De-Carbonizing the Campus: Planning, Tools & Technologies

CampusEnergy2023

February 27 – March 2, 2023

Gaylord Texan Resort & Convention Center | Grapevine, Texas

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Bolster Power Reliability for Your Campus

Kaiser Hospital integrates fuel cells into a microgrid for increased flexibility

Bob Kirslis – Senior Microgrid Application Engineer – Eaton

David Smith – Principle Sales Engineer – Bloom Energy

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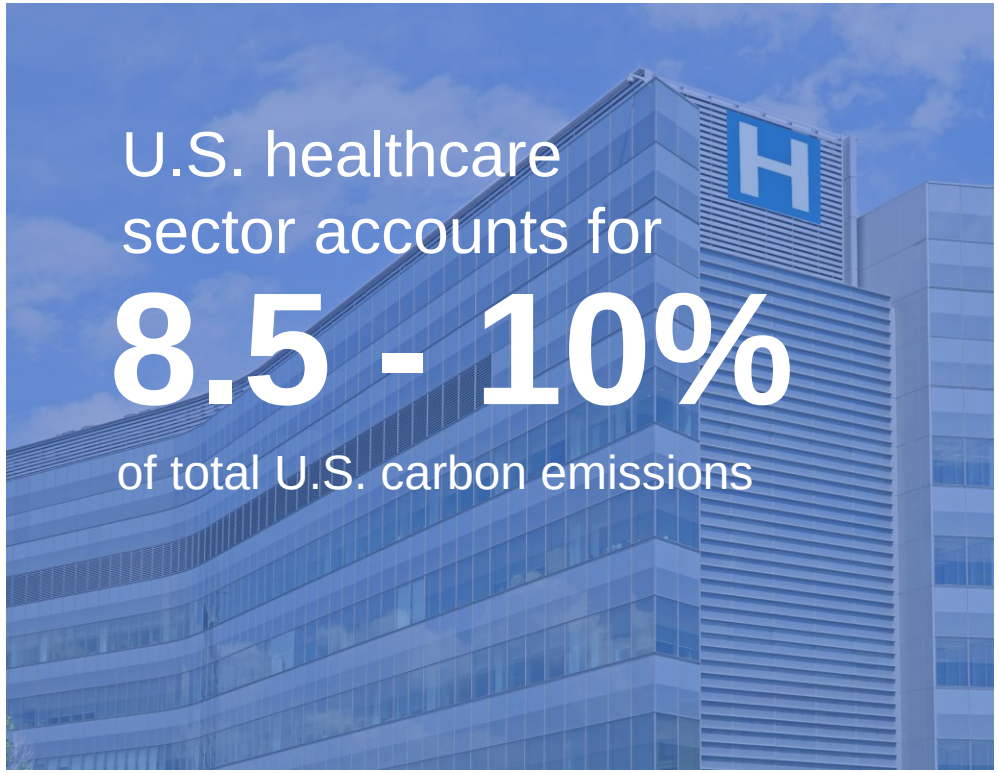
Energy Transition megatrends are driving microgrid adoption in healthcare as a solution for reliable, clean power infrastructure



Ambitious global commitments to ESG goals

- HHS Healthcare Climate Pledge: >100 healthcare organizations commit to cut emissions 50% by 2030 and achieve net zero by 2050

Federal Stimulus clean energy incentives

- Investment Tax Credit (ITC) expanded to include solar + storage, microgrids and fuel cells
- Tax credits now refundable for tax-exempt entities and transferrable to 3rd party financing partners

Improving microgrid/DER project economics

- Healthcare industry driving to reduce burden of rising electricity prices & tariffs
- Healthcare facilities spend >$8B per yr on energy
- DER monetization with grid services

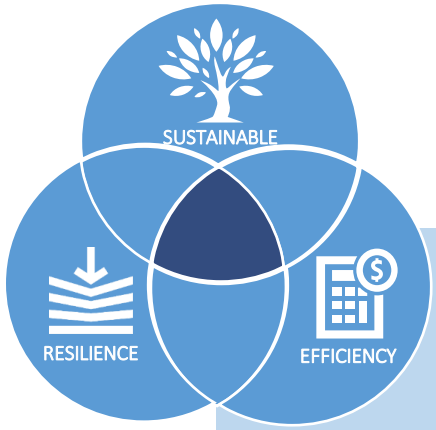
Evolving regulatory landscape

- Updated NEC guidance on Life Safety Codes for healthcare facilities to include microgrids – Senator Markey pitched for HHS to adopt new standards
- FERC Orders 841 and 2222 – opens energy trading

(1) White House statement on Health Sector Climate Pledge
(2) Practice Greenhealth

Climate change and extreme weather events are impacting access to reliable power for critical patient care

A power infrastructure solution should address all your needs



Sustainability

- Generate more power from clean and renewable sources
- Accelerate sustainability roadmap and reduce greenhouse gas emissions
- Fuel-flexible, upgradeable, future proof power solutions

Resilience

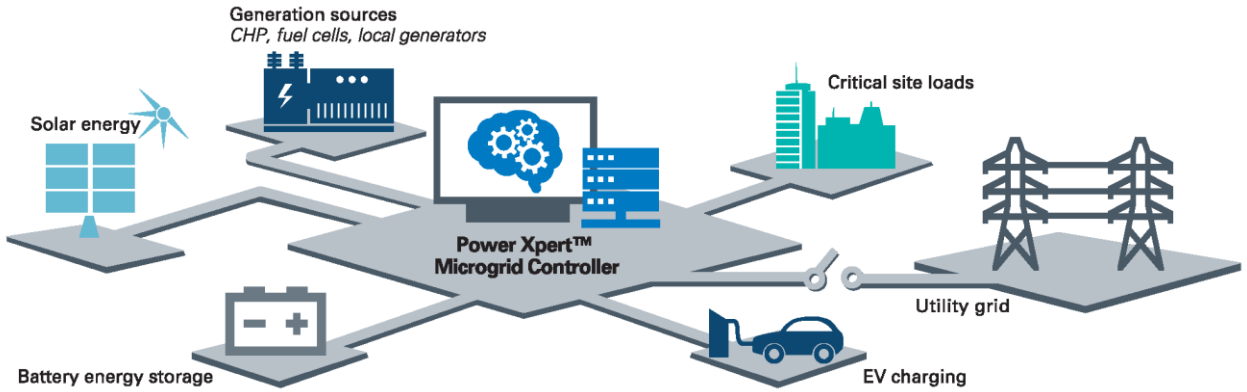
- Power quality and power reliability during grid outage events like power shutoffs
- Eliminate outage risk with energy independence
- Bolster operations to ensure business continuity

Efficiency

- Reduce energy costs
- Avoid costly utility peak demand charges
- Predictable energy costs over the long term

What is a microgrid and how does it work?

A **microgrid** is a system of interconnected generating assets and electrical loads that can operate either grid-connected or islanded from the grid as a self-sufficient power system



The heart of the microgrid is an **intelligent microgrid controller** to optimize system performance

Local "grid within the grid"

- Delivers clean, reliable power and resilience
- Microgrids range in complexity and scale depending on the application

Distributed energy resources (DERs) can be:

- On-site renewables - solar or wind
- Battery energy storage
- **Fuel cells**
- Backup generators
- Combined Heat and Power (CHP)

Microgrid applications

- Peak shaving
- Islanding & synchronization
- Black start
- Generation/load balance control
- Ancillary services like frequency regulation

What is a fuel cell and how does it work?

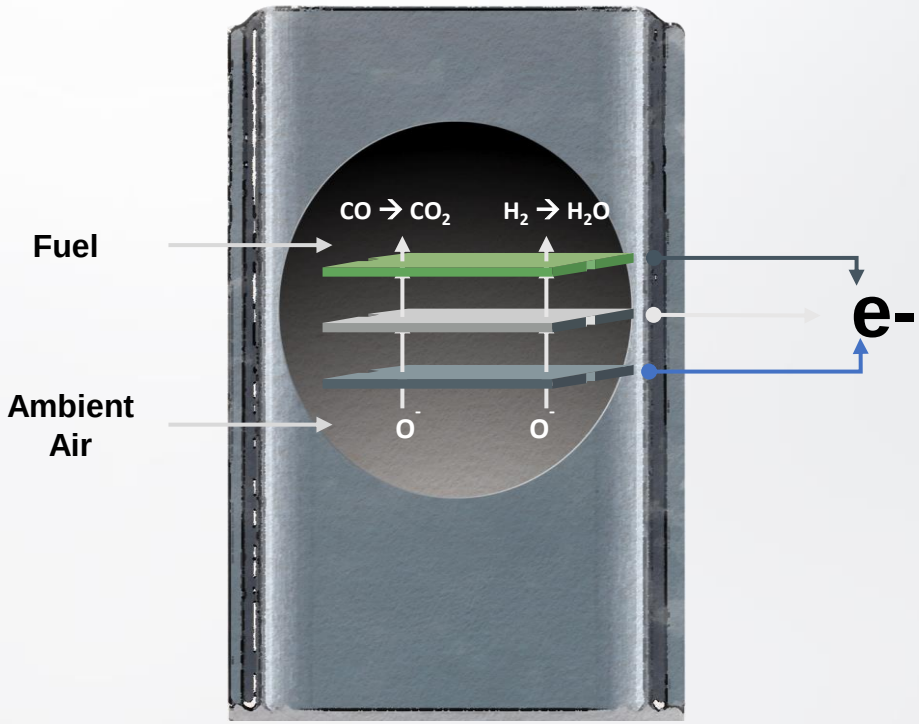
Designed with sustainability in mind

Highly Efficient

Electrochemical process reduces CO_2 emissions vs. grid alternatives

Fuel Flexible

Natural gas, renewable natural gas, biogas or hydrogen as fuel



Bloomenergy® fuel cell

No Combustion

Unlike traditional technologies Bloom does not require combustion, eliminating harmful criteria pollutants

No Water

Used during normal operation

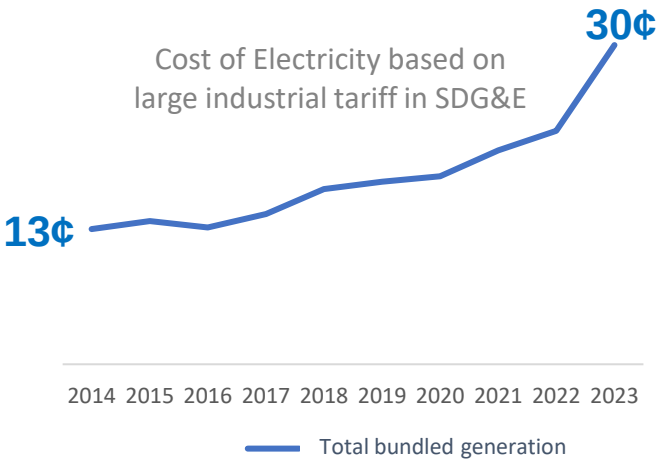
Kaiser San Marcos Hospital Microgrid Case Study

Design criteria:

Design a **resilient** power system for a new acute-care Kaiser hospital campus in Southern California that uses low cost, cleaner power in line with their ESG goals

- Provides AlwaysOn power to supply hospital base load - 24x7
- Integrate life safety back up generators as an alternate source
- Flexible, scalable solution to add solar and battery storage as a Phase 2

Utility rates continue to rise steeply in California

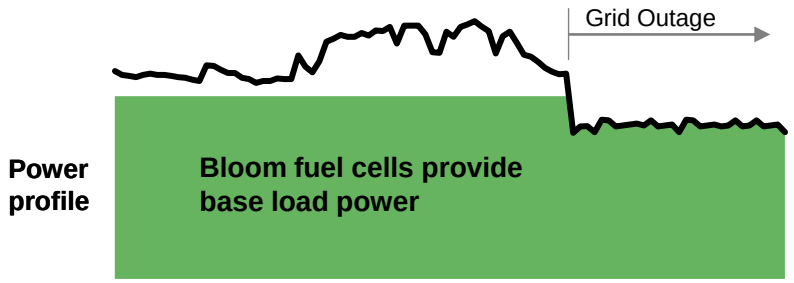


+130%

Due to…

- **Wildfire mitigation costs**
- **Regulatory uncertainty**
- **Grid modernization**
- **Resource adequacy**

Microgrid with fuel cells supports critical loads through grid outages with **up to 20% savings** on electricity



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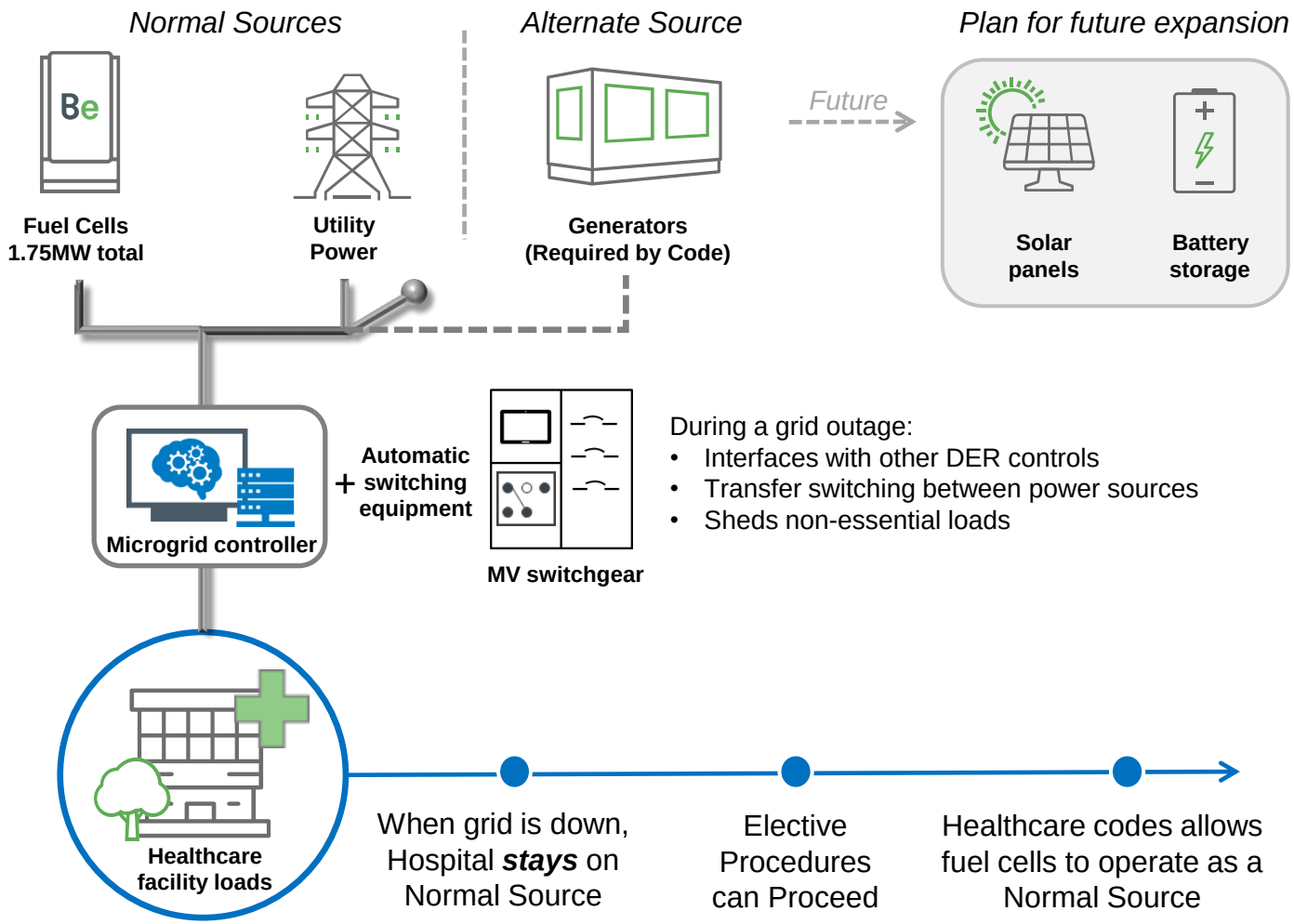
Kaiser San Marcos Microgrid Solution

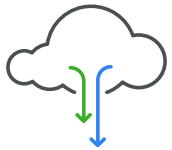
Solution:

Eaton and Bloom Energy partnered along with an electrical contractor to develop and finance a microgrid at Kaiser's site by leveraging our respective intelligent power management capabilities

Project Scope:	
EATON	• Feasibility study – power system • Microgrid Controls • Medium Voltage (MV) Switchgear • Microgrid system design & engineering
Bloomenergy	• Fuel cells • Operations & Maintenance • Project Financing through Power Purchase Agreement (PPA) • Utility interconnection



IMPACT: Estimated real-world sustainability benefits from Kaiser's 1.75MW fuel cell microgrid in addition to the resilience benefits



CO_2e Reductions
1,686 Mt/year

24.8%

Reduction[1]

The equivalent of CO_2e reductions from:

325

Passenger vehicles taken off the road annually

NOx Reductions	SO_2 Reductions
16,816 lbs./year	1,534 lbs./year

99.9+%

Reduction[2]

Saves the equivalent of:

$474,934 - $1,069,780

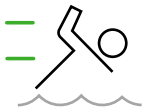
in increased healthcare costs

Water Withdrawal
162 M gals/year

99.9+%

Reduction[3]

Savings equivalent to:



245

Olympic-sized swimming pools of water annually

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1. Bloom's emissions compared to gird emissions with 2020 eGRID non-baseload emission rates for **WECC California** and a Tier 2 diesel genset operating for 1 week (168 hours) per year
2. EPA COBRA Tool (https://cobra.epa.gov/)
3. Bloom's water use of 0.69 gal/MWh is compared to the USGS United States average water withdrawal for thermoelectric power (https://www.eia.gov/todayinenergy/detail.php?id=37453)

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Key planning and microgrid design considerations

1. Conduct a **power system feasibility study** as a first step to size your DER assets and assess eligibility for clean energy incentives
   → Right size the fuel cells to your facility base load profile
2. Design your greenfield site's **power infrastructure from the ground up with a replicable reference design** that uses proven microgrid control and fuel cell technology
3. **Future-proof your microgrid with a scalable solution** that allows you to add additional DER assets as your campus expands and your capacity needs evolve
4. **Unlock additional value by monetizing your flexibility:** maximize your economic benefit by incorporating battery storage to capture excess power and participate in grid programs

What questions do you have?

Thank You!

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Is my hospital a good candidate for a microgrid with fuel cells?

Answering "yes" to any of the following questions indicates a potentially compelling opportunity

- ❑ Does the hospital spend more than **$0.10 per kWh** on average for power (incl. generation, transmission and distribution with demand charges)?
- ❑ Is the hospital base electric load **1MW or more**?
- ❑ Are **power reliability or power quality issues** a concern for the hospital with outages or light flickering that could damage expensive equipment or put patients at risk?
- ❑ Are hospital administrators concerned about **rising energy costs** and the impact on hospital financials?
- ❑ Does the hospital have sustainability or **carbon emission reduction goals**?
- ❑ Is a **facility expansion expected** within the next 3 to 5 years or a project planned to **install new EV charging infrastructure** that may exceed capacity of the site's utility service?
- ❑ Do you plan to continue to **operate the site for at least the next 10+ years**?
- ❑ Is there **available land at the site** or a flat and open roof?
- ❑ Is the hospital located in an **underserved or low-income community** based on census tracts?