Can renewable energy energise remote Australian communities?

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Overview:

Remote communities in Australia are generally electrified by distributed networks relying on diesel generators. This is expensive, environmentally damaging and fails to exploit the vast solar resources available. These communities are often regarded as the 'low hanging fruit' from a renewable energy deployment perspective, though the reality is not that simple.

Governments and utilities are struggling to respond to increasing costs of supply while maintaining social objectives of energy access and availability. Solar hybrid systems have long been suggested as alternative systems that could offset rising cost of supply and reduce environmental damage while maintaining local electricity provision.

In Western Australia, the distribution utility responsible for remote networks developed a scheme designed to incentivise communities to install renewable energy to reduce cost of supply and environmental damage from diesel generation. This scheme aimed to facilitate renewable energy deployment from the "bottom up"; that is, driven and funded by communities themselves rather than by government or utilities. However, to date there has been zero deployment of renewables in remote communities across the vast and sparsely populated Kimberley region of northern Western Australia. This paper examines the viability of renewable energy in indigenous communities in the Kimberley, identifies barriers to deployment and highlights the potential benefits that can arise from increased deployment across remote communities.

Methods:

A mixed methods approach was used to evaluate the viability of renewables in isolated distributed networks in remote indigenous communities in the Kimberley region of WA. The analysis was undertaken in the context of a utility led scheme which provided an incentive of $AUD 0.50/kilowatt-hour buyback (equivalent to a feed-in tariff) for communities to install renewable energy. The analysis consists of the following methods:

- Levelised cost of energy (LCOE) was used to determine the cost of electricity for photovoltaic and thermal solar technologies of three different sizes (20kW, 90kW and 242kW (up to a maximum of ~60% of average network load over the year). LCOE was also calculated for diesel generation (under 4 alternate diesel price scenarios).
- Cost benefit analysis (CBA) was used to determine the net financial benefit from the perspectives of the community and of the utility. This enabled the motivation and benefits behind the scheme to be analysed more closely as the utility provided no capital contribution but could share any savings resulting from reductions in local cost to supply from renewable energy installation. The size of any upfront capital subsidy required for projects to break-even under the arrangement was also determined.
- Semi-structured interviews in each of the communities and with local aboriginal Corporations (community governance organisations) and other key stakeholders were undertaken. The interviews were designed to identify barriers to and expected benefits of deployment. Semi-structured interviews provided the vehicle to uncover why deployment had not yet occurred despite the substantial financial incentive (of $0.50/kWh). Information from the interviews also provided further insights into the potential for renewable energy in remote indigenous communities.

The mixed methods approach enabled deep understanding of the challenges for deploying renewable energy in circumstances where the more traditional government or utility led "top down" approach to electricity generation is not practical. Together the analyses enable assessment of the viability of renewable energy in the context of financial considerations as well as social and institutional barriers and benefits.

Results:

Remote isolated diesel powered networks in high solar radiation areas are seemingly prime candidates for renewable energy deployment due to the isolation from interconnected grids and high local cost of supply. However, to date no deployment has occurred. LCOE analysis showed that all solar technologies at the specified size were cheaper than diesel generation. Further, CBA demonstrated that financial benefits accrued to the utility for all system sizes, while the net benefit to communities was positive for fixed tilt PV and single axis PV at specified WACC and system size. Almost all solar technologies modelled (including cheapest – fixed tilt PV) required a capital subsidy where nominal WACC was 11.3%, although the size of the subsidy differed between technologies. The distribution of benefits between communities (as owners and investors) and the utility (as network operator and owner and primary beneficiary of reduced cost of supply) favoured the utility.

It was found that a range of barriers frustrated deployment of renewables in the communities. Barriers identified include: access to and understanding of information; follow through from external parties; administrative capacity and governance; access to capital; and institutional barriers. Together these barriers prevented deployment and must be overcome for renewable energy penetration to increase. However, if these challenges can be overcome, a range of direct and indirect benefits were identified for remote communities. These benefits include reduced local cost of supply (under the existing regime this primarily benefits the utility), greater resources available to communities, job opportunities and an opportunity to increase independence and community empowerment through locally driven initiatives.

Conclusion:

Deployment of renewable energy in the Kimberly region of WA requires awareness and adaptation of traditional methods of incentivising installation. The policy environment is critical in defining opportunities for renewable energy deployment. In Western Australia, the policy environment effectively prevents capital being made available by government for deployment in remote communities. Consequently, stakeholders have attempted to incentive communities themselves to drive installation, so far with limited success. Pricing signals, such as the buy-back price, can be an effective method to incentivise installation though a number of qualitative barriers must be overcome, even if just incrementally. The requirement for community driven deployment raises challenges not normally associated with the more conventional top-down government or utility driven installation approach. Deployment is likely to be led by local Aboriginal Corporations which have greater access to capital, can avoid administrative issues by installing on buildings they own, and have greater administrative resources. Household installations are unlikely, at least in the short term, until administrative barriers (eg. different government department objectives and agendas with respect to indigenous communities and capital barriers can be overcome.

Operating in remote indigenous communities requires a dynamic and adaptive approach that recognises local challenges and provides communities with a pathway to installation. All communities examined were enthusiastic about the potential of renewable energy and there is scope for substantial penetration of renewable energy without significant network augmentation. The prospect of both immediate and longer term benefits for communities resulting from deployment that enabled communities to become more independent and empowered was highly valued. However, as each stakeholder pursues their own private interests they can frustrate the achievement of broader benefits resulting from installation. The erosion of financial and social barriers to installation must be a priority for deployment to gain momentum. Installation of renewables in remote communities has the potential to help overcome many social challenges while providing direct financial benefits to the utility and communities through reduced cost of supply.