The Rise of the All-Electric Hospital

Exploring the impact of electrifying healthcare facilities

White Paper

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Executive summary

As healthcare sector technology advances and decarbonization requirements intensify, the concept of the all-electric hospital is rapidly gaining traction.

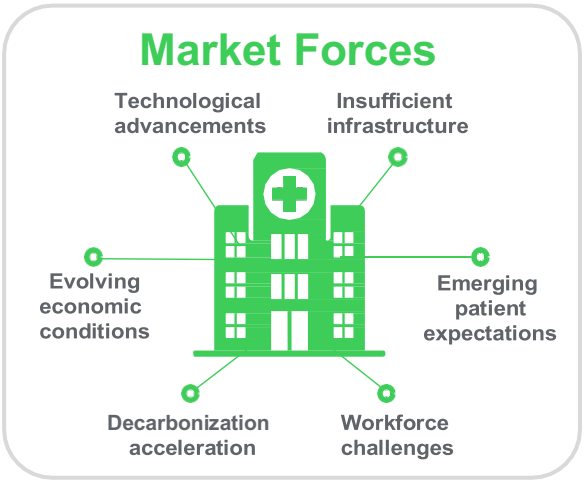
The rise of the all-electric hospital signals a fundamental shift in the global healthcare sector. Healthcare leaders who embrace the change stand to see gains in savings, resilience, and sustainability.

This white paper explores the key drivers, challenges, and opportunities associated with the all-electric hospital.

Preface

The healthcare sector is undergoing a profound transformation driven by powerful and persistent market forces. **Healthcare leaders are embracing digitalization and electrification to adapt.**

Digitalization offers numerous benefits, including real-time monitoring and predictive maintenance, which lead to more cost efficient and resilient facility operations. Electrifying these systems facilitates smart energy management and optimizes energy consumption and costs by integrating renewable energy sources.



Together, digitalization and electrification create an environment where data, automation, infrastructure, and care providers can thrive – contributing to the best possible patient experience. Digitalization and electrification represent a continuous journey, and the rewards are worth the investment. To unlock its full potential, healthcare organizations must troubleshoot the complexities of transforming an entire infrastructure and the processes that support it. Rising to the occasion will require exceptional preparation, perseverance, and partnerships.

Schneider Electric™ partners with healthcare organizations at every step of the digitalization and electrification journey. With deep **sector and domain expertise and vast network of Healthcare Consultants and Solution Specialists**, we help our customers harness the power of digitalization and electrification to address existing challenges and adapt to those yet to come.

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Introducing the all-electric hospital

Imagine a hospital where every aspect of its operations, from lighting to life-saving equipment, is powered by reliable, renewable energy. This is the vision for the all-electric hospital – a revolutionary facility aimed at improving energy efficiency, reducing costs, and driving decarbonization – all while creating a safer, more efficient environment for patients and staff.

This vision is rapidly becoming a reality as organizations advance with planning and developing all-electric facilities. **Figure 1** highlights some of these pioneering projects.

Figure 1

Examples of all-electric hospital projects currently in development

Electrification and healthcare sector decarbonization

Healthcare organizations are crucial in protecting and enhancing community health and well-being. However, the sector significantly contributes to greenhouse gas (GHG) emissions due to its high energy demands and 24/7 operations, making it a key target for increased regulations targeting emission reduction.

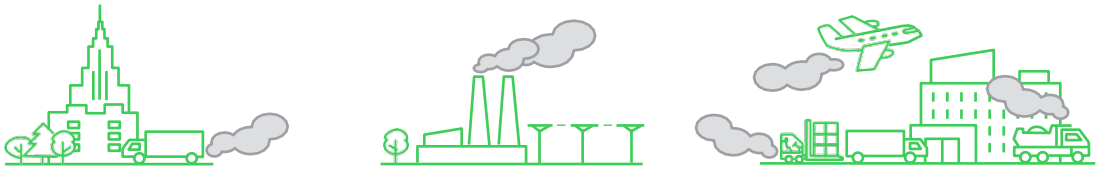
4.4%
of total global net emissions are from healthcare sector[1]

99%
of the world's population live in places where air pollution levels exceed guideline limits[2]

1. Healthcare without Harm, Healthcare's Climate Footprint
2. World Health Organization, Air pollution data portal

The benefits of decarbonization in healthcare facilities are clear — it simplifies regulatory compliance, increases cost-savings, and prepares facilities to integrate available and upcoming technology that drives operational efficiency. However, achieving true transformation requires meticulous planning and stakeholder collaboration.

Measuring GHG emissions is essential to driving decarbonization. The Greenhouse Gas Protocol 'Corporate Standard' is the globally recognized tool for accounting for these emissions. It categorizes an organization's emissions-producing activities as either direct or indirect. **Figure 2** shows the healthcare sector's share of carbon emissions across the three scopes.[3]



Scope 1

17% of total emissions

All direct emissions within an organization's operational control, such as the direct combustion of fossil fuels (e.g., natural gas or fuel for owned vehicles).

Scope 2

12% of total emissions

From purchased energy sources (e.g., electricity, district heating and cooling, steam), which are dependent on grid electricity generation.

Scope 3

71% of total emissions

From activities a company is indirectly responsible for up and down its value chains, such as business travel and waste management.

Figure 2

Share of healthcare carbon emissions across emissions scopes

Electrification reduces Scope 1 emissions by eliminating direct fossil fuel use in hospital operations and providing charging infrastructure for electric emergency and hospital-owned vehicles. This shift moves emissions to Scope 2, which depends on the energy sources used for grid electricity.

In 2022, see **Figure 3**, the International Energy Agency (IEA) reported that fossil fuels comprised 64.1% of global electricity generation, while renewables hit a record high of 28.5%. Although there's still a long way to go to eliminate Scope 2 indirect emissions, analysts predict global electricity production will be fully decarbonized by 2050.

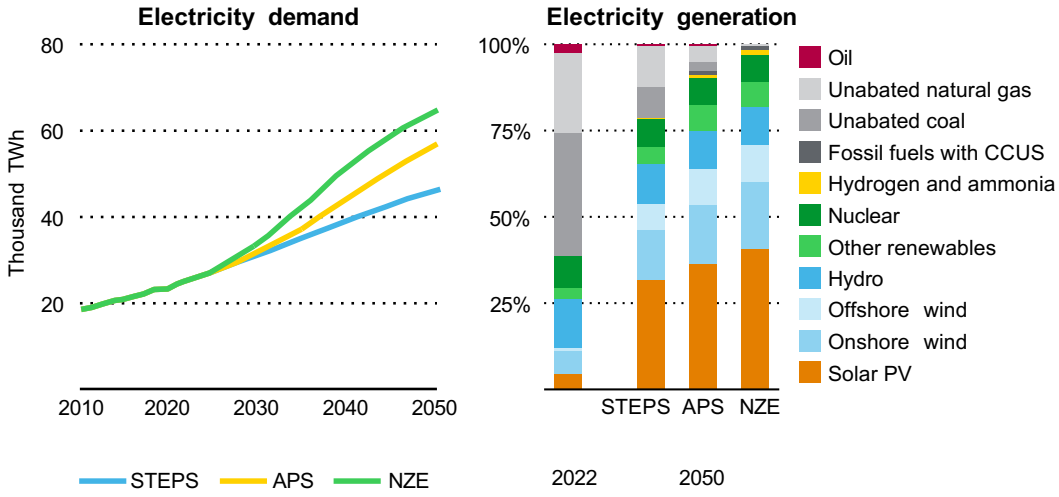


Figure 3

2022 global electricity demand and generation mix and expected evolution until 2050

Source: IEA

Electrifying the design of a large acute care hospital

As U.S. healthcare systems face mounting pressure to decarbonize while maintaining resilience and quality of care, electrification is emerging as a powerful solution. The rise of the all-electric hospital is no longer a distant aspiration but an achievable reality with the potential to deliver profound benefits. Arriving at that reality requires careful planning, capital investment, specialized expertise, alignment, and collaboration across multi-disciplinary stakeholders within the estate.

Figure 2
All-electric, all-digital solutions across the building lifecycle

A recent case study of an 800-bed acute care hospital illustrates the transformative potential of full electrification in healthcare infrastructure. By replacing all fossil fuel-dependent systems — including heating, hot water, kitchen and laundry services, emergency power, and transportation — with electric alternatives, the hospital's electrical power demand increased by a factor of 2 to 2.25.

Table 1

Summary of fossil fuel-dependent scopes in the original hospital and electric alternatives

Scope	Original design	Electrified design	Load criticality
Heating Hot Water (HHW) plant	Gas-fired boilers	Combination of heat pumps and electric boilers	Essential
Domestic Hot Water (DHW) plant	From HHW plant via heat exchangers + gas-fired boilers	Combination of heat pumps and electric boilers	Essential
Steam boilers	None – point-of-use treatment and electric autoclaves	No change	N/A
Kitchen services	Gas-fired cooktops, grills, deep fryers and steamers	Electric alternatives	Essential
Laundry services	Gas-fired dryers and ironers	Electric alternatives	Essential
Visitor and staff vehicles	Internal Combustion Engine (ICE) vehicles	Electric Vehicles (EV) EV Chargers: 15% of all car parking spaces (330)	Non-essential
Emergency response vehicles	Internal Combustion Engine (ICE) Vehicles	Electric Vehicles (EV) EV Chargers: 10 dedicated chargers	Essential
Backup power generation	Diesel gensets	Hydrogen fuel cells (PEMFC)	Critical and essential

The design incorporated renewable energy generation, battery storage, and hydrogen fuel cells to support sustainability and resilience goals. This example provides a practical blueprint for healthcare facilities seeking to reduce emissions, enhance operational efficiency, and future-proof their infrastructure.

This clear, real-world scenario demonstrates that it is feasible for hospitals to move away from fossil fuels and toward cleaner, more resilient energy systems. It helps decision-makers understand what's involved in electrifying a large healthcare facility and provides practical insights to guide planning, investment, and sustainability efforts.

Read the full case study here

3. Healthcare without Harm, Healthcare's Climate FootPrint

Four considerations for electrifying healthcare facility infrastructure

While every healthcare organization is unique, common factors are shaping the future of their facilities and infrastructure. This section highlights potential challenges and the opportunities that arise with them across four key scopes.

1. Regulation and compliance

Healthcare facilities operate in a complex landscape of regulations, standards, and stakeholders across healthcare and energy sectors. Standards such as those from the International Electrotechnical Commission (IEC) and the National Fire Protection Association (NFPA®) require hospitals to provide an uninterrupted power supply to ensure continuous patient care in critical areas. Historically, electrification efforts, like transitioning to renewables, were considered unreliable for critical systems, leading to a reliance on fossil fuel-powered backup generators.

However, this position is slowly evolving. For example, the U.S., the Centers for Medicare & Medicaid Services (CMS) issued a categorical waiver permitting health systems to use clean energy microgrid systems for emergency power, reducing reliance on fossil fuels.

Electrification offers opportunities such as:

- **Meeting regulations:** Helping facilities meet stringent GHG emissions targets and environmental regulations by removing direct fossil fuel usage.
- **Automating processes:** Enabling digitalization, which streamlines compliance by automating energy usage and environmental impact reporting. Advanced tools can track real-time consumption, emissions, and system performance, simplifying documentation and reducing administrative burdens.

2. Energy supply and demand

Hospitals are heavily energy-intensive, and full electrification can increase electricity demand and peak loads, straining the grid. Actions can mitigate grid strain while providing further opportunities for healthcare organizations, such as:

- **Integrating renewable energy**: Using grid management systems to maximize clean energy use and on-site energy during peak demand, reducing grid strain and high energy charges during peak times.
- **Advanced load management**: Ensuring consistent energy supply by prioritizing power for critical systems and enabling load shedding for non-essential areas like visitor EV charging stations.
- **Intelligent planning**: Electrical digital twin software that simulates electrification scenarios allows organizations to understand the impacts of their projects before implementation and enhances project efficiency.

3. Maintenance evolution and technology adoption

As technology advances, **healthcare organizations must fundamentally alter their maintenance operations** to accommodate changes in facility infrastructure. Transitioning to an all-electric estate requires facility operators with electric-related expertise. This may necessitate **training on new equipment** like heat pumps and renewable energy technologies.

Electric technologies facilitate the **adoption of digital tools and services** that can transform maintenance regimes. For example, IoT-enabled sensor technology monitors electrical infrastructure's operating conditions (e.g., temperature, vibration, humidity, etc.), immediately **alerting teams when disruption occurs and even preempting failure.** These tools also make remote management support feasible for facility teams, enabling 24/7 offsite support and management at a distance.

Next, **electric technologies often have fewer moving parts** than fossil fuel systems, leading to lower maintenance requirements, reduced downtime, and a safer working environment by mitigating risks like flammability and emissions.

4. Cost, investment, and funding

Like many improvement projects, electrification can involve high upfront capital costs for new equipment, infrastructure upgrades, and renewable energy installations. However, these upfront costs can be counterbalanced by valuable returns, such as:

- **Avoiding charges from unplanned downtime**: Ensuring a more stable and reliable energy supply reduces vulnerability to outages and grid failures, minimizing penalty costs. This resilience can also save indirect costs, such as preventing negative patient experiences.
- **Long-term operational expenditures (OpEx) savings**: Reducing energy bills, lowering maintenance expenses, and enhancing operational efficiency. Despite concerns about potential OpEx increases from switching to electricity, fluctuating gas prices and the greater efficiency of electrical equipment can lead to cost benefits.
- **Funding opportunities**: Financial mechanisms like government grants, subsidies, and tax breaks at both the state and federal level to make electrification more viable. Examples include the Inflation Reduction Act incentives and the Clean Electricity Investment Credit.

Conclusion

Healthcare organizations are transforming their facilities to deliver resilient care while reducing resource use and building more resilient critical infrastructure. Electrification of operations is a crucial step to decarbonize heating systems, backup power, and transportation, which traditionally contribute significantly to facilities' carbon footprints. Electrification must be complemented by 'cleaning the grid' and improving energy efficiency, supported by digitalizing infrastructure to identify and correct inefficiencies.

Technologies are available today to achieve full electrification of hospital systems, particularly to reduce the use of gas. Before beginning the electrification journey, engagement with grid authorities is essential to understand the grid's capacity to absorb the additional demand from electrification. In some regions, the grid may not meet the required surge in electricity. Here, technologies like on- site renewable generation or energy storage will be key to mitigating the excess power demand and reducing grid capacity stress.

Regulatory bodies are constantly revisiting standards to allow healthcare facilities to deploy new technologies, including microgrids, to replace or supplement fossil-fuel backup power technologies. These initiatives can positively impact a hospital's ability to accelerate electrification, decarbonization, resiliency, and energy reduction.

Establishing a network of external experts and advisors is critical for success. With specialized expertise in the healthcare sector, a best-in-class portfolio of software, and infrastructure solutions for all-electric hospitals, Schneider Electric is the proud partner of more than 6,500 healthcare sites worldwide.

At Schneider Electric, we believe nothing should hold your healthcare facility behind. Join us today as we journey towards the healthcare facility ahead of its time.

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