



# Microgrids in Healthcare

IEEE Seattle

**endurant** 

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VP, Microgrid Development

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# Agenda

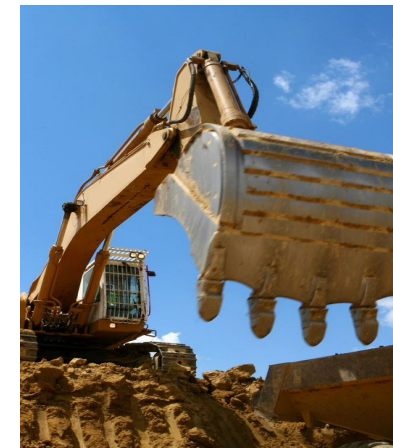
Healthcare Segment Overview

Market Developments

Microgrid Case Studies

Additional Considerations

Q&A



# Introduction

Ryan De La Cruz

- **Relevant Experience:**
  - VP, Microgrid Development: Endurant Energy
  - Director, Business Development: Ecom-Energy
- **Industry Participation:**
  - AEE: Association of Energy Engineers
  - CSHE: California Society for Healthcare Engineering
  - ASHE: American Society for Healthcare Engineering
- **Certifications:**
  - REP: Renewable Energy Professional
  - CEP: Certified Energy Procurement Professional
  - CMVP: Certified Measurement & Verification Professional
- **Passion for Healthcare:**
  - Energy cost savings and enhanced reliability have a direct impact on the quality of patient care!

# About Endurant Energy



Endurant has the in-house expertise to develop, own, and optimize reliable, resilient, clean, and cost-effective energy infrastructure solutions.

## Company Highlights:

- Turnkey developer & financier
- Technology agnostic
- 15+ years of experience
- National footprint
- Backed by LS Power
- Fortune 500 portfolio





# SEGMENT OVERVIEW

# The Value of Energy Savings in Healthcare

Healthcare is ranked as the 2<sup>nd</sup> largest commercial energy user in the U.S. (8.5% of all emissions). [\[Source\]](#)

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Each dollar saved by a non-profit healthcare organization through better energy performance is equivalent to generating up to \$20 in new revenues. [\[Source\]](#)

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Over 90% of surveyed hospitals report higher energy costs over the previous year, with more than half citing double digit increases. [\[Source\]](#)



# Segment Overview

## The What & Why

- **What?**
  - Acute care hospitals
  - Medical office buildings (MOBs)
  - Medical clinics, skilled nursing facilities (SNFs), psychiatric health facilities (PHFs), etc.
- **Why?**
  - Large electric/thermal loads
  - 24/7/365 power requirements and inelastic energy demand
  - Redundancy mindset
  - Old, aging infrastructure
  - Healthcare systems represent portfolio opportunities
  - Funded solutions often preferable
  - Three major developments in 2022-23

# Key Segment Drivers

## Understanding What's Important to Healthcare Facilities

1. Cost Savings
  - Hospitals recorded an \$8 billion net loss in 2020 due to COVID-19. [\[Source\]](#)
2. Resiliency
3. Sustainability





# MARKET DEVELOPMENTS

# Market Developments



## Three Paradigm Shifts for the Healthcare Industry

1. Department of Health & Human Services' (HHS) Health Sector Climate Pledge
2. The Joint Commission's (TJC) proposed sustainability standards
3. Centers for Medicare & Medicaid Services' (CMS) categorical microgrid waiver



# Health Sector Climate Pledge



## The Industry's Largest Unified Move Toward Sustainability

- Shared at 27<sup>th</sup> U.N. Climate Conference (COP27) in November 2022.
- **102 organizations** representing **837 hospitals** have signed the Pledge.
  1. Reduce organizational emissions by **50% by 2030** (from a baseline no earlier than 2008) and achieve **net-zero by 2050**, publicly accounting for progress on this goal every year.
  2. Designate an **executive-level lead** for work on reducing emissions by 2023 and conduct **an inventory of Scope 3** emissions by the end of 2024.
  3. Develop and release a climate resilience plan for continuous operations by the end of 2023, anticipating the needs of groups in their community that experience disproportionate risk of climate-related harm.



# Health Sector Climate Pledge



## The First Unified Move Toward Sustainability

- **Health Systems & Hospitals**

- AdventHealth, Advocate Aurora Health, Advocate Children's Hospital, AltaMed Health Services Corporation, Ascension, Aspirus Health, Atlantic Health System, Atrium Health, Baystate Health, Berkshire Health Systems, Beth Israel Deaconess Medical Center, Boston Children's Hospital, Boston Medical Center, Care Alliance Health Center, CentraState Healthcare System, Cherokee Health Systems, Children's National Hospital, Children's Hospital Los Angeles, ChristianaCare, CommonSpirit Health, Dana-Farber Cancer Institute, DaVita, Englewood Health, Gillette Children's, Greater Lawrence Family Health Center, Gundersen Health System, Hackensack Meridian Health, HealthPartners, Henry Ford Health, HonorHealth, Kaiser Permanente, Keck Medicine of USC, Kedren Health, Legacy Health, Mass General Brigham, Memorial Health Services (MemorialCare), Montefiore, Mount Sinai Health System, Nebraska Medicine, Northern Arizona Healthcare, Northwell Health, NYC Health + Hospitals, NYU Langone Health, OhioHealth, OLE Health, Oregon Health & Science University, Providence Health, Rush University System for Health, RWJBarnabas Health, Seattle Children's Hospital, Southcoast Health, SSM Health, Stanford Children's Health, Stanford Health Care, Stanford Health Care Tri-Valley, Steward Health Care System, Stony Brook University Hospital, Sun River Health, The Valley Health System, Tufts Medicine, University Medical Center of El Paso, University of Arkansas for Medical Sciences, University of California Health, University of Nebraska Medical Center, University of Pittsburgh Medical Center, University of Utah Health, UW Medicine, Valley Children's Healthcare, WellSpan Health, Western Wisconsin Health

- **Other Industry Organizations**

- AmerisourceBergen, AstraZeneca, Biogen, Blue Cross Blue Shield of Massachusetts, Blue Shield of California, Blue Zone Technologies, Cardinal Health, Chiesi Group, Daniels Health, Elevance Health, Excellus Health, GE HealthCare, GSK, MindClick, Inc., NewGen Surgical, Owens & Minor, Pfizer, Philips, Premier, Inc., Sanofi, Vizient, WCM Waste and Compliance Management

- **Associations, Nonprofits & Technical Assistance Organizations**

- American College of Physicians (NJ), Association of American Medical Colleges, Children's Hospital Association, ecoAmerica, Health Care Without Harm, Kimball Sustainable Healthcare, Mazzetti, My Green Lab, National Academy of Medicine, The Joint Commission



# The Joint Commission's Sustainability Standards



## Pairing Sustainability with Accreditation

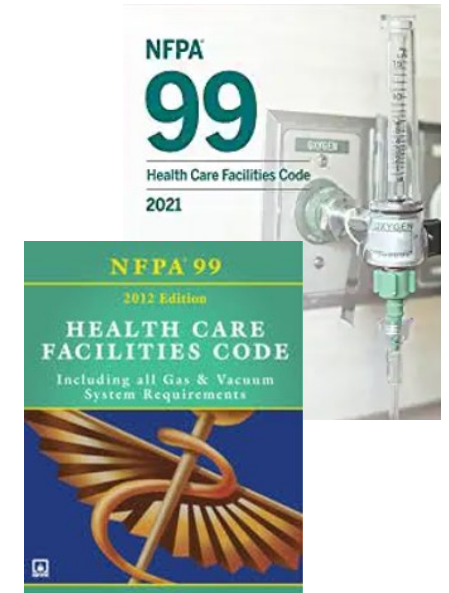
- TJC accredits +22,000 U.S. healthcare organizations.
- Most state governments recognize TJC accreditation as a condition of licensure for CMS reimbursements.
  1. Hospital leaders must designate an individual responsible for the oversight of activities to reduce GHG emissions in coordination with clinical and facility representatives.
  2. Hospitals must measure three or more of the following:
    - Energy use
    - Purchased energy (electricity and steam)
    - Anesthetic gas use
    - Pressurized metered dose inhaler use
    - Fleet vehicle gasoline consumption
    - Solid waste disposal to landfills or through incineration
  3. Hospitals must develop written goals and action plans to reduce GHG emissions in three or more areas that they have measured.
  4. At least annually, hospitals must analyze their sustainability measures to determine whether they are meeting goals and revise plans if goals are not achieved or sustained.



# CMS Categorical Waiver

## Microgrids as Emergency Power

- The 2012 edition of NFPA 99 (Healthcare Facilities Code) requires emergency power to be supplied by a generator or battery system.
- On March 31, CMS issued a categorical waiver permitting new and existing healthcare facilities to utilize sources of power other than a generator or battery system as emergency power (i.e. microgrids!).
- Additional Requirements:
  - 2021 Edition of NFPA 99
  - 2023 Edition of NFPA 70 (National Electric Code)
    - Note: Waiver excludes long-term care (LTC) facilities that provide life support.



NFPA 99 Codes: 2012 & 2021

## Takeaway

If You Only Remember One Thing...

*For the first time, healthcare facilities can align their sustainability and emergency power strategies, opening the door for more microgrid deployment.*



# MICROGRID CASE STUDIES



# Microgrid Case Studies

## Two California Energy Commission (CEC) Projects

1. Kaiser Richmond Medical Center (November 2017)
2. Kaiser Ontario Medical Center (Summer 2023)



*Kaiser Santa Rosa, 2017 Wildfire*

# Kaiser Richmond Medical Center

## Project Overview

- Location: Contra Costa County
  - Located in disadvantaged community (air quality).
  - Few alternative hospitals nearby.
- Utility: PG&E
- Grant Funding: ~\$4.78M
- Kaiser Commitment:
  - Funding match
  - Space availability
- First renewable energy microgrid at a CA hospital.
  - Dell Children's Medical Center (Texas)
  - Utica College/Faxton-St. Luke's Healthcare (New York)
  - Shands Cancer Hospital (Florida)



*Graphic via CEC Blog*

# Kaiser Richmond Medical Center



## Microgrid Components

- 250 kW solar PV carport (SunPower)
- 250 kW / 1 MWh BESS (Samsung SDI)
- Princeton Power Systems BIGI250 inverter
- Custom Charge Bliss / Nhu Energy microgrid controller



*Interior of Battery Room and Electrical Systems  
Photo via CEC Report*



*Interior of Inverter Room Showing BIGI250  
Photo via CEC Report*



# Kaiser Richmond Medical Center



## Microgrid Results

- Successfully demonstrated that hospital life safety branches can be support with a microgrid.
- Achieved 20-25% peak demand reduction.
- Saves ~20% of baseline utility costs annually.
- Enables demand response participation.
- Reduced facility's carbon footprint by 214 MT annually.
- Achieved 94% continuous uptime, with expectations for 98%.
- Detailed project documentation / knowledge dissemination.



# Kaiser Richmond Medical Center



## Lessons Learned

- Facility participation was difficult.
- Internal champion at the corporate level was key (National Director, Energy & Utilities).
- Limited site records were available.
- Non-export interconnect with PG&E simplified utility review.
- Placing the BESS was challenging.
- Siting the solar on the parking structure required additional structural and civil engineering.
- Proximity to the existing CUP was important.
- Tuning/commissioning took ~6 months.



# Kaiser Richmond Medical Center



## Additional Costs

- Total Unanticipated Costs: **\$492,000**
  - Solar: \$125,000
    - Originally designed for ground mount installation.
  - Cement Block Rooms: \$273,000
    - Built to house the inverter, batteries, and control equipment.
  - Controller: \$74,000
    - Original cost estimates did not include engineering design or installation of conduit, wiring, etc.
  - Travel: \$20,000
    - Additional construction duration results in more travel-related costs.



# Kaiser Ontario Case Study

## CA Healthcare Microgrid Pilot Project



Graphic Provided by Seth Baruch, National Director, Energy & Utilities



# Kaiser Ontario Case Study

## CA Healthcare Microgrid Pilot Project

- Grant Funding: ~\$8M
- Microgrid Components:
  - 2 MW solar PV carports
  - 9.5 MWh BESS
  - 1 MW fuel cell (existing)



# Kaiser Ontario Case Study



## Sequence of Operation

1. Microgrid is paralleled with the utility to supplement building load.
2. Normal power is interrupted.
3. Microgrid goes offline.
4. Generators pick up all hospital emergency loads.
5. After pre-determined delay, microgrid controller sequences the microgrid assets to parallel with the generators.
6. Switchgear evaluates load vs. microgrid contribution and shuts off unnecessary generators.
  - If power quality declines, the microgrid disconnects and generators carry emergency load.





# ADDITIONAL CONSIDERATIONS

# Additional Considerations



## Things to Think About

- **Funding**
  - Inflation Reduction Act's provides a direct pay option for non-profit hospitals.
  - Energy as a Service offering is growing in demand and acceptance.
- **EV Charging**
  - Incorporating additional loads and bundling this solution into DER deployment.
- **MOBs**
  - Kaiser has +10 MOB microgrids in the pipeline, including BESS replacing diesel generators.
  - Incorporate resiliency into design:
    - Identify critical loads in design phase of new buildings.
    - Ensure these loads are connected to one panel – making facilities “microgrid-ready.”
- **Physical Constraints**
  - Many healthcare facilities are landlocked, parking is a precious commodity.
  - Rooftops aren't viable at hospitals.
  - Facilities are often very old and engineering records, SLDs, etc. are not always available.
  - Cumbersome cogeneration systems are a recurring theme in healthcare facilities.



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THANK YOU

