



Hospitals & Healthcare Facilities

WINTER EDITION

CONSULTING - SPECIFYING
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eBOOK





HEALTHCARE BUILDING SOLUTIONS: CONFIDENCE WITH CARE

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The Current State of the Healthcare Industry

As the climate crisis reaches critical levels, there is increasing urgency for the healthcare sector to take significant steps to minimize its disproportionately large environmental impact. Practice Greenhealth, the non-profit membership organization dedicated to sustainable health care, makes the case why the healthcare industry must adopt a proactive stance towards decarbonization.

- Healthcare facilities account for nearly 10% of the overall energy consumption in U.S. buildings, with an annual energy expenditure surpassing \$8 billion.
- The healthcare sector contributes up to 8.5% of total U.S. greenhouse gas emissions including carbon dioxide, methane and ozone.
- Annually, hospitals generate in excess of 5 million tons of waste.
- Hospitals are responsible for approximately 7% of the total water consumption in U.S. commercial and institutional facilities.
- Operating rooms generate over 30% of a healthcare facility's waste.¹

Andy Woommavovah, System Director of Facility Management, Construction, Energy and Infrastructure at Trinity Health shares some of advice gained through recent sustainability initiatives.

Prioritization for Reducing Emissions is Critical for the Healthcare Industry

The healthcare industry must take meaningful steps to reduce its carbon footprint. This may involve initiatives such as enhancing energy efficiency in healthcare facilities, transitioning to renewable energy sources and promoting sustainable practices in the procurement of equipment and pharmaceuticals.

Approximately 84% of emissions in the healthcare industry stem from the combustion of fossil fuels, which is essential for regulating the temperature of hospitals, powering crucial equipment like CT scanners and MRI machines, facilitating patient transportation, and delivering necessary equipment and pharmaceuticals.² According to a report from the nonprofit organization Health Care Without Harm, an urgent solution lies in swiftly adopting energy efficient practices and transitioning to renewable energy sources. This can be achieved through on-site installations of solar panels, wind turbines, energy storage systems or through the procurement of clean energy for healthcare facilities.

Greenhouse Gas Emissions (GHG)

Gases that trap heat in the atmosphere are called greenhouse gases and consist of carbon dioxide, methane, nitrous oxide and fluorinated gases. Each of these can remain in the atmosphere for different amounts of time, ranging from a few years to thousands of years. The **U.S. healthcare market is accountable for 8.5% of GHG emissions.**³ In

comparison to the global average of approximately 4.6% of total GHG emissions attributed to healthcare systems worldwide, the U.S. wields a significant impact in contrast to the rest of the world.

In the American healthcare sector, **hospitals stand out as the primary source of GHG emissions**. Additionally, they generate large quantities of non-recyclable waste due to the extensive use of single-use supplies and disposable devices, which often find their way into landfills and incineration facilities.³

GHG emissions not only encompass hospitals and clinics, but also extends to the vast supply chain for medical equipment and pharmaceuticals. Recent reports indicate that these emissions are trending upwards. A study by Health Care Without Harm suggests that **global healthcare emissions could triple by 2050** unless substantial changes are implemented.²

GHG Scopes

Without aggressive measures to reduce emissions, "health care's absolute global

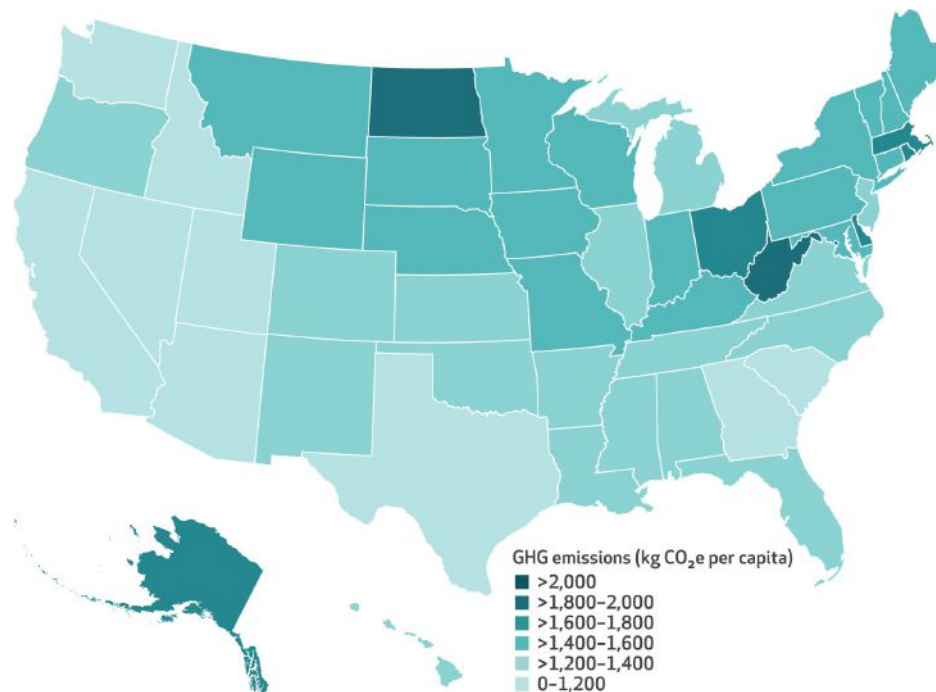


Image Source¹³

emissions would grow enormously from a 2014 baseline and more than triple by 2050, reaching six gigatons a year.”⁴

GHG output is evaluated and categorized in three different distinct scopes. Scope 1 are direct emissions that are owned or controlled by a company. Scope 2 and 3 are indirect emissions that are a consequence of the activities of the company but occur from sources not owned or controlled by it.

- **Scope 1 emissions:**

Covers emissions from sources that an organization owns or controls directly. For example, from burning fuel in a hospital’s fleet of non-electrically powered vehicles.

- **Scope 2 emissions:**

Emissions that a company causes indirectly and come from where the energy it purchases and uses is produced. For example, the emissions caused when generating the electricity for a hospital.

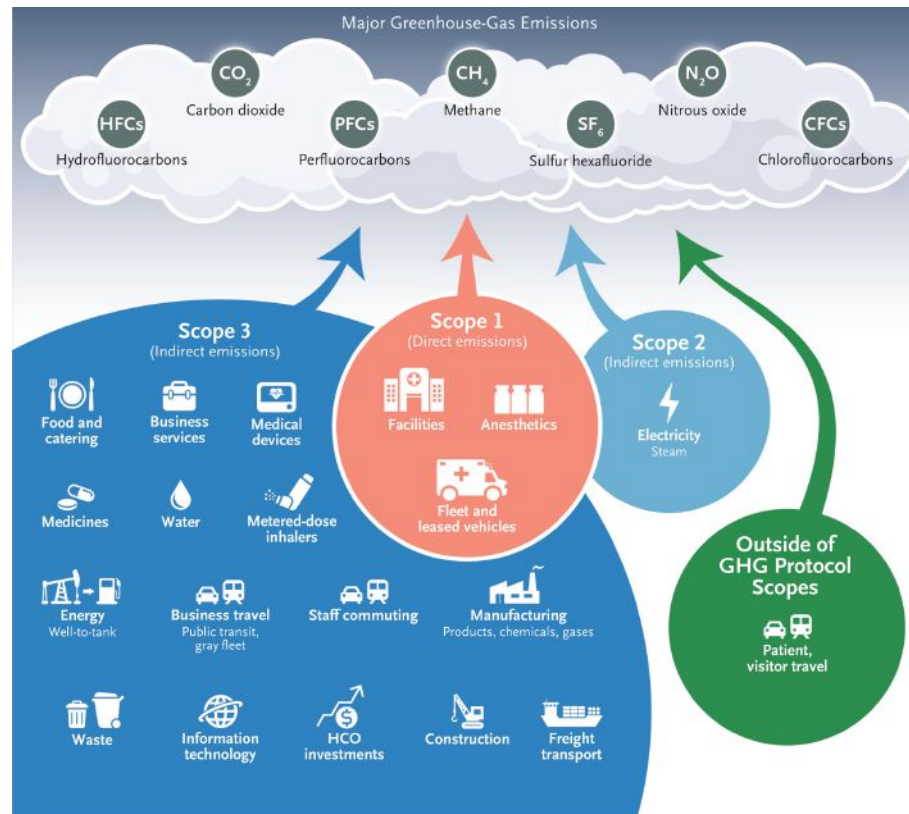


Image Source⁶

- **Scope 3 emissions:** Encompasses emissions that are not produced by a company itself and are not the result of activities from assets owned or controlled by them. They are emissions that an organization is indirectly responsible for throughout its supply chain. An example of this is when a hospital buys, uses and disposes of products from suppliers. Scope 3 emissions include all sources not within the scope 1 and 2 boundaries.

Decarbonization

Environmental, Social and Governance (ESG) programs have gained traction in most industries. In healthcare, ESG goals are prominent because the industry is responsible for anywhere from “8% to 10% of GHG gases that are emitted in the U.S.”⁵ These emissions disproportionately affect individuals with compromised immune systems or advanced age and have led to a surge in environmental events, from floods and droughts to the proliferation of vector-borne diseases spread by insects.

It is critical to align with well-versed vendor partners that understand decarbonization and what is needed within a specific healthcare network to meet their carbon reduction goals. “I look for partners that are grounded in what decarbonization and sustainability is all about. When I think about how large Trinity [Health] is and how focused our folks are in the field, I don’t want them to have to totally understand decarbonization,” states Woommavovah. “So, we’re going to need partners that come to the table with us and can speak that language, and they understand what it is. They can tell us exactly

“For many years, decarbonization was referred to as clean energy reduction initiatives. We didn’t call them decarbonization initiatives, but they essentially accomplish the same goal. Now we’re just calling it a different name and those are the things that can intimidate our Trinity Health folks in the field when we talk about what sustainability and decarbonization is. They’re intimidated by this new vocabulary that we use to describe it, but in reality, they’re already doing a lot of the things that we need to do anyway to meet decarbonization goals.”

Andy Woommavovah
System Director of Facility Management,
Construction, Energy and Infrastructure,
Trinity Health

how decarbonization plugs in with our systems right, and I want our partners asking us questions about our sustainability goals and what we have established so far.”⁵

Carrier’s Role in Decarbonization

At Carrier sustainability is driven with a focus on addressing climate change through accelerating decarbonization. Carrier is aiming to reduce customers’ carbon footprint by more than one gigaton by 2030 in part through a tailored approach for commissioning, specifying equipment and providing assessment services based on each customer’s sustainability, operational and budgetary goals. The approach meets customers where they are within the product lifecycle and capital planning process with expertise and solutions to design, enable and deliver improved sustainability.

Aging Infrastructure Issues

Addressing decarbonization amid aging infrastructure presents a dual challenge: ensuring both capital availability and acquiring the right equipment for sustainable practices. **“Choices made today will impact the next 20 to 25 years, depending on asset age, so strategic planning is critical,”** Woommavovah says.⁵ To be successful in decarbonization, healthcare facility managers must be careful what assets are put online today because that will have to be managed moving forward.

“What I’ve experienced in healthcare is we have been very inconsistent in not investing in our critical infrastructure because infrastructure doesn’t generate revenue. It’s common to find that many systems within a typical hospital are burdened with aging infrastructure that is overdue for replacement.”

Andy Woommavovah

System Director of Facility Management,
Construction, Energy and Infrastructure,
Trinity Health

Image Source⁵

An aging infrastructure amplifies risk, potentially leading to the failure of critical assets in vital environments. This can exert severe impacts on the financial performance of healthcare facilities, and in extreme cases, it can detrimentally affect clinical outcomes and patient care.

The Future of HVAC Equipment Decarbonization in the Healthcare Sector

There are three primary approaches to implement for reducing carbon dioxide equivalent (CO_{2e}) emissions in HVAC and refrigeration systems. CO_{2e} emissions have a similar global warming contribution as greenhouse gases.

- **Energy Efficiency:** For as long as HVAC equipment has been in existence, energy efficiency has been a pivotal factor, primarily driven by the aim to save on energy costs. Minimizing carbon footprint is the latest motivation. With all other factors held steady, lower energy consumption directly leads to a decrease in emissions from fuel combustion.
- **Refrigerant Management:** Implementing low global warming potential (GWP) refrigerants and ensuring minimal leakage through maintenance and timely replacements are both vital aspects of effective refrigerant management. Refrigerant leaks, frequently overlooked but a key factor of decarbonization, is usually a substantial component of a building's leaked emissions.⁹
- **Electrification:** As electricity providers shift from high-emission fuels like coal and oil to carbon-free sources such as solar, wind, and other renewables, electrical grids are undergoing their own decarbonization process. Consequently, electricity is becoming progressively less emissions-intensive, leading to a reduction in its CO_{2e} emissions per unit of energy. For HVAC owners, this renders electricity the preferred energy source. Employing electrified HVAC equipment also sets the stage for automatic emissions reduction in the years ahead. This

aligns with the ongoing decarbonization efforts within electrical grids, moving towards carbon-free energy generation.

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Energy Performance Through Building Automation Systems (BAS)

Building automation systems for hospitals can help support healthier indoor environments. Based on data collected from sensors, a BAS makes automatic adjustments to HVAC equipment to improve air quality. Additionally, they can help healthcare facility stakeholders find ways to reduce costs, increase staff efficiency and provide secure operational systems, all while helping to ensure resiliency and redundancy.

Canada's first zero carbon office building, evol1 relies on Carrier's i-Vu® BAS for comprehensive management of all building systems to achieve a net positive energy output and generate more energy than it consumes. To achieve this, evol1's BAS needed to successfully integrate, monitor and manage HVAC equipment, as well as ancillary building systems.⁸

"From a controls and full building automation perspective, evol1 was the most interesting and technically challenging project that we've had to date. Creating a successful controls and BAS solution for a zero carbon, net positive and LEED Platinum certified building comes with its own inherent complexities. "

Kyle Marvin
HVACR/Controls Lead, Cornerstone Mechanical Inc., Carrier's Controls Expert Contractor

Trinity Health relies on BAS systems that have shown to help them reduce their carbon footprint. They gather data from all their facilities regarding energy consumption, emissions, water usage, HVAC system efficiency and waste management. By meticulously analyzing this data, they fine-tune strategies and evaluate the performance of each facility, assigning them rankings on the performance scale. "Trinity Health St. Joseph Mercy Ann Arbor in Michigan has realized significant savings through its sustained efforts to improve energy efficiency:

Image Source⁸

Between January 2004 and January 2021, that region decreased its natural gas consumption by 28%, its electricity use by 29% and its water use by 57%.”¹

Healthcare Facility Condition Assessment (FCA)

An FCA involves creating a thorough overview of the physical state and operational efficiency of buildings and infrastructure. Through data collection and analysis, valuable insights can be gained for making informed decisions regarding infrastructure, energy management and sustainability measures. FCAs are typically constructed through a customized scope that can include a site inspection(s) of all major building systems, a meticulous review of pertinent building documents and records and customized data analysis and calculation of needed equipment and infrastructure. The goal of the FCA is to identify:

- Routine and/or deferred maintenance
- Systemic deficiencies
- Remaining useful life of all major building systems
- Capital replacement needs
- Overall system compliance with the original design/engineering intent
- Compatibility with contiguous systems
- Prioritized list of repairs
- Total building replacement cost

“It’s imperative you align with a knowledgeable partner that can provide a comprehensive FCA with all estimated costs, and not just the cost of the asset,” said Woommavovah. “A useful FCA needs to account for all of the replacement costs for a given asset such as, design, temporary equipment rental and market adjustments with geographical location — We can get all kinds of support service and equipment in Houston, not so much in Devils Lake, North Dakota.”⁵

Tactics for Funding Carbon Reducing Initiatives

Tight expenditure budgets and limited revenues are posing greater challenges for most healthcare networks in their pursuit of decarbonization. The situation is further compounded by heightened regulatory demands. For example, “a Senate bill in Maryland requires a 60% reduction in greenhouse gas emissions by 2031 (using a 2006 baseline) for any building over 35,000 square feet.”¹⁰

Power Purchasing Agreements (PPAs)

While the majority of decarbonization projects are funded internally or through self-financing from a capital budget, certain hospital systems have explored additional incentives from local utility or other external sources. **Numerous solar installations are facilitated through PPAs**, wherein a solar company is responsible for the installation, operation and ownership of the system. The user then pays a per-kilowatt price for the electricity generated.

“The challenge is we have addressed most of the low-hanging fruit, so the ROI on major mechanical equipment is not always attractive. Fortunately, our leaders are thinking differently and understand there will be some additional cost to carbon-reducing projects that they must consider.”

Andy Woommavovah
System Director of Facility Management,
Construction, Energy and Infrastructure,
Trinity Health

Image Source¹⁰

Trinity Health effectively utilized a PPA to implement a fuel cell project, which

encompassed a 1.5-megawatt unit at St. Mary's Hospital in Waterford, Connecticut. They are also contemplating renewable projects in California and the Midwest, looking to leverage PPAs alongside the new incentives provided by the Inflation Reduction Act (IRA).¹⁰

IRA Tax Credits

IRA tax credits present an opportunity for tax exempt hospitals and healthcare facilities, including those operated by state and local governments to directly receive the value of the designated tax credit. This includes the credit monetization applicable to clean energy production tax credits for providers who invest in and own energy generated from sources like solar, wind, hydro and related power technologies.

Recently, Trinity Health “funded a major LED project at a 1-million-square-foot facility that may be eligible for the IRA’s 179D incentive. This incentive allows a deduction for a portion of the cost (subject to a maximum cap of \$5 per square foot) of energy-efficient measures, including interior lighting, HVAC and building envelope upgrades.”¹⁰ Trinity is currently delving into the workings of the 179D incentive and is collaborating with its LED supplier to apply for this benefit. The 179D program offers scalability, bolstered by additional bonuses for energy communities and adherence to prevailing wages.¹⁰

“Now that the incentives are available to not-for-profit health care, you will have the ability to overlay them into your return on investment calculations,” says Woommavovah. “It’s important to have partners that come to the table fully understanding the funding mechanisms that can allow us to drive ROI up. When we work with a vendor partner that show us where our investment plugs into a tax credit like IRA179, that is hugely beneficial.”⁶

Professional Certifications and Affiliations in the Healthcare Sector

When integrating sustainability into healthcare systems, collaboration with engineers is paramount. Their expertise and technical acumen are invaluable in implementing and advancing sustainability initiatives.

- **American Society for Healthcare Engineering (ASHE):** ASHE is the largest association dedicated to professionals who design, build, maintain and operate hospitals and other healthcare facilities. “They are a professional membership group of the American Hospital Association, a trusted resource that provides education, regulatory guidance, networking, advocacy representation and professional development for our members.”¹¹

“Understanding how to operate in the healthcare environment is essential because you can’t just walk in and start turning valves and switches,” states Woommavovah. There are things like infection control and pre-construction risk assessments that must be completed. Having partners that understand that process, they become force multipliers for us, and we don’t have to completely manage them in the field.”

Andy Woommavovah
System Director of Facility Management,
Construction, Energy and Infrastructure,
Trinity Health

Image Source⁶

- **Certified Healthcare Constructor (CHC):** ASHE offers CHC certifications to develop professional leaders working in the healthcare industry. Some local ASHE chapters have requirements in their contracts that require CHC certification(s) or have some kind of familiarity with Joint Commission standards for infection control for life safety. Anytime you bring someone new into the hospital that’s not there every day, that creates risk for patient safety.

Conclusion

The emissions-intensive design choices of the past have caught up with us in the form of a looming climate crisis. Legislation, regulations and incentive programs are aligning with this reality, prioritizing the reduction of CO_{2e} emissions. Simultaneously, technological advancements continue to introduce new products for a wide range of applications. With these environmental challenges and sustainable solutions in mind, there is a collective push for timely investments in decarbonized solutions.

“Having partners that are well versed in the details of what decarbonization is all about and understanding the three GHG emissions scope categories of reduction is imperative as there’s a of pressure that’s occurring in the healthcare industry,” states Woommavovah. “Joint commission created a sustainability healthcare certification that starts in the beginning of 2024 that currently isn’t mandatory, but I think that’s coming. So, when that does come, we’re going to need partners that can step in there with us and understand the requirements of decarbonization and sustainability.”⁶

Carrier Capabilities

Our suite of connected solutions and digital platform enables real-time, intelligent results that make buildings more efficient and responsive. Our expansive portfolio of innovations—including connected equipment, efficient healthy building solutions, system-embedded energy-savings features, and whole-building lifecycle management offerings—allow us to meet the high expectations for healthier, more sustainable spaces.



NORESCO

Helps clients adapt to and mitigate the impacts of climate change by decarbonizing, modernizing and electrifying aging infrastructure to be more sustainable and resilient. By deploying innovative distributed energy, storage and renewable energy solutions, Noresco improves the health and efficiency of existing healthcare buildings and hospitals.



Building Automation Systems

Carrier's building automation systems such as, Automated Logic's WebCTRL® manages building systems to optimize comfort, energy consumption, cost and equipment performance.



Carrier HVAC Equipment

Carrier takes a consultative and comprehensive approach to understanding and recommending the HVAC equipment needs to improve your healthcare facility's indoor air quality (IAQ).



Abound™

Carrier's Abound applications can show healthcare facility managers their energy consumption and air quality in a single interface. Using sensors and third party information, Abound can help them manage their IAQ.



BlueEdge™

BlueEdge services provides healthcare buildings IAQ assessments, wellness services, retro-commissioning and more to support a healthier building environment.



RENTAL SYSTEMS

Carrier Rentals

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