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Cleaner Health Care: Hospital Emissions Mitigation

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Bipartisan Policy Center

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HEALTH PROGRAM

Under the leadership of former Senate Majority Leaders Tom Daschle and Bill Frist, M.D., BPC's Health Program develops bipartisan policy recommendations that will improve health care, lower costs, and enhance coverage and delivery. The program focuses on coverage and access to care, delivery system reform, cost containment, chronic and long-term care, and rural and behavioral health.

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DISCLAIMER

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Executive Summary

Climate change's toll on human health is undisputed: Cardiovascular diseases, respiratory illnesses, liver diseases, diabetes, preterm births, and behavioral health issues have all been associated with the presence of extreme temperatures.[1,2,3,4,5,6,7,8] Children, older Americans, and low-income communities remain especially vulnerable.[9,10,11,12,13,14,15,16]

The nation's health care sector has an important role to play in reducing the greenhouse gas (GHG) emissions that are contributing to a warming planet. The United States remains the top emitter of health care GHG emissions globally, accounting for 27% of Earth's total health care emissions.[17] Hospitals generate the most emissions in the U.S. health care sector at 36%, followed by physician and clinical services at 12%, and prescription drugs at 10%.[18]

This report focuses on the immediate actions that hospitals can take, but BPC recognizes that the GHG emissions originating from health care supply chains must be addressed as well, given that they account for nearly 80% of U.S. health care emissions.[19] Although the problem extends well beyond the health care system, addressing the unique features of the health care system's supply chain—such as the development and manufacturing of health care goods and services (e.g., pharmaceutical drugs and medical devices)—is also essential to lowering emissions and will require input from a much larger set of stakeholders.

Promisingly, experts and policymakers at all levels of government increasingly acknowledge the need to reduce the GHGs emitted by the health care system, starting with the nation's hospitals.[20,21,22] Indeed, many hospitals and health care entities have already begun to act.

And now is a propitious time to act: The 2022 Inflation Reduction Act (P.L. 117-169) and the 2021 Infrastructure Investment and Jobs Act (P.L. 117-58) both offer significant incentives for hospitals and health care systems to lower their greenhouse gas emissions.

To help hospitals reduce their emissions in a way that is consistent with both the effects of a changing climate on human health and the nation's larger transition to clean energy, the Bipartisan Policy Center recommends the following federal actions:

- At least every three years, the Centers for Medicare and Medicaid Services (CMS) should publicly post on its website a report (1) detailing whether CMS deems any building code changes to be "significant" as they relate to the potential for reducing GHG emissions, and (2) describing how hospitals are utilizing categorical and noncategorical waivers granted since the previous report, including whether GHG emissions reductions have resulted.
- The National Institute for Occupational Safety and Health (NIOSH) at the Centers for Disease Control and Prevention (CDC)—in coordination with the National Institute of Environmental Health Sciences (NIEHS) at the National Institutes of Health (NIH)—should research ventilation strategies in hospitals to determine ways to use the lowest energy ventilation while balancing risk reduction from infectious aerosols, given that ventilation technologies represent a significant portion of energy usage within hospitals. NIOSH should publish and promote this research utilizing its existing processes.
- CMS, via the Hospital Inpatient Quality Reporting Program, should require hospitals to report whether they utilize ENERGY STAR Portfolio Manager or a similar measuring tool.
- The Government Accountability Office (GAO) should issue a report detailing the various clean energy workforce development programs within the Departments of Energy, Labor, Agriculture, and Health and Human Services (HHS), and provide recommendations, if warranted, on where programs could be adjusted or developed to strengthen workforce expertise specific to health care settings. A member of Congress will likely need to request that GAO complete this report.

These recommendations are designed for immediate action and implementation, primarily by utilizing existing statutory and regulatory authorities, except for two areas that might require more congressional engagement—(1) at least one member of Congress will need to request a GAO report; and (2) Congress might need to act to provide CMS with the authority to collect information regarding hospital utilization of ENERGY STAR Portfolio Manager or a similar measuring tool.

Given the current congressional environment—and to make it more likely for Congress to act, if necessary—BPC's recommendation related to ENERGY STAR Portfolio Manager is narrowly tailored and represents simply a first step—that is, only requesting that hospitals report if they are utilizing an energy and emissions measuring tool.

BPC also offers the following best practices for hospitals to begin reducing their GHG emissions:

- Hospitals should leverage federal funding opportunities, including those created by the Inflation Reduction Act. To do so, hospitals are encouraged to follow real-time updates from the HHS Office of Climate Change and Health Equity (OCCHE).
- Hospitals should employ C-suite personnel and, to the extent needed, contract out for additional services dedicated to driving and supporting organization-wide efforts to reduce GHG emissions.
- Hospitals should reduce their GHG emissions from anesthetic gases by gradually reducing, with the goal of eliminating, the use of desflurane gas and nitrous oxide—both of which are particularly potent greenhouse gases. They should also work to reduce their GHG gas emissions from anesthesia-related sources overall.
- Hospitals should reduce their GHG emissions from food waste by:
    - devoting resources to sourcing more locally grown, healthier, and fresher fruits and vegetables options;
    - providing more tailored meal options to patients;
    - taking immediate advantage of opportunities for composting or otherwise repurposing food waste and unused food products.

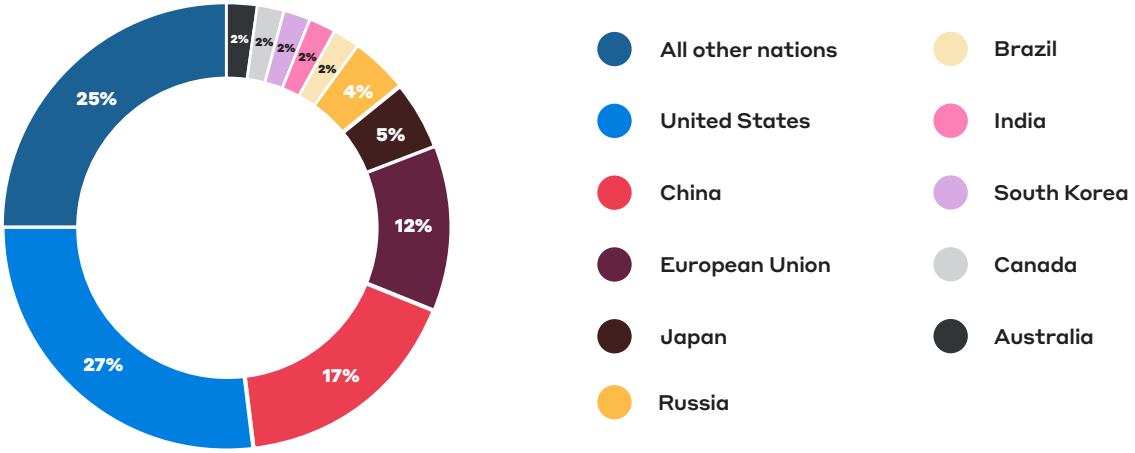
BPC developed these recommendations through expert and stakeholder interviews and reviews of relevant literature. For hospitals to achieve success, and in addition to supportive federal policies, they will need significant support from their C-suites and other leaders.

Introduction

HEALTH CARE'S CONTRIBUTIONS TO GREENHOUSE GAS EMISSIONS

Utilizing a collection of sophisticated methods—including the Greenhouse Gas Protocol, which measures emissions—a 2020 *Health Affairs* report attributed 8.5% of U.S. greenhouse gas (GHG) emissions to the health care sector.[23] Additionally, the United States is the leading emitter of health care GHGs, accounting for 27% of the world's total health care emissions (**Figure 1**) despite having less than 5% of the world's population.[24] Hospitals alone contribute the most health care sector emissions at 36%, followed by physician and clinical services at 12% and prescription drugs at 10%.[25]

Figure 1: Top Global Health Care GHG Emitters, 2019



Source: https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_090619.pdf.

This figure represents the 5% of total global emissions attributable to health care.[26]

Additionally, hospitals are outliers when it comes to their energy use intensity (EUI), which is a measure of energy used per square foot. In the United States, the average *source* EUI (i.e., the measure of energy including "transmission, delivery, and production losses" of that energy, and different from *site* EUI) for general medical and surgical hospitals is twice as much as the next comparable health care facility—residential care facilities (426.9 kBtu/ft2 versus 213.3 kBtu/ft2).[27]

THE GREENHOUSE GAS PROTOCOL: MEASURING GHG EMISSIONS

The Greenhouse Gas Protocol provides GHG accounting standards for businesses, local governments, and other entities. Developed by the global nonprofit World Resources Institute and the World Business Council for Sustainable Development, the protocol also provides "scopes" to measure GHG emissions.[28]

Scope 1 includes "direct" emissions. An example of a scope 1 emission is that which originates from an on-site boiler.[29] Within the health care industry, scope 1 encompasses emissions directly from health care facilities. Scope 1 accounts for 7% of GHG emissions from the U.S. health care system.

Scope 2 encompasses "indirect" emissions created by energy purchased; in total, it accounts for about 11% of U.S. health care system GHG emissions.[30] Emissions from the electricity a hospital purchases would be an example of a scope 2 emission.[31]

Scope 3 also contains indirect emissions, but it includes those from production, transportation, and waste management. For example, scope 3 emissions would include emissions produced to manufacture a medical product or device or to produce a pharmaceutical product (i.e., within the health care system's supply chain).[32] Within the U.S. health care industry, scope 3 emissions account for more than 80% of total emissions.[33]

While these scopes are generally well understood within the health care setting, health care entities do not yet measure them in a standardized format; doing so will be a key step to allow for a more comprehensive comparison across all scopes and hospitals nationally.

GHG'S THREATS TO HEALTH AND HEALTH CARE

GHGs—primarily carbon dioxide—trap heat close to Earth's atmosphere and warm the climate. This change in climate, in turn, affects human health and physical safety. Overall warming causes sea levels to rise and coastal flooding, as well as increases in annual precipitation levels in some places (but drought in others) and in the frequency and severity of hurricanes and other weather events.[34] Each of these affects the health sector: Extreme weather can lead to evacuations, power outages, supply chain disruptions, damage to critical infrastructure, and loss of life, among others.[35,36]

GHG emissions also impact humans' physical health, both in terms of health care outcomes and physical safety, as well as mental health.[37,38,39,40] Cardiovascular diseases, respiratory illnesses, renal illnesses, liver diseases, diabetes, preterm births, and behavioral health issues have all been associated with the presence of extreme temperatures.[41,42,43,44,45] One recent and striking example of the burden of extreme heat comes from Maricopa County, AZ, which experienced a 25% increase in heat-related deaths—from 339 to 425—from 2021 to 2022.[46]

A changing climate has also increased the prevalence of vector-borne diseases and asthma in some areas of the country, as well as a rise in vector-borne diseases that originate and are locally acquired within the United States.[47,48] In June 2023, for example, the first instances of locally acquired malaria—a vector-borne disease—were identified in Texas and Florida; this was the first time locally acquired malaria cases have been identified in the United States since 2003.[49] The incidence of "Valley fever"—a colloquial term for a fungal infection caused by the inhalation of *Coccidioides* organisms, which causes respiratory symptoms—has also increased in the past two decades due to climate change.[50,51]

Climate change might also be intensifying pathogenic diseases.[52] The health hazards associated with pollen, wildfires, and droughts are also well documented, as are the hazards of increased air pollution, most of which are caused by human energy usage rather than by natural causes.[53,54,55,56,57] In 2022, a group of scientists published findings suggesting a connection between air pollution and lung cancer, including among individuals who have never smoked.[58] Air pollution has also been found to be associated with dementia.[59]

All of these conditions affect population groups that are both more susceptible to the effects of climate change and often already disadvantaged (e.g., children, older adults, low-income communities, individuals with chronic conditions, and communities of color).[60,61,62,63,64,65,66,67,68] Moreover, the American Public Health Association has identified climate change as a "threat multiplier," in that it exacerbates existing poverty and reduces the ability of disadvantaged communities to prepare for and respond to a changing climate.[69] Psychologists

have also noted and made efforts to address the mental health needs of their patients in the face of climate change.[70,71,72]

Hospitals are disproportionately seeing and feeling climate change's effects on the health outcomes of the populations they serve. One study found that heat waves coinciding with multiday blackouts would result in significant emergency room usage due to heat-related illnesses.[73] Another study published in *GeoHealth* found that hospitals on the Atlantic and Gulf Coasts remain at risk from hurricanes and sea-level rise.[74] The same study highlighted that even lower-intensity weather events can have an outsized impact on access to health care due to, for example, flooding risks to hospitals.[75]

HOSPITAL SECTOR: OPPORTUNITIES TO REDUCE GHG EMISSIONS

Experts and policymakers at all levels of government increasingly acknowledge the urgency of responding to the needs of those communities whose health and safety are most acutely affected by climate change. Addressing this issue will likely also have an impact on federal spending: According to a recent RAND Corp. report, the nation can expect climate change to cause a "substantial net loss" to the federal budget.[76]

Additionally, experts and policymakers increasingly acknowledge the need to reduce GHG emissions of our health care system—beginning with the nation's hospitals.[77,78,79,80,81,82] Indeed, in September 2021, a collection of 200 health and medical journals issued an editorial calling on health professionals to act to address climate change and protect human health.[83] Although similar editorials have been issued before, this was the first to have been coordinated at such scale.[84]

This urgency—coupled with additional investments offered through the 2022 Inflation Reduction Act (IRA) (P.L. 117-169) and the 2021 Infrastructure Investment and Jobs Act (P.L. 117-58)—offers an opportune moment for hospitals and health care systems to examine how to reduce their GHG emissions. Four health care system chief executive officers recently wrote about the "low-hanging fruit" available to hospitals to reduce energy usage, save money, and "build momentum for future work."[85] Still, the health care sector continues to fall behind other sectors in its level of reporting on sustainability measures and activities.[86]

Encouragingly, hospitals looking to reduce their GHG emissions can work in tandem with the nation's greater transition toward alternative and renewable energy sources. This opportunity is even more propitious given the investments the Inflation Reduction Act made in energy infrastructure upgrades.[87] At every step of the way, hospitals should both anticipate and be prepared to adapt to state and local changes in energy generation and delivery.[88]

Additionally, if hospitals have not already begun to reduce their GHG emissions, they should be motivated by newly available incentives. Not only are financial incentives available through the IRA, but many hospitals have already started the journey to better understanding the critical initial steps to reduce their GHG emissions. Embracing changes at the hospital level can also open the door to greater changes in the wider health care sector.[89]

The following report provides federal recommendations and a learning pathway to assist hospitals in reducing their GHG emissions. It focuses on immediate actions that hospitals can take, but BPC recognizes that the GHG emissions originating from health care supply chains must be addressed, as well, given that they account for nearly 80% of U.S. health care emissions.[90] Although the problem extends well beyond the health care system, focusing on the unique features of the health care system's supply chain—such as the development and manufacturing of health care goods and services (e.g., pharmaceutical drugs and medical devices)—is essential to lowering emissions and will require input from a much larger set of stakeholders.

FEDERAL RECOMMENDATIONS AND OPPORTUNITIES FOR HOSPITALS

To encourage hospitals to reduce their GHG emissions in a way consistent with the effects of a changing climate on human health, the safe delivery of health care, and the evolving nature of our nation's energy infrastructure, BPC offers the following federal recommendations:

- At least every three years, the Centers for Medicare and Medicaid Services (CMS) should publicly post on its website a report (1) detailing whether CMS deems any building code changes to be "significant" as they relate to the potential for reducing GHG emissions, and (2) describing how hospitals are utilizing categorical and noncategorical waivers granted since the previous report, including whether GHG emissions reductions have resulted.
- The National Institute for Occupational Safety and Health (NIOSH) at the Centers for Disease Control and Prevention (CDC)—in coordination with the National Institute of Environmental Health Sciences (NIEHS) at the National Institutes of Health (NIH)—should research ventilation strategies in hospitals to determine ways to use the lowest energy ventilation while balancing risk reduction from infectious aerosols, given that ventilation technologies represent a significant portion of energy usage within hospitals. NIOSH should publish and promote this research utilizing its existing processes.
- CMS, via the Hospital Inpatient Quality Reporting Program, should require hospitals to report whether they utilize ENERGY STAR Portfolio Manager or a similar measuring tool.

- The Government Accountability Office (GAO) should issue a report detailing the various clean energy workforce development programs within the Departments of Energy, Labor, Agriculture, and Health and Human Services, and provide recommendations, if warranted, on where various programs could be adjusted or developed to strengthen workforce expertise specific to health care settings. A member of Congress will likely need to request that GAO complete this report.

The aforementioned recommendations are designed for immediate action and implementation, primarily utilizing existing statutory and regulatory authorities, except for two areas that might require more congressional engagement—(1) at least one member of Congress will need to request a GAO report; and (2) Congress might need to act to provide CMS with the authority to collect information regarding hospital utilization of ENERGY STAR Portfolio Manager or a similar measuring tool.

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BPC also offers the following best practices for hospitals to begin reducing their GHG emissions:

- Hospitals should leverage funding opportunities, including those created by the Inflation Reduction Act. To do so, hospitals should follow real-time updates from the HHS Office of Climate Change and Health Equity (OCCHE).
- Hospitals should employ C-suite personnel and, to the extent needed, contract out for additional services dedicated to driving and supporting organization-wide efforts to reduce GHG emissions.
- Hospitals should reduce their GHG emissions from anesthetic gases by gradually reducing, with the goal of eliminating, the use of desflurane gas and nitrous oxide—both of which are particularly potent greenhouse gases. They should also work to reduce their GHG gas emissions from anesthesia-related sources overall (e.g., designing a system with less leakage and safely reducing the flow of all anesthesia gases).
- Hospitals should reduce their GHG emissions from food waste by:
    - devoting resources to sourcing more locally grown, healthier, and fresher fruits and vegetables (known as "fresher plant forward food") options;
    - providing more tailored meal options to patients;
    - taking immediate advantage of opportunities for composting or otherwise repurposing food waste and unused food products.

Federal Policy Recommendations

FEDERAL BUILDING CODES

Building codes can have a significant impact on hospitals' GHG emissions. However, many existing federal building codes lack contextualization on how they contribute to or reduce GHG emissions. Moreover, hospitals might view federal building codes as a barrier to reducing GHG emissions. In light of this perceived barrier, federal regulators and policymakers should consider the following changes to reduce hospital GHG emissions: (1) provide more information and education regarding available federal building code waivers (specifically those that provide flexibility for hospitals to address their GHG emissions); and (2) undertake more research to better inform federal building codes in a way that would help reduce hospital GHG emissions (e.g., ventilation methods and air exchange requirements, especially as they relate to operating rooms).

TRANSPARENCY IN BUILDING CODE WAIVERS

CMS does not currently provide detailed information on how hospitals can utilize building code waivers to reduce their GHG emissions. To remedy this problem, **at least every three years, CMS should publicly post on its website a report (1) detailing whether CMS deems any building code changes to be "significant" as they relate to the potential for reducing GHG emissions, and (2) describing how hospitals are utilizing categorical and noncategorical waivers granted since the previous report, including whether GHG emissions reductions have resulted**. Hospitals should take advantage of waivers that would assist in reducing their GHG emissions.

At the federal level, hospitals—as both critical infrastructure and recipients of federal dollars—are held to higher standards and more complex and stringent building codes than the average commercial building. Indeed, CMS requires hospitals and other Medicare and Medicaid providers to comply with the 2012 edition of the National Fire Protection Association (NFPA) Life Safety Code (LSC) (NFPA 101) and Health Care Facilities Code (NFPA 99).[91] Health care facilities are also held to NFPA 110, Standard for Emergency and Standby Power Systems.[92]

The National Fire Protection Association develops codes and standards in an effort to eliminate "death, injury, property and economic loss due to fire, electrical and related hazards."[93] Consequently, NFPA 101 outlines minimum requirements for building design, operations, and maintenance, while NFPA 99 outlines "minimum requirements for health care facilities for the installation, inspection, testing, maintenance, performance, and safe practices for facilities, material, equipment, and appliances."[94] Finally, NFPA 110 addresses "performance requirements for emergency and standby power systems providing an alternate source of electrical power in buildings and facilities in the event that the normal electrical power source fails."[95]

In 2016, CMS issued a final rule that updated the fire safety standards for hospitals and other health care facilities.[96] Under 42 CFR 482.41(b)(1)(i), hospitals must "meet the applicable provisions and must proceed in accordance with the Life Safety Code," which includes compliance with NFPA 101 (issued 2011) and NFPA 99 (2012 edition), along with other cross-referenced building codes.[97]

However, the Health and Human Services (HHS) secretary can waive these requirements—per 42 CFR 482.41(b)(2)—if they put "unreasonable hardship upon a hospital" and provided that the waiver would "not adversely affect" patients' health and safety.[98] Likewise, CMS maintains the right to "defer to newer editions of the LSC," as well as to "accept a state's fire and safety code instead of the LSC" if it is more rigorous.[99]

When NFPA updates its standards every three years, CMS reviews the changes to determine whether any newer standards need to be adopted.[100] If CMS deems that "significant" changes have been made to the newer standards and should be adopted by hospitals, the agency engages in notice and comment rulemaking.[101] If CMS decides not to require the newer standards, hospitals can still opt to conform to these standards through a waiver process. As part of the waiver process, CMS has developed policies related to categorical (i.e., blanket) and noncategorical (i.e., one-off) waivers.[102] Categorical waivers are generally issued when CMS has been made aware that the code affects similarly situated facilities and, as such, a categorical waiver would reduce the burden on hospitals.

Despite this process, CMS does not currently provide details on how hospitals are utilizing the waivers. Publishing a report at least every three years would remedy that situation, especially considering CMS's recent waiver for backup power generators.

BACKUP POWER GENERATORS

Hospital facilities must be functional 24 hours a day, seven days a week. Additionally, to address potential patient vulnerabilities, CMS requires hospitals to have reliable backup power systems available during a power outage. That is why under 42 CFR 482.4(a)(1), hospitals must have emergency power and lighting that comply with NFPA 99 (2012 edition), which mandates that hospitals utilize a generator or a battery system for emergency power.

Hospital executives have contended that this CMS requirement reduces their ability to address GHG emissions by preventing them from using backup power technologies that utilize renewable or more sustainable forms of energy.[103] To counteract this limitation, CMS recently provided a categorical waiver with respect to backup power generators.

More specifically, on March 31, 2023, CMS announced a categorical waiver that allows hospitals to use nonfossil fuel microgrid systems for emergency backup power, in accordance with the NFPA 99 (2021 edition).[104] This waiver was a result of state representatives and industry stakeholders notifying CMS of updated NFPA codes that would help reduce GHG emissions at health care facilities. To utilize the waiver, hospitals "must formally elect and document their decision," although CMS does not require a formal application.[105] More hospitals should be encouraged to utilize this categorical waiver.

This waiver represents a significant attempt by CMS to allow health care systems to utilize more clean energy technologies. Additionally, energy experts warn that the nation's electric grids will become increasingly vulnerable as extreme weather events caused by climate change become more common, increasing the importance of renewable or more sustainable on-site backup energy options.[106]

A few hospitals have begun testing newer backup energy options. In 2018, Kaiser Permanente pioneered the first hospital microgrid at its Richmond Medical Center in California.[107] In partnership with a microgrid designer and builder, Kaiser Permanente installed a solar power system on top of the medical center's parking garage.[108] Kaiser Permanente continues to test the utilization of more energy efficient microgrids to support emergency energy needs. One of Kaiser Permanente's hospitals in Ontario, CA, is expected to have 10 times the capacity of the microgrid at Richmond Medical Center.[109]

AIR EXCHANGE RATES AND HEATING, VENTILATION, AND AIR CONDITIONING

The National Institute for Occupational Safety and Health at the CDC—in coordination with the National Institute of Environmental Health Sciences at the NIH—should research ventilation strategies in hospitals to determine ways to use the lowest energy ventilation while balancing risk reduction from infectious aerosols, given that ventilation technologies represent a significant portion of energy usage within hospitals.

As previously noted, hospitals must follow specific building code requirements, although those requirements do not necessarily take the goal of reducing GHG emissions into account. Indeed, one area of tension in ventilation relates to the air exchange rates—the number of times air is removed and replaced within a given space. To meet the dual goals of reducing GHG emissions and lowering the risk of disease transmission from infectious aerosols within hospitals, additional research would allow for a better understanding of how to potentially modify building codes related to ventilation strategies.

NFPA 99 (2012 edition)—which outlines minimum safety standards for many aspects of heath care facilities—requires that hospitals comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 170-2008 with respect to ventilation, temperature, and relative humidity for new, renovated, altered, or modernized areas of a facility.[110,111] These building codes detail specific air exchange rates for various portions of the hospital, including operating rooms. From a GHG emissions perspective, additional requirements to remove and replace air are very intensive, given that the replaced air must be heated or cooled to the desired temperature.

Under both ASHRAE 170-2008 and the more recent ASHRAE 170-2021, operating rooms must have a minimum of 20 air exchanges (i.e., every 3 minutes) per hour.[112,113] These air exchanges are typically driven by an HVAC system that requires the use of electricity and, sometimes, refrigerants. However, even when unoccupied, an operating room might change air 25 times or more per hour.[114] One report indicates that some hospital operating rooms reach up to 40 air changes per hour, far above the established minimum.[115]

These higher air exchange rates may be driven, in some cases, by the use of older HVAC systems; alternatively, air exchange rates may be altered to control the atmosphere in ways that are unrelated to infection control, such as to regulate humidity or odors.[116] In any case, some misunderstandings in the effective use of HVAC systems within clinical settings seem to persist. This can lead to the utilization of HVAC systems in ways that waste energy without providing any additional clinical benefit. The utilization of unnecessary energy is also a waste of a hospital's financial resources, which is especially worrisome given that HVAC systems account for at least 50% of a hospital's energy usage.[117]

Hospitals could save energy—and money—by reducing the number of air exchanges to required minimums per hour when an operating room is unoccupied.[118] Hospitals might also achieve savings by addressing other aspects of ventilation—such as air flow patterns and pressurization—as well as modifying room temperatures when an operating room is not in use, although considerable coordination with clinical staff would be required.[119]

Based on BPC's review of existing literature, we believe that additional research and investigation are needed to determine proper ventilation strategies that will use the lowest possible air exchange while protecting human health, maintaining an agreeable atmosphere, and reducing energy usage. NIOSH should build upon the CDC's Building Resilience Against Climate Effects cooperative agreement with states to further its research related to climate change's effects on health.

More specifically, NIOSH should investigate strategies that allow for the lowest energy ventilation method consistent with risk reduction from infectious aerosols. For example, NIOSH could examine how to better ascertain the optimal air exchange to minimize occupational exposure to infectious agents within an operating room while also minimizing the number of air exchanges required to reduce GHG emissions. In doing so, NIOSH should coordinate with the NIEHS, given that the National Institute of Environmental Health Sciences is the coordinator for the NIH Climate Change and Health Initiative. NIOSH should also consider the value of coordinating with the Department of Energy's Office of Energy Efficiency and Renewable Energy and Building Technologies Program, which has also conducted work in this space.[120,121]

NIOSH should publish and promote this research utilizing its existing processes, including making it searchable among its Numbered Publications, which includes a list of all NIOSH publications, or its NIOSHTIC-2 Publications database, which is a searchable database of more than 70,000 citations related to occupational safety and health information supported in whole or in part by NIOSH. The agency's library of existing publications includes many written products with helpful guidance among which research on ventilation strategies to reduce energy consumption and GHG emissions could exist. For example, in April 2023, NIOSH published *Managing Hazardous Drug Exposures: Information for Healthcare Settings*, a robust document outlining drug exposure risk management.

Metrics and Reporting

ENERGY STAR PORTFOLIO MANAGER: A KEY TOOL FOR HOSPITALS

CMS, via its Hospital Inpatient Quality Reporting Program, should require hospitals to report whether they utilize ENERGY STAR Portfolio Manager or a similar measuring tool.

One of the first steps hospitals should take to effectively reduce their GHG emissions is to measure and understand these emissions. Although a variety of tools exist, the most widely used program is the Environmental Protection Agency's (EPA's) ENERGY STAR Portfolio Manager. Already, more than 3,500 hospitals nationwide—nearly 60% of hospitals—utilize Portfolio Manager to measure their energy performance.[122]

CMS should develop a plan to require hospitals to report whether they utilize Portfolio Manager or a similar measuring tool. Additionally, CMS should consider including an *option* for hospitals to report additional details—such as specific information related to energy usage—to CMS.

The goal of the ENERGY STAR program is to help "consumers, businesses, and industry save money and protect the environment through the adoption of energy-efficient products and practices."[123] In 2020, ENERGY STAR reported that program users had helped reduce nationwide electricity consumption by more than 10% of total U.S. demand, resulting in a 5% reduction in U.S. GHG emissions.[124] ENERGY STAR-certified buildings use 35% less energy and *also* emit 35% less GHG emissions than typical buildings, on average.[125] The ENERGY STAR program began scoring hospitals in 2001.[126]

In addition to enabling hospitals to measure and track their energy use intensity, Portfolio Manager provides an ENERGY STAR 1-100 score that allows hospitals to compare their efficiency. To receive a score, hospitals enter hospital-specific data inputs, such as building size, the number of staffed beds, and the number of MRIs.[127] The EPA established these variables based on surveys conducted by the industry, and they include the number of operating and surgical rooms, trauma rooms, and delivery rooms; whether the facility has on-site laundry, labs, and/or commercial kitchens; and the number of full-time equivalent workers.[128]

Furthermore, the ENERGY STAR program utilizes regression analyses to determine the most statistically significant variables for assessing hospital efficiency and calculating an individual hospital's score.[129] The score allows buildings to compare themselves to their peers (or a national median). Buildings that score 75 or higher operate in the top 25% nationally and are eligible to be "ENERGY STAR" certified by EPA for superior performance.[130]

The value of reporting on energy use and GHG emission data—through ENERGY STAR or other programs—is that it helps hospitals to better understand their energy usage and associated costs. The information also provides them with tangible details on where they could achieve energy use and cost savings. Indeed, the American Society for Health Care Engineering reviewed ENERGY STAR scores among hospitals relative to energy cost per staffed bed, and found that the higher the ENERGY STAR score, the lower the cost per bed.[131] Although data comparisons such as these are currently limited, promoting the use of ENERGY STAR Portfolio Manager would allow more hospitals to understand their energy usage and associated costs more fully.

As is true elsewhere in the health care system, hospitals could then reinvest savings from reduced energy usage in efforts to lower further GHG emissions, in patient care or, more generally, in fulfilling the various missions of hospitals and health care systems. Several major hospital systems have already seen such returns by better measuring, understanding, and working to reduce their energy consumption.

For example, Memorial Hermann Health System—a nonprofit health care system headquartered in Houston—earned ENERGY STAR certification for 80% of its hospitals and was awarded the 2022 ENERGY STAR Partner of the Year Award by EPA for its leadership role in and commitment to energy efficiency.[132] To achieve more than $100 million in utility cost savings between 2008 and 2018, Memorial Hermann focused on moving less air and water, varying air and water temperatures to match seasonal requirements, and benchmarking and publishing quality improvement outcomes to promote competition among its facilities.[133]

However, despite both the benefits in understanding energy consumption and demonstrated cost savings, hospitals have opposed *requirements* to report data on energy usage or GHG emissions, as exemplified in the recent experience by The Joint Commission—the country's oldest and largest health care accrediting body (see below). In addition, some stakeholders—including Biden administration officials—have voiced concerns that CMS might not have the statutory authority to require reporting on hospital GHG emissions. As such—and especially given hospital reluctance to report this data—***Congress might need to provide explicit authority for CMS to require these activities***.

Because Congress might need to explicitly provide these authorities—and to help retain the bipartisan nature of the recommendations and make it more likely for Congress to act—this recommendation is tailored narrowly and represents simply a first step—that is, CMS should only request hospitals to report whether they are utilizing an energy and emissions measuring tool.

CONDITIONS OF PARTICIPATION VERSUS THE HOSPITAL INPATIENT QUALITY REPORTING PROGRAM

In determining how hospitals should report to CMS regarding their GHG emissions, the agency has at least two relevant statutory authorities–the Hospital Inpatient Quality Reporting Program and the Conditions of Participation (CoPs). BPC's recommendation focuses on CMS utilizing its authority under the Hospital Inpatient Quality Reporting Program, which was initially authorized under Section 501(b) of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (P.L. 108-173). According to CMS, the program's goal is to drive "quality improvement through measurement and transparency by publicly displaying data to help consumers make more informed decisions about their health care."[134] Patients can view data collected under this program at Care Compare.[135]

The statutory authority for the Hospital Inpatient Quality Reporting Program notes that it must address "quality" and is not as narrowly tailored as statutory provisions related to CoPs. As such, the pursuant penalties are less severe than noncompliance with CoPs. For instance, failure to report all measures might result in a slight reduction in payment. Additionally, CMS has the authority to require the submission of quality measures that are not subject to the value-based payment, which means that some measures might simply require reporting to avoid any penalties.

To participate in the Medicare and Medicaid program, however, hospitals must also comply with the health and safety standards outlined in statute and regulation, commonly known as the CoPs. The CoPs derive from the narrowly tailored statutory authority under 42 U.S.C. §1395x(e)(9), which says that the "requirements ... [are] necessary in the interest of the health and safety of individuals who are furnished services in the institution."

Some stakeholders have suggested that CMS should utilize its authority under the CoPs to require GHG emissions reporting. A hospital's failure to comply would then result in that hospital not being eligible for Medicare or Medicaid funding. However, stakeholders have mixed views about whether the current CoPs allow for such reporting or if Congress would need to amend the CoPs.[136,137] Those arguing that the current CoPs are sufficient cite current requirements related to quality assessment and performance improvement.[138]

CMS might lack the statutory authority to amend the CoP regulations, however, because doing so would fall outside the statutory scope of regulations that address the "health and safety of individuals who are furnished services in the institution." Indeed, the latest 5-4 Supreme Court ruling related to COVID-19 vaccines mandates effectuated through the CoPs questioned whether CMS has the statutory authority to amend its regulation to allow for GHG emissions reporting.[139,140] And, even if one concluded that CMS has the statutory authority to amend its regulations, the agency would still likely need to update them.

Furthermore, although the CoPs *do* have requirements related to the physical environment, those standards include language related to emergency situations and tend to suggest that they are related to hospital resiliency (i.e., being able to maintain patient care when climate disasters occur) and not related to hospital energy usage (i.e., reducing GHG emissions). As such, BPC's assessment—especially considering the potential statutory and regulatory hurdles—is that any changes to the CoPs would likely take several years to effectuate. Because our focus is on developing recommendations designed for immediate action, a change to the CoPs falls outside the scope of this report. The need for quick action is also why the BPC recommendation relied upon the statutory and regulatory authority of the Hospital Inpatient Quality Reporting Program.

THE JOINT COMMISSION EXPERIENCE REGARDING HOSPITAL REPORTING

As the environmental impact of GHG emissions from health care entities has become more apparent, hospitals have resisted requirements that they report their energy usage to regulatory entities. For instance, in early 2023, The Joint Commission developed proposed sustainability accreditation standards for hospitals.[141] These standards would have required hospitals to dedicate an individual responsible for overseeing a hospital's GHG emissions reductions and to report certain measures related to energy usage.[142]

The Joint Commission received a wide range of comments on the standards, from strong opposition to the proposal to support of the mandatory accreditation requirements. Critics of the standards cited the increased reporting burden, workforce issues, and financial challenges, particularly on the heels of the COVID-19 pandemic.[143]

A wave of support followed this initial feedback, however. Given this momentum—and after taking initial feedback into consideration—The Joint Commission determined that it could best support progress on reducing hospital GHG emissions by proceeding with a voluntary certification program. This certification—the Sustainable Healthcare Certification—offers a framework to help organizations reduce their GHG emissions. More specifically, the certification offers assistance with carbon accounting, an area that is at the heart of reducing energy waste and improving energy efficiency.

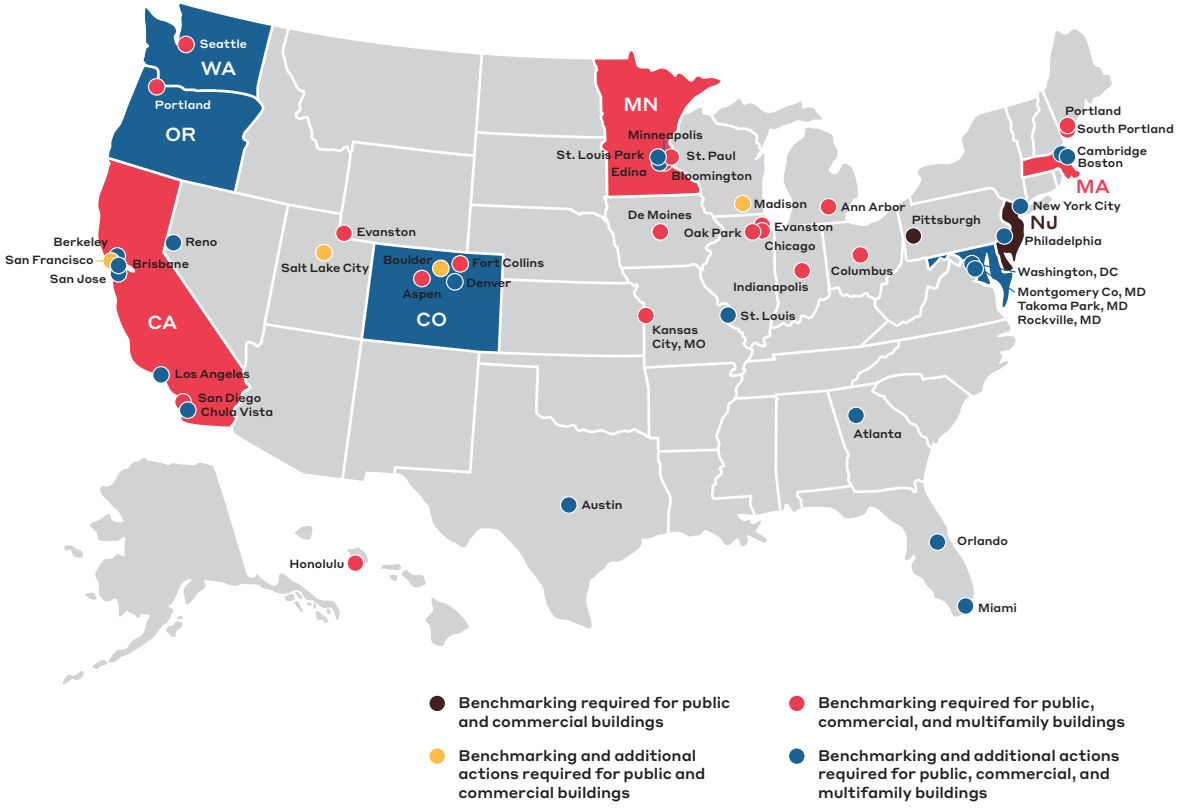
To address workforce concerns, The Joint Commission eliminated over 400 standards in other areas to allow organizations to focus on health equity and environmental sustainability. The certification's requirements are more stringent, as a result, and—unlike accreditation, which occurs over a three-year cycle—they pose no inherent barrier to earlier adoption. The Sustainable Healthcare Certification will launch in January 2024.[144,145] In addition to providing a framework for reducing GHG emissions, it also allows health care organizations to receive public recognition for their commitment and achievements in reducing their footprint.

Moreover, the certification is available to both Joint Commission accredited and noncommission accredited U.S. hospitals and critical access hospitals. The certification review will be conducted virtually. At the time of review, a hospital must have baseline emissions data for three GHG emission sources and an action plan to reduce them. For recertification, a hospital must have 24 months of data and demonstrate a reduction of three GHG emission sources. Hospitals should take advantage of this new certification.

Alongside this certification, The Joint Commission has developed a resource center with strategies and educational tools for hospitals to reduce their GHG emissions. The Joint Commission will continue to curate and share information to help organizations meet certification requirements, as well as to address sustainability as a practical, operational matter. Hospitals should also take advantage of the tools and strategies available within the resource center.

Several states, counties, and cities are moving forward with GHG measurement and reporting requirements. For example, the state of Colorado requires reporting utilizing ENERGY STAR Portfolio Manager.[146] The city of Boston, under its Building Energy Reporting and Disclosure Ordinance, also requires disclosure of a building's ENERGY STAR score.[147] More than 50 jurisdictions have instituted benchmarking requirements for existing buildings, as represented in **Figure 2**. All require use of Portfolio Manager, although a few exempt hospital facilities.[148]

Figure 2: U.S. City, County, and State Policies for Existing Buildings: Benchmarking, Transparency, and Beyond



Source: https://www.imt.org/wp-content/uploads/2023/07/IMT-Benchmarking-Map-09122023-CURRENT-1-scaled.jpg.

These state and local policies—particularly where they impact hospitals—were often designed with input from relevant state and local stakeholders. These stakeholders, in many cases, also continue to help hospitals comply with these policies.

For example, in Washington state, the Washington State Hospital Association played an active role in passage of the state's "Clean Buildings" law and continues to offer resources and compliance assistance to hospitals and health care systems.[149] Similar to the Ohio Hospital Association—which is discussed in further detail below, although it should be noted that Ohio does *not* currently require buildings to track or reduce their GHG emissions—state hospital associations are particularly well placed to help their member hospitals implement GHG emissions reduction strategies to meet state and local requirements.

Additional details on state and local policies and resources for reducing building GHG emissions can be found in **Table 1**, alongside what BPC identified as potential best practices that hospitals might look to from their cities and states when GHG emissions reduction policies are enacted.

Table 1: Potential Best Practices Among U.S. Cities and States with Building GHG Emissions Reduction Policies Affecting Hospitals

Best Practice	Originating Initiative	Additional Details
State hospital association leadership	In 2019, Washington state passed a "Clean Buildings" law (HB 1257) to reduce building GHG emissions by requiring energy benchmarking and the utilization of energy efficiency measures.[150] The law requires hospitals larger than 220,000 gross square feet to comply beginning on June 1, 2026, and smaller hospitals at slightly later dates.[151]	To ensure the unique circumstances of hospitals were considered, the Washington State Hospital Association played an "active role" in the rulemaking process that followed passage of HB 1257. Thereafter, the association issued a bulletin containing a "high-level overview of the regulations and recommended next steps" for hospitals and health systems that will need to comply with HB 1257. The association also continues to work with the state Department of Commerce to "ensure hospitals remain an active participant in shaping clean building policies."[152]
Hospital and health care representation	In 2020, St. Louis passed a building energy performance standard (Ordinance No. 71132).[153] The ordinance applies to buildings—including hospitals—that are 50,000 square feet and more, and provides until at least May 2025 for compliance.[154]	St. Louis's Building Energy Improvement Board—a mayoral-appointed board—establishes and approves building energy performance standards in accordance with Ordinance No. 71132.[155] Board members include individuals from a variety of entities. Of note, the Building Energy Improvement Board currently includes representation from BJC Healthcare—a St. Louis-based health care system—as well as from the Washington University School of Medicine.

Best Practice	Originating Initiative	Additional Details
Clear links to benchmarking resources, technical assistance, and partner organizations	In 2016, Evanston, WY, approved an ordinance (33-O-16) which requires large buildings within the city to track and report annual energy and water usage.[156]	The city of Evanston's website provides several resources to assist buildings with ordinance compliance. This includes a Benchmarking Guide, a Compliance Checklist, and a list of professional data verification organizations.
	In 2019, the city council of Des Moines, IA, passed an Energy and Water Benchmarking Ordinance (O. 15,7779). The ordinance aims to increase building energy efficiency and reduce GHG emissions and requires compliance by buildings that are 25,000 square feet and more.	The city of Des Moines's website also provides resources to assist buildings with compliance. This includes direct access to technical assistance with building benchmarking, a list of and links to training resources for ENERGY STAR Portfolio Manager, and helpful documents such as Benchmarking 101 and a Benchmarking Compliance Checklist.
	In 2022, Aspen, UT, passed Ordinance No. 05. Subsequently, the city launched "Building IQ," which outlines the city's energy benchmarking process and continues to develop details on "covered buildings, timelines, standards, and targets" for building performance standards.[157]	The city of Aspen's website is much like those of Evanston and Des Moines in that it offers links to relevant resources to assist with benchmarking. However, Aspen has partnered with and provides a direct link to the Community Office of Resource Efficiency—or CORE—which is an organization that offers assistance with energy benchmarking for Aspen city buildings.[158]

With hospitals already so widely using ENERGY STAR Portfolio Manager, CMS should work on a plan to require hospitals to report whether they utilize the Portfolio Manager (or a similar tool) and, like other entities requiring such reporting, provide the *option* to report Portfolio Manager information to CMS.

Workforce Pipeline

GAO should issue a report detailing the various clean energy workforce development programs within the Departments of Energy, Labor, Agriculture, and Health and Human Services, and provide recommendations, if warranted, on where various programs could be adjusted or developed to strengthen workforce expertise specific to health care settings. A member of Congress will likely need to request that GAO complete this report.

To help hospitals reduce their energy usage and meet their GHG emission reduction goals, it is imperative that the appropriate energy workforce is available. Indeed, expanding the energy workforce in this sector is important even beyond hospitals, given that reducing energy consumption and GHG emissions is an objective of industries nationwide.

The design, production, operations, and maintenance of cleaner energy technologies requires a significant level of technical expertise that demands unique consideration within federal energy workforce development policies. This is particularly important given the available federal investments that have been dedicated to growing the clean energy economy, such as the IRA. The Department of Energy (DOE) has reported on significant growth in the number of clean energy jobs since 2021, and industry experts anticipate this growth will continue.[159,160] Given the unique operations and maintenance requirements of clinical facilities—which necessitate the use of substantial amounts of energy and, occasionally, coordination with clinical staff—specificity to hospitals is of particular significance.

Federal investments in the energy workforce have existed for decades and span multiple federal departments, including Energy, Labor, and Agriculture. Several initial investments originated with the DOE—for example, through the National Renewable Energy Laboratory, which is a hub of renewable energy research, development, and deployment. Others originated at the Departments of Labor and Agriculture, as outlined in greater detail below.

Through the Federal Energy Management Program (FEMP), the DOE created a Performance Contracting National Resource Center with a no-cost, accredited, and interactive training series designed to strengthen the performance of the contracting workforce.[161] The training is targeted at the workforce that supports the federal government, as well as buildings owned by municipal and state governments, schools, and hospitals. The DOE also has an Office of Energy Jobs, which works with relevant stakeholders to support energy-sector job creation.[162]

Several additional federal programs promote growth in a clean energy workforce. These include the DOE's Advanced Research Projects Agency-Energy and the U.S. Department of Agriculture's (USDA) State Energy Extension Partnership. USDA established this program in coordination with the DOE to facilitate "nationwide community-based education and outreach programs that support energy, and provide environmental and economic advantages for individuals, communities, businesses and government."[163]

Each of these federal resources is designed to drive growth in and add value to the clean energy workforce, but they are not tailored to hospitals and other clinical settings. Given the unique operations and maintenance requirements of clinical facilities, which utilize significant amounts of energy, such specificity is especially important.

At least one member of Congress should request that the GAO perform an audit of the programs at the Departments of Energy, Labor, Agriculture, and HHS to examine their internal clean energy workforce development programs and to determine where they can be modified or established to strengthen workforce training specific to health care settings. In making this request, Congress should give GAO the flexibility to review workforce programs that might exist in other agencies, such as within the Departments of Veterans Affairs (VA), Defense, and Interior.

For the GAO to undertake an investigation or audit, a member of the House or Senate must directly make a request to the agency.[164] Given competing priorities, GAO prioritizes requests that originate from senior congressional leaders and committee and subcommittee chairs and ranking members.[165] BPC, as a result, suggests that at least one member of a congressional committee with jurisdiction over workforce programming originate such a request. A bipartisan request from the appropriate congressional committee would be of even greater value.

In conducting this review, GAO should keep in mind that the training needed for electricians, engineers, and operations and maintenance staff to support renewable energy technologies has the benefit of supporting workforce needs beyond energy and electrification specific to clinical settings. Expanding the availability of a workforce with the technical expertise to support the operations and maintenance of solar microgrids, for example, supports hospitals *and* other organizations that might utilize such technologies.

The GAO review should take into account activities that relevant associations already support. Outside of the federal government, energy, engineering, and facility management industry associations continue to play a significant role in advancing policies to support the growth of clean energy technologies and a robust clean energy workforce. Many of these associations either directly offer or provide referrals to relevant workforce development programming options and opportunities.

Additional Opportunities and Best Practices for Hospitals

In addition to federal-level recommendations, hospitals have an array of options for reducing their GHG emissions. These include taking advantage of existing renewable energy financing options; rethinking internal organizational structures and how hospitals can coordinate to better support energy reduction efforts; and acting on energy intensive areas of hospitals, such as the use of anesthetic gases and food waste.

All hospitals seeking to lower their GHG emissions must have internal organizational support. The options related to reducing food waste and controlling anesthetic gases, however, are more specific to each hospital's unique environment. Importantly, hospitals must look closely at the costs and trade-offs associated with making the investments needed to reduce their energy use and GHG emissions.

A variety of financing options are available to hospitals seeking to reduce their GHG emissions, including federal programs, tax incentives, "green" revolving funds, and green bonds. The following section details these financing options.

FUNDING AND FINANCING OPTIONS

Business Case for Action

The COVID-19 pandemic clearly strained hospitals' finances and created additional workforce challenges. However, data suggests a positive trendline for hospitals moving forward.[166] This is likely due, in part, to the federal support

that hospitals received during and after the pandemic. Given the financial benefits that result from reduced energy usage, tackling GHG emissions should be an attractive option for hospitals.

Encouragingly, examples abound of hospitals and other health care entities that have reduced their GHG emissions while generating cost savings. From 2008 to 2012, Ascension—a nonprofit health system with headquarters in Missouri—reduced its energy usage by 7.1% and achieved $18.8 million in savings.[167] Additionally, by simply switching from fluorescent lights to lower-energy LED lights, the Cleveland Clinic has saved $2 million annually since 2016.[168,169] Finally, Boston Medical Center, by entering into a power purchase agreement, issuing green bonds, and developing a rooftop garden—all best practices outlined below—has continued to reduce its energy footprint year over year.[170]

These savings enable hospitals to reinvest in patient care. An overall focus on sustainability might also assist with employee satisfaction and, therefore, could improve recruitment and retention.[171] Additionally, a review of evidence-based health care facility design shows that well designed hospitals are safer, improve patient outcomes, and result in a more positive environment for staff.[172]

Reducing hospital energy consumption to save money is not a new idea. In 1982, GAO released a report, *Millions Can Be Saved Through Better Energy Management in Federal Hospitals*, that outlined how utilizing energy audits, conservation measures, and energy-use monitoring could reduce costs at hospitals run by the DoD, the Indian Health Service, and VA.[173] Moreover, a team of researchers at the Center for Sustainable Business at New York University's Stern School of Business continue to advance its Return on Sustainability Investment (ROSI™) Methodology, with a framework for hospitals and health care systems forthcoming.[174,175]

Promisingly, hospitals have a variety of financing options for reducing their GHG emissions, ranging from federal programs and tax incentives to financing mechanisms such as energy savings performance contracts, green revolving funds, and green bonds.

Opportunities Within the Inflation Reduction Act

Hospitals should leverage funding opportunities, including those created by the Inflation Reduction Act. To do so, hospitals are encouraged to follow real-time updates from OCCHE.

Signed by President Biden in August 2022, the Inflation Reduction Act (IRA) (P.L. 117-169) committed nearly $370 billion to address climate change.[176] The legislation is projected to reduce U.S. GHG emissions by about 40% by 2030, making the IRA perhaps the most substantial federal climate legislation in the nation's history, although the full impact of investments might not be understood for years to come.[177,178,179]

The IRA includes several provisions applicable to the health care sector, including new and expanded tax credits for energy efficiency.[180,181] These incentives include an investment tax credit, a production tax credit, and an updated commercial building deduction tax credit, as well as a "direct pay" option. Direct pay allows tax-exempt entities to elect to receive cash payments in place of a tax credit; this is particularly important, given that nearly 60% of hospitals are nonprofit.[182,183]

The Department of Treasury is responsible for overseeing most climate and clean energy related dollars provided by the IRA. On June 14, 2023, Treasury provided notice of proposed rulemaking for tax credits, including for direct pay.[184] The HHS Office of Climate Change and Health Equity (OCCHE) released additional details to help health care stakeholders take advantage of options available to them as part of the IRA. BPC has summarized several of the tax credits most applicable to hospitals in **Table 2**.

Table 2: Available IRA Tax Credits

Tax Credit	Credit Purpose and Amount	Timeframe
Production Tax Credit for Electricity from Renewables (26 U.S. Code § 45)	For production of electricity from renewable energy sources (e.g., solar microgrids). Ten-year annual credit on every kilowatt hour of electricity produced at 1.5 cents per kilowatt hour.	Projects beginning construction before 1/1/25.
Investment Tax Credit for Energy Property (26 U.S. Code § 48)	For investment in renewable energy projects. One-time credit based on dollar amount of investment, up to $1,500 per 0.5 kilowatt.	Projects beginning construction before 1/1/25.
Energy Efficient Commercial Buildings Deduction Tax Credit (26 U.S. Code § 179D)	Deduction for energy efficiency improvements. The 179D tax deductions existed before IRA passage; however, the IRA reduced the minimum energy reduction requirement and increased the maximum allowable deduction.	Beginning in 2023, no expiration date.

Table adapted from information provided by OCCHE: https://www.hhs.gov/climate-change-health-equity-environmental-justice/climate-change-health-equity/quickfinder-ira/index.html.

To aid hospitals and health care systems in taking advantage of the IRA, OCCHE has compiled a list of resources that provides cross-cutting information related to tax incentives and direct pay provisions, grants, and incentives for lowering emissions, and grants and incentives for climate resilience. The IRS also continues to provide updates on IRA implementation.

OCCHE plans to update this information as other agencies implement the legislation's various provisions. Hospitals and health systems interested in these provisions should subscribe to or regularly visit OCCHE's website for the latest information.

Additional Financing Options

In addition to the various IRA funding options, hospitals can tap numerous other financing mechanisms for GHG-reduction projects:

- energy savings performance contracts;
- green revolving funds;
- green bonds;
- power purchasing agreements;
- commercial property assessed clean energy programs;
- on-bill financing and repayment;
- efficiency-as-a-service.

Energy savings performance contracts

As part of MUSH markets—a collective name for buildings owned by municipal and state governments, schools, and hospitals—hospitals can take out energy savings performance contracts (ESPCs).[185,186] According to DOE, these contracts are good options for large projects with higher upfront costs.[187] The benefit of these arrangements for hospitals lies in their ability to use ESPCs to upgrade facilities without needing to access capital budgets.[188]

Federal agencies already use these performance contracts through DOE's Federal Energy Management Program and have done so since 1998.[189] The majority of these performance contracts have been utilized in non-health care federal facilities—such as mail processing facilities and military bases—although the VA has previously showed promise for performance contracting usage at locations in California and Connecticut.[190,191]

Green revolving funds

Green revolving funds support investments in energy efficiency and sustainability, utilizing cost savings from these investments to replenish funds. The commercial sector and several hospital settings have already utilized this financing mechanism. The Bon Secours Health System, Cleveland Clinic, and Grady Health System have all instituted internal processes to better account for any savings from sustainability projects and to allocate some or all of those savings to a revolving fund.[192,193,194,195] Additionally, DOE has tools for organizations interested in developing green revolving funds that already exist.

Revolving funds geared toward energy efficiency could be a valuable tool for hospitals, although they might require longer payback terms than more traditional forms of revolving funds.[196] Green revolving funds are also advantageous to hospitals in that they help reduce financial pressures from other capital-intensive departments due to dedicated funding.[197]

Green bonds

Hospitals can access green bonds to fund capital projects. As defined by the DOE, these bonds are a "fixed income debt instrument in which an issuer borrows a large sum of money from investors for use in sustainability-focused projects."[198] Since 2007, investors have invested more than $600 billion in green bonds, including for health care entities.[199] In 2020, for example, Pfizer launched a $1.25 billion sustainability-linked bond, the first to be issued by a biopharma company.[200] Bond proceeds support energy efficiency, water conservation, waste reduction, and creation of "green design and construction."[201]

Hospitals have also utilized green bonds. For instance, Kaiser Permanente and Boston Medical Center have both issued green bonds for their sustainability projects.[202] Boston Medical Center has reported that its bonds were oversubscribed, suggesting that investors are looking for more opportunities to support these projects.[203]

Specialized Options

The DOE, through its Better Buildings Initiative, "partners with leaders in the public and private sectors to make the nation's homes, commercial buildings, and industrial plants more energy efficient."[204] The department has identified several financing options that may be of interest to hospitals looking to fund initiatives to reduce their GHG emissions.

Power purchase agreements

A power purchase agreement—or PPA—is a financial arrangement in which a third party installs, owns, and operates an energy system on the customer's property.[205] Hospitals (or the local government, which often purchases the electricity utilized by hospitals) then purchase the energy for a predetermined period.[206] PPAs can also exist offsite, with power delivered to the customer at predetermined rates and for specified periods of time.[207] Importantly, health care facilities and hospitals utilized PPAs to purchase renewable energy, as Boston Medical Center did in 2016.[208] Boston Medical Center invested—in partnership with two additional entities—in a solar installation that has provided power to the hospital since January 2017.[209]

When utilized to deliver renewable energy, PPAs can effectively help hospitals reach their energy usage goals and provide greater cost predictability.[210] Given that a third party is responsible for operating the production and delivery of energy, PPAs also carry reduced operational risks.

Commercial property assessed clean energy programs

Commercial property assessed clean energy programs—also known as C-PACE—operate when an entity pays back the funding for energy improvements over time through a property tax bill assessment.[211] In 2021, the Los Angeles Downtown Medical Center utilized C-PACE financing—made available through the California Statewide Communities Development Authority—to fund several energy efficiency projects.[212]

On-bill financing and repayment

On-bill financing and repayment options fund an energy project through either a utility company or private capital. An extra charge on a customer's utility bills—over a set period—is used to pay back the utility company or reimburse private capital.[213] Typically, the energy cost savings offset the additional charge.[214] Unfortunately, not all states allow for the use of this financing mechanism.[215]

Efficiency-as-a-service

Another option for hospitals is efficiency-as-a-service, or EAAS. Like C-PACE and on-bill financing and repayment, EAAS allows for investment in energy efficiency upgrades with no upfront cost to the customer.[216] Under EAAS, an energy service company enters into an agreement with a customer. The company investigates and reports an estimated savings level, then works with a contractor to implement energy efficiency upgrades and to maintain the equipment. The customer then uses the generated savings from the upgrades to pay the energy service company.[217]

Special Considerations for Rural Hospitals

Although the effects of climate change are felt nationwide, the impact in rural areas and on rural hospitals is unique and worth noting. Rural residents tend to be older and have more limited access to health care, both of which are risk factors that climate change exacerbates.[218] Additionally, given the smaller size and unique financial challenges of rural hospitals and the populations they serve, reducing their GHG emissions will likely look different than in urban and suburban areas.

Rural hospitals number approximately 1,800, many of which are small, with a maximum of just 25 beds.[219] Slightly more than half of these hospitals are nonprofits, and about one-third of them are owned by state and local governments. Most rural hospitals are also critical access hospitals (CAHs), which receive higher Medicare reimbursements to account for the additional costs they face. As of April 2023, the nation has just over 1,300 CAHs.[220]

Concerningly, rural hospitals remain at financial risk for closure.[221] Considering the distinct position of rural hospitals in terms of their financial stability and vulnerability to climate change—affecting both their physical infrastructure and the health of their surrounding communities—the reduction of their GHG emissions requires special attention.

Several programs could directly or indirectly benefit rural hospitals looking to increase their energy efficiency and reduce their GHG emissions. Because investments in energy efficiency can ultimately reduce costs, the programs outlined below could be of specific interest to rural communities and hospitals.

FINANCING AND TECHNICAL ASSISTANCE

In addition to funds from the IRA, rural hospitals have access—both directly and indirectly—to options for financing GHG emissions reductions through the USDA's Rural Energy for American Program, the Rural Energy Savings Program (RESP), and Community Facilities Direct Loan & Grant Program, among others. Rural hospitals should take advantage of the financing options and technical assistance available to them.

The **Rural Energy for America program** "provides guaranteed loan financing and grant funding to agricultural producers and small rural businesses for renewable energy systems or to make energy improvements."[222] To qualify, a hospital must be a small business within a rural area (defined as a population with 50,000 residents or less).[223] Hospitals can apply to their local USDA Rural Development Office.[224]

The **Rural Energy Savings Program**, authorized as part of the 2014 Farm Bill, provides loans to rural energy efficiency service providers.[225] RESP funds can be used for a variety of items, including renovations and infrastructure and equipment upgrades.[226] It is important to note that while hospitals cannot apply directly to USDA for either of these loans, they can work with commercial lenders to access the funds, which can be used to make energy efficiency upgrades.[227]

Hospitals can also utilize the USDA's **Community Facilities Direct Loan & Grant Program**. This program "provides affordable funding to develop essential community facilities in rural areas."[228] Hospitals and other entities can use this funding in the form of loans and/or grants for construction or facility improvements that include energy efficient facility upgrades.

Several USDA programs also assist rural areas in making energy efficiency improvements and advancing the use of renewable energy.[229] Although more indirect to hospitals, programs such as the **Rural Energy Pilot Program** help local rural communities understand, plan for, and install energy efficient technologies.[230] Several communities have already used program funds to install solar panels and microgrid technologies.[231] Considering the available space in comparison to urban and suburban areas, rural communities and hospitals might find renewable energy technologies especially appealing.

The USDA works in collaboration with the DOE to offer technical assistance and investments in rural energy innovation.[232] As a part of the collaboration, five distinct working groups have been established, including one focusing on improving rural energy infrastructure.[233] Such collaboration and information-sharing among federal agencies is an important and promising step in better understanding and addressing the unique infrastructure challenges and energy needs of rural areas.

Building Organizational Support

Hospitals should employ C-suite personnel and, to the extent needed, contract out for additional services dedicated to driving and supporting organization-wide efforts to reduce GHG emissions.

Through stakeholder conversations and reviews of relevant literature, BPC concluded that the level of success hospitals attain in reducing their GHG emissions often correlates with the amount of C-suite and administrative support present within the organization.[234] Hospitals and health care systems that have taken the most proactive steps in reducing their GHG emissions boast executive leadership that is highly visible and publicly supportive of the efforts.

For example, Kaiser Permanente, which became the nation's first carbon neutral health system in 2020, has an executive director of environmental stewardship.[235] The director worked closely with Health Care Without Harm—an international coalition of organizations that advocates reducing health care's environmental footprint—to develop *The Path to Carbon Neutral: A Guide to Building a Climate-Smart Health Care System*, and they have publicly committed to environmental goals.[236]

Providence, a health care system that operates in Alaska, California, Montana, New Mexico, Oregon, and Washington, similarly employs an executive director of environmental stewardship to, in part, help it meet its goal of becoming a carbon negative health system by 2030; Providence has already reduced hospital emissions by more than 11% from 2019 to 2021.[237,238,239]

Finally, Massachusetts General Hospital works with its Center for the Environment and Health to incorporate its environmental stewardship goals across hospital activities and has reduced its energy consumption by 36% since 2008.[240,241]

Memorial Hermann Health System, a standout leader in energy management in the ENERGY STAR program, has made a commitment to protecting the environment through several sustainability initiatives.[242] Facilities engineering services spearhead these efforts.[243] Finally, Cleveland Clinic houses an Office for a Healthy Environment, which supports sustainability efforts across health system buildings and operations, resulting in a reduced environmental impact.[244,245]

There is considerable complexity within hospital administration vis-à-vis the mixture of organizational components required to address reducing GHG emissions (e.g., facilities management, operations and maintenance, engineering, and finance). For example, a hospital's building engineers and maintenance personnel are most likely to understand how to manage a project to upgrade infrastructure, while a hospital's chief financial officer or treasurer will be better positioned to understand the necessary investment, potential savings, and available tax incentives to make such upgrades possible. Meanwhile, facilities management personnel might be best suited to track, measure, and understand energy usage across hospital facilities, with input from clinical staff on patient and staff comfort and safety. However, a chief executive officer, chief sustainability officer, or other such C-suite leadership often underpins each of these roles, setting manageable goals and encouraging the strategic execution of tactics to meet those goals.

Engaging hospital staff at various levels to meet energy goals might also improve employee satisfaction. One analysis found that reducing hospital GHG emissions aligns well with broader health system objectives.[246] This includes modernizing data management, improving patient experiences and outcomes, and building a stronger, more dedicated workforce.[247]

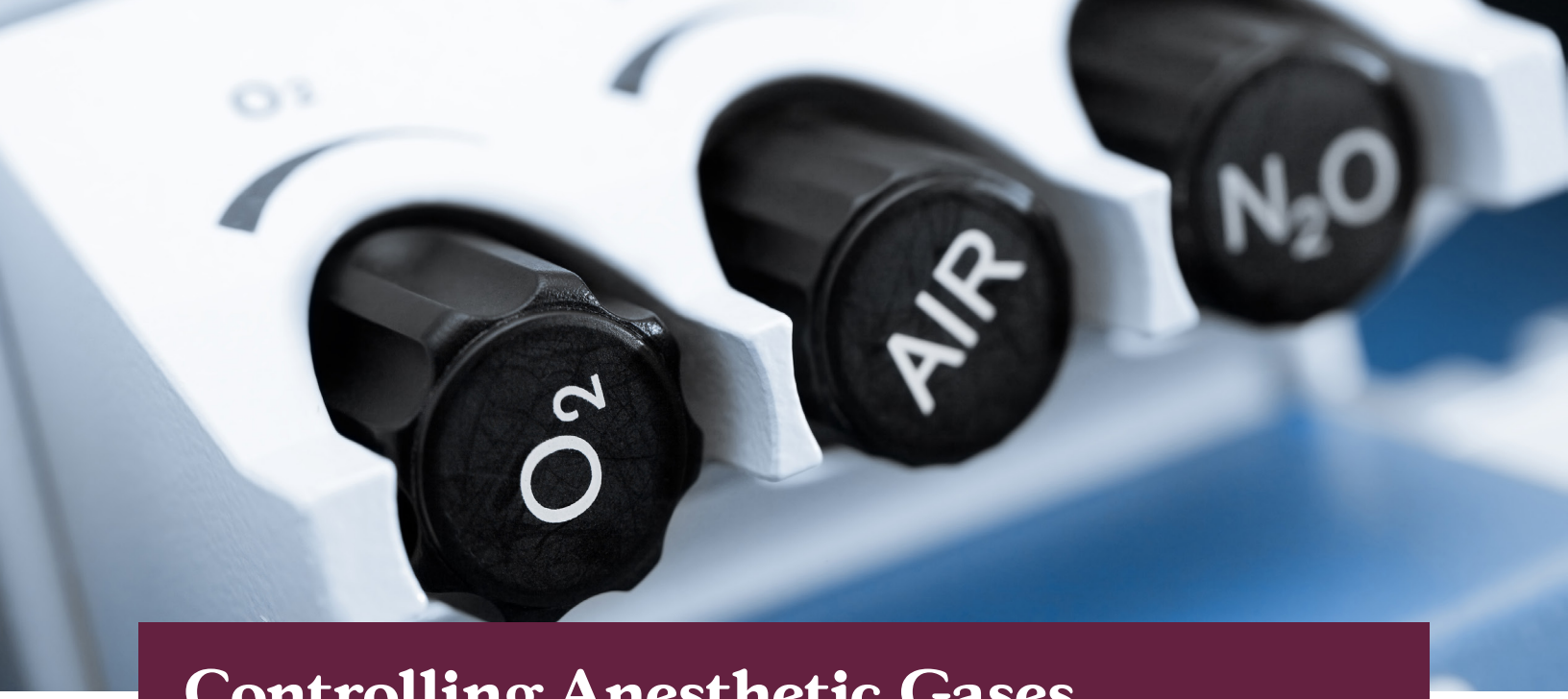
Establishing organizational support for reducing GHG emission through executive leadership and workforce engagement—as well as setting tangible, reachable energy goals—has already been tested as an effective strategy to help reduce hospital greenhouse gases. *Reducing Healthcare Carbon Emissions: A Primer on Measures and Actions for Healthcare Organizations to Mitigate Climate Change*, an Agency for Healthcare Research and Quality (AHRQ) publication, outlined the value of such "structural enablers."[248] In addition, to drive broader changes toward sustainability, the Essential Hospitals Institute in a recent report, *The State of Climate Resilience and Climate Mitigation Efforts at Essential Hospitals*, recommended educating hospital leadership on the relationship between patient health and climate.[249] Both reports outline viable strategies that hospitals can begin to implement immediately.

Employing dedicated personnel to focus solely on environmental stewardship is nearly always necessary, although it might take different forms depending on the structure and size of a hospital or health care system. It is important, however, that these executive leaders or personnel push against the tendency for organizations to work in silos, as reducing hospital GHG emissions requires the involvement of the entire organization, and they should engage hospital employees at various levels.

There is significant value in ensuring that employees are adequately informed and educated about how to participate in the reduction of hospital GHG emissions. In addition to the numerous workforce supports outlined above, hospitals should be prepared to engage with professional associations, advocacy organizations, and hospitals and health systems with a track record of success in reducing their GHG emissions.

For rural hospitals that might have more constraints on resources than their urban counterparts, developing the proper organizational support will likely require additional creativity. They could, for example, consider the value of employing a shared full-time equivalent staff member or utilize a health care engineering firm. A variety of firms offer consulting and engineering services tailored to the health care sector and to reducing GHG emissions.[250]

Finally, the Ohio Hospital Association (OHA) offers one unique example of how hospitals can reduce their GHG emissions. The OHA is the only state hospital association in the nation with a dedicated program to sustainability issues.[251] Through its Energy & Sustainability Program, the OHA supports hospitals in the state with important decision-making, energy procurement, and several other tool kits and educational resources.[252] In fact, in 2022 alone, the OHA reports that participating hospitals saved more than $11 million in their utility costs.[253] The OHA works closely with ENERGY STAR to help Ohio hospitals become benchmarked and certified; the state now has 19 ENERGY STAR certified hospitals.[254] State hospital associations seeking to encourage members to reduce hospital GHG emissions should look to the OHA as a potential mode.



Controlling Anesthetic Gases

Hospitals should reduce their GHG emissions from anesthetic gases by gradually reducing, with the goal of eliminating, the use of desflurane gas and nitrous oxide—both of which are particularly potent greenhouse gases. They should also work to reduce their GHG emissions from anesthesia-related sources overall.

According to the American Society of Anesthesiologists, inhaled anesthetics constitute up to 5% of a hospital's GHG carbon dioxide emissions and up to 50% of operating room emissions.[255] Hospitals should work to further reduce their GHG emissions by making changes related to anesthetic gases, which are inhaled substances used to sedate patients before an operation.

Hospitals have options when sedating patients (e.g., utilizing intravenous anesthesia, regional anesthesia, or anesthetic gases). Anesthetic gases pose unique challenges, however, given that certain gases have greater environmental effects than others, and a substantial proportion of the anesthetic gases utilized in a clinical setting escape into the atmosphere.

The American Society of Anesthesiologists has already published clinical guidelines calling for a series of practical, evidenced-based actions to reduce GHG emissions, including:

- avoiding the use of anesthetic gases overall (e.g., prioritizing total intravenous anesthesia and regional anesthesia when clinically safe to do so);
- eliminating the utilization of certain gases (e.g., removal of desflurane from drug formularies, avoidance of nitrous oxide use);
- minimizing the effects of certain gases (e.g., decommissioning central nitrous oxide piping);
- acting to minimize the effects of all gases (e.g., minimizing fresh gas flows during anesthesia).[256]

Hospitals should reduce GHG emissions from anesthesia-related sources overall (e.g., by designing a system with less leakage and safely reducing the flow of all anesthesia gases). Although broadly available data remains limited, an estimated 80% of anesthetic gases escape during administration, and most remain in the atmosphere for years beyond carbon dioxide, depending on the gas.[257]

Massachusetts General Hospital, which has taken steps to reduce the GHG contributions of anesthetic gases, found that 90% of gas delivered to the hospital is ultimately lost due to leaks.[258] To help reduce the impact of anesthesia gases, clinicians should utilize the lowest possible fresh gas flow when employing inhaled anesthetics.[259]

Hospitals have several options for anesthetic gases, including sevoflurane, isoflurane, and halothane, as well as desflurane and nitrous oxide. However, desflurane and nitrous oxide are the most potent polluters; hospitals can and should eliminated their use. Desflurane has over 2,500 times the global warming potential of carbon dioxide.[260] Nitrous oxide must be used in greater amounts, as it has a lower potency; it also has a global warming potential of over 270 times that of carbon dioxide.[261,262] Several hospitals—including Advocate Aurora Health, Virginia Mason Medical Center, and UC San Francisco Health—have already reduced or eliminated the use of desflurane.[263,264] With respect to nitrous oxide, if a hospital opts to retain its usage, it should reduce its environmental impact by switching from central piping to portable tanks to reduce the amount of escaped gas.[265]

Reducing Food Waste

The primary purpose of hospital food services is to deliver healthy foods to patients, hospital employees, and visitors. In doing so, hospitals must balance dietary restrictions, cultural preferences, and appropriate foods with food safety and clinical conditions (e.g., low salt, limited saturated fats).

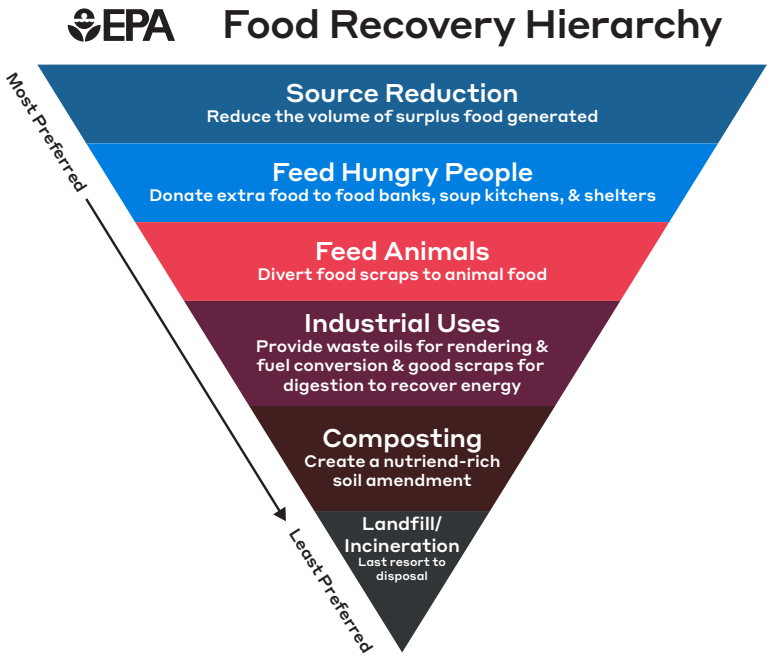
However, hospitals are estimated to generate more than 5 million tons of waste each year, 10% to 15% of which consists of food waste.[266] One study found that up to 38% of hospital-provided food is thrown out.[267] The breakdown of food waste results in GHG emissions of carbon dioxide and methane, an especially potent GHG.[268]

According to EPA, food waste is the "single most common material landfilled and incinerated in the United States, comprising 24 and 22 percent of landfilled and combusted municipal solid waste, respectively."[269] While data on the contribution of food waste to hospital GHG emissions remains limited, food waste globally accounts for 8% of GHG emissions.[270]

Although the reasons for hospital food waste vary, patient satisfaction with food is likely a key variable, alongside barriers to meeting patient nutritional requirements and organizational challenges in food preparation, delivery, and disposal.[271,272] Hospitals are uniquely positioned, however, to address the impact of food and food service operations on access to healthful food and food systems, prevention and treatment of diet-related diseases, and associated health care sector costs.[273,274] BPC has published numerous reports and other written products encouraging the federal government, health care sector, and others to support the reduction of diet-related diseases through the implementation of federal initiatives to increase access to healthy foods.[275,276,277] As such, it was important to include that emphasis within this report.

EPA continues to promote its Food Recovery Hierarchy, illustrated below. Organizations such as Practice Greenhealth promote the utilization of this hierarchy, as it advances viable actions for organizations to prevent and reduce food waste.[278,279] As noted in the figure below, there are a variety of strategies for reducing food waste.

Figure 2: EPA Food Recovery Hierarchy



Source: https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy.

Hospitals should reduce their GHG emissions from food waste by devoting resources to sourcing more locally grown, healthier, and fresher fruits and vegetables (known as "fresher plant forward food") options.

For hospitals, a handful of pathways can reduce food waste. The first is sourcing more local, sustainable, and healthy foods—with a focus on those food products most likely eaten by their patient population. Among other effects, this strategy would likely reduce transportation-related emissions and increase food intake as more appealing foods options become available to patients, staff, and hospital visitors.

Already, some hospitals are beginning to address this issue.[280] For instance, UC San Diego Health has committed to procuring 30% of its food and beverages from sustainable sources and reducing 25% of food-related emissions by 2030.[281] In fiscal year 2021, it also increased the availability of plant-based menu options from 15% to 20%.[282] New York City Health + Hospitals—which operates the city's public hospitals and health clinics—also offers plant-based meals to patients at 11 of its hospitals.[283]

In 2017, Boston Medical Center implemented a 2,658-square-foot rooftop farm after acquiring funding for installation and roof modifications.[284] Consisting of more than 25 crop varieties and yielding 5,000 to 7,000 pounds of food annually, the farm's produce contributes to the hospital's cafeteria, inpatient meal services, teaching kitchen, and preventive food pantry, a pantry that seeks to address nutrition-related illnesses and undernutrition.[285,286] In addition to addressing food and nutrition insecurity among patients, the rooftop farm is working to reduce Boston Medical Center's carbon footprint by increasing green space, adding carbon-breathing plants, mitigating combined sewer overflow, decreasing the building's energy use, and reducing the energy required to transport food.[287]

Hospitals should reduce their GHG emissions from food waste by providing more tailored meal options to patients.

The second pathway is a greater emphasis on personalizing meals to meet both the nutritional needs and preferences of patients, with the intention of ensuring meals are correctly portioned and acceptable to patients. One comprehensive review of food waste studies revealed that the four most common approaches used by hospitals to reduce food waste included "flexible portion sizes, increased food choices through selective menus, additional nutritional support and a better ordering and delivery system."[288] Another study found that more personalized food increased patient food consumption, thereby reducing waste.[289]

Other researchers have studied DIMS, or dietary intake monitoring system, as a waste-monitoring technique to optimize patient meal portion sizes and minimize food waste.[290] UC San Franscisco Health, for example, began serving food "on-demand" to patients (with some exceptions, based on patient needs and clinical directions), cutting its food waste by 30% and increasing patient satisfaction.[291,292]

The University of Vermont Medical Center also offers room service to patients on its main campus—based on directions from a physician—and promotes this service as one way to reduce food waste.[293]

Hospitals should reduce their GHG emissions from food waste by taking immediate advantage of opportunities for composting or otherwise repurposing food waste and unused food products.

The third pathway is to rethink the ways in which hospitals dispose uneaten food, given the extent to which wasted food contributes to GHG emissions. This pathway would include composting and, to the extent possible, food donations. Some researchers have looked closely at diverting hospital food waste into local composting programs.[294] A natural decomposition process allows composted food to be converted into a usable, nutrient-rich fertilizer; thus, rather than simply wasting food, composting allows for its reuse.[295]

In addition to reducing GHG emissions from food waste, composted soil reduces GHG emissions as it has increased carbon sequestration capabilities.[296]

It should be noted, however, that disposal and donation options pose different (and sometimes additional) challenges. These include service costs and the logistics of physically moving food waste.[297] However, EPA has a valuable resource for identifying opportunities to divert food waste at the local level that hospitals and other health care facilities can use.[298]

BPC recognizes that dedicated and sustained efforts by hospitals to reduce food waste—including by applying the options outlined above—will require considerable resource investments. These efforts might potentially require novel coordination and organizational systems, as well. However, given our previous efforts to address access to nutritious foods, BPC believes further encouraging hospitals to address diet-related illnesses is key to achieving a larger policy goal.

Conclusion

As the country wrestles with climate change, hospitals are in a unique position to reduce their GHGs emissions. Indeed, policymakers at all levels are increasingly acknowledging that now is a favorable time for hospitals to act.

In addition to engaging in established best practices, the federal government can help and further incentivize hospitals to reduce their GHG emissions in addition to encouraging them to follow established best practices. For the protection of human health and well-being, supporting hospitals on their GHG emissions reductions journeys is both viable and necessary. For hospitals to achieve success, they will need significant support from their C-suite leaders.

Appendix 1: Additional Federal-Level Initiatives, Programs, and Resources

The federal government, both before and under the Biden-Harris administration, has developed an array of initiatives and resources for federal and nonfederal partners to promote sustainable energy development.

HHS/OASH Office of Climate Change and Health Equity. Biden Executive Order (EO) 14008 (Tackling the Climate Crisis at Home and Abroad) section 222(d)—signed January 27, 2021—directed the secretary of HHS to establish an Office of Climate Change and Health Equity to "address the impact of climate change on the health of the American people."[299]

At the direction of the HHS assistant secretary for health, the office was formally established on August 31, 2021. The office's purpose is as follows:

> The Office of Climate Change and Health Equity addresses the impact of climate change on the health of the American people. Exercising powers of convening, coordination and collaboration, the Office serves as a department-wide hub for climate change and health policy, programming, and analysis, in pursuit of environmental justice and equitable health outcomes. The Office also facilitates the use of regulatory and statutory powers of the Department of Health and Human Services to address matters affecting disadvantaged communities and people on the frontlines of the climate crisis. The Office works alongside community-based organizations, nongovernmental organizations, academia, business, industry, along with, state, tribal, local, and territorial governments, to define and implement strategies, conduct strategic outreach and communications, and train and empower community residents.[300]

The priorities of OCCHE include "supporting regulatory efforts to reduce greenhouse gas emissions and criteria air pollution throughout the health care sector, including participating suppliers and providers," as well as coordinating with other federal agencies to achieve their mission.[301] At this time, OCCHE is staffed with employees on loan from other federal agencies, including OCCHE's acting director, Dr. John Balbus, who was previously at the National Institute of Environmental Health Sciences.

As part of the Biden administration's fiscal year 2023 budget, the administration requested $6 million in PHS evaluation funds (also known as the Public Health Service Act Evaluation Set-Aside) for OCCHE, to support

eight full-time staff positions. Several months after the creation of OCCHE, more than three dozen organizations representing various public health and scientific communities requested that Congress provide financial support—in the form of an additional $6 million—to allow the office to fulfill its mission.[302]

As part of their FY2023 bill, House and Senate Labor and HHS appropriators allocated $3 million to OCCHE. Appropriators, however, removed this money before the appropriations legislation passed, and OCCHE remains unfunded. The Biden administration's FY2024 appropriations request set aside $5 million for the office; funding from congressional appropriators is still to be determined.[303]

Nonetheless, OCCHE has developed a comprehensive list of federal resources to help health care organizations reduce their GHG emissions and increase their resilience. The office has also hosted a webinar series examining, among other items, financial supports for health care organizations looking to make climate-related changes and pursue best practices.

In early August 2023, OCCHE and the National Highway Traffic Safety Administration launched the Heat-Related Illness EMS Activation Surveillance Dashboard.[304] The tracker is intended to "help public health officials ensure that outreach and medical aid reach the people who need it most," and represents a recognition by the federal government that climate change is affecting human health in a way that can no longer be ignored.[305]

Biden Executive Order 14057 and the Federal Sustainability Plan. On December 8, 2021, President Biden signed Executive Order 14057 (EO 14057)—*Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*—which, among several objectives, directs federal agencies to modernize "policy, programs, operations, and infrastructure to support climate resilience investment" and "increase the sustainability of federal supply chains."[306] The Federal Sustainability Plan, which directs the federal government to reach net-zero emissions by 2050, was released the same day. In August 2022, the White House Council on Environmental Quality issued Implementing Instructions to assist federal agencies in responding to EO 14057.

Department of Veterans Affairs. In response to EO 14057, the VA issued its latest Sustainability Plan in October 2022, which builds on performance data the department has published since around 2010.[307] In its 2022 plan, the VA outlined the following goals:

- achieving 100% carbon pollution-free electricity;
- achieving 100% zero-emission vehicle fleet;
- achieving net-zero emissions buildings, campuses, and installations by 2045 through updated guidance for design and construction, increased energy efficiency, and increased water efficiency;
- reducing waste and pollution;

- promoting sustainable procurement;
- enhancing a climate- and sustainability-focused workforce;
- incorporating environmental justice;
- accelerating progress through partnerships.[308]

As of October 2022, the VA has increased, in partnership with the General Services Administration (GSA), its usage of renewable energy and made progress toward reducing the waste of anesthetic gases.[309]

The VA also utilizes energy savings performance contracts (ESPCs). Under these contracts, the VA partners with private companies and utilities (which bear the performance risk) to install conservation measures; the VA then uses subsequent savings to repay the money over time.[310] According to the VA, since 2011, $10 million in upgrades were made at 88 medical centers, resulting in "more than $1.66 billion in long-term avoided costs for VA facilities."[311]

Department of Defense. In response to EO 14057, the DoD "designated the *Senior Advisor for Climate at the Office of the Secretary of Defense* as the Department of Defense's Chief Sustainability Officer."[312] Although the DoD developed annual plans before the release of EO 14057, it has not provided one since.[313]

Indian Health Service. According to the *Fourth National Climate Assessment*, climate change will impact the health of tribal populations as a warming planet affects their natural resources.[314] As part of the 2022 HHS sustainability plan, the Indian Health Service (IHS) published its *2022 AE Design Guide*, which provides standardized information on architecture and engineering requirements for IHS health care facilities.[315] One group of experts has posited that under the Climate-Ready Tribes Initiative, American Indigenous communities are "leading the way in innovative health-related climate change adaptation work." The initiative is jointly run by the CDC and the National Indian Health Board, the latter of which represents tribal governments receiving IHS funding.[316]

Biden-Harris Administration Health Sector Climate Pledge. In June 2022, 61 of the largest U.S. hospitals and health sector companies signed onto the Biden-Harris administration's Health Sector Climate Pledge to reduce their emissions by 50% by 2030 and to achieve net zero by 2050.[317] To date, more than 100 organizations have signed the pledge, and over 800 hospitals are represented.[318] As part of the voluntary pledge, signers committed to publicly reporting on their progress, creating an inventory of their scope 3 emissions, and developing their own climate resilience plan. Under the pledge, signers also designated executive leads for their efforts.[319] In March 2023, HHS reopened the pledge to allow health sector organizations to sign on an ongoing basis.[320]

Federal Building Performance Standard. In December 2022, the Biden-Harris administration announced, via the Council on Environmental Quality, the Federal Building Performance Standard.[321] The standard is consistent with EO 14057 and states that, as the largest landowner in the country, "the Federal Government has a once-in-a-generation economic opportunity" to create jobs, protect public health, and "lead by example to deliver a net-zero emissions building portfolio by 2045."[322] The announcement was paired with proposed rulemaking from the Department of Energy to "electrify and cut emissions from new or newly renovated federal buildings."[323]

The Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) Program exists separately from the Federal Building Performance Standard.[324] The program, which operates out of the DOE's Federal Energy Management Program, "provides grants for the development of energy and water efficiency projects and processes at U.S. federal government-owned facilities."[325] Although the Federal Energy Management Program has been around since the 1970s, the AFFECT Program received funding recently through the Infrastructure Investment and Jobs Act and operates in accordance with EO 14057 and the Biden-Harris administration's agenda.[326]

Agency for Healthcare Research and Quality/Primer (AHRQ). AHRQ has called the climate crisis "the single greatest public health challenge of the 21st century."[327] In line with the goals of the current administration, in September 2022, AHRQ funded the development of and published *Reducing Healthcare Carbon Emissions: A Primer on Measures and Actions for Healthcare Organizations to Mitigate Climate Change*.

Of note, the AHRQ primer identifies several "structural enablers necessary to support decarbonization initiatives." These include:

- establishment of a management system, including executive leadership who can support climate-related action;
- setting emissions reductions targets and timelines;
- building a workforce with climate literacy and embedding such a workforce within both administrative and clinical roles;
- managing carbon accounting and finance.[328]

Department of Energy/Better Climate Challenge. The DOE runs the Better Climate Challenge, which urges "organizations to set ambitious, portfolio-wide GHG emission reduction goals."[329] Partners commit to reducing scope 1 and 2 emissions by 50% within a decade. DOE launched the challenge in February 2022. Currently, four health care entities have signed on: UW Health, the Mayo Clinic, the Cleveland Clinic, and DaVita.[330,331,332] The DOE has also developed a comprehensive training resource for professionals at various career levels to gain additional, relevant credentials for serving the building sector.[333] It includes links to resources from several of the associations listed above,

including the ASHE Energy to Care Educational Resources; the Association of Energy Engineers' training program locator; and the Building Performance Association's Training & Careers Hub, among others.

Department of Energy/Federal Energy Management Program (FEMP). The DOE operates a Performance Contracting National Resource Center with a no-cost, accredited, and interactive training series designed to strengthen the performance contracting workforce.[334] Although the FEMP helps federal agencies reach their energy goals through performance contracting, the training is not limited to federal employees or contractors; the training is designed to help any professional develop his or her performance contracting skills.

Department of Energy/Energy Efficiency & Renewable Energy. The DOE's Building Technologies Office has developed the *Advanced Energy Retrofit Guide for Healthcare Facilities*. The guide is designed "to provide specific methodologies, information, and guidance to help energy managers and other stakeholder plan and execute energy efficiency improvements in existing buildings."[335]

As part of the Healthy Buildings Toolkit, the Office of Energy Efficiency and Renewable Energy has also developed *Integrating Health and Energy Efficiency in Healthcare Facilities*.[336] The report outlines items at the "intersection of energy efficiency and occupant health at U.S. health care facilities," including a discussion of ventilation, humidity, thermal comfort, and lighting.[337]

Environmental Protection Agency/ENERGY STAR Commercial Buildings program. The ENERGY STAR Commercial Buildings program helps businesses and industry save money and protect the environment through the adoption of energy-efficient products and practices.[338] The goal of the ENERGY STAR program is to help "consumers, businesses, and industry save money and protect the environment through the adoption of energy-efficient products and practices."[339] Partnering organizations set goals and track their energy use in Portfolio Manager. They use ENERGY STAR tools to make the financial case or to improve their energy management programs. In 2020, ENERGY STAR reported that program users had helped reduce nationwide electricity consumption by more than 10% of total U.S. demand, resulting in a 5% reduction in U.S. GHG emissions.[340] The ENERGY STAR program began scoring hospitals in 2001.[341]

Environmental Protection Agency/Green Power Partnership. EPA, via its Green Power Partnership program, partners with businesses, nonprofits, hospitals, and others to provide procurement assistance and guidance for the purchase of clean renewable energy, public recognition for green power use, and credible benchmarks.[342]

General Services Administration/Facilities Management Institute. The Facilities Management Institute seeks to drive innovation within the facilities management community.[343] At the institute, the General Services Administration also operates the Sustainable Facilities Tool. This tool provides education, strategies, and links to additional training for professionals looking to improve their building management and to design in more efficient ways, even if they are not federal employees or are working on federal buildings.[344]

National Institutes of Health (NIH). NIH runs the Climate Change and Health Initiative, "an urgent, cross-cutting NIH effort to reduce health threats from climate change across the lifespan and build health resilience in individuals, communities, and nations around the world, especially among those at highest risk."[345] NIH is also home to the National Institute of Environmental Health Sciences, which recently produced a *Climate Change Vulnerability Assessment*. This assessment looks, in part, at the role of health care workers vis-à-vis climate change.[346] President Bidens's FY2024 budget request included a $25 million increase for NIH to continue its climate change-related activities.[347]

Appendix 2: Additional Organizations and Resources

Outside of the federal government, many resources and organizations within the health care sector promote energy sustainability. Health care organizations can look to these resources for assistance and guidance in reducing their GHG emissions.

National Academy of Medicine Climate Collaborative. The National Academy of Medicine (NAM) is a private, nonprofit institution with a mission to "improve health for all by advancing science, accelerating health equity, and providing independent, authoritative, and trusted advice nationally and globally."[348]

NAM launched its Action Collaborative on Decarbonizing the U.S. Health Care Sector—also known as the Climate Collaborative—"to address climate change through health sector leadership."[349] The collaborative is led by a steering committee and supported by four working groups. The Climate Collaborative has developed a list of "key actions" that hospitals and health care systems can take to reduce their GHG emissions:

- establish an executive level sustainability team;
- perform a GHG inventory across all three scopes;
- establish specific decarbonization goals;
- develop an implementation plan with documented milestones and deliverables;
- reduce building emissions;
- reduce emissions from anesthetic gases and pressurized metered dose inhalers;
- reduce physical waste and single-use plastics;
- reduce emissions from food services;
- reduce transportation emissions.[350]

NAM has also developed Carbon Accounting 101, a prerecorded series of "Carbon Clinics" to help health care systems understand how to measure, track, and report their GHG emissions across all three scopes.[351]

Practice Greenhealth. Practice Greenhealth offers options to hospitals and health care systems to increase their environmental sustainability in the United States and Canada.[352] The organization is the "innovation hub" of Health Care Without Harm, a global organization that seeks to address environmental sustainability within health care.[353] Practice Greenhealth has

developed a Health Care Emissions Impact Calculator, a publicly available accounting tool designed to measure GHG emissions across all three scopes.

Medical Society Consortium on Climate & Health. The Medical Society Consortium on Climate & Health brings together physicians and other health care professionals to advocate for climate and health related policy changes.[354] It hosts annual meetings, provides educational resources, and offers opportunities for advocacy for both members and nonmembers.[355]

STANDARD, GUIDANCE, AND ACCREDITATION ORGANIZATIONS

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) provides research and develops standards for building systems with a focus on both energy efficiency and sustainability.[356] The Facility Guidelines Institute develops guidance for hospital planning, design, and construction.[357] ASHE—a professional membership group of the American Hospital Association—also provides regulatory guidance for hospitals and health care facilities.[358]

Unlike NFPA codes, the standards and guidance produced by ASHRAE, the Facility Guidelines Institute, and ASHE are generally voluntary. However, each of these organizations—both independently and in collaboration—have released some updated guidance related to the reduction of GHG emissions in the health care system generally and in hospitals more specifically.

ASHRAE, for example, began the Task Force for Building Decarbonization, which calls for all new buildings in operation to be net-zero in GHG emissions; for retrofitting of existing buildings to be "well underway" by 2030; and for "all new and existing assets must be net zero GHG emissions across the whole life cycle" by 2040.[359] As a part of this work, ASHRAE has also called for considering "whole building life-cycle assessments" for future buildings codes and utilizing building performance standards for reducing the GHG emissions of future buildings.[360] ASHRAE is expected to release a guide for decarbonizing hospital buildings in March 2024.[361]

Importantly, ASHRAE's codes are often referenced within the NFPA codes with which CMS requires hospitals to comply. CMS has previously required certified health care facilities to comply with ASHRAE codes. CMS did this in 2017 with ASHRAE Standard 188: Legionellosis: Risk Management for Building Water Systems.[362]

Glossary of Terms

AFFECT	Assisting Federal Facilities with Energy Conservation Technologies
AHRQ	Agency for Healthcare Research and Quality
ASHE	American Society for Healthcare Engineering
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CAH	Critical access hospital
CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicare and Medicaid Services
CoP	Conditions of Participation
C-PACE	Commercial property assessed clean energy program
DoD	Department of Defense
DOE	Department of Energy
EAAS	Efficiency-as-a-service
EO	Executive Order
EPA	Environmental Protection Agency
ESPC	Energy savings performance contract
EUI	Energy use intensity
FEMP	Federal Energy Management Program
GAO	Government Accountability Office
GHG	Greenhouse gas
HHS	Department of Health and Human Services
IHS	Indian Health Service
HVAC	Heating, ventilation, and air conditioning
IRA	Inflation Reduction Act
LSC	Life Safety Code
NAM	National Academy of Medicine
NFPA	National Fire Protection Association
NIEHS	National Institute of Environmental Health Sciences
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
OCCHE	Office of Climate Change and Health Equity
OHA	Ohio Hospital Association
PPA	Power purchase agreement
RESP	Rural Energy Savings Program
USDA	U.S. Department of Agriculture
VA	Department of Veterans Affairs

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