



**DYNAMIC  
ENERGY  
NETWORKS**

# Microgrids are Bringing Certainty to Healthcare

*Microgrid 2017 – Boston*

*Steve Pullins, VP, Dynamic Energy Networks*

*Brian Levite, Microgrid Application Director, S&C Electric*

*This presentation reflects a full scale report and article series on Microgrids in Healthcare developed by Microgrid Knowledge, Steve Pullins, and Brian Levite.*

# Healthcare Transformation

- Senior population doubling in the US
- New medical technologies (70% of hospitals are adding wings, buildings, and satellites in the next three years)
- Hospital energy use is 2.5X a commercial building
- Energy costs is a top concern of healthcare CEOs – rates in major areas of the US are projected to double over the next twenty years
- In 2017, some hospitals in Ontario, Canada have laid off medical staff to enable paying rising utility bills.
- Hospitals must be at “full strength” during major storms – Sandy, Harvey, Irma ...



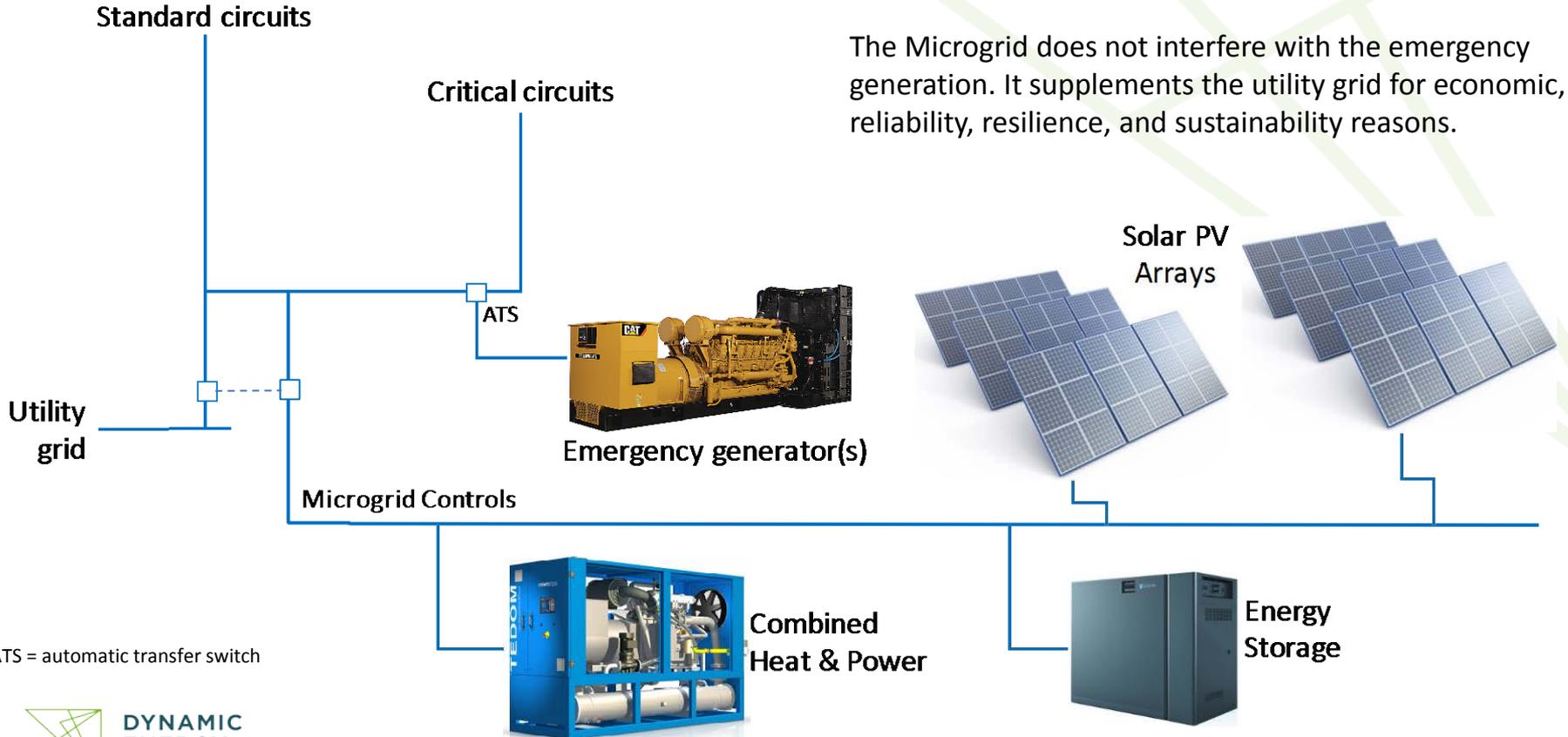
# What can Healthcare do about its Energy?

- Growth of hospitals (footprint, digital technologies, mission in the community) says more aggressive energy planning
- Healthcare performance must be at its highest when the grid is at its lowest
- The increase in mission says healthcare services must be expanded beyond just CRITICAL BUSES supported by EMERGENCY GENERATORS on BATCH FUEL supply
- Drive more self-determination and mission support from energy sources. Drive very high reliability & resilience (99.999%+ uptime) which can be aligned with cost savings

# Microgrid Knowledge Series on Healthcare Microgrids

- Special Report: Healthcare Microgrids (2017)
- Article Series on Healthcare Microgrids
  - Healthcare Microgrids: A Guide to More Reliable, Clean, Lower-Cost Energy for Hospitals
  - What are Healthcare Microgrids and How Can They Make Your Community More Resilient?
  - More than Back-up Power: The Genius of the Healthcare Microgrid
  - What Makes Hospital Microgrids Efficient and Green?
  - Perks of the No Money Down Microgrid for Healthcare Facilities
  - Learning From Successful Real World Healthcare Microgrids

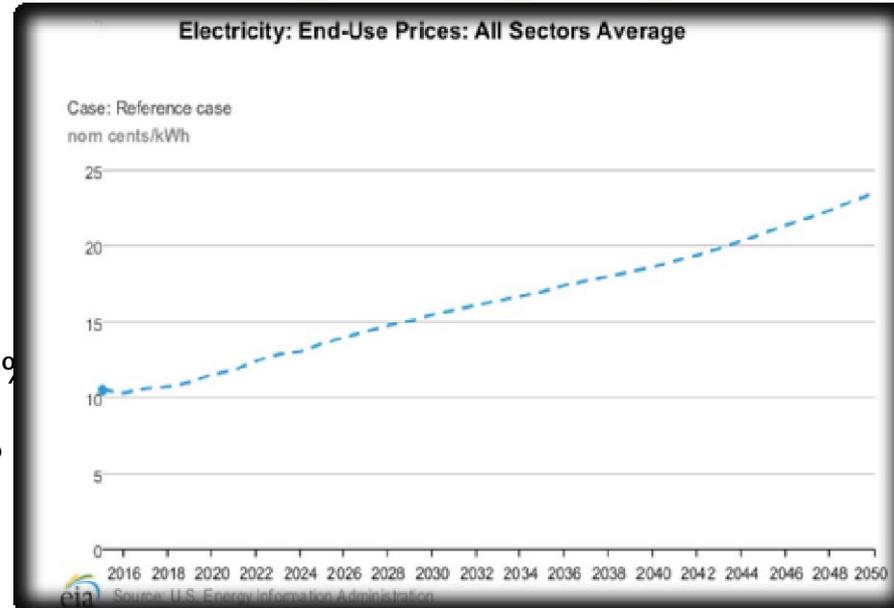
# Healthcare Microgrid Architecture



ATS = automatic transfer switch

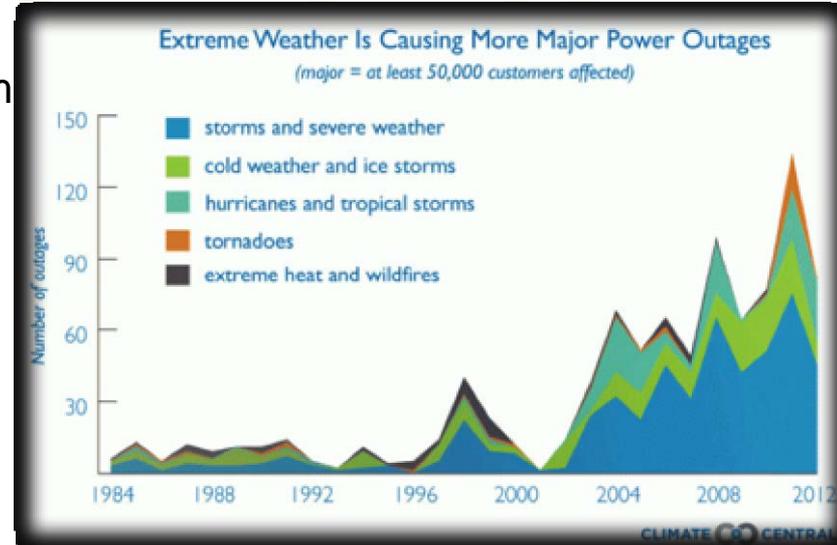
# More Reliable, Clean, Lower-Cost Energy for Hospitals

- How old is the existing energy infrastructure?  
End of life?
- Do the various energy systems in the facility work well together?
  - CHP versus boiler
  - Integration of load management
- How efficient are the existing boiler, heating, and sterilization systems?
  - Old boiler @ 70% efficiency; new CHP at 90% efficiency
  - Microgrids often reduce carbon footprint by 25-30%
- Where energy systems “add-ons” as various wings and buildings were added to the facility?
  - Integration of thermal systems
  - Optimization between thermal and electric



# How Can Healthcare Microgrids Make A Community More Resilient?

- Severe weather causes power outages that harm the economy \$18B - \$33B annually
- NY Prize Community Microgrid program – more than half of the communities involved included hospitals, nursing homes, and other medical facilities as critical facilities
- Local healthcare facilities are expected to “step up” during major storms and extended grid outages – this requires more than backup power on critical circuits – healthcare needs to be fully functional at these times
- Seamless islanding of microgrids on loss of the grid happens without human intervention or disruption – typical Microgrid uptime is 99.999%



Tom Doyle, NRG Renew, article in [renewableenergyworld.com](http://renewableenergyworld.com)  
on March 19, 2015



# The Genius of the Healthcare Microgrid

- More than backup generation
  - Northeast blackout (2003), half of NYC 58 hospitals' backup generators failed
  - During Sandy (2012), many NYC hospitals transferred patients to hospitals with microgrids – again failed backup generators
  - Beth Israel Medical Center saw a 64% in ambulance arrivals for four weeks following Sandy
- Healthcare is not just at hospitals
  - Resilience across the system is necessary: urgent care clinics and other satellite care centers, adult care / nursing homes, EMS
  - Microgrids across the healthcare system provides better, safer care; reduces the burden on the main hospitals; and offers new flexibility to healthcare professionals and community leaders at a time most needed.



*“A healthcare microgrid is truly a new energy business model for your hospital, one that encompasses your electric utility, your backup generators, and your new on-site supply, all configured with a dynamic software intelligence. The microgrid tends to your energy needs and energy budget while you tend to your core business.” Steve Pullins, Healthcare Microgrids (2017) chapter 3*

# What Makes Hospital Microgrids Efficient and Green?

- Solar energy prices have fallen 60% over the last several years. Today in New York, a 1 MW solar PV array, as a 25-year asset, can achieve a levelized cost of delivered energy of \$0.084/kWh. Solar PV is a very good resource in Microgrids.
- Converting boiler operations to CHP operations in healthcare moves the thermal efficiency from about 70-75% to 88-91%.
- Both of these resources working in concert can reduce the carbon footprint about 30%.
- Since Microgrid resources are on-site, there are no line losses and transformation losses.
- In addition, a Microgrid can be optimized for economic objectives, yielding a much flatter energy cost curve that utility projections over the next 20 years. This is not only cost savings, but improves predictability.

*“The Natural Marketing Institute surveyed 53,000 Americans in 2016 and found that 58 percent were more likely to do business with those that employ sustainable practices.”  
Healthcare Microgrids (2017) chapter 3*



# No Money Down Microgrid for Healthcare Facilities

- As healthcare groups need to expand their services and invest in new healthcare technologies (core business), making capital investments in energy is much less likely.
- As energy infrastructure in healthcare facilities ages, the gap in energy cost savings grows. Need to change the game on energy costs.
- A practical alternative is to shift the cost and risk to a no-money down Microgrid through an energy services agreement (ESA). This requires bankability of the project.
- Bankability can occur wherever electricity prices for commercial customers exceeds the national average.
- These ESA's are typically competitive in year one with a much smaller rate escalator than what the healthcare facility has seen historically, thus the Microgrid generates a “wedge of savings” for the facility over the term (20 years).



Proton Beam Therapy Center  
\$30M to \$100M

# Learning From Successful Real World Healthcare Microgrids

## Dell Children's Medical Center (Austin, TX)

- With a grid outage, Microgrid continues to run for all the hospital power, steam, and cooling needs.
- Designed, owned, operated by local municipal utility.
- Microgrid exports excess electricity to the local municipal utility; excess chilled water supports cooling for 6 nearby facilities.
- During disasters, the hospital becomes a refuge for displaced persons and a hub for medical care.

## Longwood Medical Area (Boston, MA)

- 213-acre Longwood Medical and Academic Area (LMA) with 5 hospitals, medical research centers, and teaching institutions.
- LMA Medical Area Total Energy Plant (MATEP) created to own and operate 47.5 MW high-efficiency CHP. It has reduced fuel consumption by 24%.
- Thermal energy via underground piping for heating, hot water, sterilization, and air conditioning.
- The Microgrid can island on loss of the utility grid.

## Utica Healthcare Microgrid (Utica, NY)

- Utica College and Faxton-St. Luke's Healthcare has operated this 3.4 MW Microgrid since 2009.
- Comprised mainly of four small CHP units for the bulk of the energy needs of the college, hospital, and 50% of a nursing home.
- Upon utility grid loss, the Microgrid can island and operate independently.
- Typically operates in parallel with the utility grid selling excess power to the grid.

## Shands Cancer Hospital at Univ. of Florida (Gainesville, FL)

- Built, operated, and maintained by the local municipal utility.
- Microgrid provides all the campus energy needs, including steam, normal and emergency power, chilled water, and medical gases.
- Resources include CHP and diesel generator. Excess power is sent to the grid for other customers.
- Shands was adamant about the reliability and resilience of having a Microgrid to have the hospital operate through fully 24/7/365 even during storms, especially its trauma center. It has islanding capability.

# Thank You !!

Steve Pullins  
VP Development  
865-300-7395  
spullins@dynamicenergynetworks.com

DYNAMIC ENERGY NETWORKS  
535 Mission St, 25th Floor  
San Francisco, CA 94105  
203-252-1654  
info@dynamicenergynetworks.com



**Dynamic Energy Networks (DEN)** is a global independent energy infrastructure platform that owns and operates microgrids and distributed energy resources (DER). Our infrastructure can work in parallel with or independent of the current utility grid and will be deployed in the commercial and industrial (C&I) sector, as well as the municipality, healthcare, institutional campus, and military sectors. As owners and operators we enable dynamism across microgrid infrastructure and innovate around contractual structures, providing bespoke solutions efficiently.