

Sustainable Energy Incubator

Technical Assistance Resource – Microgrids

Applicable subject areas:

- Building decarbonization
- Demand management
- Energy storage
- Energy technologies
- Renewable energy

Type of support requested:

- Cost or return on investment (ROI) information
- Project design, planning, and/or implementation
- Costing information
- Sources of funding or financing

Cost or return on investment (ROI) Information:

Return on Investment (or Cost Recovery) depends on how and why the microgrid system is being deployed. These uses can be roughly grouped in two ways -

1. Microgrids and storage for clean energy reliability, quality or peak-shaving – used in situations where there is a clearly definable economic/cost motivation, such as episodic power failures or irregularities causing unacceptable costs or losses, or where normal energy use patterns incur high peak use costs that can't be mitigated by efficiency or demand response.
2. Microgrids for emergency capacity and clean back-up generation – used in situations where there may be a moral or political imperative, but defining the cost or loss associated with non-performance is subjective or difficult to quantify, such as non-interruption of power for emergency call centers or other communications systems, financial or data processing systems.

Microgrids with clean renewable energy generation and storage may be expensive on the surface but operationally cost effective (especially in the first scenario) or they may be costly, but necessary (in the second scenario). Having clearly stated priorities is essential to success.

Project Design, Planning, and/or Implementation:

You must first identify its priorities as a city. What comes first? Public Safety? Cost? Emissions reductions? Is there a priority order? Does that priority order ever change depending on circumstances?

And, how likely is a power outage and what are the consequences of a power outage?

A simple risk assessment tool like the one below might be helpful. There are two questions to ask:

- 1) What is the likelihood of something occurring (based on history, projections... do your best to get good information about this) 1 = remote chance, 2 = some chance, 3 = likely/probably will happen (you can also time bound this - for example: how likely is this to occur 'this year', 'in the next 5 years', or 'ever'?)
- 2) IF it happens, what is the severity of the impact on critical operations? 1 = little impact, 2 = some impact/recoverable, 3 = very serious impact/difficult or impossible recovery.

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Severity				High Risk
3	3	6	9	
2	2	4	6	
1	1	2	3	
Low Risk				
	1	2	3	Likelihood

The next step may be identifying the functional priorities for each of your departments and their operations. The City can put itself through a variety of ranking or rating exercises to identify each department’s critical operations that align with the overall priority order of the City. Some departments may have no critical energy loads, others may have many. If the City is interested in partnering with other regional organizations (school districts, for example), this exercise can be expanded to include those partners.

Then, each critical load can be further characterized – does power need to be continuous; can there be defined periods of up-time and down-time, are there critical times of day, would any interruption of power be harmful? What is the energy load for each critical energy need, by time, by quantity, by circumstance?

Asking questions of each department to assess all their operations will help identify the types of solutions and their scales, that are best suited to each situation.

Costing Information:

The costs of microgrids depend on too many variables and unique circumstances to be able to provide useful information in this context. There are an increasing number of references and studies available to help guide local governments in their evaluation of suitable technologies, priority locations for microgrids, and contracting vehicles for accomplishing local government objectives.

A few useful references related to microgrids are included below.

Sources of Funding or Financing:

State funding has been obtained for pilot projects through EPIC grants from the CEC. In some cases, local air pollution control districts have also contributed funds. Where microgrids are supporting emergency response capabilities, some have been successful in applying for funding from the Department of Homeland Security or perhaps the State’s Office of Emergency Services. School districts have been able to take advantage of Prop. 39 funds. There may be grant funding associated with water supply reliability, or wastewater treatment system upgrades that might – in part – apply towards energy reliability. Grant funding may or may not need to be ‘matched’ by local government resources, which is a factor to consider when applying for grants. Recent ‘water-energy nexus’ methodologies under the California Climate Action Reserve may result in carbon offsets which can be a traded commodity. The applicability of the methodology and the value of any resulting carbon offsets as a result of the implementation of a clean energy microgrid is too situation-specific to guess at a cost/value proposition.

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Recently, funding concepts resembling Power Purchase Agreements (PPAs) have surfaced. This “Energy as a Service” model may be most applicable to microgrids where storage is coupled with renewable generation for peak shaving/load shifting. Siemens is one of the organizations pioneering this approach.

Partnership Ideas: Connection to community groups, government agencies, and/or other potential project partners

In other communities, microgrid projects have included collaborations with, Fire Departments, Police Departments, School Districts, and Community College or University campuses.

Supportive agencies and organizations have included: air districts, transportation agencies, the California Energy Commission, and the investor-owned utilities.

There are many organizations providing microgrid design and integration services. A random sampling of them include:

- TerraVerde Energy
- Ameresco
- EcoMotion
- DR Microgrid
- From the MicroGrid Knowledge website, this link provides a more exhaustive list:
<https://microgridknowledge.com/category/players/>

Other Resources:

There are a variety of professional and trade associations, and research groups specializing in microgrids. The following resources may be helpful:

- This publication by an Ameresco associate <https://microgridknowledge.com/microgrid-project-get-started/>
- MicroGrid Knowledge <https://microgridknowledge.com/> is an online publication and deep resource on nation-wide microgrid policy, technology and economics.
- U.C. Irvine’s APEP program provides many useful examples, and an annual conference:
<http://www.apep.uci.edu/>
- This resource includes a description of the UC San Diego campus microgrid and has a collection of other microgrid examples: <https://building-microgrid.lbl.gov/ucsd>
- The California Energy Commission (CEC) has provided many EPIC grant awards to projects deploying microgrids. The CEC has also published the following helpful resources:
 - <https://www.energy.ca.gov/2018publications/CEC-500.../CEC-500-2018-022.pdf>
 - <https://www.energy.ca.gov/research/microgrid/documents/index.html>
- Greentech Media has also published an assessment of the various EPIC funded microgrids:
<https://www.greentechmedia.com/articles/read/lessons-learned-from-californias-pioneering-microgrids>