

A person in climbing gear is silhouetted against a bright sunset sky as they ascend a dark rock face. The background shows a hazy mountain range and a forest of evergreen trees.

Six Barriers to Community Microgrids...

...and Potential Ways Developers Can Surmount Them

White Paper

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POWER CONSULTING



by Steve Hoffman
Charles Carmichael

Summary

To develop community microgrids, microgrid providers can potentially partner with any of the over 3,000 U.S. electric utilities and 750 community choice aggregators (CCAs), as well as over 3,000 U.S. cities, and 3,000 counties, to increase resilience to wildfires, extreme weather, cybersecurity and physical security attacks, and other threats. Designing, installing, operating, and maintaining community microgrids offers a potentially lucrative business opportunity for microgrid providers, system developers and installers, and related enterprises.

However, in many jurisdictions, various financial, institutional (regulatory and legal), and perceptual barriers present key challenges to community microgrid implementation. This white paper describes these barriers and leading practices for microgrid developers to consider for successful community microgrid implementation.



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The Opportunity: Community Microgrid Market

The potential market for community microgrids is significant. In the U.S. alone,¹ potential community microgrid project participants include the following (see Figure 1):

- **Utilities.** About 3,000 investor-owned and public power electric utilities, as well as at least 750 CCAs [1]²
- **Communities.** Over 3,000 cities and towns with a population of 10,000 or more, and over 3,000 counties [2]
- **Major Electricity Users.** Thousands of large organizations in these communities that consume large amounts of electricity, want to leverage their energy investments, and seek to boost their standing in the community



Figure 1. Potential Community Microgrid Market

This means that many collaborative projects are possible in the U.S. for a first community microgrid in each city or county. Once a city or county completes its first community microgrid and realizes its various benefits, the potential for additional community microgrids increases.

¹ This white paper focuses on community microgrids in the U.S. Much can be learned from experience outside the U.S. – the topic of a planned future paper from Hoffman Power Consulting.

² In some states, community choice aggregations (CCAs) are also known as municipal energy aggregations or community choice energy. The 2019 NREL report on CCAs lists 490 in Illinois, 120 in Ohio, 110 in Massachusetts, 15 in New Jersey, 9 in California, and 1 each in New York and Rhode Island [1].

Community microgrids offer a business opportunity for microgrid providers, enabling the following potential business benefits:

- Diversified client base
- Increased revenue
- Cross-selling of complementary value-added services, such as improved energy efficiency in buildings, distributed renewable generation, distributed storage, and electric vehicle (EV) charging.
- Strengthened business relationships with utilities, communities, and major energy users, enabling further business benefits

Overview of Community Microgrid Barriers

Despite these potential benefits, communities and electric utilities face myriad 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 may suffer from limited capital to invest in community microgrids. Hence, any consideration of community microgrids is likely to require a business model that minimizes upfront investment.
- **Regulatory uncertainty.** Multiple-customer microgrids, such as 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 [3]. 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.³ In some situations, nonutility microgrids cannot cross public rights-of-way without municipal permission, usually in the form of a franchise [4].
- **Uncertain utility support.** Some utilities may view nonutility microgrids as a threat to their revenue stream. Hence, some utilities may not fully support multi-customer microgrid development.

³ 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 [5].

- **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, many utilities and communities perceive community microgrid projects to be risky propositions. Electric utilities need to justify all investments included in their rate base, including community microgrids. Communities need to justify investments to local government. Municipal utilities and rural electric cooperatives need to justify their investment to their respective governing bodies and constituents.

Business Models to Address Limited Capital

In recent years, solutions to institutional considerations, such as ownership, financing, and other aspects of the microgrid business model, have evolved. Third-party ownership and financing, and various types of energy-as-a-service (EaaS) models are now dominating microgrid projects, rather than customer-owned or community-owned models. Such arrangements, which typically include some sort of power-purchase agreement (PPA) or pay-as-you-go model, eliminate or minimize the need for customers or communities to invest the significant capital that many microgrid projects require. Resiliency-as-a-service (RaaS) is also emerging as a means to monetize the combined energy and risk mitigation benefits of community microgrids.

A 2019 Navigant study found that, as of the second quarter of 2019, 81% of microgrid projects worldwide use an EaaS model. In contrast to a utility rate-base or owner financing approach, EaaS “simplifies operations, reduces capital cost barriers to deployment, and syncs up well with the recent trend on developing modular microgrids,” according to the report [6].



Wood Mackenzie Power & Renewables tracks 2,250 microgrids. In March 2019, it reported that more than 50% of 2018 U.S. microgrid projects were third-party-owned, and that third-party financing supported 80% of new microgrids in 2018. “Financing options for microgrid development are making microgrids a more accessible solution for price-sensitive organizations,” explained Isaac Maze-Rothstein of Wood Mackenzie. “These organizations can now tap new opportunities for demand-charge management, and are not required to allocate capital away from their core business” [7].

Schneider Electric, which has designed, built, and maintained more than 300 microgrid and controls projects in North America, agrees that advantageous business models avoid a requirement for large upfront capital investment [8]. In its 2017 white paper on microgrid business models and value chains, Schneider Electric called this a microgrid-as-a-service model. The report explains that the PPA can have an equity and debt financing structure, and that part of the structure can be volumetric and part can include a capacity charge. The authors opine that it “offers a flexible ownership structure and presents the best opportunity to capitalize on this growing market” [9]. A Microgrid Knowledge Special Report from AlphaStruxure and a Microgrid Knowledge white paper from Scale Microgrid Solutions and Shell also describe the EaaS microgrid model [10,11].

Addressing Regulatory Uncertainty

Several states are passing laws and implementing regulations to accommodate microgrids. For example, the California legislature passed a bill in 2018 directing the California Public Utilities Commission (CPUC) to develop “standards, protocols, guidelines, methods, rates, and tariffs that serve to support and reduce barriers to microgrid deployment” by December 2020 [12]. During the first half of 2020, the CPUC opted to emphasize immediate utility action to quickly implement as many utility-owned microgrids as possible.

By the end of July 2020, the CPUC staff released a set of proposals to address many of the regulatory and financial barriers to community microgrids. The “Staff Proposal for Facilitating the Commercialization of Microgrids Pursuant to Senate Bill 1339,” described these CPUC staff proposals [13]. Three important CPUC proposals and the staff recommendation for each are as follows:



- **Allow microgrids to serve critical customers on adjacent parcels.** The proposal would alter the rule prohibiting one building or premise from serving another. Utilities view this “over the fence” rule as a safety and reliability measure, but microgrid providers see it as a barrier to resilience, efficiency, and economy, preventing them from serving a nearby (but not adjacent) facility during a grid outage. The CPUC recommended an exemption from the rule for critical facilities that municipal corporations own, but only for ten microgrids within the service territories of the three California investor-owned utilities (IOUs).
- **Develop a microgrid rate schedule.** Lack of a microgrid rate schedule (tariff) leads to rate complexity (a regulatory barrier), high initial costs (a financial barrier), and high operating costs (another financial barrier). Rate complexity follows from different net metering rules for solar, solar plus storage, fuel cells alone, or various combinations of these technologies. High initial costs could prevent optimal microgrid investments that would be in the public interest. High operating costs such as departing load charges (when the utility loses customers) and standby charges could also depress investment below a socially desirable level.

The staff recommended that utilities be directed to develop a single rate schedule for any combination of technologies that meet current interconnection requirements. However, the staff also recommended against granting additional exemptions from cost responsibility surcharges beyond those already in existence, thus limiting the risk of cost shifting.

- **Develop a microgrid pilot program.** The proposal suggests that utilities be required to develop an incentive program to fund clean energy microgrids that support the “needs of vulnerable populations most likely to be impacted by grid outages.” The staff proposed a pilot program administered by the three IOUs consisting of 15 microgrids capped at \$15 million each and funded by ratepayers in the same county where the project is located.

In August 2020 comments on the staff proposals, the Local Government Sustainable Energy Coalition objected to the CPUC staff’s preference for utility construction of the 15 pilot microgrids. This Coalition, which includes 13 cities and 23 counties in California and claims to represent three-fourths of California’s population, encouraged regulators to give local communities control of the administration and funding of the pilot microgrid program [14].



As part of the same CPUC microgrid proceeding (Rulemaking 19-09-009), on September 14, 2020, the Microgrid Resources Coalition (consisting of 25 stakeholders) encouraged the commissioners to finalize a microgrid tariff for single customer microgrids by January 2021 and implement a multi-customer microgrid by mid-2021. The Coalition is suggesting that such tariffs reward microgrids for the variety of services they provide, including resilience, resource adequacy, generation, storage, and load management [15].

As California edges closer to a system more favorable to community microgrids, the legal and regulatory status of microgrids is likely to remain in flux for the near future, as well as evolve at different rates on an individual state, utility, and potentially city basis. To identify prime markets for community microgrids, prudent microgrid developers carefully investigate utility, state, and local regulations and policies.

Microgrid as Public Utility?

In general, microgrid developers attempt to avoid classification of a proposed microgrid as an electric utility, unless an electric utility is a partner in the microgrid project. If a nonutility, third-party, multiple-customer microgrid is deemed to be a distribution utility, then it may be required to assume a legal obligation to serve and be subject to other utility regulations. If a third party-owned microgrid provides service to a separate customer – transferring power through a utility’s service territory – legal and regulatory issues arise [16].



Uncertain Utility Support?

Utility-owned microgrids typically encounter barriers such as considerations of customer fairness/equity and cost justification. For example, in 2018, the Maryland Public Service Commission rejected two proposed microgrids (one from Potomac Electric Power Company and another from Baltimore Gas and Electric Company) on the “grounds of unequal distribution of benefits to ratepayers and the inability to quantify resilience benefits” [17]. On the other hand, Commonwealth Edison’s (ComEd’s) multi-customer Bronzeville Community Microgrid received approval from

the Illinois Commerce Commission (ICC), which cited “community learning benefits” [17]. The ICC approved rate base inclusion of ComEd’s \$25 million share of the microgrid, agreeing that learning from the project would benefit all customers [18]. In its study of the value of resilience for the National Association of Regulatory Utility Commissioners, Converge Strategies reviewed these same three regulatory proceedings, and concluded that the three “Commissions did not consider a specific value for resilience in their decision making and instead focused on other quantified benefits. The regulatory decisions in each of the three cases were driven by factors other than resilience” [19].

Another barrier for some utilities seeking to implement community microgrids is policies in deregulated states, in which utilities usually are not permitted to own power generation resources. Utility microgrid projects also face the efforts of private microgrid providers that oppose utility ownership of microgrids, citing the utility’s ownership of the grid, its ability to charge all ratepayers [20], and its monopoly status as unfair competition [21].

Hybrid microgrids, in which multiple parties share ownership, are sometimes preferred in states with deregulated generation, where electric distribution utilities usually cannot own power generation facilities. This arrangement has the advantage of providing an incentive for the utility to cooperate and benefit financially by earning a return on its investment in microgrid equipment. In this situation:

- The municipal, cooperative, or investor-owned utility might own the microgrid’s distribution equipment.
- A second company might own a solar array feeding the microgrid.
- A third company might own the microgrid battery storage.
- A fourth company might own the microgrid control equipment, as well as operate and maintain the microgrid.



An example of a hybrid community microgrid now moving forward is the Redwood Coast Airport Microgrid on the northern coast of California [22]. The main customer of the Redwood microgrid will be the local airport and a U.S. Coast Guard air station, and a few commercial customers will also be connected. The local utility, Pacific Gas & Electric (PG&E), will own and operate the physical microgrid and oversee its operation. The Redwood Coast Energy Authority (RCEA) will own and operate a solar facility and maintain a battery storage system and EV charging station that will take part in demand response programs.

An Easier Path to Success for Municipals and Cooperatives?

All three types of utilities (municipal, cooperative, and investor-owned) consider issues such as customer and social equity, as well as conduct cost-benefit analyses [23]. However, municipal and cooperative utilities, as well as CCAs, typically have greater flexibility, because they need to justify their investment decisions to only a local board or directors.

After reviewing dozens of applications for community microgrid planning funding (as part of the NY Prize) [24], the New York State Energy Research and Development Authority (NYSERDA) indicated that microgrids in municipal utility or cooperative service areas have “an easier pathway to success” [25]. Municipals or cooperatives already own or control the infrastructure, controls, communications networks, and interfacing elements required for a microgrid. Hence, municipals and cooperatives essentially own and operate an existing power grid within a larger interconnected utility power grid. When implementing a microgrid within a municipal or cooperative service area, the points of common connection and interaction agreements with the larger utility power grid remain unchanged. Conversely, a microgrid within an IOU service territory “must work out these agreements from scratch with an IOU that is uncertain of the role of the microgrid, concerned about encroachment upon their service territory and customer base, and is working with existing policies that predate the concept of the community microgrid and its potential benefits to the power grid” [25].

Municipal and cooperative utilities, as well as CCAs and regional transmission and planning authorities, are nonprofit entities. In contrast, shareholders expect IOUs to earn a profit – a competitive return on their investment. IOUs are permitted to earn a return only on those investments that regulators deem to be “prudent.”

Those investments are allowed into the utility's rate base, on which the utility earns a defined rate of return.

Because an IOU's earnings are directly related to its infrastructure spending that regulators approve, some observers believe this approach discourages IOUs from encouraging third-party investments in innovative technologies such as microgrids. If a business other than the utility seeks to implement a microgrid, due to the existing regulatory environment in many jurisdictions, many IOUs are likely to view this as a two-fold threat:

- The utility may lose revenue.
- The utility may not gain an addition to its rate base, on which its earnings are based [26].

These concerns can be addressed as regulators develop a microgrid tariff, which could provide the utility a revenue stream to cover use of its facilities and provision of backup power [27].

According to the NYSERDA report on feasibility assessments⁴ the most successful microgrid proposals generally have garnered the support and cooperation of local utilities. Agreements between proposed microgrids and interfacing utilities are quite complex, encompassing:

- The utility's policies
- State and utility commission regulations
- Ownership of equipment and controls
- Compensation to the utility for use of distribution equipment and operations
- Microgrid operation and maintenance arrangements
- PPAs for microgrid-generated power
- Provisions that address other legal and financial considerations [25]

⁴ NYSERDA funded a number of microgrid feasibility studies under the umbrella of the "NY Prize." Its evaluation of these feasibility studies contains useful examples of the complex components of community microgrids [28].

The DSO: A Potential Long-Term Solution?

Some companies such as S&C Electric and policy groups such as the Center for Energy Efficiency and Renewable Technologies (CEERT) argue that a solution to many of the conflicting policies that currently inhibit community microgrids is to adopt the distribution system operator (DSO) model [29,30]. Under this model, rather than remaining dependent on increasing electric sales and infrastructure investments, the utility becomes a distribution system operator (similar to a transmission system operator). According to S&C Electric, a DSO can derive “a significant portion of its revenue...from incentives, providing ancillary services, and serving as a market platform...The DSO will manage a system with better information and low market barriers, enabling energy solutions to meet customer needs while the utility profits from meeting its performance metrics” [29].

In its comments to the CPUC on PG&E’s safety practices, CEERT reiterated earlier comments in which it urged PG&E to become a DSO. CEERT argued that without this service model, PG&E (and potentially other utilities) would not be able to support truly resilient infrastructure. CEERT argues that “creating the infrastructure for truly resilient service requires distribution system operation to be a platform that welcomes and facilitates DER interconnection, encourages evolution of linked local grids that prioritize neighborhood level needs, developed in conjunction with city and county planners, and that enable all resources on the grid to transact power and grid services and to function as ‘non-wires alternatives’ to offset grid infrastructure investments” [30].



Leading Practices

Based on a review of successful (and some not implemented) community microgrids, following are leading practices for microgrid developers to consider when addressing microgrid financial, legal and regulatory barriers. Figure 2 summarizes the limitations and proposed practices.



Figure 2. Summary of Community Microgrid Barriers and Leading Practices

Limited Availability of Capital

- **Consider the EaaS model.** To address capital investment limitations of communities and individual energy users, consider employing EaaS business models.

Regulatory Uncertainty

- **Seek areas with microgrid policy clarity.** Prioritize microgrid projects in states/utility service territories with laws and regulatory requirements that provide clarity about microgrid policies.
- **Maximize likelihood of regulatory approval.** Pursue at least some community microgrid projects that offer a high probability of regulatory approval, rather than only engaging in projects that set a regulatory precedent. For example, incorporate into microgrid proposals:
 - Outside funding, including local, state, federal, or private grants
 - Public/private partnerships
 - Building and process energy efficiency and conservation [25]
- **Focus on social and racial equity.** Develop microgrid projects in traditionally underserved neighborhoods to provide social and racial equity and environmental justice, address the impact on housing affordability, and emphasize these aspects to regulators.
- **Incorporate an educational component** for elementary, high school, and college students and the public
- **Integrate environmental initiatives,** including clean energy goals, climate action plans,⁵ and other environmental and non-carbon emission benefits
- **DSO consideration.** Prioritize microgrid projects in jurisdictions considering or implementing a DSO model

Microgrid as Public Utility

- Prioritize jurisdictions that do not classify a multi-customer, non-utility microgrid as an electric utility

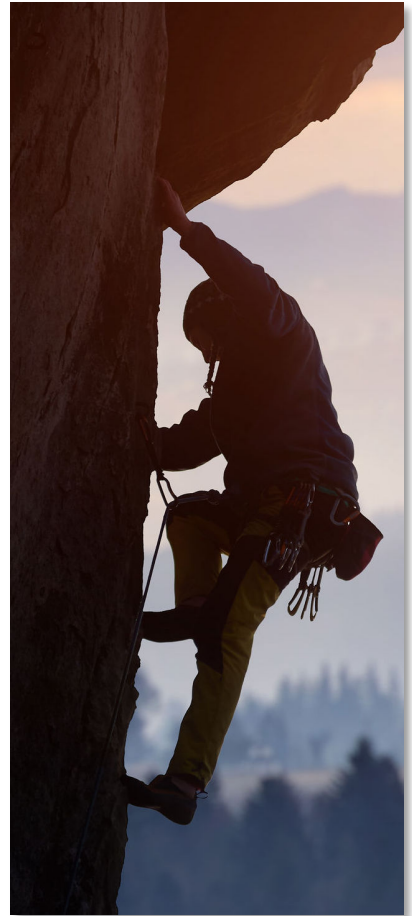
⁵ Climate action plans are “comprehensive roadmaps that outline the specific actions that an agency will undertake to reduce greenhouse gas emissions” [31].

Uncertain Utility Support

- **Garner utility involvement and support.** Work closely with the local utility early and often during project planning and implementation, in an effort to gain utility support and benefit from their expertise
- **Identify projects for municipal utilities and rural cooperatives.** Identify municipal utilities and rural electric cooperatives that are seeking microgrid partners

Perceived High Technical Risk

- **Incorporate lessons learned.** Learn from existing microgrids, use off-the-shelf technology, and incorporate best practices into new microgrid projects. 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](#).
- **Collaborate with a local university.** Locate the microgrid next to a university, preferably one with an existing campus microgrid, to demonstrate resource sharing across the two microgrids, motivate establishment of educational programs on microgrids, and physically connect to the second microgrid.



Perceived High Financial Risk

- **Share project risk and choose partners carefully.** Select value-adding partners that will share project risk, including various microgrid service and solution providers, investors, local energy users, neighborhood and community leaders, and of course the community leadership.
- **Emphasize avoided utility costs.** Describe and emphasize to regulators how the microgrid avoids other necessary expenditures or investments in T&D upgrades (i.e., non-wires alternatives)

To Learn More

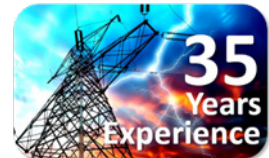
To learn more, refer to the following white papers and report from Hoffman Power Consulting, available at [Hoffman Power Consulting Publications](#):

- *Benefits but Barriers: Assessing the “Big Three” Types of Microgrids*, Steve Hoffman and Charles Carmichael, Hoffman Power Consulting, white paper, September 2020.
- *Nine Lessons Learned from Successful Community Microgrids*, Steve Hoffman and Charles Carmichael, Hoffman Power Consulting, white paper, September 2020.
- *What on Earth is an “Oasis” Community Microgrid?* 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.

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