Department of Health Care Access and Information

Advisory Guide Series

A7

MICROGRIDS FOR HEALTH CARE FACILITIES

FOR HOSPITALS, ACUTE PSYCHIATRIC, SKILLED NURSING FACILITIES, INTERMEDIATE CARE FACILITIES AND CLINICS [OSHPD 1, 2, 3 & 5]

Office of Statewide Hospital Planning and Development

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INTRODUCTION

The California Department of Health Care Access and Information (HCAI), Office of Statewide Hospital Planning and Development (OSHPD), has developed the *Advisory Guide series* to assist owners, architects, engineers, and contractors understand the process of designing, submitting, and obtaining approval to build health care projects under HCAI jurisdiction. *Advisory Guide A7* has been developed to assist users in understanding what it will take to obtain necessary clearances, plan approvals, building permits, and permits to operate from the authorities having jurisdiction for Health Care Microgrid projects. It identifies the jurisdictional regulations, standards, and Title 24 requirements that need to be addressed for a code compliant Health Care Microgrid design. However, the advisory guide does not address the ideal size and configuration of microgrid components that should be selected or provide an overview of Health Care Microgrid technology. For additional information regarding Health Care Microgrid technology, please consider the documents listed in the Resources section of this guide.

The term *Health Care Microgrids* has been developed to address microgrids installed at health care facilities, which have additional requirements above and beyond traditional microgrids to ensure continuity of electrical power to support patient care. This *Advisory Guide* addresses new health care building projects that add or modify electrical systems to implement microgrids. The *Advisory Guide* addresses the different health care facility types for buildings under HCAI jurisdiction including OSHPD 1 Hospitals and OSHPD 2 Skilled Nursing and Intermediate-Care Facilities as well as OSHPD 3 Clinics which are under local jurisdictions. While Title 24 permits Health Care Microgrids (HCM) to serve as both supplemental power for normal and essential power, the implementation of HCM's as an essential electrical system (EES) on-site power source at health care facilities, has a number of challenges to consider:

- Finding energy producers and microgrid controllers that are listed and seismically certified.
- Developing robust sequence of operations and commissioning plans for these new systems.
- A method of accounting for capacity of on-site fuel storage will need to be developed as the total run time might be a summation of multiple power production/storage units that will work as a single system yet could all have different fuel storage systems.
- Dealing with multiple agencies, codes, standards, and regulations.
- Timelines needed to obtain all approvals and permits
- Coordination for all essential Overcurrent Protection Devices (OCPDs). See Policy Intent Notice PIN 70 Electrical Coordination.

While HCAI acknowledges that the Health Care Microgrid concept has considerable upside potential in the way of increased resilience, lower energy costs, and lower carbon footprints, this *Advisory Guide* gives no consideration as to the suitability for use

in a specific application, cost vs. benefit, appropriate use of materials, appearances, etc. The facility owner and/or their representative is responsible for the review all such qualities, features, and properties to ensure that their investment is beneficial and meets the facilities intended goals. HCAI recommends that experts be consulted to study and develop cost models and to make the “right” selection of products to be installed at their site to best meet their particular needs and goals. If a facility owner and/or their representative plan to pursue a microgrid installation, below is a list of items that HCAI recommends considering in developing the base microgrid design parameters.

- What does the load profile look like? What are the facilities annual energy costs? What utility rates apply for energy consumption throughout the day, throughout the year?
- What goals does the owner want to accomplish with a microgrid? Sustainability goals? Improved resilience? Energy costs savings? These should be ranked with target ranges for each.
- Is the plan to use the microgrid to parallel with the utility? Have island mode capabilities? To be code mandated emergency power sources for your site?
- Are there any government funding opportunities to pursue? Tax rebates etc.
- What site constraints exist? Can new equipment be installed without relocating existing?
- What is the project budget?
- Will the entire microgrid be constructed as a single project, or will it be built in phases?

Defining, developing, designing and operating the microgrid with these goals in mind should result in successful projects.

HCAI welcomes partnerships that will be helpful in implementing new technologies and design concepts. HCAIs goal is to support the design and installation of HCMs at California health care facilities in a safe and code compliant manner, that do not compromise the EES power sources and distribution. If the HCM is intended to serve as the EES, it will need to be as reliable as the current technologies for EES power sources, which generally utilize diesel generators and paralleling switchgear. HCAI recommends that you contact our office for preliminary discussions to assist with planning.

Department of Health Care Access and Information (HCAI)
Office of Statewide Hospital Planning and Development (OSHPD)

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SECTION 1
CODES REFERENCES

Access is provided to the codes promulgated by HCAI through the California Building Standards Commission website (https://www.dgs.ca.gov/en/BSC/Codes) with active links to each publisher's website for read-only public access versions of the California Building Standards Code, Title 24 of the California Code of Regulations (Title 24).

Part 1, California Administrative Code (CAC)
Part 2, California Building Code, Volumes 1 and 2 (CBC)
Part 3, California Electrical Code (CEC) (Note: Accessed through the National Fire Protection Association (NFPA), however, requires the creation of a user account to view the Free Access - NFPA 70: 2022 California Electrical Code - NFPA 70 (2020 NEC®)
Part 4, California Mechanical Code (CMC)
Part 5, California Plumbing Code CPC)
Part 6, California Energy Code (CESC)
Part 9, California Fire Code (CFC)
Part 10, California Existing Building Code (CEBC)

CAN 1-0 *Enforceable Codes* identifies the version of the Title 24 that is applicable based on the date a project is submitted to HCAI.

SECTION 2
ACRONYMS AND DEFINITIONS

Acronyms and Definitions assist the user in recognizing and identifying various acronyms and terms generally used in OSHPD documents. Please refer to the Master Glossary of Acronyms and Definitions on the HCAI website at https://hcai.ca.gov/document/master-glossary-of-acronyms-and-definitions/.

Other definitions may also be found in the Title 24, California Code of Regulations, California Building Standards Code.

The following is a list of key definitions or acronyms to assist with the understanding of these terms that are used in this document:

Distributed Energy Resources (DER) – Local (on-site) sources of electricity generation, storage or services that can lower utility bills, reduce emissions and enhance system resilience. DERs may include, but not limited to, solar photovoltaic (PV) systems, wind electric systems, combined heat and power (CHP) systems, fuel cells systems, and energy storage systems (ESS).

Health Care Microgrid (HCM) – An on-site group of interconnected loads and DERs within clearly defined boundaries at a health care facility, that acts as a single controllable entity with respect to the utility.

Island Mode –The operating mode for power production equipment or microgrids that allows energy to be supplied to loads that are disconnected from an electric power production and distribution network or other primary power source. [NFPA 70:2023]

Microgrid **-** An electric power system capable of operating in island mode and capable of being interconnected to an electric power production and distribution network or other primary source while operating in interactive mode, which includes the ability to disconnect from and reconnect to a primary source and operate in island mode. [NFPA 70:2023]

SECTION 3
IMPLEMENTATION OF HEALTH CARE MICROGRIDS

The following is a list of jurisdictional regulations, various standards, and Title 24 requirements that may be applicable for the implementation of microgrids at a health care facility. The Requirements/Codes/Standards listed in the matrix below (see Figure 1) address: CARB air quality requirements; CPUC Rule 21 requirements for utility interconnection; requirements for local approval for siting of equipment in regards to aesthetics and accessibility; Title 24 CBC pertaining to seismic certifications and restraint for equipment serving and located in HCAI facilities; Title 24 CFC requirements for the various on-site power generators and fuel systems; Title 24 CEC requirements for electrical systems for health care buildings and various on-site power generation systems; applicable NFPA standards. The NFPA Standards detail the requirements for fuel storage/delivery, health care facilities, emergency and standby power, stored electrical energy for emergency and standby use, hazardous materials code, and the installation of stationary fuel cell power systems.

	Requirements/Codes/Standards - Applicable Codes Matrix	Microgrid Power Source					
		Solar (PV's)	Wind	Fuel Cells	CHP	Energy Storage	Gas Turbine
	Codes/ Requirements						
1	CARB - California Air Resources Board - Air Quality Requirements	no	no	no	yes	no	yes
2	CPUC - California Public Utility Commission (Rule 21)	yes	yes	yes	yes	yes	yes
3	OSHPD CAN 2-0 Local Approval	yes	yes	yes	yes	yes	yes
4	CBSC - California Standards Building Code (Title 24)						
4a	CBC - California Building Code	yes	yes	yes	yes	yes	yes
4b	CFC - California Fire Code						
4b-1	1207 Electrical Energy Storage Systems	no	no	no	no	yes	no
4b-2	1205 Solar Photovoltaics Power Systems	yes	no	no	no	no	no
4b-3	1206 Stationary Fuel Cell Power Systems	no	no	yes	no	no	no
4c	CEC - California Electrical Code						
4c-1	517 Healthcare Facilities	Only if in OSHPD building and/or serving as alternate source					
4c-2	690 Solar Photovolatic (PV) Systems	yes	no	no	no	no	no
4c-3	692 Fuel Cell Systems	no	no	yes	no	no	no
4c-4	694 Wind Electric Systems	no	yes	no	no	no	no
4c-5	700 Emergency Power	Only if in OSHPD building and/or serving as alternate source					
4c-6	705 Interconnected Electric Power Production Sources	yes	yes	yes	yes	yes	yes
4d	CMC - California Mechanical Code						
4d-1	407 - Outdoor Air Intakes	no	no	no	yes	no	yes
5	NFPA - Guides and Standards						
5a	NFPA 30 - Flammable and Combustible Liquids Code	no	no	yes	yes	no	yes
5b	NFPA 37 - Stationary Combustion Engines and Gas Turbines	no	no	no	yes	no	yes
5c	NFPA 54 - National Fuel Gas Code	no	no	yes	yes	no	yes
5d	NFPA 58 - Liquid Petroleum Gas Code	no	no	yes	yes	no	yes
5e	NFPA 59A - Production/ Storage/ Handling of Liquified Natural Gas LNG	no	no	yes	yes	no	yes
5f	NFPA 99 - Healthcare Facilities Code	yes	yes	yes	yes	yes	yes
5g	NFPA 101 - Life Safety Code	yes	yes	yes	yes	yes	yes
5h	NFPA 110 - Emergency and Standby Power	no	no	yes	yes	no	yes
5i	NFPA 111 - Stored Electrical Energy Emergency and Standby Power Systems	no	no	no	no	yes	no
5j	NFPA 400 - Hazardous Materials Code	no	no	yes	yes	yes	yes
5k	NFPA 853 - Installation of Stationary Fuel Cell Power Systems	no	no	yes	no	no	no
5l	NFPA 855 - Standard for the Installation of Stationary Energy Storage Systems	no	no	no	no	yes	no
6	Advisory Guide A9 - Sitework Under OSHPD Jurisdiction	yes	yes	yes	yes	yes	yes

Figure 1. *Applicable Requirements/Codes/Standards Matrix for Health Care Microgrid Implementation*

This *Advisory Guide* will address the typical Distributed Energy Resources (DER) being used in HCMs today. This list of requirements and standards, while not exhaustive, will

provide direction to those pursuing HCMs regarding the entities to coordinate with, requirements involved and where to find those requirements relevant to their proposed design. Each project will need to identify microgrid power producers, storage units, controllers, and associated equipment that will be utilized. The HCM may be simple, using only one of the DER systems or equipment shown, or it may be more complex employing multiple, or all the systems and equipment in the matrix. Once a proposed list of components are identified for a particular microgrid, the list can be cross referenced with this matrix of requirements and standards to determine which are likely to affect the microgrid project. The project will need to be designed with sufficient detail to build and demonstrate compliance with requirements associated with the scope of work identified.

The implementation of a microgrid usually involves work that may be under multiple jurisdictions. The Advisory Guide A9 – *Sitework Under OSHPD Jurisdiction*. assists design professionals in determining what sitework is under the jurisdiction of OSHPD, what sitework is under other jurisdictions, and what sitework is under both OSHPD and other jurisdictions.

For more information regarding Interconnected Electric Power Production Sources, Energy Storage Systems, Solar Voltaic (PV) Systems, Fuel Cell Systems, Wind Electric Systems, and Direct Current Microgrid CEC requirements refer to Appendix C of Advisory Guide A8 – Electrical Guide for Health Care Facilities.

SECTION 4a
POTENTIAL OSHPD 1 (HOSPITAL) NORMAL POWER MICROGRID SOLUTION EXAMPLE

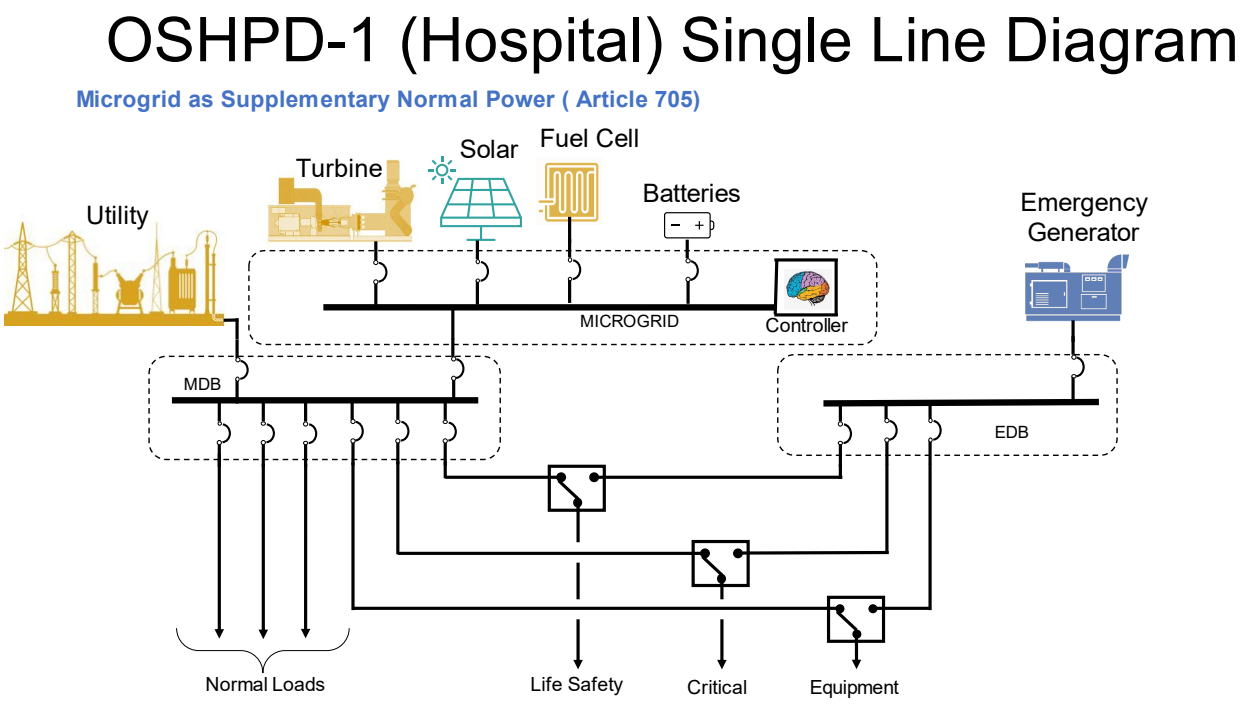


Figure 2. OSHPD 1 (Hospital) Single Line Diagram – Microgrid as Supplementary Normal Power Source

Basis of Design for this example – The proposed design is to install a microgrid as supplementary normal power source(s) at an existing or new hospital. The concept is to install DERs that are configured as a microgrid and that produce energy 24/7 to offset utility costs and provide the capability of transitioning to island mode to provide power during a utility outage. DERs for this example include a gas turbine, a solar photovoltaic (PV) system, a fuel cell, and storage batteries. The code mandated EES power requirements will be met by either new or existing emergency generator(s) and an essential electrical distribution system that meets CEC Article 517 requirements for a Type 1 EES.

Note: This is just one of many configurations that could be implemented for a hospital and is shown here for demonstration purposes only. The microgrid's DERs could be any configuration of those shown, or others not shown, up to and including a single DER serving as the microgrid.

Step 1 - Trim down the applicable Requirements/Codes/Standards Matrix based on the proposed scope of work to include just those line items that are relevant to this specific proposed project. (See Figure 3)

		Requirements/Codes/Standards - Applicable Codes Matrix	Microgrid Power Source			
			Solar (PV's)	Fuel Cells	Energy Storage	Gas Turbine
		Codes/ Requirements				
1	*	CARB - California Air Resources Board - Air Quality Requirements	no	no	no	yes
2	*	CPUC - California Public Utility Commission (Rule 21)	yes	yes	yes	yes
3	*	OSHPD CAN 2-0 Local Approval	yes	yes	yes	yes
4		CBSC - California Standards Building Code (Title 24)				
4a		CBC - California Building Code	yes	yes	yes	
4b		CFC - California Fire Code				
4b-1		1207 Electrical Energy Storage Systems	no	no	yes	no
4b-2		1205 Solar Photovoltaic Power Systems	yes	no	no	no
4b-3		1206 Stationary Fuel Cell Power Systems	no	yes	no	no
4c		CEC - California Electrical Code				
4c-1		517 Healthcare Facilities	Only if in OSHPD building and/or serving as alternate source			
4c-2		690 Solar Photovoltaic (PV) Systems	yes	no	no	no
4c-3		692 Fuel Cell Systems	no	yes	no	no
4c-6		705 Interconnected Electric Power Production Sources	yes	yes	yes	yes
4d		CMC - California Mechanical Code				
4d-1		407 - Outdoor Air Intakes	no	no	no	yes
5		NFPA - Guides and Standards				
5a		NFPA 30 - Flammable and Combustible Liquids Code	no	yes	no	yes
5b		NFPA 37 - Stationary Combustion Engines and Gas Turbines	no	no	no	yes
5c		NFPA 54 - National Fuel Gas Code	no	yes	no	yes
5d		NFPA 58 - Liquid Petroleum Gas Code	no	yes	no	yes
5e		NFPA 59A - Production/ Storage/ Handling of Liquified Natural Gas LNG	no	yes	no	yes
5f		NFPA 99 - Healthcare Facilities Code	yes	yes	yes	yes
5g		NFPA 101 - Life Safety Code	yes	yes	yes	yes
5h		NFPA 110 - Emergency and Standby Power	no	yes	no	not initially
5i		NFPA 111 - Stored Electrical Energy Emergency and Standby Power Systems	no	no	not initally	no
5j		NFPA 400 - Hazardous Materials Code	no	yes	yes	yes
5k		NFPA 853 - Installation of Stationary Fuel Cell Power Systems	no	yes	no	no
5l		NFPA 855 - Standard for the Installation of Stationary Energy Storage Systems	no	no	yes	no
6		Advisory Guide A9 - Sitework Under OSHPD Jurisdiction	yes	yes	yes	yes
Legend						
	*	contact outside agencies as early on in project as possible to help avoid delays				

Figure 3. OSHPD 1 (Hospital) Requirements/Codes/Standards Matrix – Microgrid as Supplementary Normal Power Source

Here is a summary of what will need to be addressed:

1. California Air Resources Board (CARB) – Air Quality Requirements

   CARB is the lead air quality regulatory agency for California. This agency sets state ambient air quality standards and coordinates and provides oversight for meeting federal ambient air quality standards by working closely with 35 local air districts in California to develop State Implementation Plans.

   The common types of air quality permits issued for stationary source operations can be issued at the facility or equipment level and include the following:

   Authority to Construct (ATC) - These are permits that are issued by air districts to project applicants that allow a permit holder (owner/operator) to build, construct, modify, or relocate equipment. An ATC permit can authorize on-going operations until a permit to operate is issued. [Also referred to as: Pre-construction Permit, Permit to Construct (PC), Authority to Construct (AC)]

Permit to Operate (PTO) - These permits are issued by air districts to operators once all ATC permitting requirements are met. (Also referred to as: Permit to Operate (PO), Operational Permit)

At the beginning stages of a new project the design and/or build team should access and follow directions that can be found on the California Air Resources Board (CARB) webpage, which have been developed to help the public understand how stationary source air quality permitting is conducted in California. https://ww2.arb.ca.gov/

Generally, the CARB requirements are unique to the location of the facility and the proximity to schools, hospitals and other public spaces. We recommend that the design professionals look into the details for their site early on in the process to determine what will be required to meet the air quality requirements for that specific site.

2. California Public Utility Commission (CPUC) (Rule 21)

Any interconnection with the public utility will need to be approved by the local utility provider. For projects designed to parallel with the local utility service and to have the option to operate in island mode, the local electric utility company will need to be contacted and sign off on electrical distribution design and relaying scheme to ensure that the microgrid does not back feed the local utility system during a utility outage.

3. Local Jurisdiction vs CAN 2-0 OSHPD Jurisdiction

While this is a hospital project and falls under HCAI jurisdiction, the design for outdoor equipment may be under the jurisdiction of the local building authorities. For instance, if the gas turbine, PV's, fuel cell, battery storage units, distribution equipment, and microgrid controllers are not located in or on an OSHPD building, and they are not used for essential electrical power to an OSHPD building, then they will be reviewed by the local agencies (building department, fire marshal etc.). The delineation between OSHPD jurisdiction and the local jurisdiction can be found in CAN 2-0 OSHPD Jurisdiction. Here are a few things to keep in mind:

- Typically, a city will have sound ordinances that will limit the sound level at property lines that should be researched and adhered to.
- The local fire department will need to review and sign off on battery storage systems and on-site fuel storage systems.
- The local fire department will need to review to verify that fire lanes, exiting, and all applicable regulations, referenced standards, and Title 24 requirements are not compromised by the installation of the new equipment and structures

4. California Building Standards Code, Title 24 of the California Code of Regulations

4(a) California Building Code (CBC)

All applicable sections of CBC, including but not limited to Sections 414, 442, and 705.5 (Table), Chapter 6, and other applicable sections, codes and referenced standards shall apply.

The general requirements found in Section 1003 General Means of Egress shall apply to the exit discharge. In addition to Section 1003 requirements, means of egress which provide access to, or egress from, buildings or facilities where accessibility is required shall also comply with Chapter 11B.

All applicable sections of CBC pertaining to the installation of PV panels including but not limited to Sections 602.1, 1505, 1511.9, 1607A.14.4, 1613A.3, 3111, and 3111.3.5 will need to be adhered to.

4(b) California Fire Code (CFC)

Fire apparatus access road(s) shall be provided per CFC and.
California Code of Regulations, Title 19, Division 1, Section 3.05(a) Fire Department Access and Egress. (Roads)
Roads. Required access roads from every building to a public street shall be all-weather hard surfaced (suitable for use by fire apparatus) right-of-way not less than 20 feet in width. Such right-of-way shall be unobstructed and maintained only as access to the public street.

CFC Section 508.1.6 requires emergency and standby power status indicators be located at the fire command center (where provided).

CFC Chapter 12 Energy Systems covers a wide range of systems that generate and store energy in, on, and adjacent to buildings and facilities. Ensuring appropriate criteria to address the safety of such systems in building and fire codes is an important part of protecting the public at large, building occupants, and emergency responders. The entire Chapter 12 will need to be reviewed; including but not limited to the following:

4b-1) Section 1207 Electrical Energy Storage Systems (ESS)

4b-2) Section 1205 Solar Photovoltaic Power Systems

4b-3) Section 1206 Stationary Fuel Cell Power Systems

All applicable sections in Chapter 50, Chapter 58, and other applicable codes and sections shall apply.

4(c) California Electrical Code (CEC)

4c-1) Article 517 Health Care Facilities

4c-2) Article 690 Solar Photovoltaic (PV) Systems

Provides requirements for PV systems including maximum voltage, circuit sizing, overcurrent protection, arc-fault circuit protection and rapid shutdown for PV systems on building. Grounding requirements, disconnect means and wiring methods and material requirements are detailed in this section.

4c-3) Article 692 Fuel Cell Systems – Installation requirements for fuel cell systems

4c-6) Article 705 Interconnected Electric Power Production Sources

Note: the interconnections requirements of Article 705 identify 2 options for connection of microgrids.

1) As source connections to a service and

2) As load side source connections. Article 705 includes requirements for disconnects and sizing and ratings of equipment to address the unique conditions that microgrids impose on an electrical distributions system. The approach for each individual facility should be identified early and design should follow requirements included in this code section regarding bus ratings, feeder sizing, and required disconnects.

4(d) CMC

4d-1) Section 407.2.1 Outdoor Air Intakes.

Outdoor air intakes shall be located at least 25 feet from exhaust outlets of combustion equipment stacks.

5. National Fire Protection Association (NFPA)

The NFPA publishes and maintains over 300 codes and standards, all of which are formulated to reduce or possibly eliminate the likelihood and effects of fire and other related hazards. These codes and standards are administered by more than 250 technical committees that comprise roughly 9,000 members and are adopted and used throughout the world. The following codes might apply for this project scope.

5(a) NFPA 30: Flammable and Combustible Liquids Code

5(b) NFPA 37: Installation and Use of Stationary Combustion Engines and Gas Turbines

5(c) NFPA 54: National Fuel Gas Code

5(d) NFPA 58: Liquefied Petroleum Gas Code

5(e) NFPA 59A: Production/Storage/Handling of Liquefied Natural Gas (LNG)

5(f) NFPA 99: Health Care Facilities Code

5(g) NFPA 101: Life Safety Code

5(j) NFPA 400: Hazardous Materials Code

5(k) NFPA 853: Installation of Stationary Fuel Cell Power Systems

5(l) NFPA 855: Installation of Stationary Energy Storage Systems

Step 2 – Make initial contact with CARB/local utility company/local building department and OSHPD to review preliminary design for use and housing of equipment at your site. Review relevant regulations, standards, and Title 24 requirements that will come into effect for your site and develop a plan to meet all requirements.

Step 3 - Submit plans and obtain all approvals required for permitting.

As part of the contract documents, a summary of steps should be developed which will provide a sequence of events that will occur during various utility outages. This sequence should explain the intermediate steps necessary to transition from normal operating conditions (utility available and all on-site sources of power operational) to island mode and demonstrate how emergency loads are maintained throughout this transition. A separate sequence should be developed to demonstrate how the system will transition from island mode back to normal operating conditions.

Step 4 - Construct/Commission

As part of the construction phase, a commissioning plan should be developed to demonstrate that the programmed sequence of operations function correctly. At the end of equipment installation, the commissioning phase should be performed, and results recorded to demonstrate that the system operates as intended and with acceptable power quality levels.

Step 5 – Receive final approval of construction phase.

Here are a few key considerations for this example:

a. If the gas turbine is not installed, there might not be any requirements to contact and file with CARB.

   Note: most fuel cells will have an air resources board exemption.

b. Typically, the CPUC interconnection requirements will need to be signed off by the local serving utility company (Southern California Edison, San Diego Gas and Electric, Pacific Gas and Electric, etc.). Based on the configuration of microgrids for your proposed solution, the application and acceptance process could take anywhere from 1-3 years to complete. It has been brought to HCAIs attention that this is one of the most time consuming and challenging aspects of HCM projects. In some cases, HCAI has seen owners pivot and opt to configure the microgrids without a seamless transition to island mode operation to move the jobs forward in a timely manner. HCAI recommends being proactive in scheduling, communicating, and following through with the utility companies regarding Rule 21 requirements (including commissioning of system) to avoid delays.

c. Typically, main service and distribution equipment installations have not anticipated the connection of microgrid systems. They will need to be evaluated to confirm that the service equipment overcurrent protective devices (OCPDs) and busbars ratings can accommodate a connection of a microgrid which might increase maximum overload and short circuit currents. These increases could exceed service equipment short-circuit current ratings, ampere ratings, and OCPD's Available short circuit values. Also, the necessary modifications to the existing electrical equipment may impact the current listing which might require a letter from the manufacturer accepting the modifications and/or field listing of the equipment prior to reenergization. The Electrical Engineer of Record should study these challenges thoroughly during the schematic phase of the project.

d. When connecting a microgrid to the main service equipment, the main service to the site will typically need to be temporarily deenergized. In order to meet the requirements of CEC Section 517.29 during this utility power outage, a temporary or interim design is often necessary to ensure that there are two power sources, or two sets of power sources, available for the essential electrical system loads. This process usually involves connecting rental generators to the electrical distribution system to compensate for the loss of utility power. Refer to CAN 2-108 *Temporary/Interim Structures, Tents, and Equipment Uses.*

SECTION 4b
POTENTIAL OSHPD 1 (HOSPITAL) NORMAL AND ESS POWER MICROGRID SOLUTION EXAMPLE

There might be cases where engineers/owners might will want to install Health Care Microgrids (HCMs) at existing facilities that already have existing emergency generators, these facilities might want to have the HCM serve as supplementary normal power and as code mandated EES power source in the future (i.e. when generators reach end of life). If this is desirable, then the onsite DERs should be submitted to HCAI for review and approval as a "future" EES on-site power source. This effort will need to be coordinated with the local jurisdictions, as permits from both entities are usually required.

For new construction projects, it might be desirable to avoid the installation of emergency generators and to use the microgrid as the EES on-site power source.

For both of these cases the single line diagram might look something like the single line diagram shown below.

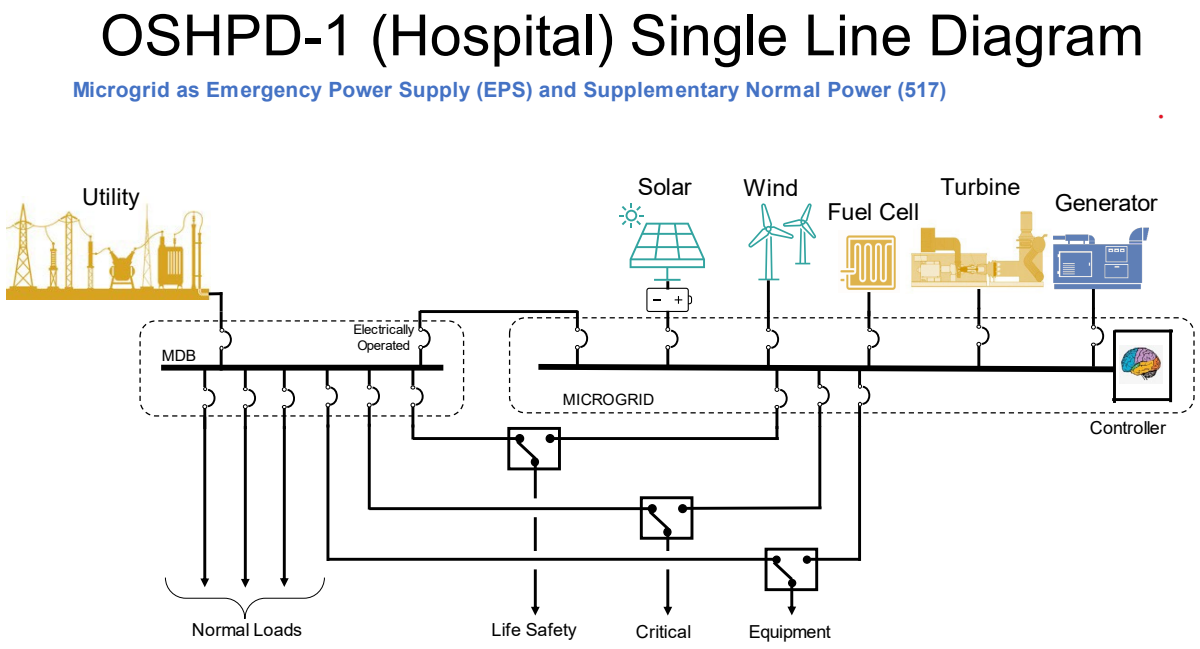


Figure 4. OSHPD 1 (Hospital) Single Line Diagram – Microgrid as Supplementary Normal Power Source and Essential Electrical System (EES) On-site Power Source

Basis of Design for this example – The proposed design is to install a microgrid as supplementary normal power source(s) and the Type 1 ESS on-site power source at an existing or new hospital. The concept is to install DERs that are configured as a microgrid and that produce energy 24/7 to offset utility costs and provide the capability of transitioning to island mode to provide power to the code mandated Type 1 essential

electrical system (ESS) during a utility outage. DERs for this example include a gas turbine, solar photovoltaic (PV)'s, a fuel cell, and storage batteries.

Note: This is just one of many configurations that could be implemented for a hospital and is shown here for demonstration purposes only. The microgrids DERs could be any configuration of those shown up to and including a single DER serving as the microgrid

In addition to the recommendations provided in Section 4a, here are some key considerations for this approach which would use the microgrid as the facility EES:

1) HCAI will need to review all DER's that will be part of the EES.
2) As required by CBC Section 1705A.14.3.1 [OSHPD 1 & 4], Special Seismic Certification (SSC) shall be required for DERs, microgrid interconnect devices, and HCM control systems used in an ESS HCM solution. Refer to the Appendix for additional information regarding OSHPD's SSC Preapproval Program (OSP).
3) Microgrid controllers, inverters, and DERs will need to be listed for their intended use as required by CEC Section 110.3 (C).
4) EES on-site power sources' locations shall meet the requirements of CBC Sections 1617A.1.40 and 2702.1.8.
5) Overcurrent protection devices shall meet the coordination requirements per PIN 70 Electrical Coordination.
6) HCMs shall meet CBC Section 2702.1.
7) DERs shall be classified as Type 10 (or better), Class X (72 hr.), Level 1 as required in NFPA 99: 6.7.1.2.1 and CEC.
8) Turbines, fuel cells, and generators must meet the requirements of NFPA 110: Emergency and Standby Power Systems.
9) 96 hours of on-site fuel supply is required for all DERs requiring fuel.
10) Energy storage systems such as storage batteries must meet the requirements of NFPA 111: Stored Electrical Energy Emergency and Standby Power Systems.
11) CEC Section 517.33(E) and (F) requirements for functions related to emergency generators that are required to be connected to the life safety branch will be enforced for DERs and distribution equipment that are part of the EES.
12) Task illumination and select receptacles at the DERs will need to be fed by the life safety branch of the EES [CEC 517.33(E)].
13) DER accessories, including fuel pumps and other accessories essential for DER operation will be fed either directly from the DERs or from the life safety branch of the EES [CEC 517.33(F)]

14) A sequence of operations shall be submitted and approved during the design phase and included in the contract documents to facilitate the commissioning requirements of NFPA 99: 6.10.7.

15) A commissioning plan as described in NFPA 99: 6.10.7.2 shall be developed by the HCM system installers or commissioning agents and be submitted to HCAI for review and approval. The commissioning plan should address functionality of the system and quality of the power produced by the microgrid and demonstrate minimum microgrid run times of 72 hours.

16) HCMs used for EES must have sufficient reliability. Refer to CAN 3-517.30(B.1)(4) *Health Care Microgrids as Type 1 Essential Electrical System (EES) Source.*

SECTION 5a
POTENTIAL OSHPD 2 (SNF) NORMAL POWER MICROGRID SOLUTION EXAMPLE

OSHPD- 2 (SNF)

Microgrid as Supplementary Normal Power

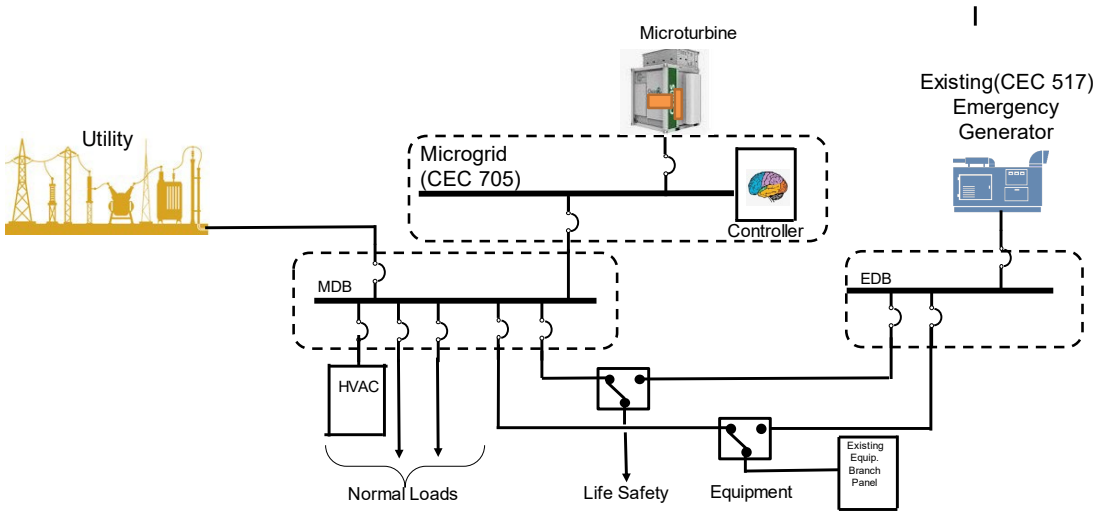


Figure 5. OSHPD 2 (SNF) Single Line Diagram – Microgrid as Supplementary Normal Power Source

Basis of Design for this example – The proposed design is to install a microgrid as supplementary normal power at an existing (or new) SNF. The concept is to install a distributed energy resource (DER) that is configured as a microgrid that can produce energy 24/7 to offset utility costs and to provide the capability of transitioning to island mode, to provide power during a utility outage. The DER for this example is a single gas turbine. The emergency power mandated by regulations, standards, and Title 24 requirements will be met by either new or existing emergency generator(s) and an essential distribution system that meets Article 517 requirements for a Type 2 EES.

Note: this is just one of many configurations that could be implemented for a SNF and is shown here for demonstration purposes only. The microgrid DERs could be any configuration of onsite power producers or storage units (microturbine, a solar PV system, fuel cell, batteries, etc.). The microgrid could be made with just one DER like in this example or multiple DERs.

Step 1 - Trim down the applicable Requirements/Codes/Standards Matrix based on the proposed scope of work to include just those codes that are associated with the proposed DER. (See Figure 6)

		Requirements/Codes/Standards - Applicable Codes Matrix	Microgrid Power Source
			Gas Turbine
		Codes/ Requirements	
1	*	CARB - California Air Resources Board - Air Quality Requirements	yes
2	*	CPUC - California Public Utility Commission (Rule 21)	yes
3		OSHPD CAN 2-0 Local Approval	yes
4		CBSC - California Standards Building Code (Title 24)	
4a		CBC - California Building Code	yes
4b		CFC - California Fire Code	yes
4c		CEC - California Electrical Code	
4c-1		517 Healthcare Facilities	yes
4c-5		700 Emergency Power	not initially
4c-6		705 Interconnected Electric Power Production Sources	yes
4d		CMC - California Mechanical Code	
4d-1		407 - Outdoor Air Intakes	yes
5		NFPA - Guides and Standards	
5a		NFPA 30 - Flammable and Combustible Liquids Code	yes
5b		NFPA 37 - Stationary Combustion Engines and Gas Turbines	yes
5c		NFPA 54 - National Fuel Gas Code	yes
5d		NFPA 58 - Liquid Petroleum Gas Code	yes
5e		NFPA 59A - Production/ Storage/ Handling of Liquified Natural Gas LNG	yes
5f		NFPA 99 - Healthcare Facilities Code	yes
5g		NFPA 101 - Life Safety Code	yes
5h		NFPA 110 - Emergency and Standby Power	not initially
5j		NFPA 400 - Hazardous Materials Code	yes
6	*	Advisory Guide A9 - Sitework Under OSHPD Jurisdiction	yes
	*	Contact outside agencies as early on in project as possible to help avoid delays	

Figure 6. OSHPD 2 (SNF) Requirements/Codes/Standards Matrix – Microgrid as Supplementary Normal Power Source

Here is a summary of what will need to be addressed:

1. California Air Resources Board (CARB) – Air Quality Requirements
   CARB is the lead air quality regulatory agency for California. This agency sets state ambient air quality standards and coordinates and provides oversight for meeting federal ambient air quality standards, including by working closely with 35 local air districts in California to develop State Implementation Plans.

   The common types of air quality permits issued for stationary source operations can be issued at the facility or equipment level and include the following:

   Authority to Construct (ATC) - These are permits that are issued by air districts to project applicants that allow a permit holder (owner/operator) to build, construct, modify, or relocate equipment. An ATC permit can authorize on-going operations until a permit to operate is issued. [Also referred to as: Pre-construction Permit, Permit to Construct (PC), Authority to Construct (AC)]

Permit to Operate (PTO) - These permits are issued by air districts to operators once all ATC permitting requirements are met. (Also referred to as: Permit to Operate (PO), Operational Permit)

At the onsite of new projects, the design and/or build team should access and follow directions that can be found on the California Air Resources Board (CARB) webpage, which has been developed to help the public understand how stationary source air quality permitting is conducted in California. https://ww2.arb.ca.gov/

Generally, the CARB requirements are unique to the location of the facility and the proximity to schools, hospitals and other public spaces. OSHPD recommends that the design professionals investigate the details for your site early in the process to determine what will be required to meet the air quality requirements for your particular site.

2. California Public Utility Commission (CPUC) (Rule 21)

   Any interconnection with the public utility will need to be approved by the local utility. For projects designed to parallel with the utility and have the option to operate in island mode, the local electric utility will need to be contacted and sign off on electrical distribution design and relaying scheme to ensure that the microgrid does not back feed the utility system.

3. Local Jurisdiction vs CAN 2-0 OSHPD Jurisdiction

   While this is a SNF project and falls under OSHPD jurisdiction, the design for outdoor equipment may be under the jurisdiction of the local building authorities. For instance, if the gas turbine, PV's fuel cell, battery storage units, distribution equipment and microgrid controllers are not located in OSHPD buildings and are not used for essential electrical power, then they could be reviewed by the local building department. Here are a few things to keep in mind:

   - Typically, a city will have sound ordinances that will limit the sound level at property lines that should be researched and adhered to.
   - The local fire department will need to review and sign off on on-site fuel storage systems.
   - The local fire department will need to review to verify that fire lanes, exiting, and all applicable regulations, referenced standards, and Title 24 requirements are not compromised by the installation of the new equipment and structures.

4. California Standards Building Code (CBSC) (Title 24)

   4(a) CBC

All applicable sections of CBC, including but not limited to Sections 414, 442, and 705.5 (Table), Chapter 6, and other applicable sections, codes and referenced standards shall apply.

The general requirements found in Section 1003 General Means of Egress shall apply to the exit discharge. In addition to Section 1003 requirements, means of egress, which provide access to, or egress from, buildings or facilities where accessibility is required shall also comply with Chapter 11B.

4(b) CFC

Fire apparatus access road(s) shall be provided per CFC and.
California Code of Regulations, Title 19, Division 1, Section 3.05(a) Fire Department Access and Egress. (Roads)
(a)Roads. Required access roads from every building to a public street shall be all-weather hard surfaced (suitable for use by fire apparatus) right-of-way not less than 20 feet in width. Such right-of-way shall be unobstructed and maintained only as access to the public street.

CFC Section 508.1.6 requires emergency and standby power status indicators be located at the fire command center (where provided).

All applicable sections of CFC Chapter 12, including Sections1201 and 1203. Chapter 50, Chapter 58, and other applicable codes and sections shall apply.

4(c) CEC

4c-1) Article 517 Health Care Facilities

4c-6) Article 705 Interconnected Electric Power Production Sources – Note: the interconnections requirements of Article 705 identify 2 options for connection of microgrids. 1) As source connections to a service and 2) As load side source connections. This code includes requirement for disconnects and sizing and ratings of equipment to address the unique conditions that microgrids impose on an electrical distributions system. The approach for each individual facility should be identified early and design should follow requirements included in this code section regarding bus ratings, feeder sizing and required disconnects.

4(d) CMC

4d-1) Section 407.2.1 Outdoor Air Intakes. Outdoor air intakes shall be located at least 25 feet from exhaust outlets of combustion equipment stacks.

5. National Fire Protection Association (NFPA)

The NFPA publishes and maintains over 300 codes and standards, all of which are formulated to reduce or possibly eliminate the likelihood and effects of fire and other related hazards. These codes and standards are administered by more than 250 technical committees that comprise roughly 9,000 members and are

adopted and used throughout the world. The following codes would apply for this project scope.

5(a) NFPA 30: Flammable and Combustible Liquids Code

5(b) NFPA 37: Installation and Use of Stationary Combustion Engines and Gas Turbines

5(c) NFPA 54: National Fuel Gas Code

5(d) NFPA 58: Liquefied Petroleum Gas Code

5(e) NFPA 59A: Production/Storage/Handling of Liquefied Natural Gas (LNG)

5(f) NFPA 99: Health Care Facilities Code

5(g) NFPA 101: Life Safety Code

5(j) NFPA 400: Hazardous Materials Code

Step 2 – Make initial contact with CARB/local utility company/local building department and HCAI to review preliminary design for use and housing of equipment at your site. Review relevant codes that will come into effect for your site and develop a plan of attack to meet all requirements.

Step 3- Submit plans and obtain all approvals required for permitting

As part of the contract documents, a brief summary of steps should be developed which will provide a sequence of events that will occur during various utility outages. This sequence should explain the intermediate steps necessary to transition from normal operating conditions (utility available and all on-site sources of power operational) to island mode and how emergency loads are maintained throughout this transition. A separate sequence should be developed to demonstrate how the system will transition from island mode back to normal operating conditions.

Step 4 - Construct/Commission

As part of the construction phase, a commissioning plan should be developed to demonstrate that the programmed sequence of operations function correctly. At the end of equipment installation, the commissioning phase should be performed, and results recorded to demonstrate that the system operates as intended and with acceptable power quality levels.

Step 5 – Receive final approval of construction phase.

Here are some key concepts for this example:

1) CEC 517.1(B) requires an alternate source of power to maintain safe temperatures and feed oxygen-generating devices and life saving devices during a power outage caused by a natural disaster. Therefore, the DER, microgrid interconnect device, and microgrid control system will need Special Seismic Certification. Refer to the Appendix for additional information regarding OSHPD's SSC Preapproval Program (OSP).

    a. The requirement to maintain safe temperatures which typically means that air conditioning (AC) units serving patient care areas are required to be backed up by an alternate source. Typically, AC units require a high percentage of all electrical power required to operate a SNF. Thus, they are not usually fed from a single panelboard making it challenging to refeed these units to a dedicated alternate power source. Based on these facts and the relatively small size of SNF's, some owners choose to provide an alternate power source to back up the entire facility. This would not only meet code but would exceed code with the benefit of all systems being fully operational in an unplanned power outage.

    b. The code requires that the alternate source of power continue operation for 96 hours, in the event of a utility power outage. While the natural gas fired microturbine can run on utility provided natural gas, this is not a reliable source that could be used to meet the run time requirements. One way to meet the storage requirements would be to store natural gas on-site in a code compliant manner. Another way to achieve the on-site fuel requirement would be to have a dual fuel gas turbines capable of running on natural gas and propane, and to store the propane on-site to allow 96 hrs. of operation.

SECTION 5b
POTENTIAL OSHPD 2 (SNF) NORMAL AND ESS POWER MICROGRID SOLUTION EXAMPLE

The normal power microgrid solution example in Section 5a shows a microgrid backing up the entire facility with provisions for 96 hours of on-site fuel storage and special seismic certification of the DERs and distribution equipment. This nearly matches the requirements for essential electrical system on-site power source in CEC 517.41(B.1). This means the microgrid that backs up the entire facility in the previous example could be modified to replace the emergency generator if the SNF is a non-sub-acute SNF. The new single line diagram could look something like that shown in Figure 7:

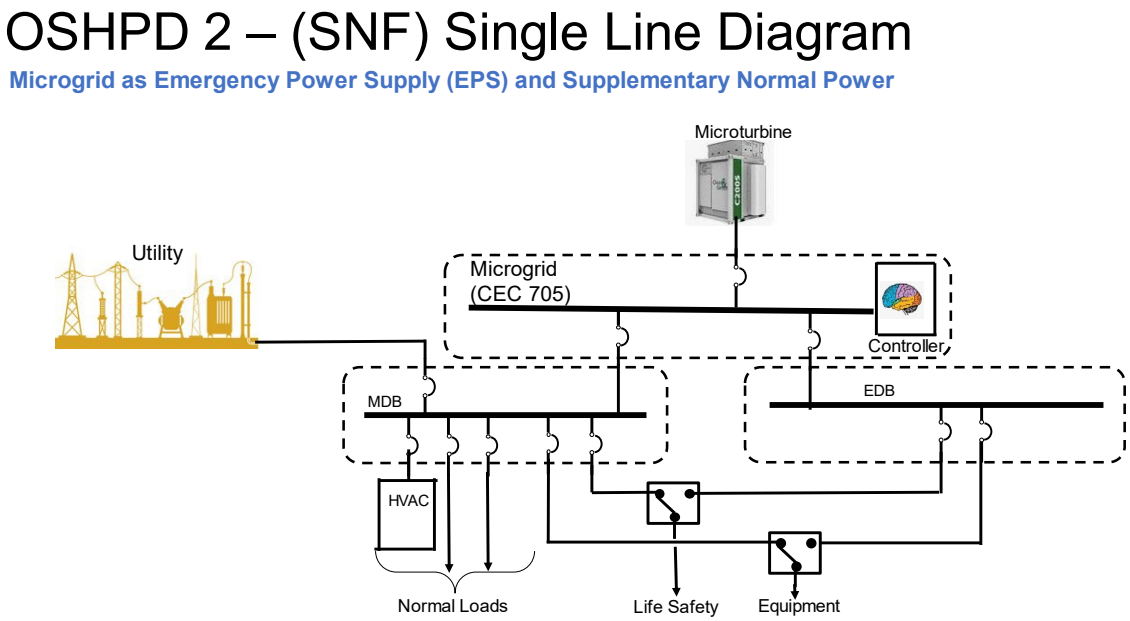


Figure 7. OSHPD 2 (SNF) Single Line Diagram – Microgrid as Supplementary Normal Power Source and Essential Electrical System (ESS) On-site Power Source

Basis of Design for this example – The proposed design is to install a microgrid as supplementary normal power and the Type 2 ESS on-site power source at an existing or new SNF. The concept is to install DER(s) that are configured as a microgrid that can produce energy 24/7 to offset utility costs and to provide the capability of transitioning to island mode to provide power to the HVAC loads and code mandated Type 2 essential electrical system (ESS) during a utility outage. The DER for this example is a single gas turbine.

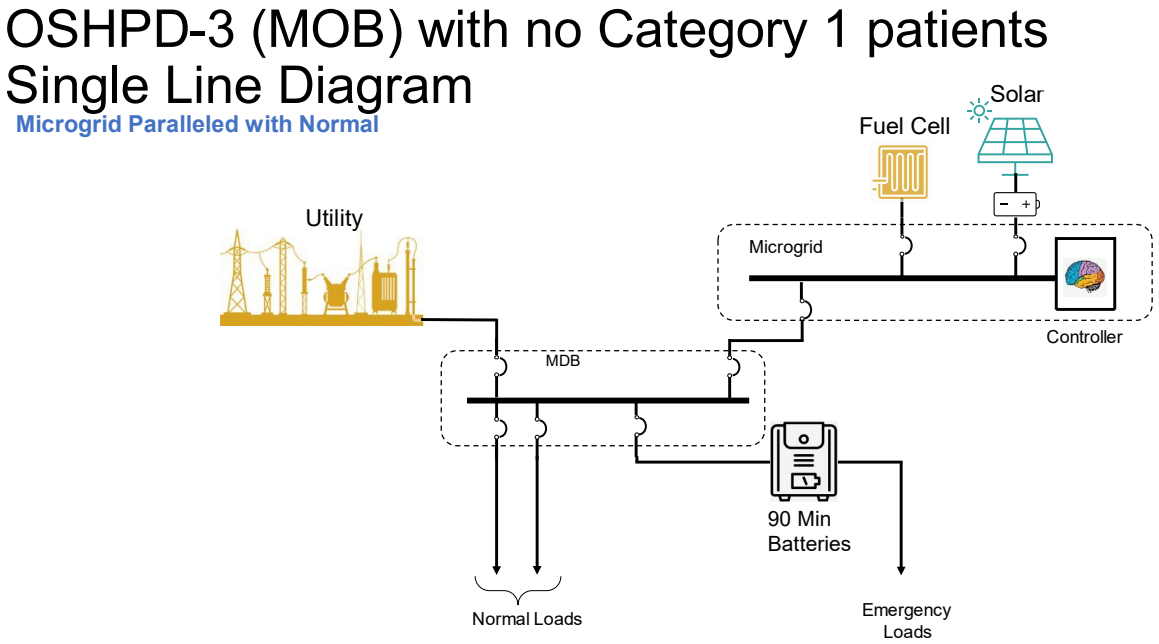
Note: this is just one of many configurations that could be implemented for a SNF and is shown here for demonstration purposes only. The microgrid DER's could be any configuration of onsite power producers or storage units (microturbine, a solar PV

system, fuel cell, batteries, etc.) or the microgrid could have just one DER like in this example.

Here are some key concepts for this approach which would use the microgrid as the facility EPS:

1) With just one unit that backs up the entire site and also serves as the EPS for 517.40 loads, the design will need to make provisions for a temporary source of power for maintenance or repair of the alternate source of power (CEC 700.3(F) either at the microgrid board or the emergency distribution board (EDB). Spare breakers are show at both locations above.
2) Task illumination and select receptacles at the microturbine will need to be fed by the life safety branch of the EES (CEC 517.43(E).
3) Microturbine accessories, including fuel pump and other accessories essential for microturbine operation will be fed either directly from the microturbine or from the life safety branch of the EES [CEC 517.43 (G)]
4) A sequence of operations shall be submitted and approved during the design phase and included in the contract documents to facilitate the commissioning requirements of NFPA 99: 6.10.7.
5) A commissioning plan as described in NFPA 99: 6.10.7.2 shall be developed by the health care microgrid system installers or commissioning agents and be submitted to Office of Statewide Hospital Planning and Development (OSHPD) for review and approval. The commissioning plan should address functionality of the system and quality of the power produced by the microgrid and demonstrate minimum microgrid run times of 96 hours in accordance with CEC 517.2(B)(2)(a).
6) Review all references listed in the normal power microgrid solution example found in Section 5a and NFPA 110, CBC Chapter 5, and all other applicable sections, codes and referenced standards.

SECTION 6
POTENTIAL OSHPD 3 CLINICS MICROGRID SOLUTION EXAMPLES



*Note: Ambulatory Surgery Clinics will need to be provided with an Emergency Generator (CEC 517.45 E.1)

Figure 8. OSHPD 3 (Clinics) Single Line Diagram – Microgrid as Supplementary Normal Power

Basis of Design for this example – The proposed design is to install a microgrid as supplementary normal power at an existing (or new) medical clinic with no critical care (CEC Category 1) patients. The concept is to install a PV system and battery storage unit(s) on-site that are configured as a microgrid and produce energy intermittently (during daylight hours) with the capability of charging or discharging batteries on a programable schedule to offset utility costs. The code mandated emergency power requirements will be met by either new or existing batteries (either individual units in egress light fixtures, illuminated exit signs and at fire alarm panel or an UL 924 listed site inverter with 90 mins of operation capabilities) that are separate from the storage batteries that are part of the microgrid.

Note: This is just one of many configurations that could be implemented for a clinic and is shown here for demonstration purposes only. The microgrids DERs could be any configuration of those shown up to and including a single DER serving as the microgrid.

Step 1 - Based on the proposed scope of work, trim down the Applicable Codes Matrix to include just those codes that are associated with the proposed DER's.

		Requirements/Codes/Standards - Applicable Codes Matrix	Microgrid Power Source	
			Solar (PV's)	Energy Storage
		Codes/ Requirements		
2	*	CPUC - California Public Utility Commission (Rule 21)	yes	yes
3		OSHPD CAN 2-0 Local Approval	yes	yes
4		CBSC - California Standards Building Code (Title 24)		
4a		CBC - California Building Code	yes	yes
4b		CFC - California Fire Code		
4b-1		1207 Electrical Energy Storage Systems	no	yes
4b-2		1205 Solar Photovoltaics Power Systems	yes	no
4c		CEC - California Electrical Code		
4c-1	**	517 Healthcare Facilities	Only if serving as ESS on-site source	
4c-2		690 Solar Photovoltaic (PV) Systems	yes	no
4c-5	***	700 Emergency Power	Only if serving as ESS on-site source	
4c-6		705 Interconnected Electric Power Production Sources	yes	yes
5		NFPA - Guides and Standards		
5g		NFPA 101 - Life Safety Code	yes	yes
5i		NFPA 111 - Stored Electrical Energy Emergency and Standby Power Systems	Only if serving as ESS on-site source	
5j		NFPA 400 - Hazardous Materials Code	no	yes
5l		NFPA 855 - Standard for the Installation of Stationary Energy Storage Systems	no	yes
6		Advisory Guide A9 - Sitework Under OSHPD Jurisdiction	yes	yes
	*	contact outside agencies as early on in project as possible to help avoid delays		
	**	If Aumbulatory Surgery Center or Category 1 patients will need to follow 517.30 for Type 1 EES and generator is required		
	***	If no Surgery or Category 1 patients, this will be an article 700 Emergency Power System		

Figure 2. OSHPD 3 (Clinic) Requirements/Codes/Standards Matrix – Microgrid as Supplementary Normal Power Source

2. California Public Utility Commission (CPUC) (Rule 21)

   Any interconnection with the public utility will need to be approved by the local utility. For projects designed to parallel with the utility and have the option to operate in island mode, the local electric utility will need to be contacted and sign off on electrical distribution design and relaying scheme, to ensure that the microgrid does not back feed the utility system.

3. OSHPD CAN 2-0 Local Approval

   OSHPD is responsible for proposing the building standards for OSHPD 3 (Clinic) building. The authority for review, permitting, and construction inspection of out-patient clinical services, primary-care clinics, and specialty clinics is typically under the jurisdiction of the local building department. Here are a few things to keep in mind:

- Local agencies will need to review and approve the aesthetics related to new PV's and equipment mounted to the building and on site.
- The local fire department will need to review and sign off on battery storage systems and on-site fuel storage systems
- The local fire department will need to review to verify that fire lanes, exiting, and all applicable regulations, referenced standards, and Title 24 requirements are not compromised by the installation of the new equipment and structures

4. California Standards Building Code, Title 24 of the California Code of Regulations

4(a) CBC

All applicable sections of CBC pertaining to the installation of PV panels including but not limited to Sections 602.1, 1505, 1511.9, 1607A.14.4, 1613A.3, 3111, and *3111.3.5.*

4(b) CFC

Fire apparatus access road(s) shall be provided per CFC and.
California Code of Regulations, Title 19, Division 1, Section 3.05(a) Fire Department Access and Egress. (Roads)
(a)Roads. Required access roads from every building to a public street shall be all-weather hard surfaced (suitable for use by fire apparatus) right-of-way not less than 20 feet in width. Such right-of-way shall be unobstructed and maintained only as access to the public street.

Chapter 12 Energy Systems covers a wide range of systems that generate and store energy in, on, and adjacent to buildings and facilities. Ensuring appropriate criteria to address the safety of such systems in building and fire codes is an important part of protecting the public at large, building occupants, and emergency responders. The entire Chapter 12 will need to be reviewed; in particular, here are a few sections that will apply.

4b-1) Section 1207 Electrical Energy Storage Systems (ESS)

4b-2) 1 Section 205 Solar Photovoltaic Power System

4(c) CEC

4c-1) Article 517 Healthcare Facilities

4c-2). Article 690 Solar Photovoltaic (PV) Systems

Provides requirements for PV systems including maximum voltage, circuit sizing, overcurrent protection, arch-fault circuit protection and rapid shutdown for PV systems on building. Grounding requirements, disconnect means and wiring methods and material requirements are detailed in this section.

4c-5. Article 700 Emergency Power

4c-6. Article 705 Interconnected Electric Power Production Sources

Note: the interconnections requirements of Article 705 identify 2 options for connection of microgrids.

1) As source connections to a service and

2) As load side source connections. Article 705 includes requirements for disconnects and sizing of equipment to address the unique conditions that microgrids impose on an electrical distributions system. The approach for each individual facility should be identified early and design should follow requirements included in this code section regarding bus sizing, feeder sizing, and required disconnects.

5. National Fire Protection Association (NFPA)

   The NFPA publishes and maintains over 300 codes and standards, all of which are formulated to reduce or possibly eliminate the likelihood and effects of fire and other related hazards. These codes and standards are administered by more than 250 technical committees that comprise roughly 9,000 members and are adopted and used throughout the world. The following codes would apply for this project scope.

   5(g) NFPA 101: Life Safety Code

   5(i) NFPA 111: Stored Electrical Energy Emergency and Standby Power Systems

   5(j) NFPA 400: Hazardous Materials Code

   5(l) NFPA 855: Standard for the Installation of Stationary Energy Storage Systems

Step 2 – Make initial contact with local utility company/local building department to review preliminary design for use and housing of equipment at your site. Review relevant regulations, standards, and Title 24 requirements that will come into effect for your site and develop a plan to meet all requirements.

Step 3- Submit plans and obtain all approvals required for permitting

As part of the contract documents, a summary of steps should be developed which will provide a sequence of events that will occur as related to the microgrid. This summary would describe when batteries will charge and discharge, power flow from the PV's (i.e., to serve building loads, or to charge batteries) and how the microgrid will react to various utility outages. This sequence should explain the steps necessary to transition from normal operating conditions (utility available and all on-site sources of power operational and available) to island mode if this feature will be provided. A separate sequence should be developed to demonstrate how the system will transition from island mode back to normal operating conditions if applicable.

Step 4 - Construct/Commission

As part of the construction phase, a commissioning plan should be developed to demonstrate that the programmed sequence of operations function correctly and that the power quality is acceptable. At the end of equipment installation, the commissioning phase should be performed, and results recorded to demonstrate that the system operates as intended.

Step 5 – Receive final approval of construction phase.

Here are a few key concepts for this example:

A. OSHPD 3 Clinics facilities generally have 2 classifications which have very different emergency power requirements.
    I. If no Critical Care Patient spaces and no life support equipment, then the electrical distribution system will be a standard CEC Article 700 system (i.e. typically only 90-minute batteries for egress lighting and exit signs)
    II. If a Surgery clinic, critical care spaces and/or electrical life support equipment, then the electrical distribution system will be a CEC 517.30 system with 3 branches to the essential electrical system, similar to OSHPD 1 essential electrical systems.

        Note: Per CEC Section 517.45(E.1) Ambulatory surgery clinics shall be provided with a generator with fuel sufficient for not less than 4 hours full demand operation per CEC Section 700.12(D)
B. Special seismic certification is not required for emergency power sources for OSHPD 3 (Clinics)

APPENDIX

RESOURCES

Microgrids for Health Facilities – Hospital Building Safety Board White Paper, September 24, 2021

Microgrid Program Strategy – Department of Energy, Office of Electricity White Papers:

1. *Program Vision, Objectives, and R&D Targets in 5 and 10 years*
2. *T&D Co-simulation of Microgrid Impacts and Benefits*
3. *Building Blocks for Microgrids*
4. *Microgrids as a Building Block for Future Grids*
5. *Advanced Microgrid Control and Protection*
6. *Integrated Models and Tools for Microgrid Planning and Designs with Operations*
7. *Enabling Regulatory and Business Models for Broad Microgrid Deployment*

SPECIAL SEISMIC CERTIFICATION

The CBC and ASCE/SEI 7-10 (ASCE 7) require special seismic certification for certain equipment/components in the form of a "Certificate of Compliance." This certificate is provided by manufacturers indicating that after a Design Earthquake, equipment/components shall maintain structural integrity and functionality.

To facilitate compliance with this requirement, HCAI has developed the OSHPD Special Seismic Certification Preapproval (OSP) program. This is a voluntary program, established to streamline and simplify hospital construction for facility owners, consultants, contractors, and manufacturers of equipment/components by providing a program for review and preapproval of special seismic certifications.

HCAI has developed the following PowerPoint to explain the OSP process.

OSHPD Special Certification Preapproval (OSP)

HCAI has developed PIN 55 that provides a summary of the processes and procedures for the OSP Program and generic issues related to special seismic certification.

Policy Intent Notice (PIN) 55 Special Seismic Certification Preapproval Program (OSP)