White Paper

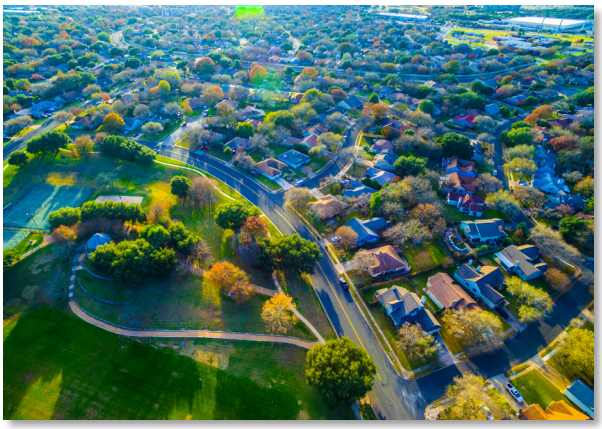
What on Earth is an "Oasis" Community Microgrid?

September 30, 2020

Hoffman POWER CONSULTING

by Steve Hoffman
Charles Carmichael

Summary



As extreme weather and wildfires increase in intensity and frequency, and the economic cost of power outages grows, local communities increasingly recognize that resilience to extreme events begins at home, at the community level – and that's where the community microgrid resides. In contrast to most existing microgrids, which each power only one electricity customer, a community microgrid can keep electricity flowing in the area it serves, thereby increasing local community resilience. An extension of this is an "oasis" community microgrid, which encompasses critical community services in the microgrid. It provides a centralized community refuge – an oasis – during an extreme event. But is it feasible today? Due primarily to various regulatory and institutional barriers, only a handful have been implemented in the U.S. This white paper examines this potential superhero of microgrids.

Table of Contents

Introduction

In the last few decades, over 2,200 commercial/industrial (C/I) energy users, universities, military bases, and public facilities around the world have implemented microgrids [1] to reduce electric power costs, incorporate clean power (decarbonize), and enhance power reliability. Today, another benefit of microgrids has emerged that further strengthens their value proposition: enhanced electric power resilience.

In recent years, the increasing intensity and frequency of wildfires and extreme weather – and the threat of cybersecurity and other attacks on the electric power infrastructure – have motivated energy users, communities, and electric utilities to enhance the resilience of electric power systems. One way to achieve this is a microgrid.

Each of the 2,200 existing microgrids provides resilience for a single entity (e.g., C/I user, university, or military base). The emerging *community* microgrid has the potential to provide all the benefits of its conventional cousin – plus resilience – for multiple entities in a community, or even an entire community. Extending this evolution, a handful of communities in the U.S. have built community microgrids as a centrally-located refuge – an "oasis" – for community residents during extreme events. These few existing *oasis community microgrids*[1] are demonstrating their potential resilience value, decarbonizing capability, and other benefits.

What do Communities Need?

To see why these communities are turning to microgrids, it is helpful to understand the following needs of communities:

- Protection of citizen health and safety
- Social and racial equity for community services across neighborhoods and socio-economic groups
- Resilient electric power infrastructure, which underpins other critical infrastructures in the community, including water and wastewater systems, emergency services, food services, healthcare services, telecommunications, and financial services

[1] A prominent use of the term "oasis" microgrid is in the direct testimony of Commonwealth Edison Vice President Joseph Svachula to the Illinois Commerce Commission in July 2017 regarding the Bronzeville Community Microgrid. Mr. Svachula testified that "The Project will not only deliver benefits to the customers it directly serves, but during a major system disruption, it will also provide an "oasis" of functioning critical infrastructure where residents of neighboring communities can also obtain food and supplies" [2].

- Business continuity for local businesses, employee retention, and business retention to protect the local economy
- Clean energy, environmental protection, and sustainability

Meeting Community Needs: Start with Resilience

How can a community meet all of these needs with a single solution? One answer may be implementation of a community microgrid, as a few early-adopting communities are attempting.

Meeting these community needs begins with improving electric power resilience to extreme events. When an extreme weather or wildfire event occurs, a microgrid can enhance resilience by operating separately (islanding) from the main grid and using generation and storage resources inside the microgrid. In this way, the microgrid continues to provide power to customers in the microgrid that otherwise may not receive it. This resilience benefit is most applicable to areas where the extreme weather or wildfire does not cause major electric power infrastructure damage, but that would lose power due to infrastructure damage in nearby areas, or even remote areas due to the interconnected nature of the main grid.

With a few exceptions, this resilience benefit of microgrids is being realized only one entity (e.g., one C/I user, one university, or one military base) at a time. Achieving this resilience benefit – and the other benefits that flow from it – at a community level may require community microgrids. In contrast to single-entity microgrids, a community microgrid can conceivably serve more than 1,000 energy users, including public facilities, homes, and businesses.

A community microgrid can be a microgrid for the people, responding to the resilience priorities of citizens in the local community, not only the needs of a specific enterprise, campus, or facility. These priorities can include some of the other community needs listed above. For example, many communities seek to increase their use of clean energy, so community microgrids can be based on renewable resources.

An Oasis: The New Community Microgrid

An *oasis community microgrid* can further extend the community microgrid to provide a centrally-located refuge for its residents during an extreme event. A community center or school in the microgrid can provide a site for residents to gain information and support, recharge mobile phones and electric vehicles (EVs), receive medications and medical treatment, obtain emergency fresh food and water, etc.

Thought leaders provide substantial support for this resilience approach (although they may not use the term "oasis"). According to Senior Fellow Richard Heinberg of the Post Carbon Institute in its 2017 "Think Resilience" video course, the community level – where an oasis community microgrid resides – is the "sweet spot" for maximizing the impact of actions to enhance resilience: "Local and state governments often have great flexibility in making public decisions, as well as significant regulatory and investment power over the issues that most affect everyday life" [3]. What's more, the COVID-19 pandemic has increasingly empowered these local governments.

According to a recent Rocky Mountain Institute article: "Cities need to make resilience a feature of their communities by investing in essential facilities that can provide direct relief during emergencies and can serve as a foundation for more expansive local microgrids in the future" [4]. At the June 1-3, 2020 *Microgrid Knowledge* Microgrid Virtual Conference [5], President of Smart Grid at Schneider Electric North America Mark Feasel explained "Our approach to critical infrastructure must pivot to a new reality in which lower energy-intensity loads must be addressed (shopping centers, elder care, food processing, banks, etc.)" [6].

What's in a Community Microgrid?

An oasis community microgrid can help meet many community needs during an extreme event by including the following within its boundaries:

- A school, community center, senior center, or other facility where residents can congregate and supplies can be distributed
- A public EV charging station (that also enables use of the storage capacity of charged vehicles to support the microgrid)
- A food warehouse or grocery store
- A hardware store (for emergency supplies)
- An urgent care facility (for medical care)
- A gas station (to maintain mobility within the microgrid)

Incorporating a community center (or a suitable substitute) as a safe haven in an oasis community microgrid can:

- **Provide temporary shelter** to warm citizens in the winter and cool them in the summer
- **Act as a distribution center** for emergency food, water, medical care, and other essential or emergency services
- **Enhance public health and safety**, especially the elderly or citizens with special needs
- **Establish a footprint** that can accommodate solar generation and EV charging
- **Accommodate large gatherings** to provide information, enable families to reconnect, and provide other community interaction
- **Build morale** during a difficult time [7]

Potential Benefits of Oasis Community Microgrids

Oasis community microgrids aim to:

- Reduce the incidence and severity of power outages
- Maintain electric power to critical loads
- Reduce electricity costs
- Expand use of clean energy
- Reduce air emissions and provide other environmental benefits
- Meet sustainability goals
- Protect human health and safety, and save lives during extreme events

An oasis community microgrid may also offer a range of additional benefits.

Demonstrate Feasibility and Value

An oasis community microgrid can demonstrate that resilience is economically and technically feasible. The first microgrid in each community can act as a demonstration project that increases awareness and can lay the groundwork for additional community microgrids in the city or county.

Foster Awareness, Understanding, and Cooperation

The project can educate all involved parties about disaster preparedness, energy efficiency, social and racial equity, and new technologies (such as EVs). The project can serve as a symbol of cooperation and collaboration among community and neighborhood leaders, utilities, universities/colleges, citizen groups, microgrid providers, investors, and local businesses. The process of developing the project – and then the functioning result of the collaboration – can demonstrate what these stakeholders can achieve when they work together for the good of the community.

Generate Revenue

Microgrids can generate revenue (or avoid costs) for citizens and business in local communities by:

- Lowering utility demand charges by decreasing peak consumption
- Leveraging macro grid pricing
- Providing ancillary services to the macro grid
- Participating in macro grid demand response programs [8].

Benefit the Macro Grid

The microgrid can provide benefits back to the macro grid, for example, by "throttling back and forth between resiliency at the site (microgrid) and sending energy back into the grid when it is most valuable [using a virtual power plant model]," as a 2019 Navigant report describes [9]. A microgrid may enable the local electric utility to redirect power and response resources to parts of its service territory outside of the oasis community microgrid or microgrids – areas that otherwise may not receive these resources due to various limitations. A microgrid can also delay or obviate the need to increase transmission line capacity into an area, thus reducing utility capital needs.

Enhance Economic Prosperity

The project can provide economic value to the community in several ways [10]:

- Enable enterprises to continue operation during power interruptions, stimulating the economy
- Encourage local businesses to remain (and expand) in the community by offering a premium power alternative that reduces costly outages and corresponding costs
- Attract high quality businesses that require premium power (e.g., data centers) to the community for similar reasons
- Stimulate the local economy through construction and operation of the microgrid

Promote Social and Racial Equity

The project can show that an endeavor to improve the resilience, safety, health, economic vitality, and quality of life of a community can be equitable across socio-economic groups. Studies show that traditionally underserved or economically disadvantaged communities, as well as the elderly and medically sensitive citizens, are most vulnerable to natural disasters [4,11]. Because microgrids can help protect against the effects of these natural disasters, microgrids can aid these communities.

Overview of Community Microgrid Barriers

However, communities and microgrid developers face the following financial, legal, and regulatory barriers to implementing community microgrids:

- **Limited availability of capital**. Particularly in light of expenditures to manage the COVID-19 pandemic, communities and energy users suffer from limited capital to invest in community microgrids. Hence, any consideration of community microgrids is likely to require a business model that eliminates community upfront investment.

- **Regulatory uncertainty**. Multiple-customer microgrids, such as community microgrids and oasis community microgrids, do not fit neatly into legacy regulatory concepts that U.S. public utility commissions established primarily for vertically-integrated utilities with centralized resources [12]. Further, these commissions do not consistently define the legal and regulatory status of community microgrids.
- **Microgrid as public utility**. In some utility service territories, nonutility microgrids producing power for sale could be considered a public utility and subject to significant state regulations, including an "obligation to serve" requirement.

  This can potentially discourage communities from embarking on community microgrid projects.[2] In some situations, nonutility microgrids cannot cross public rights-of-way without municipal permission, usually in the form of a franchise [13].
- **Uncertain utility support**. Some utilities may view nonutility-owned multiple-customer microgrids as a threat to their revenue stream. Hence, some utilities may not fully support multi-customer microgrid development.

[2] The California Public Utility Commission (CPUC) is addressing this barrier by crafting a bill (SB 1215) that exempts microgrids that will serve multiple customers from definition (or responsibilities) of an "electricity corporation." On May 26, 2020, the California Senate's Energy, Utilities and Communications Committee passed the bill [14].

- **Perceived high technical risk**. Although the technology exists today to construct and operate community microgrids, few are operating, and hence operational experience is limited. This may raise questions about the technical viability of such systems. To learn more about lessons learned from community microgrid operation, see the companion white paper "Nine Lessons Learned from Successful Community Microgrids" on the publications page of Hoffman Power Consulting.
- **Perceived high financial risk**. Because of other barriers listed above, some utilities and communities perceive community microgrid projects to be risky propositions. Electric utilities need to justify all investments that are included in their rate base, including investments in community microgrids. Communities need to justify investments to local government. Municipal utilities and rural electric cooperatives need to justify their investment to the respective governing bodies and constituents.

To learn more about community microgrid barriers and solutions, see the companion white paper "Six Barriers to Community Microgrids...and How Developers Can Surmount Them" on the publications page of Hoffman Power Consulting.

Positive Signs on the Horizon for Community Microgrids

Despite these barriers, positive signs are on the horizon for community microgrids.

FEMA Grant Program

In mid-2020, the Federal Emergency Management Agency (FEMA) boosted future development of community microgrids when it announced a $500 million grant program to fund projects that lessen disaster risk, reduce threats to public health and safety, and improve recovery efforts. FEMA indicated it would give weight to grant applications that "mitigate risk to multiple 'lifelines.'" FEMA defines community lifelines as "fundamental services in the community that, when stabilized, enable all other aspects of society to function" [15].

An oasis community microgrid can enable multiple community lifelines simultaneously, based on the community's priorities. FEMA's endorsement of community lifelines – and by extension community microgrids – presents an opportunity for communities with "shovel ready" oasis microgrids to receive priority weighting in this grant competition.

California PUC Microgrid Pilot Program

In July 2020, the California Public Utilities Commission (CPUC) staff released a proposal calling for a new microgrid pilot program, a microgrid tariff to codify the benefits of community microgrids, and other actions to overcome microgrid barriers. The CPUC staff proposed implementation of 15 community microgrids by January 31, 2022 at $15 million per microgrid. In addition, the proposal suggests that ten of these microgrids would be exempt from the legal restrictions preventing municipalities from serving buildings on adjacent properties [16].

Storm Isaias Reveals Resilience Needs

The August 2020 storm Isaias highlighted ongoing concerns about resilience along the East Coast of the U.S., yet demonstrated microgrid resilience. Despite major utility efforts to shore up resilience in the area, the storm caused widespread outages there, which were almost as extensive as those from Hurricane Sandy in 2012. For example, in the service area of Public Service Electric and Gas (New Jersey's largest utility), 700 critical facilities – including seven hospitals with no microgrid, fire and ambulance stations, gas stations, transit stations, nursing homes, and water and sewage facilities – were without power.

Conversely, microgrids that PowerSecure, Bloom Energy, and other developers operated were able to maintain power for hundreds of facilities during and after the storm [17]. This success of existing microgrids in the midst of large-scale power disruptions could provide policymakers and developers new impetus to facilitate implementation of more community microgrids along the East Coast.

With FEMA funds poised to fund microgrids that provide community lifelines, the CPUC's groundbreaking community microgrid proposals, and mounting evidence of the need for further resilience to extreme weather and wildfires, the tipping point for community microgrids may be approaching.

Conclusion

Blue Lake Rancheria PV System, California. Image Credit: Blue Lake Rancheria, US Department of Energy

A Northern California microgrid energized in 2017 made a compelling case for the value of oasis community microgrids. During public safety power shutoffs (PSPSs)[3] in October 2019, the Blue Lake Rancheria Microgrid was credited with saving multiple lives by powering hotel rooms for critically ill hospital patients who required electrical medical equipment. It powered American Red Cross safety shelter-in-place facilities. It provided residents and emergency responders with fuel, ice, internet access, handheld device charging, ATMs, refrigeration for medicines, and other services that would not otherwise have been available [18-21]. One year earlier, the microgrid had maintained power during the Shasta and Trinity County Carr Fire in the summer of 2018 [22].[4]

Providing essential services, reducing human suffering, and saving lives – that's what an oasis community microgrid is all about.

[3] PSPSs are utility attempts to prevent wildfire ignition by purposely de-energizing power systems under certain conditions and in locations with a high wildfire risk.

[4] The project was developed in collaboration or coordinated with Humboldt State University's Schatz Energy Research Center, Siemens, Idaho National Laboratory, CEC, Pacific Gas and Electric, and others.

To Learn More

To learn more, refer to the following white papers and report from Hoffman Power Consulting, available at Hoffman Power Consulting Publications:

- *Nine Lessons Learned from Successful Community Microgrids*, Steve Hoffman and Charles Carmichael, Hoffman Power Consulting, white paper, September 2020.
- *Six Barriers to Community Microgrids...and Potential Ways Developers Can Surmount Them*, Steve Hoffman and Charles Carmichael, Hoffman Power Consulting, white paper, September 2020.
- *The Oasis Community Microgrid: Reality or Mirage? A Critical Assessment of the "Big Three" Types of Microgrids*, Steve Hoffman, Charles Carmichael, and Jim Davis, Hoffman Power Consulting, special report, September 2020.
- Visit Hoffman Power Consulting for more thought leadership papers and reports on microgrids, electric power resilience, and related topics.

For More Information

To learn more or provide comments on this white paper, contact:

Steve Hoffman
President and CEO
Hoffman Power Consulting
Palo Alto, CA
408-710-1717
steve@hoffmanpowerconsulting.com
www.hoffmanpowerconsulting.com

About the Authors

Steve Hoffman is president and founder of Hoffman Power Consulting, which specializes in providing writing, content marketing, and marketing communications for stakeholders in the electric power industry. In the last decade, industry decision makers have frequently hired Steve for his specific expertise in microgrids; power industry resilience to wildfires, extreme weather, cybersecurity and physical security attacks; and related topics. Steve has authored more than 500 technical and marketing documents in the electric power industry.

Charles Carmichael, Ph.D., senior writer at Hoffman Power Consulting, brings to electric utility communications a keen understanding of regulatory, financial, environmental, reliability, resilience, and customer relations issues. For more than 30 years, he focused on utility executive communications, public policy, and government relations. Charles wrote speeches and shareholder communications for utility CEOs, energy-related white papers for presidential candidates, rate case testimony and presentations, and utility business plans.

References

1. M. Warneryd et al., "Unpacking the complexity of community microgrids: A review of institutions' roles for development of microgrids," *Renewable and Sustainable Energy Reviews*, Volume 121, April 2020, 109690.
2. Direct testimony of Joseph Svachula, Commonwealth Edison Company, before the State of Illinois, Illinois Commerce Commission, "Petition Concerning the Implementation of a Demonstration Distribution Microgrid," docket number P2017-0331, July 28, 2017.
3. Post Carbon Institute, Senior Fellow Richard Heinberg, "Think Resilience: Preparing Communities for the Rest of the 21st Century," Lesson 14 – Community Resilience in the 21st Century, 2017.
4. Madeline Tyson and Rushad Nanavatty, Rocky Mountain Institute, "Adapting to Fire: How Cities Can Enhance Resilience with Distributed Energy," March 3, 2020.
5. *Microgrid Knowledge* Virtual Conference, "Microgrids as a Recovery Tool During Social and Economic Disruption," June 1-3, 2020.
6. Elisa Wood, *Microgrid Knowledge*, "Three Key Ideas Emerging about Microgrids in an Era of Societal Disruption," quoting Mark Feasel of Schneider Electric, June 9, 2020.
7. Emily Douglas, Doug Ledbetter, and Neal Bartek, "CPUC Workshop; Order Instituting Rulemaking (OIR) on Microgrids (R. 19-09-009)," December 12, 2019.
8. AlphaStruxure, "Why Energy-as-a-Service Microgrids are the Logical Next Step for California...and the Rest of the U.S.," *Microgrid Knowledge,* special report, 2020.
9. Navigant Research, "Resiliency Microgrids: Enabling Cost-Effective Solutions to Both Mitigate Outages from Wildfire and Extreme Weather Risks and to Capture Grid Benefits," 4Q 2019.
10. Elisa Wood, *Microgrid Knowledge*, "Microgrid Benefits: Eight Ways a Microgrid Will Improve Your Operation...and the World," November 4, 2018.
11. Ian P. Davies, et al., *PLOS ONE*, "The unequal vulnerability of communities of color to wildfire," November 2, 2018.
12. Craig Lewis, "Overcoming the barriers to microgrid proliferation," Clean Coalition website, March 13, 2020.
13. NYSERDA, "Microgrids for Critical Facility Resiliency in New York State: Final Report Summary," December 2014.
14. California Senate Committee on Energy, Utilities and Communications, "SB 1215: Electricity: Microgrids, Bill Analysis," May 24, 2020.

References, continued

15. Department of Homeland Security (DHS), "Notice of Funding Opportunity (NOFO) FY 2020 Building Resilient Infrastructure and Communities," August 2020.
16. CPUC, "Administrative Law Judge's Ruling Requesting Comment on the Track 2 Microgrid and Resiliency Strategies Staff Proposal, Facilitating The Commercialization of Microgrids Pursuant to Senate Bill 1339," Rulemaking 19-090009, July 23, 2020.
17. Elisa Wood, *Microgrid Knowledge*, "What Isaias Laid Bare about the East Coast's Progress – or Lack of – on Energy Resilience," August 11, 2020.
18. REC Solar, "Blue Lake Rancheria Native American Reservation Microgrid Goes Live," press release, April 27, 2017.
19. Jana Ganion, Blue Lake Rancheria, "Amid rolling blackouts in California, a microgrid proves its resilience," Siemens website, accessed March 2020.
20. David Carter, Jim Zoellick, and Marc Marshall, Schatz Energy Research Center, Humboldt State University, 2019, "Demonstrating a Secure, Reliable, Low-Carbon Community Microgrid at the Blue Lake Rancheria," California Energy Commission, Publication Number: CEC-500- 2019–011.
21. Mike Gravely, CEC, "Lessons Learned from Energy Commission Microgrid Research Activities," presented at the CPUC R. 19-09-009 Microgrid Workshop, December 12, 2019.
22. Siemens, "A Holistic Approach for Wildfire Mitigation," 2019.

Disclaimer

Hoffman
POWER CONSULTING

HPC-WP-06-20, September 2020