowledge and experience in related topics, and literacy, both about energy and resilience, varied. This enriched the workshops, but also led to imbalance in contributions.

**Our surveys revealed that participants came to the workshops with a diversity of views and interests in microgrids, but also with a willingness to learn and share.**

Workshop participants in general were more highly educated than average, and one participant mentioned in an aside to the researchers that the process felt rather 'elite', suggesting that it didn't reflect the lived experience of many in the community, particularly those with less wealth and education. With this caveat in mind, all participants did contribute, expressed their own views, and also learned and shifted in their perspectives during the process.

Gender was quite a strong factor in the process with some men, especially those with technical knowledge, dominating. However, some women with specialist knowledge also dominated at times. In general, men tended to focus on technical and economic dimensions and how things would work. Women tended to be the stronger advocates for the environment and equity and also for education. Both men and women played informal roles in leading and facilitating group process.

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Some of the shifts in thinking included thinking more broadly about a microgrid, for example considering different types of emergencies (fire and flood) and how they bring different considerations, whether other renewables like wave power could be harnessed, how holiday homes could provide energy resources to help support community energy needs if a business model could incentivise it, how social infrastructure can be built alongside physical infrastructure, and how local energy systems can be built up to be flexible and allow responsiveness to change over time.

**Some of the shifts in thinking included thinking more broadly about a microgrid, for example considering different types of emergencies...whether other renewables like wave power could be harnessed, how holiday homes could provide energy resources to help support community energy... how social infrastructure can be built alongside physical infrastructure, and how local energy systems can be built up to be flexible and allow responsiveness to change over time.**

There were also shifts in the optimism people had for microgrids, with people questioning whether a microgrid was indeed a cost-effective way to increase resilience, and whether other measures like an emergency hub or investment in solar would be cheaper solutions, also recognising the social dimensions of resilience that a microgrid would not necessarily serve. There was also more focus on what is it the community actually needs and wants and how energy means different things to different people. One person wondered what it would be like to start from scratch and imagine what system the community needs.

An issue for this as for many engagements of this kind, was balancing information and elicitation. The challenge is to support discussions while avoiding framing or biasing the discussion. In particular, giving information about current possibilities can limit people's imagination about future possibilities, which can be a particular benefit of processes involving non-experts. In our first set of workshops, for example, we tried to stimulate some broad discussion about sharing, equity and demand reduction, which could then inform thinking about microgrid models, but participants found these topics too abstract without understanding the context.

**An issue for this as for many engagements of this kind, was balancing information and elicitation. The challenge is to support discussions while avoiding framing or biasing the discussion.**

As the workshops progressed, we took cues from the questions and information requests that participants had to tailor information to their needs. The microgrid cards we developed were used with mixed success. One group was unclear about what was required, while another group used the cards effectively to build up an understanding and explore various issues and options, suggesting that the cards were an open way to explore the possibilities of a microgrid (compared to a figure, for example), but that the exercise needed good instructions and support from facilitators.

Participants' satisfaction with the workshops was high, based on survey responses, most finding the workshops good or excellent, and agreeing that the process had helped them feel heard, learn together and explore the issues. They appreciated the openness of fellow participants to listen and collaborate and appreciated hearing other perspectives. They were positive about the organisation, design and facilitation of the workshops, and also appreciated hearing from Essential Energy about the energy system and their resilience work.

**Participants' satisfaction with the workshops was high, based on survey responses, most finding the workshops good or excellent, and agreeing that the process had helped them feel heard, learn together and explore the issues.**

In feedback, there were requests for more information, for more time for exercises, and a comment that some people dominated. One of the exercises was poorly explained. Participants indicated that they had become more interested in energy and energy choices and assets as a result of the workshops, and some were keen to explore community initiatives.

## Process – implications and future work

The shifts in views during the workshop didn't point to a strong influence of the process on the overall view that participants left with. Some became more positive, some less, suggesting that people were open to changing their minds, not in particular directions. This was something of a surprise, because the SμRF feasibility results were not positive, and suggested that microgrids were not feasible from a revenue perspective under most conditions for these communities.

This raised questions for participants, but didn't seem to dampen their overall enthusiasm. This probably reflects a general enthusiasm for technology, and renewable energy technology in particular. However, the workshops did allow participants to get clearer about what they might want from a microgrid, what conditions it would need to meet to satisfy them, and what other resilience options and measures they might draw on. In comparison to interviews, many of the same themes emerged, including priorities such as equity, sharing, local control and affordability and an interest in education about transition. Interviewees prioritised energy bills more than workshop participants seemed to.

**...the workshops did allow participants to get clearer about what they might want from a microgrid, what conditions it would need to meet to satisfy them, and what other resilience options and measures they might draw on.**

Community cohesion was not discussed by interviewees as much as workshop participants, although it was certainly raised by many. Although not surprising, this reflects the fact that different methods and approaches elicit different types of responses, in this case as a household consumer vs a community member, which bring different values to the fore.

Workshop participants spoke a lot about energy-independent emergency hubs. Interestingly, this was the option that gained least interest and support in the householder interviews, people feeling that it wouldn't sufficiently meet the community's needs for electricity in the home. In the workshops, interest in emergency hubs/energy refuges partly emerged from the growing understanding of the challenges and obstacles to larger microgrids (particularly the cost, which interviewees did not have information about). It also seemed to align with the recognition of the resilience benefits of people coming together in times of emergency.

This process sought to bring diverse voices to bear on the consideration of microgrids for resilience. However, the workshop participants were not representative of the communities, as it's impossible for even a small population to be represented in such a small group, and representation implies a stronger relationship. The process we ran in SuRF arguably moved beyond the 'usual

suspects', in bringing more women, younger people and those without an existing interest in the topic, for example. But we need to recognise the voices and people that don't show up and the imbalances in power and knowledge that do. This is true of deliberative processes and energy projects. It is inevitable and reflects the resources that people have to step up to community conversations and into leadership.

**This process sought to bring diverse voices to bear on the consideration of microgrids for resilience...The process we ran in SuRF arguably moved beyond the 'usual suspects', in bringing more women, younger people and those without an existing interest in the topic**

On the one hand, the commitment of this engaged group to equity suggests that vulnerability will be considered and addressed. On the other hand, misconceptions about people's ability to engage, participate and contribute suggested that the challenges for disadvantaged households were not well understood. The issue of representation is a vexed one; the fact that it arose in both sets of workshops seems a positive step.

These workshops were part of an early feasibility study of a technological solution that is nascent and under-developed. They shed important light on community values, aspirations and priorities. However, further work would be needed to understand these values, and particularly the trade-offs between them and how community members would judge these. Values such as equity and sharing are common but not easily defined, and may require more specific scenarios to clarify exactly what they mean to different people. In terms of trade-offs, the information about the costs of microgrids in these workshops led to some consideration of how cost balances against the goals of a microgrid: resilience, decarbonisation and equity. More detailed design work would bring these different goals into closer comparison and would require participants to weigh them up more systematically. A genuine value sensitive design process, associated with different scenarios where a microgrid could conceivably be needed, would require clearer definition of goals and values and weighting of them by participants.

**These workshops were part of an early feasibility study of a technological solution that is nascent and under-developed...shed important light on community values, aspirations and priorities. However, further work would be needed to understand these values, and particularly the trade-offs between them...**

In general, the workshops demonstrated the value of bringing ordinary people into discussions of the feasibility of new energy technologies. Such processes, in enabling community values to inform feasibility assessments at early stages, emphasise the fact that social dimensions are always present in technology and infrastructure decisions. In assessments that focus exclusively on technical and economic dimensions, social dimensions are present but implicit and based on assumptions, rather than being tested and systematically assessed. Particularly as the energy system and the climate are rapidly changing, and adaptation and resilience are critical, a more careful and thorough exploration and integration of social dimensions into energy system decisions is critically needed. We hope that this research contributes to the development of methodologies and approaches for this.

Image: Nuno Marques on Unsplash

# Conclusions

## Microgrids and community resilience

In this study, resilience has emerged as a concept that draws together social and physical dimensions of transitions. People's lived experience of resilience elevates the social needs, values and capacities of communities. Understanding the social dimensions is increasingly important as the energy system becomes more complex and distributed, involving two-way flows of energy and information to and from communities, as we transition to a lower impact system.

Resilience, though ill-defined in the contemporary energy governance regime, takes on new importance as people grapple with climate change and its sometimes catastrophic effects. There is a need to develop better ways of understanding how social, economic and technical dimensions are intertwined in energy system change.

Microgrids – like other small-scale renewable technologies – capture the imagination of communities. In providing the technical possibilities of harvesting and sharing local renewable energy within communities, they meet social desires for community empowerment, sharing and self-sufficiency.

As physical infrastructure, microgrids are a visible symbol of local climate action and communities working together. The other resilience measure that was discussed repeatedly in the workshops was an energy-independent emergency hub, which likewise provides for people's physical needs, meets social needs in a crisis, and symbolises a focal point of safety.

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Community values for microgrids tend to be focused on self-sufficiency and energy independence. There seem to be two main drivers for this. The first is a desire to build a proud, cohesive community that is doing the right thing and looking after each other, using their own resources and energy. The second is distrust of the energy system and particularly of energy companies and their profit motives, a lack of confidence that community interests are being served, and concern about disruption and instability caused by climate-related disasters, but also by regional and global events and trends affecting energy prices. These drivers can be considered two sides of the same coin: people basically want to feel more empowered locally.

These drivers seem fairly universal across the participants in this study and reflect other social research conducted in Australia. However, there was a spectrum in terms of commitment to environmental and social goals. While everyone valued environmental action and social equity, some saw microgrids as part of a shift of the existing energy system to a more sustainable basis,

providing additional local benefits which could be shared across the community. They tended to have an 'abundance' mentality about renewable energy. Others saw microgrids (and/or other resilience measures) as part of a transformation of the relationship of people with energy and environment, and an opportunity to fundamentally address inequity. They tended to have a 'sufficiency' mindset and a commitment to redistribution.

## Equity and a just energy transition

Equity is a central issue for a just energy transition. A lot of attention has been given to providing new opportunities for 'fossil fuel communities', but equity is an issue for all communities as the energy system changes. Energy is an essential commodity that can exacerbate inequity (because wealthy people can invest in ways that save money) and amplify vulnerability (because energy poverty can reduce wellbeing and opportunities), and the advent of renewable energy has, if anything, widened the gap. A just transition needs to actively address inequity, at multiple scales.

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Local, smart energy systems have the potential to address equity issues within communities in a number of ways. One way is to give those who can't have their own solar panels (renters, disadvantaged groups, apartment dwellers) access to renewable energy through community batteries or solar farms. This option still tends to assume capacities and motivations that are not universal among these groups. Another is to generate revenue through energy systems and share this with the community, via lower electricity bills or via community development initiatives. Unfortunately, these mechanisms are often limited by the lack of financial feasibility of community energy systems like microgrids, which struggle to match revenue with ongoing management and maintenance costs, given the current regulatory environment.

A more complex problem is that some of the current regulations that limit the financial success of local systems are those designed to improve the efficiency and equity of the whole network. Network service costs are not 'cost-reflective', because they are aggregated across communities with different access requirements, leading to 'postage-stamp pricing', i.e. people paying for services at the same rate whether they're part of a densely populated town or an end-of-line property. Because of this, retailers are also able to offer the same electricity tariffs across different regions. So, local energy systems might save network costs, but this saving will be distributed across the network. This may seem unfair to communities that invest in the local solution, but is fairer to communities who aren't in a position to invest in such systems or just happen not to live in a part of a system that needs the investment. This scale problem makes dealing with energy equity a fraught exercise.

A concept that may help us to work out what is fair in energy transition is 'care', particularly in relation to vulnerability. Dealing with vulnerability is an important dimension of resilience, and vulnerability will be an increasing feature of our future with climate change. Our tendency, particularly in technical systems, is to fix or eliminate vulnerability.

There are two truths about vulnerability, however. One is that it is inevitable and universal. The other is that it also has value, particularly in human terms. Vulnerability is part of how humans make connection, it creates a need for, and therefore strengthens, our living together in families and communities[32]. This does not mean we should resign ourselves to all forms of vulnerability. Much disadvantage is caused by injustice and this should be fixed. But other forms of vulnerability can't or shouldn't be fixed and require care and compassion. Thus, a care approach pays attention to vulnerability and the needs of those most at risk, and addresses them in ways that consider the situation and context. Care is feeling our way towards a better future.[30,33]

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To understand a care lens, let's consider affordability. It is assumed that improving affordability addresses equity, and energy affordability is clearly key for economically disadvantaged people. However, affordability in energy is usually code for cheap energy. It addresses affordability for the vulnerable in passing, but doesn't actually address equity and has other impacts in making energy cheap for people who can afford to overuse it. A care approach would understand affordability in much more contextual and relational ways.

Caring for vulnerability can focus our attention on non-human forms of vulnerability, of other species and ecosystems, of resources such as water and food, of climate and of human-made systems. We can apply lenses of abundance or sufficiency, depending on what is at stake and whether the weakest part of the system is neglected in meeting other needs and aspirations.

This re-framing is important in the energy system, because pure market-based systems generally don't care for vulnerability. This is why the energy system is not a pure market-based system and is highly regulated to fill this gap. However, the current regulatory framework neglects both environment and community, in its focus on efficiency and affordability, and in its framing of people as consumers. Interest in microgrids and other community energy initiatives reflects people's frustration with this failing. People want to work together to act on climate change and to build stronger communities, not to be atomised as merely customers with behaviours that need changing.

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So, can microgrids improve resilience? Resilience, unlike reliability, is not only a function of the energy system; it is a function of the energy system and the community which it serves. To improve resilience, a system innovation needs to respond to the community's situation, needs, values and aspirations. At the same time, there needs to be recognition that, particularly for a community-based solution like a microgrid, the community will be changed by the new system, and by the new arrangements, relationships, opportunities and impacts it brings. Ideally then, a microgrid will be flexible and responsive, but this flexibility and responsiveness needs to be at the community level, not just at the level of individual consumers or households. This is why it's so important that something like a microgrid is designed with or by communities, not only to meet their needs, but also to anticipate the ways in which it will sustain, build or erode the qualities of the community, including its resilience.[3]

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This study demonstrated one approach to involving community members in deliberation about local energy system changes. In concert with broader engagement to inform and gain input from the whole community, including targeted engagement of hard-to-reach groups, this approach would strengthen design and implementation of energy system initiatives, like microgrids, at local levels.

One of the important findings of the SμRF study, however, was the need to involve people in developing general design criteria for new technologies such as microgrids, and how they become a part of our energy system.[2] These criteria might include 'involving local people in infrastructure design and placement' or 'free, prior and informed consent', but they would also involve considering how benefits should be distributed fairly across the whole electricity network. This type of public participation is rarely done in a transparent and clear way when new technologies emerge in energy policy.[1]

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Our analysis affirms that there is a lack of clarity among the general public about what microgrids are, in what situation they could be useful, and the process through which any benefits should be allocated or enabled by funding, policy or regulatory change.

Gaining this clarity through broad deliberative processes that draw on diverse experiences and perspectives should underpin subsequent local engagement. The local community could then be provided with much more tangible information about options and benefits and make decisions based on this. This was a limitation of our study, in that participants were seeking to grapple with these broader issues at the same time as thinking about local issues. They were frustrated at not getting more clarity about what was on the table.

Thus, local decision-making needs to be nested in system planning at higher levels. This planning needs to consider constraints, requirements and least-cost solutions across regions, with attention to equity at a whole-of-system level. Building capacity for socio-techno-economic system planning integrated across levels is as important as building the infrastructure for transition. But like that infrastructure, it also needs to provide flexibility for communities to respond and contribute to transition in ways that empower and strengthen them. And because system planning is about shaping futures, particularly in the context of a more distributed energy system, it cannot be just a technocratic process. Energy system transformation is fundamentally a democratic project and therefore needs to embed processes of public deliberation and judgement.

We hope that this report provides some methods and insights that will contribute to building an energy system, and an energy governance system, that is responsive and caring in relation to communities and their needs, concerns and aspirations.

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Image: Eurobodalla Coast Tourism ©

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# Appendices

## Survey questions
## Workshop designs
## Coding frame
## Workshop materials, presentations

## SµRF project reports:

### Governance report:

Ransan-Cooper, H. and Lucas-Healey, K. 2024. Challenges and opportunities for delivering grid-tied microgrids for energy resilience. Professional perspectives on governance and business models. Australian National University.
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### Technical report:

Sturmberg, B. C. P., Hendricks, J. 2024. Exploring design challenges and opportunities for microgrids to improve resilience in the Eurobodalla. Australian National University.
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### Interviews report:

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### Workshops report (this report):

Russell, A.W. and Ransan-Cooper, H. 2024. Bringing community into designing resilient regional energy futures. Perspectives from the NSW South Coast. Australian National University.

### Project summary report:

Ransan-Cooper, H. Russell, A. W. and Sturmberg, B. C. P. 2024. Microgrids for Resilience? Findings from the SµRF project. Australian National University.