

NFPA 99 AND CMS

Changes and Implications



DISCLOSURES

- I AM A PRACTICING SURGEON, SIT ON REGULATORY BODIES FOR HEALTHCARE, AND OWN A BUSINESS THAT DEVELOPS AND BUILDS MICROGRIDS FOR COMMERCIAL FACILITIES INCLUDING HOSPITALS, CLINICS, AND SNF

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PROVISOS AND LIMITATIONS

- THE OPINIONS EXPRESSED ARE SOLELY MY OWN AND DO NOT REFLECT ANY OTHER ENTITY OR ORGANIZATION.
- THE CONTENTS OF THIS PRESENTATION INCLUDE OPINIONS AND INTERPRETATIONS THAT SHOULD NOT BE RELIED UPON TO APPLY TO A SPECIFIC PROJECT. DESIGNERS SHOULD CONSULT APPROPRIATE PROFESSIONALS AND LEGAL ADVISORS FOR SPECIFIC OPINIONS.
- NFPA 99 LANGUAGE IS STILL UNDER REVIEW AND ANY INFORMATION DISCUSSED HERE SHOULD BE CONSIDERED PRELIMINARY.

OBJECTIVES

- DEFINE ROLE, PURPOSE, AND HISTORY OF NFPA 99
- DISCUSS CHANGES SINCE 2018 WITH EMPHASIS UPON 2023 LANGUAGE
- DISCUSS CMS CATEGORICAL WAIVER AND IMPLICATIONS FOR HEALTHCARE FACILITY DESIGN AND OPERATION
- EXAMINE REAL-WORLD MICROGRID DEPLOYMENTS

OVERSIMPLIFIED CODE DISTINCTIONS

- NFPA 99: What is permissible
- NFPA 110: How to operate and maintain systems
- NFPA 70: National Electrical Code (how you safely build it)
- NOT ALWAYS IN SYNC

HISTORY OF NFPA GENERALLY

- 1980: 12 DOCUMENTS COVERING HEALTHCARE FACILITY SAFETY
+ “(1). The referenced documents were being revised independently of each other. Combining all the individual documents into one document would place all of them on the same revision cycle. (2)It would place in one unit many documents that referenced each other. (3)It would be an easier and more complete reference for the various users of the document (e.g., hospital engineers, medical personnel, designers and architects, and the various types of enforcing authorities).” **NFPA 99 Healthcare Facility Code 2018 p. 99-1**

NFPA 99 SPECIFICALLY

- NFPA 99, Health Care Facilities Code, is prepared by the Technical Committees on Electrical Systems, Fundamentals, Health Care Emergency Management and Security, Hyperbaric and Hypobaric Facilities, Mechanical Systems, Medical Equipment, and Piping Systems
- First complete document in 2002
- “3.3.51* Essential Electrical System. A system comprised of alternate sources of power and all connected distribution systems and ancillary equipment, designed to ensure continuity of electrical power to designated areas and functions of a health care facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system. (ELS)”. NFPA 99 Healthcare Facility Code 2018 p. 99-21

GENERAL ELECTRICAL SCHEMATIC

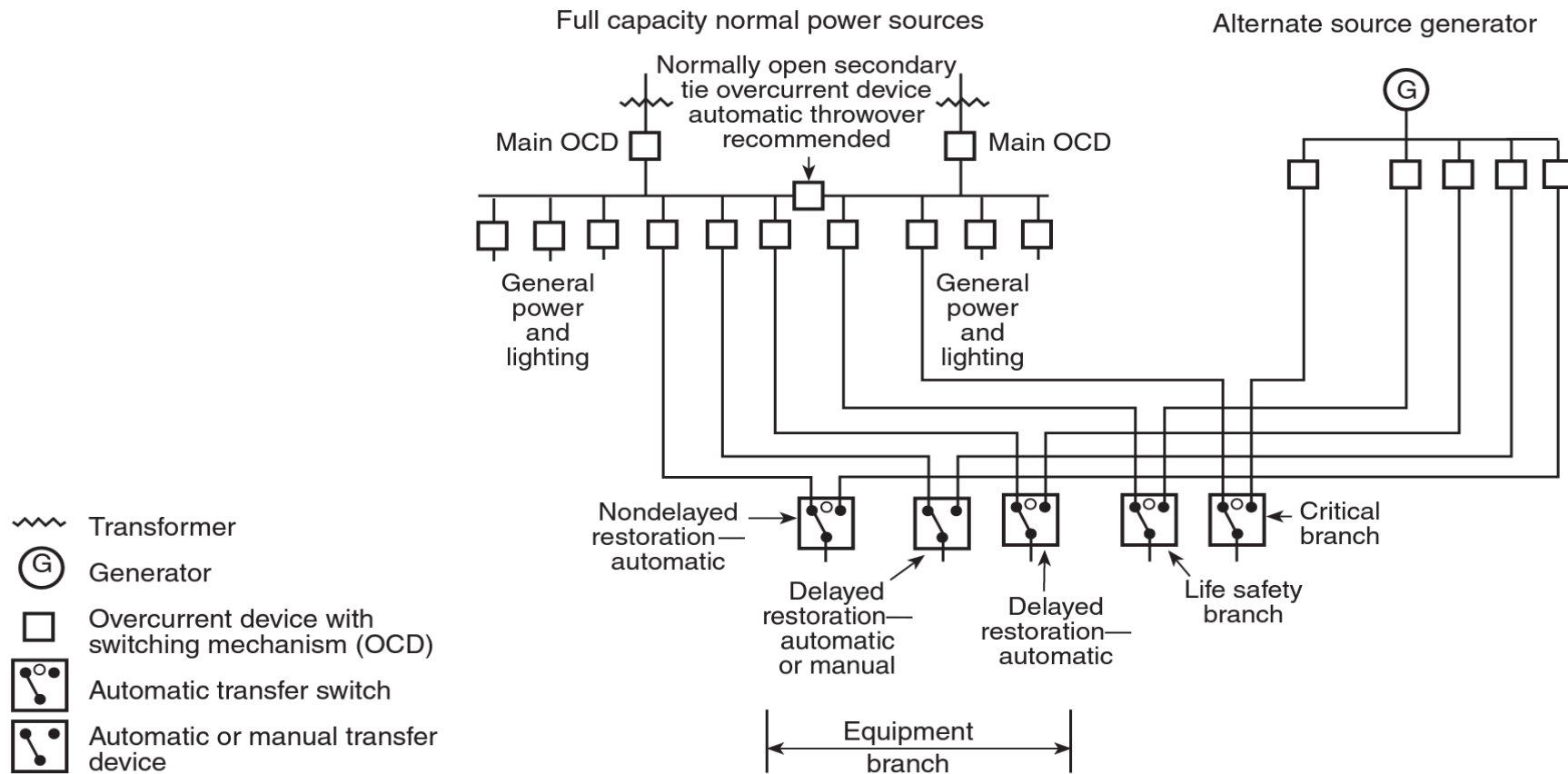


FIGURE B.6.1 Typical Hospital Wiring Arrangement.

NFPA 99
Healthcare
Facility
Code 2018
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POWER SYSTEM SPECIFICS

- “3.3.4 Alternate Power Source. One or more generator sets, or battery systems where permitted, intended to provide power during the interruption of the normal electrical service; or the public utility electrical service intended to provide power during interruption of service normally provided by the generating facilities on the premises. (ELS).” NFPA 99 Healthcare Facility Code 2018 p. 99-19
- “3.3.93 Life Safety Branch. A system of feeders and branch circuits supplying power for lighting, receptacles, and equipment essential for life safety that is automatically connected to alternate power sources by one or more transfer switches during interruption of the normal power source. (ELS)” NFPA 99 Healthcare Facility Code 2018 p. 99-23

LIFE SAFETY

- **6.7.5.1.2.4** The life safety branch shall supply power as follows: (1) Illumination of means of egress in accordance with NFPA 101 (2) Exit signs and exit directional signs in accordance with NFPA 101 (3) *Communications systems, where used for issuing instruction during emergency conditions (4) Generator set location as follows: (a) Task illumination (b) Battery charger for emergency battery-powered lighting unit(s) (c) Select receptacles at the generator set location and essential electrical system transfer switch locations (5) Elevator cab lighting, control, communications, and signal systems (6) Electrically powered doors used for building egress (7) Fire alarms and auxiliary functions of fire alarm combination systems complying with NFPA 72. **6.7.5.1.2.5** Alarm and alerting systems (other than fire alarm systems) shall be connected to the life safety branch or critical branch. **6.7.5.1.2.6** Loads dedicated to a specific generator, including the fuel transfer pump(s), ventilation fans, electrically operated louvers, controls, cooling system, and other generator accessories essential for generator operation, shall be connected to the life safety branch or the output terminals of the generator with overcurrent protective devices. **NFPA 99 Healthcare Facility Code 2018 P.80**

CRITICAL BRANCH

- **6.7.5.1.3.2** The critical branch, or a dual-fed scheme including the critical branch shall supply power for task illumination, fixed equipment, select receptacles, and select power circuits serving the following spaces and functions related to patient care: (1)Category 1 spaces where deep sedation or general anesthesia is administered, task illumination, select receptacles, and fixed equipment (2)Task illumination and select receptacles in the following: (a)Patient care spaces, including infant nurseries, selected acute nursing areas, psychiatric bed areas (omit receptacles), and ward treatment rooms (b)Medication preparation spaces (c)Pharmacy dispensing spaces (d)Nurses' stations – unless adequately lighted by corridor luminaires (3)Additional specialized patient care task illumination and receptacles, where needed (4)Nurse call systems. **NFPA 99 Healthcare Facility Code 2018**
- (5)Blood, bone, and tissue banks (6)*Telecommunications entrance facility, telecommunications equipment rooms, and telecommunication rooms and equipment in these rooms. (7)Task illumination, select receptacles, and select power circuits for the following areas: (a)Category 1 or 2 spaces with at least one duplex receptacle per patient bed location, and task illumination as required by the governing body of the health care facility (b)Angiographic labs (c)Cardiac catheterization labs (d)Coronary care units (e)Hemodialysis rooms or areas (f)Emergency room treatment areas (select) (g)Human physiology labs (h)Intensive care units (i)Postoperative recovery rooms (select) (8)Clinical IT-network equipment (9)Wireless phone and paging equipment for clinical staff communications (10)Additional task illumination, receptacles, and select power circuits needed for effective facility operation, including single-phase fractional horsepower motors, which are permitted to be connected to the critical branch. **NFPA 99 Healthcare Facility Code 2018 P. 99-80-81**

DUAL POWER RESOURCES

- **6.7.1.1* Design Considerations.** Dual sources of normal power shall not constitute an alternate source of power as described in this chapter. Δ6.7.1.2 On-Site Generator Set.
Δ6.7.1.2.1 Current-sensing devices, phase and ground, shall be selected to minimize the extent of interruption to the electrical system due to abnormal current caused by overload or short circuits, or both. Δ6.7.1.2.2 **Essential electrical systems shall have a minimum of the following two independent sources of power: a normal source generally supplying the entire electrical system and one or more alternate sources for use when the normal source is interrupted.** Δ6.7.1.2.3 Where the normal source consists of generating units on the premises, the alternate source shall be either another generating set or an external utility service. Δ6.7.1.2.4 General. Generator sets installed as an alternate source of power for essential electrical systems shall be designed to meet the requirements of such service. Δ6.7.1.2.4.1 **Type 1 and Type 2 essential electrical system power sources shall be classified as Type 10, Class X, Level 1 generator sets per NFPA 110.” NFPA 99 Healthcare Facility Code 2018 p. 99-74**

ALLOWABLE USES OF ALTERNATE POWER

- 6.7.1.2.5 Use for Essential Electrical System. Δ6.7.1.2.5.1 The generating equipment used shall be either reserved exclusively for such service or normally used for other purposes of peak demand control, internal voltage control, load relief for the external utility, or cogeneration. If normally used for such other purposes, two or more sets shall be installed, such that the maximum actual demand likely to be produced by the connected load of the life safety and critical branches, as well as medical air compressors, medical-surgical vacuum pumps, electrically operated fire pumps, jockey pumps, fuel pumps, and generator accessories, shall be met by a multiple generator system, with the largest generator set out of service (not available). The alternate source of emergency power for illumination and identification of means of egress shall be the essential electrical system. The alternate power source for fire protection signaling systems shall be the essential electrical system. NFPA 99 Healthcare Facility Code 2018 P. 99-74

OTHER USES OF ALTERNATE POWER

- 6.7.1.2.5.2 A single generator set that operates the essential electrical system shall be permitted to be part of the system supplying the other purposes as specified in 6.7.1.2.5.1, provided that any such use will not decrease the mean period between service overhauls to less than 3 years. Δ6.7.1.2.5.3*
Optional loads shall be permitted to be served by the essential electrical system generating equipment. Optional loads shall be served by their own transfer means, such that these loads shall not be transferred onto the generating equipment if the transfer will overload the generating equipment and shall be shed upon a generating equipment overload. Use of the generating equipment to serve optional loads shall not constitute “other purposes” as described in 6.7.1.2.5.1 and, therefore, shall not require multiple generator sets. **NFPA 99 Healthcare Facility Code 2018 P. 99-74**

POWER SWITCHOVER REQUIREMENTS

- 6.7.3.2 *The essential electrical system shall be served by the normal power source, except when the normal power source is interrupted or drops below a predetermined voltage level.*

Settings of the sensors shall be determined by careful study of the voltage requirements of the load. Δ6.7.3.3 Failure of the normal source shall automatically start the alternate source generator after a short delay, as described in 6.7.2.2.5.4. When the alternate power source has attained a voltage and frequency that satisfies minimum operating requirements of the essential electrical system, the load shall be connected automatically to the alternate power source. NFPA 99 Healthcare Facility Code 2018 P. 99-79

MORE SWITCHOVER

- **6.7.3.4** Upon connection of the alternate power source, the loads comprising the life safety and critical branches shall be automatically re-energized. The load comprising the equipment system shall be connected either automatically after a time delay, as described in 6.7.2.2.5.6, or nonautomatically and in such a sequential manner as not to overload the generator. **Δ6.7.3.5** When the normal power source is restored, and after a time delay, as described in 6.7.2.2.5.7, the automatic transfer switches shall disconnect the alternate source of power and connect the loads to the normal power source. The alternate power source generator set shall continue to run unloaded for a preset time delay, as described in 6.7.2.2.5.9. **Δ6.7.3.6** If the emergency power source fails and the normal power source has been restored, retransfer to the normal source of power shall be immediate, bypassing the retransfer delay timer. **Δ6.7.3.7** Nonautomatic transfer switching devices shall be restored to the normal power source as soon as possible after the return of the normal source or at the discretion of the operator. **NFPA 99 Healthcare Facility Code 2018 P.99-79**

BOTTOM-LINE STANDARDS BEFORE

2021

- **ALTERNATE SOURCE OPTIONS**

- + GENERATORS

- DIESEL OR OTHER FOSSIL FUEL
 - COGENERATION
 - 96 HOURS OF ON-SITE CAPABILITY WITH 20% EXCESS FUEL

- + BATTERIES

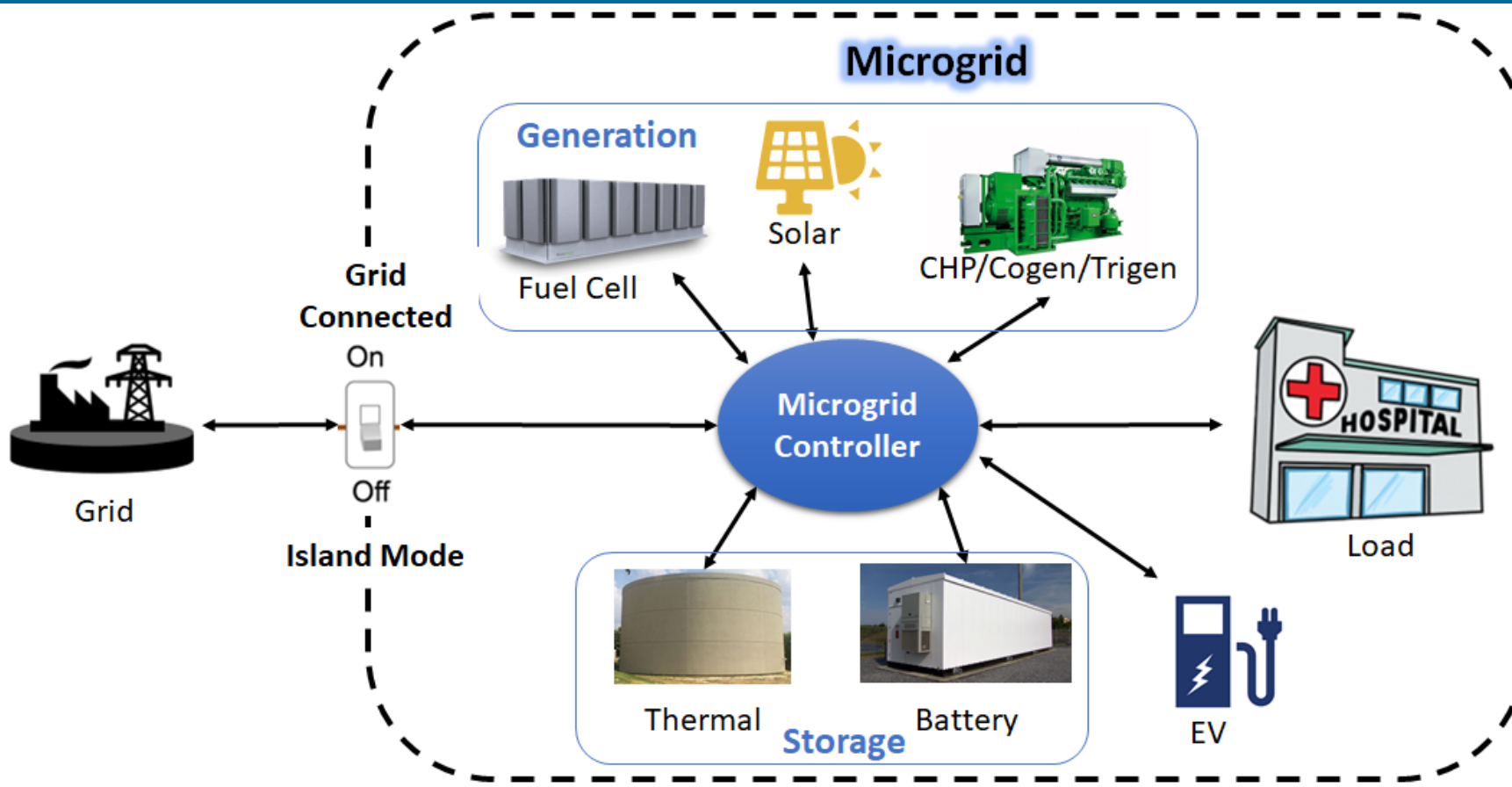
- PRESUMABLY SIMILAR DURATION REQUIREMENTS

MICROGRIDS ENTER CONVERSATION

- NFPA 99 2021

- + “A group of interconnected loads and distributed energy resources within clearly defined boundaries that acts as a single controllable entity with respect to the utility.”

- + NFPA 99 (2021), 3.3.76: Health Care Microgrid Control System is defined as a system including health care microgrid control functions that can manage itself, operate autonomously, and connect to and disconnect from the utility for the exchange of power and the supply of ancillary services.



Bernard et al., 2011; Shahmanesh et al., 2011

A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.

CHANGES IN 2021

- MICROGRIDS INCLUDED EXPLICITLY BUT WITH PROVISOS
+ “... designed with sufficient reliability to provide effective facility operation consistent with the facility’s emergency operation plan.”
- CMS: Compliance for reimbursement does not recognize microgrids as SUBSTITUTE for generators or batteries.
+ No explicit bar to microgrids as SUPPLEMENTAL to alternate source(s).

OTHER CODES MAY BE RELEVANT

Microgrid White Paper Codes/Regulations - Applicable Codes Matrix		Microgrid Power Source					UPS
		Solar (PV's)	Wind	Fuel Cells	Cogen	Energy Storage	
<u>Codes/Requirements</u>							
1	CARB - California Air Resources Board - Air Quality Requirements				x		
2	CPUC - California Public Utility Commission (Rule 21)	maybe	maybe	x	x	maybe	no
3	OSHPD CAN 2-0 Local Approval	x	x	x	x	maybe	no
4	2019 CBC - California Building Code	Only if in OSHPD building and/or serving as alternate source					
5	2019 CFC - California Fire Code						
5a	1206 Electrical Energy Storage Systems					x	x
5b	1206.2 Stationary Storage Battery Systems					x	x
5c	1204 Photo Voltaics	x				x	
5d	1205 Fuel Cell (NFPA 53 adopted by reference)			x			
6	2019 CEC - Californial Electrical Code						
6a	517 Healthcare Facilities	Only if in OSHPD building and/or serving as alternate source					
6b	690 PV Systems	x				x	
6c	692 Fuel Cell Systems			x		x	
6d	694 Wind Electric Systems		x			x	
6e	700 Emergency power					x	x
6f	705 Interconnected Electric Power Production Sources	x	x	x	x	x	
7	2018 NFPA 30 - Flammable and Combustible Liquids Code			x	x		
8	2015 NFPA 37 - Stationary Combustion Engines and Gas Turbines			x	x		
9	2015 NFPA 54 - National Fuel Gas Code			x	x		
10	2017 NFPA 58 - Liquid Petroleum Gas Code			x	x		
11	2016 NFPA 59A - Production/Storage/Handling of Liquefied Natural Gas LNG			x	x		
12	2018 NFPA 99 - Healthcare Facilities Code	x	x	x	x	x	
13	2016 NFPA 110 - Emergency and Standby Power	x	x	x	x	x	
14	2016 NFPA 111 - Stored Electrical Energy Emergency and Standby Power Systems					x	
15	2016 NFPA 400 - Hazardous Materials Code			x	x	x	
16	NFPA 853 - Installation of Stationary Fuel Cell Power Systems			x			
17	NFPA 855 - Standard for the Installation of Stationary Energy Storage Systems					x	
18	Centers for Medicare & Medicaid Services (CMS)	x	x	x	x	x	
18a	2012 NFPA 99 - Healthcare Facilities Code						
18b	2012 NFPA 101 - Life Safety Code						

Figure 25. Applicable Codes Matrix for Microgrid Implementation

Microgrids for
Healthcare
Facilities P. 47
<https://hcai.ca.gov/wp-content/uploads/2021/09/HBSB-Microgrid-White-Paper-FINAL-9.24.2021-A.pdf>

PROPOSED 2023 LANGUAGE

- DISTINCTION BETWEEN “NORMAL” AND “EMERGENCY/ESSENTIAL” POWER ELIMINATED
- REQUIREMENT FOR TWO (2) DISTINCT RESOURCES CAPABLE OF SUSTAINING ESSENTIAL FACILITY PERFORMANCE FOR THE SPECIFIED TIME PERIOD
- NO PRESCRIPTION FOR NATURE OR MIXTURE OF RESOURCES:
 - + BULK GRID + CONVENTIONAL GENERATION
 - + BULK GRID + MICROGRID
 - + BULK GRID + CONVENTIONAL GENERATION + MICROGRID
 - + CONVENTIONAL GENERATION + MICROGRID
 - + ETC...

PRACTICAL IMPLICATIONS

- **DESIGN TO PERFORMANCE**
 - + NO SPECIFIC ELECTRICAL DESIGN REQUIRED
- **NO CHANGES TO RELATED CODES (NFPA 110)**
 - + TESTING, VALIDATION, MAINTENANCE UNCHANGED
 - + “FUEL” RESOURCE REQUIREMENTS UNCHANGED
- **APPLICATION OF MICROGRIDS OPENS OPTIONS FOR OPEX REDUCTION**
 - + TIME SHIFTING OF ONSITE GENERATION
 - + PEAK DEMAND REDUCTION
 - + ANCILLARY SERVICES

THE TRUE SEA CHANGE



[Back to Policy & Memos to States and CMS Locations](#)

Categorical Waiver – Health Care Microgrid Systems (HCMSs)

Title Categorical Waiver – Health Care Microgrid Systems (HCMSs)

Memo # QSO-23-11-LSC

Posting Date 2023-03-31

Fiscal Year 2023

Title Various CMS regulations governing certain providers and certified suppliers require compliance with the 2012 edition of the National Fire Protection Association (NFPA) Health Care Facilities Code (NFPA 99). • 2012 edition of NFPA 99 requires emergency power for an essential electric system (EES) to be supplied by a generator or battery system. • 2021 edition of the NFPA 99 permits emergency power for an EES to be supplied by sources other than a generator or battery system, including a health care microgrid system (HCMS) • HCMSs are small-scale electrical grids where the sources of electricity can be provided by clean energy technologies (e.g., fuel cells, solar, wind, energy storage, etc.). • Except as noted below, CMS is issuing a categorical waiver permitting new and existing health care facilities subject to CMS requirements to utilize alternate sources of power other than a generator set or battery system only if in accordance with the 2021 edition of the NFPA 99, 2023 edition of the National Electric Code (NFPA 70), and associated references. • The categorical waiver excludes long-term care (LTC) facilities that provide life support as the LTC requirements at 42 CFR 483.90(c)(2) requires these facilities to have an emergency generator without exception.



SO...NOW WHAT???

- **OPTION 1: CHANGE NOTHING IN DESIGN**
 - + ALL PRIOR METHODS CONTINUE TO BE COMPLIANT
 - + MAY FACE OBSTACLES RELATED TO USE/STORAGE OF FOSSIL FUELS
- **OPTION 2: INCORPORATE MICROGRIDS AS SUPPLEMENTAL POWER**
 - + NO CHANGE TO CURRENT SEQUENCE OF OPERATIONS
 - + MITIGATE NEED FOR CONVENTIONAL GENERATION
 - + INTEGRATE RENEWABLES, DECREASE OPEX
 - + TAX BENEFITS
- **OPTION 3: DESIGN WITH MICROGRIDS AS SOLE OR PRINCIPAL ALTERNATE SOURCE**
 - + NEW SEQUENCE OF OPERATIONS
 - + SAME BENEFITS AS OPTION 2 PLUS NO OR MINIMAL FOSSIL FUEL CONTROVERSIES

DEPLOYMENTS

SunPower Panels

Shaded Parking/LED Lighting

Project Visibility



Charge Bliss
Intelligent Power. Delivered.



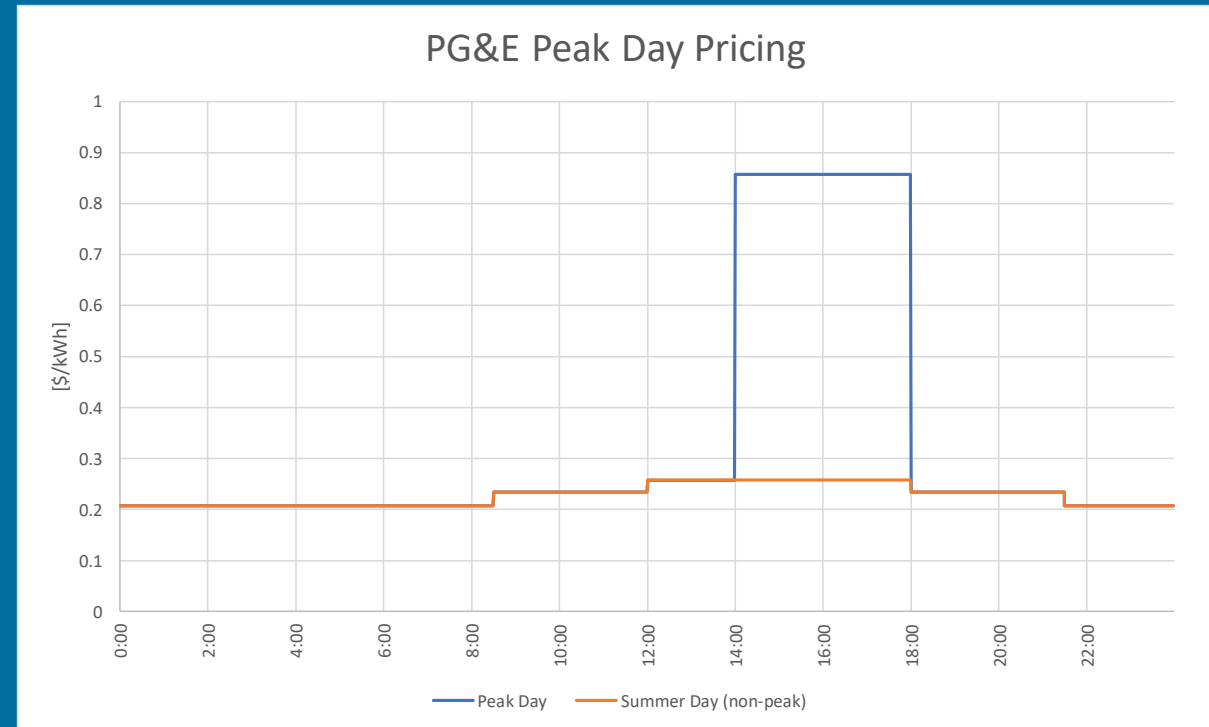
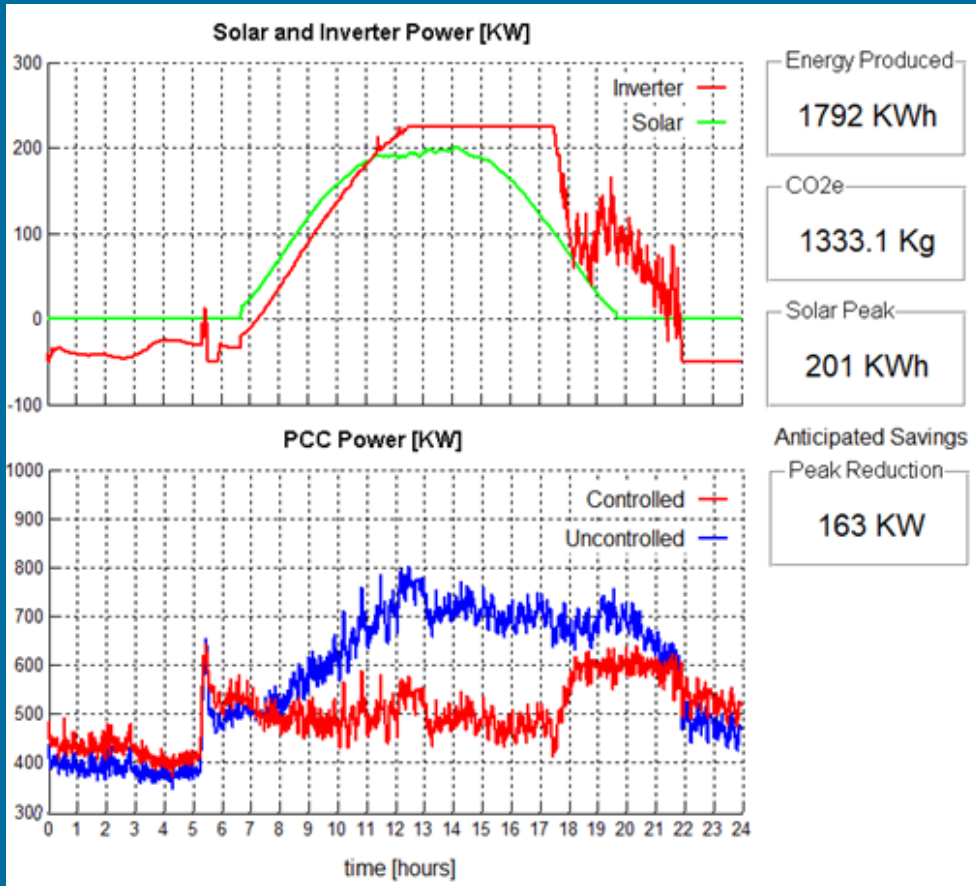


FARADAY CONTROLLER

**SAMSUNG SDI 1MWH/250KW
BATTERIES**

PRINCETON POWER SYSTEM 3-PORT INVERTER





REAL WORLD PERFORMANCE

KAISER PERMANENTE ONTARIO, CA



KAISER PERMANENTE ONTARIO



OPERATIONAL INTENT(S)

- NORMAL CONDITIONS

- + TIME-SHIFT SOLAR +/- FUEL CELL
- + DUAL ENERGY/DEMAND SAVINGS
- + ADR?
- + VPP?

- EMERGENCY SEQUENCE OF OPERATIONS:

- + MICROGRID SHUTS DOWN
- + DIESELS SPOOL UP
- + MICROGRID RESTARTS
- + DIESELS RAMP DOWN
- + MICROGRID TAKES CONTROL UP TO 10 HOURS

- ESTIMATED BENEFITS

- + \$900,000 SAVINGS PER YEAR
- + DECREASED DIESEL RUN TIME AND FUEL CONSUMPTION
- + LOWER CARBON FOOTPRINT (SCOPE 1 EMISSIONS REDUCTION TARGETS)

- INCREMENTAL STEP TOWARDS STATE APPROVAL OF MICROGRIDS AS PRIMARY ALTERNATE RESOURCE

SUMMARY

- PROPOSED CHANGES TO NFPA 99 CHANGE CONCEPT OF HEALTHCARE POWER SYSTEMS
- CMS CATEGORICAL WAIVER ALLOWS FACILITIES TO DEPLOY MICROGRIDS AND REMAIN COMPLIANT FOR REIMBURSEMENT
- REAL-WORLD DEPLOYMENTS DEMONSTRATE FEASIBILITY, SAFETY, RELIABILITY

**QUESTIONS OR
COMMENTS?**