Decarbonizing Health Care:

Clean Energy Policy Options

GEORGETOWN CLIMATE CENTER

About This Report

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Energy Policies Can Help Health Care Delivery Organizations Meet Ambitious Emissions Commitments

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Energy Policies Can Help Health Care Delivery Organizations Meet Ambitious Emissions Commitments

Executive Summary

A growing number of health care delivery organizations[1] (HDOs) have pledged to reduce their greenhouse gas emissions by 50% by 2030 and to net zero by 2050.[2] Meeting these ambitious commitments will not be easy, in large part because hospitals, which make up a significant component of the overall health care sector's emissions, are among the most energy-intensive commercial buildings; a typical hospital uses three times more energy per square foot than a typical office building.[3] Further complicating the challenge, more than 80% of the health care sector's emissions are embedded in the diverse mix of goods and services used by hospitals and other health care delivery organizations, including emissions from the manufacture of medical supplies and medicines and the production of the primary materials (e.g., chemicals and plastics) used to manufacture those products.

Fortunately, federal, state, and local energy and climate policies, most recently those in the Inflation Reduction Act (IRA), create significant incentives for energy efficiency and renewable energy. This new source of financing is unprecedented. It will make it easier to invest in the up-front costs of measures that can help hospitals and other health care delivery organizations reduce their direct on-site emissions—largely from burning natural gas in boilers—while lowering overall energy costs. At the same time, new provisions in the IRA, together with other state and federal policies, are aimed at helping to decarbonize the overall U.S. electricity supply. If swiftly

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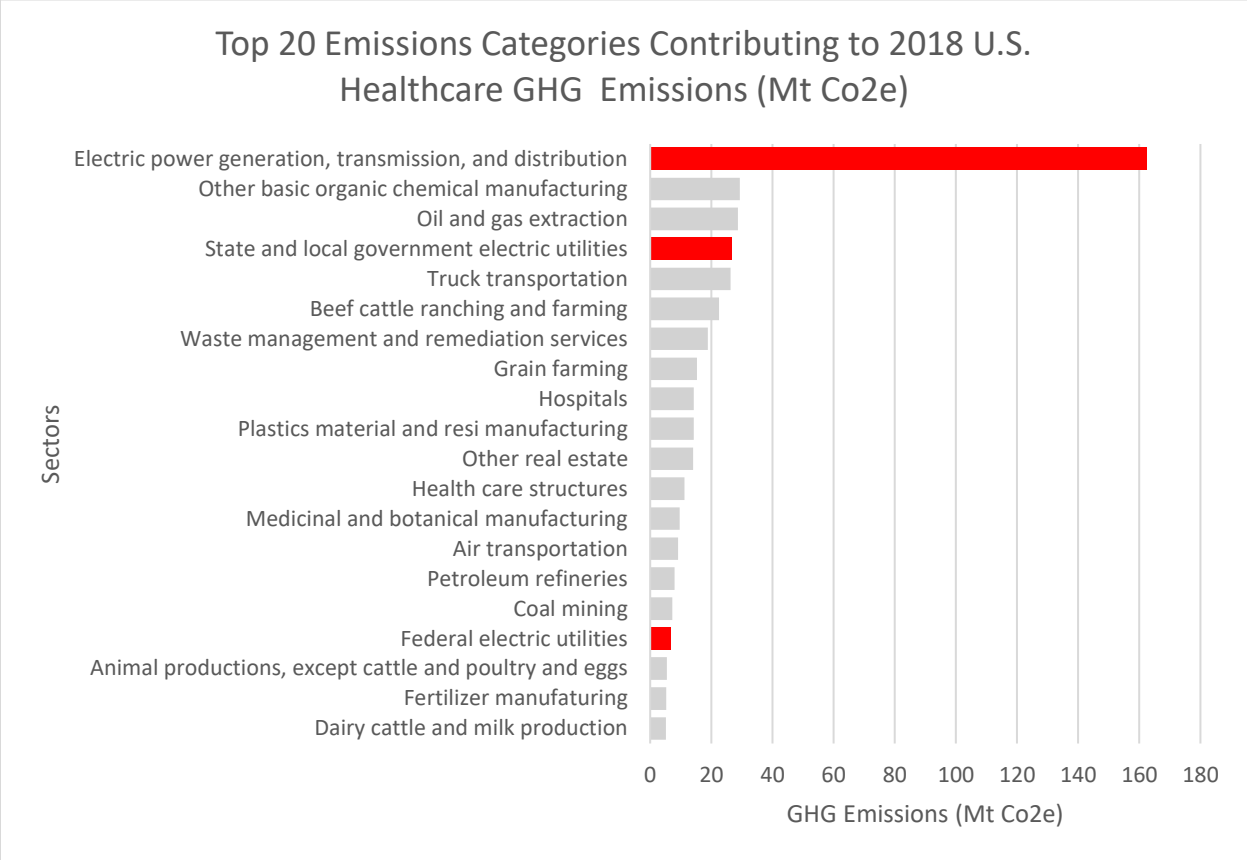
[1] This paper focuses on health care delivery organizations, which are defined as hospitals, clinics, and other institutions that provide health care services to patients. In some cases, the paper addresses hospitals specifically, which contribute a significant portion of the emissions from health care delivery organizations. In other places, the paper refers to the entire health care sector, particularly where the available data does not break out health care delivery organizations specifically. Note that the economy-wide policies for electricity and commercial buildings discussed in the paper would address the entire sector, not just health care delivery.

[2] Office of the Assistant Secretary for Health (OASH), HHS Launches Pledge Initiative to Mobilize Health Care Sector to Reduce Emissions, April 22, 2022.

[3] Sampath, B. et al., Reducing Healthcare Carbon Emissions: A Primer on Measures and Actions for Healthcare Organizations to Mitigate Climate Change, AHRQ Publication No. 22-M011, Agency for Healthcare Research and Quality, September 2022.

and effectively implemented, this would reduce emissions from the electricity purchased for health care facilities and from the electricity used to produce a variety of goods and services used by hospitals and other health care organizations. This broader decarbonization of the grid is critical because emissions that originate from electricity generation are by far the largest component of health care greenhouse gas emissions, approximately 7 times larger than the next largest category (see Figure 1), and roughly 35% of overall health care sector emissions.[4]

Figure 1: Emissions Categories Contributing to U.S. Health Care GHG Emissions[5]



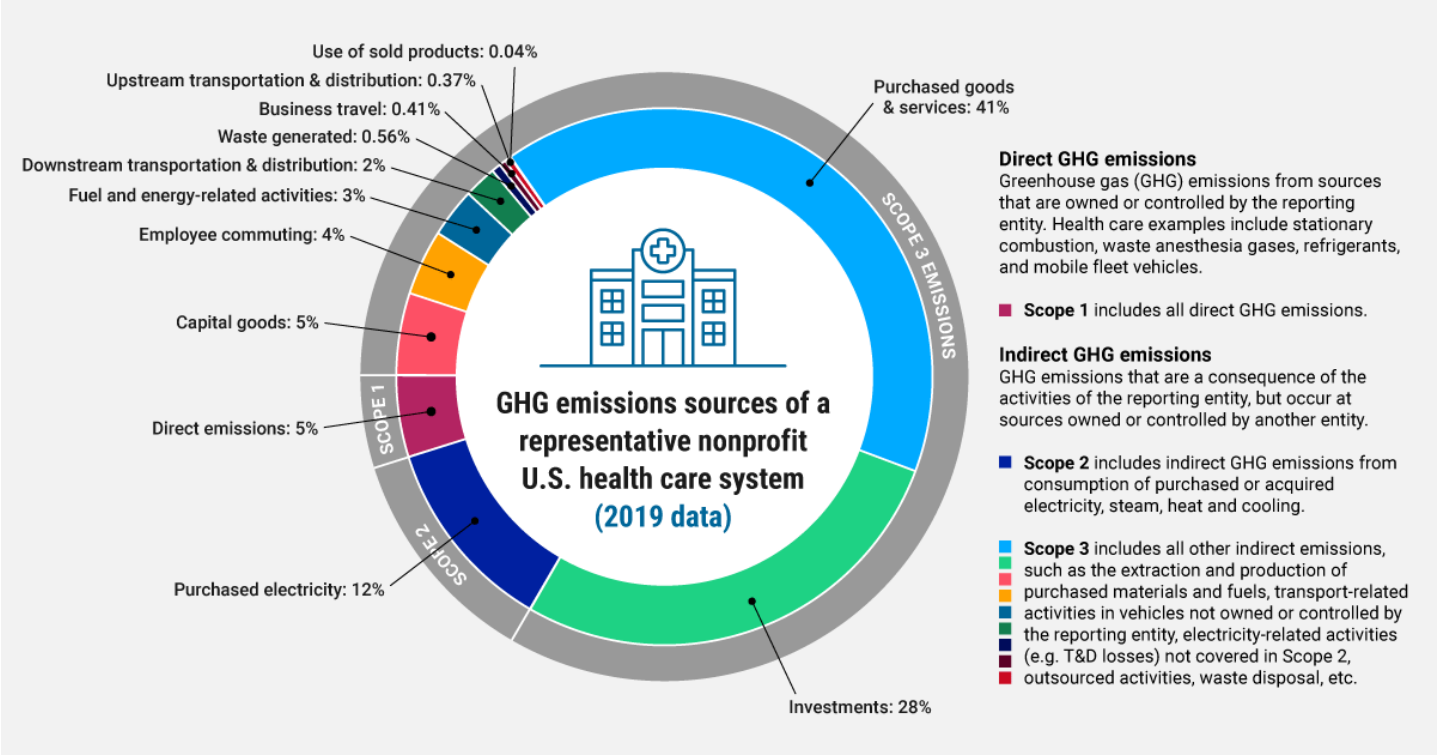
Although there are numerous energy policies and incentives that could help health care delivery organizations meet ambitious emissions targets, this paper focuses on energy policies that apply

[4] Eckelman, Matthew J., et al., Health Care Pollution and Public Health Damage in the United States: An Update, *Health Affairs* 39, no. 12 (Dec. 2020): 2071–79. Note that this 35% statistic differs from the 29% figure that appears in the text of the article. This is because Exhibit 10 in the appendix of the article (available on the journal website) breaks out electricity into three categories, including a category called "electric power generation, transmission, and distribution" with 29.4% of emissions; a category called "state and local government electric utilities", with 4.8% of emissions; and a category called "federal electric utilities'', with 1.2% of emissions. For this paper, we've combined these three categories.

[5] Eckelman et al. op. cit. Data is from Appendix Exhibit A10.

to commercial buildings and the broader U.S. electric power sector. Policies that address these two sectors have emissions reduction benefits across the three "scopes" set out in the Greenhouse Gas Protocol (see text box on pages 5-6). This includes direct emissions, such as emissions from fossil-fuel fired boilers at health care facilities (Scope 1); electricity purchased by health care facilities (Scope 2); and electricity used in the manufacture of a variety of health care organization supplies and materials and the primary materials used to manufacture these products (Scope 3). Figure 2 depicts the breakdown of emissions by scope for a typical non-profit healthcare system.

Figure 2: Healthcare Emissions by GHG Protocol Scope[6]



Given the large impact of emissions from electricity generation across Scope 2 and Scope 3 of health care sector emissions, it is unlikely that many health care organizations will be able to reach ambitious targets such as those in the HHS Health Sector Climate Pledge without broad economy-wide initiatives to decarbonize the U.S. electric grid as a complement to aggressive internal policies for decarbonization. Therefore, it is critical for health care delivery organizations,

[6] Graphic is from Practice Greenhealth, Scope 3 GHG Emissions Accounting Tool. Note that the percentages for the three scopes are estimates based on a typical non-profit health care system. These percentages are slightly different from the sector-wide percentages estimated by Eckelman et al. op. cit. and discussed elsewhere in this paper.

particularly those that have made ambitious greenhouse gas reduction pledges, to provide leadership on the development of broader electric grid decarbonization policies while simultaneously taking robust actions to reduce their onsite emissions. Similarly, by providing active leadership on the development of new technologies and approaches to decarbonize commercial buildings, health care delivery organizations can contribute to reducing their own on-site emissions and reducing emissions from commercial buildings across the U.S. economy.

Overall, we find that the following energy policies and incentives would have the largest potential impact on the healthcare sector's emissions across all three GHG Protocol Scopes:

Federal and state energy policies

Policies to accelerate decarbonization of the U.S. electric grid

Efforts to implement the IRA will be stalled without additional policies and actions to help address barriers to the timely permitting, siting, and construction of an unprecedented amount of new zero- or low-carbon generation (e.g., wind turbines and solar power facilities) and transmission capacity. In addition, there will be a need to build clean energy supply chains, train and expand the clean energy workforce, and research and deploy new and innovative technologies. Policies that accelerate progress toward these goals will be needed for healthcare organizations to meet their ambitious greenhouse gas commitments and for the U.S. to meet its national commitments for 2030 and 2050. Together with additional forthcoming EPA regulations to reduce carbon and air pollution from power plants, these actions will also reduce sulfur dioxide (SO_2) and nitrogen oxides (NO_x), which form fine particles (SO_2 and NO_x) and ozone (NO_x) in the atmosphere and have a variety of adverse health impacts. Although the development and implementation of these policies are the responsibility of federal and state authorities, the policymaking process would benefit from the engagement and leadership of health care delivery organizations and the wider health care sector.

Incentives and policies for health care delivery organizations

Near-term opportunities to reduce on-site emissions through leveraging new incentives in the IRA

The scope and new features of the Inflation Reduction Act can have an unprecedented impact on emissions and energy use at health care delivery organizations, but only if HDOs take advantage of the opportunities the IRA makes available to them. Among the new features that could facilitate onsite emissions reductions are:

- a direct payment provision that will allow not-for-profit hospitals to benefit from clean energy tax credits;
- authorization of renewable energy incentives for 10 years, providing more certainty to inform long term investment planning decisions;
- no cap or limits on the overall amount of tax credits that can be provided to eligible entities;
- provisions that allow tax deductions for energy efficiency measures at health care facilities to be taken by a project's architecture, engineering, and construction firms. These firms can pass on the value of the deductions to not-for-profit entities;
- bonus provisions for projects undertaken in disadvantaged "energy communities" and environmental justice communities; and
- a broader array of technologies covered than under previous clean energy tax credits, including stand-alone battery storage, fuel cells, geothermal heat pumps, microgrid controllers, and other energy equipment.

In addition to these provisions, a March 31, 2023 waiver from the Centers for Medicare & Medicaid System (CMS) now allows hospitals and other health care facilities to elect to use non-fossil fuel health care microgrid systems to meet emergency backup power requirements. Based on this new policy from CMS, eligible HDOs can explore using IRA tax credits to help finance these new backup electric power systems.

Approaches to decarbonize heating and on-site fuel at hospitals and health care facilities

Healthcare delivery organizations could play an important leadership role in identifying technologies, roadmaps, and policies for decarbonizing their own facilities and the broader commercial buildings sector. To that end, a health care sector initiative to identify approaches for reducing emissions from on-site burning of natural gas in boilers could be particularly valuable. This could include immediate steps to upgrade out-of-date health care building codes and to invest in all cost-effective energy efficiency measures. It might also include longer-term efforts to demonstrate and deploy emerging electric commercial building HVAC and water heating technologies.

Policies and approaches for the Department of Health and Human Services

Resolving outstanding questions about health and indoor air quality associated with ventilation systems

There are ongoing efforts by professional associations such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the American Society for Healthcare Engineering (ASHE) and others to research and develop new approaches that balance critical health-related requirements for hospital ventilation systems with energy efficiency and emission reduction imperatives. These efforts are critical because approaches that balance indoor air safety and infection control needs with energy efficiency objectives could have a significant impact on reducing fossil fuel use in hospitals. In particular, additional funding for research that could lead to updates in building codes for hospital ventilation (ASHRAE Standard 170) could be extremely valuable, particularly if a revised standard can reduce energy use from HVAC systems while maintaining or improving indoor air safety and quality.

The remainder of this paper will explore how energy policies, including policies focused on the electric power and buildings sectors, can be instrumental in helping the health care sector achieve its decarbonization goals. Section I provides background on why healthcare organizations have an important stake in helping to address climate change. Section II provides an overview of electricity and energy use in hospitals. Section III examines broader federal and state policies for a zero-carbon electric grid. These broader electricity policies can help health care delivery organizations meet ambitious emissions commitments in two ways: they provide supplies of zero carbon electricity that can be purchased by hospitals and other health care organizations, and they help decarbonize a significant component of the health care supply chain. Section IV addresses policies to create incentives and overcome barriers to achieving increased energy efficiency and renewable energy on-site at health care facilities. Section V explores longer-term challenges and approaches to reducing natural gas use at hospitals and other health care organizations. Finally, Section VI summarizes specific conclusions and recommendations for energy policies that can help healthcare organizations meet ambitious greenhouse gas targets.

Emissions Inventories and Emissions Policies

Reducing greenhouse gas emissions starts with understanding how much pollution is being produced, and where it originates. To understand the quantities and sources of emissions, it is necessary to develop an emissions inventory, which is a database that lists, by source or categories of sources, the amount of emissions discharged into the atmosphere during a year or other time period. Two types of emissions inventories are relevant to addressing

health care emissions; we refer to both throughout this paper. Many companies and large organizations, including those in the health care sector, use the emissions accounting and reporting methodologies from the GHG Protocol, which captures both direct and indirect emissions that are attributable to an organization. The GHG Protocol, developed by the World Resources Institute and the World Council for Sustainable Development with the input of hundreds of stakeholders, classifies GHG emissions into three "scopes''. Scope 1 includes direct emissions from sources owned or controlled by an organization. Scope 2 covers indirect emissions from the generation of purchased electricity and steam. Scope 3 encompasses all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting organization or company, including both upstream and downstream emissions. Figure 3, developed by the United Kingdom's National Health Service, depicts how the three scopes apply to health care organizations.

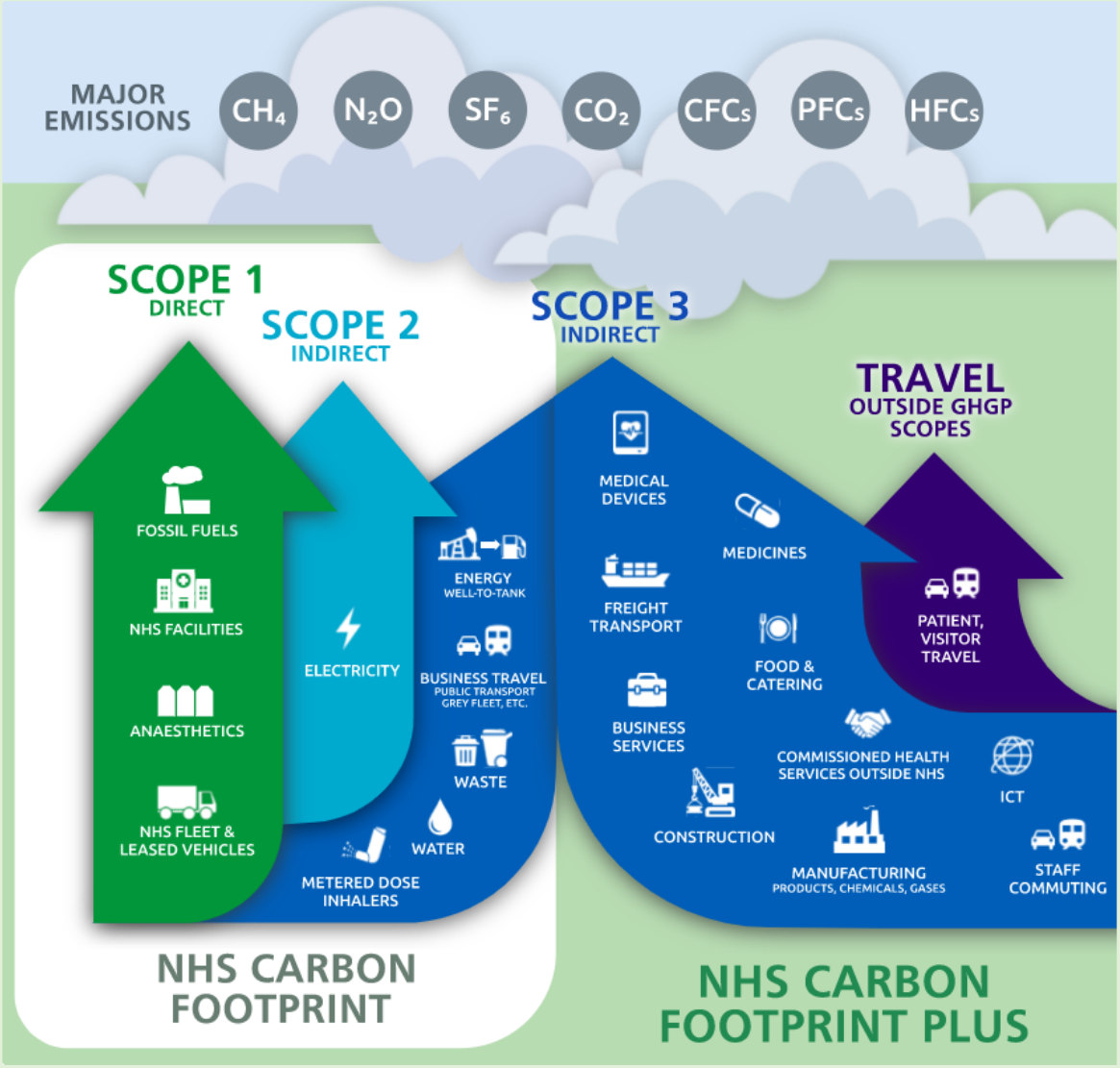
A second type of emissions inventory is used by federal and state policymakers. It accounts for emissions at the broad sectoral level (e.g., transportation, electricity, buildings, industrial, agriculture, etc.) and informs policies that focus on emissions sources within these sectors. Policymakers use sectoral inventories because a) governmental entities typically have regulatory authority only over direct sources of emissions within their geographic boundaries, and b) they make emission reduction commitments based on these direct sources of emissions. For example, the US commitments under the United Nations Framework Convention on Climate Change are based on methodologies that quantify direct emissions, rather than the indirect embedded emissions in products consumed. Similarly, state government commitments are based on direct emissions within their jurisdictions, and more than 30 states have greenhouse gas goals or statutory targets based on emission reductions within their geographic boundaries.[7]

In this paper, we focus on federal and state energy policies that address emissions at their sources and can contribute to reductions in emissions from more than one of the scopes covered by the GHG Protocol. Particularly important are emissions that originate in the electricity sector, which make up 35% of health care emissions across all GHG Protocol scopes. In addition to contributing to emissions reductions in Scopes 1 & 2, policies that decarbonize the electric supply will have an impact on Scope 3 emissions, which constitute more than 80% of health care emissions and are the most challenging emissions to reduce as they are not under the direct control of health care organizations. In other words, federal

[7] Center for Climate and Energy Solutions. U.S. State Climate Action Plans - Center for Climate and Energy Solutions, December 21, 2022.

and state electricity policies can reduce the carbon footprints of thousands of products in a hospital supply chain that are manufactured by a wide variety of companies.

Figure 3: UK National Health Service Depiction of Healthcare Organization Emissions by Scope[8]



[8] National Health Service, Delivering a 'Net Zero' National Health Service (NHS, Oct. 2020).

I. Introduction and Background

Climate change poses multiple threats to human health. The Intergovernmental Panel on Climate Change (IPCC) found that global impacts from the changing climate adversely affect physical and mental health, including through extreme heat events, increased spread of diseases, exposure to air pollution and wildfire smoke, injury and death from flooding and other extreme weather events, and trauma from economic and social disruption.[9] These health impacts are often most significant for the most underserved and vulnerable communities.[10]

The health care system contributes 8.5% of overall U.S. greenhouse gas emissions, including direct emissions and electricity used at health care facilities and indirect emissions from the sector's supply chain of goods and services. [11] Overall, hospital care contributes an estimated 35% of health care sector emissions and is the largest component of the sector's carbon footprint.[12] (See Figure 4.)

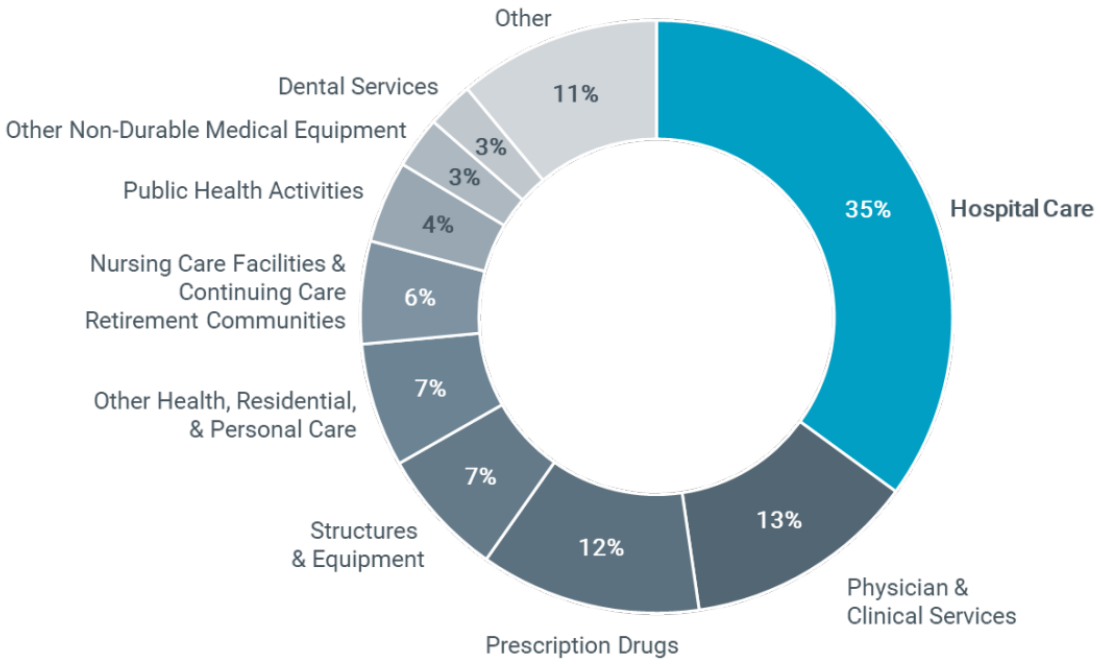
[9] IPCC, 2022, Summary for Policymakers in Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Cambridge University Press, Cambridge, UK and New York, NY, USA.

[10] Dzau, Victor J., Decarbonizing the U.S. Healthcare Sector—A Call to Action, New England Journal of Medicine, 2021; 385:2117-2119, December 2, 2021.

[11] Eckelman et al. op. cit.

[12] Sampath, B., et al., Reducing Healthcare Carbon Emissions: A Primer on Measures and Actions for Healthcare Organizations to Mitigate Climate Change. (Prepared by Institute for Healthcare Improvement under Contract No. 75Q80122P00007.) AHRQ Publication No. 22-M011. Rockville, MD: Agency for Healthcare Research and Quality; September 2022.

Figure 4: U.S. Healthcare Greenhouse Gas Emissions by National Health Expenditure Category (2018)[13]



Attention to emissions from the health care sector is important because health care is one of the fastest-growing components of the United States economy.[14] In addition, many leaders within the health care field believe the sector bears a particular responsibility to lead on addressing the impacts of climate change. For example, the President and CEO of Northwest Permanente Medical Group has said:

> *"As physicians, climate change is absolutely in our lane — let's educate ourselves, our patients, and our communities [. . .] As a world, we will develop vaccines and effective medicines to treat the COVID-19 pandemic. Climate*

[13] Based on data from Matthew J. Eckelman et al., "Health Care Pollution and Public Health Damage in the United States: An Update," *Health Affairs* 39, no. 12 (Dec. 2020): 2071–79. Graphic from Sampath, B. et al., Agency for Healthcare Research and Quality (AHRQ), "Reducing Healthcare Carbon Emissions, A Primer on Measures and Actions for Healthcare Organizations to Mitigate Climate Change", AHRQ Publication # 22-M011, September 2022.

[14] U.S. Bureau of Labor Statistics, U.S. Department of Labor, *The Economics Daily*, 5 out of 20 fastest-growing industries from 2019 to 2029 are in healthcare and social assistance, September 4, 2020.

> *change, on the other hand, is a public health crisis where there will be no point of return if we don't act today."*[15]

At the same time, health care providers and hospitals increasingly play a critical role in underserved communities through programs and resources that improve community economies, health, and climate resilience. This suggests that additional efforts to reduce emissions and increase climate resilience present an important opportunity to center environmental justice and equitable distribution of benefits from clean energy investments.

Health care leaders in government, the nonprofit sector, and the private sector are supporting a growing array of initiatives and greenhouse gas reduction targets. For example, initiatives by the National Academy of Medicine (NAM) Action Collaborative on Decarbonizing the U.S. Health Sector[16] and the Office of Climate Change and Health Equity[17] at the Department of Health and Human Services (HHS) underscore the health care sector's growing interest in reducing GHGs from the sector. In April 2022, HHS announced a new program that encourages hospitals and other organizations within the health care sector to pledge reductions in GHG emissions by 50-52 percent by 2030 and net zero by 2050, and to publicly report their progress.[18] As of November 2022, more than 100 health care organizations had committed to meeting these targets.[19] In March 2023, HHS announced that it would continue to accept new signatories to the pledge on an ongoing basis. Federal health systems, such as the Veterans Health Administration, the Indian Health Service, and the Military Health System are working to meet similar emission reduction goals.[20]

Despite these encouraging developments, meeting ambitious targets will be challenging. In large part, this is because analysis of emissions from the health care sector shows that only about 20% of the sector's emissions are either from direct emissions from health care facilities (Scope 1 emissions) or electricity purchased by facilities (Scope 2 emissions.) The remaining roughly 80%

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[15] PRNewswire/Kaiser Permanente, Kaiser Permanente Becomes First Carbon-Neutral Health System in the U.S., September 14, 2020.

[16] National Academy of Medicine, Action Collaborative on Decarbonizing the U.S. Health Sector, accessed February 22, 2023.

[17] U.S. Department of Health and Human Services, Office of *Climate Change and Health Equity (OCCHE)*.

[18] U.S. Department of Health and Human Services, HHS Launches Pledge Initiative to Mobilize Health Care Sector to Reduce Emissions, April 22, 2022.

[19] U.S. Department of Health and Human Services, HHS Shares Health Sector Emissions Reduction and Climate Resilience Announcements at COP27, November 10, 2022.

[20] U.S., Department of Health and Human Services, HHS Reopens Health Sector Climate Pledge.

of emissions are Scope 3 emissions, which the U.S. EPA defines as "the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly impacts in its value chain."[21] (See text box on p. 4.) This includes, for example, emissions generated by the manufacture of medical supplies and medicines, as well as the carbon emissions from producing the primary materials (e.g., chemicals and plastics) used to manufacture those products. Reducing this largest component of the sector's emissions presents particular difficulties because their sources are not directly controlled by health care facilities.

Nevertheless, health care organizations can make real improvements to the sources they do control directly, and they can support broader, economy-wide electricity policies that will reduce the carbon emissions embedded in the products and services they purchase. (A future paper in this series will address options for how these organizations can use their influence as customers to shape the decisions made by their suppliers and partners.)

Efforts to reduce health care emissions can be assisted by the recently passed IRA, which according to some estimates, could help the overall U.S. economy reach a 40% national reduction in greenhouse gas emissions by 2030.[22] Nearly every climate and energy provision in IRA will arguably be a factor in meeting the health care sector's emission goals, because the new law broadly addresses U.S. emissions from the electricity, transportation, buildings, and industrial manufacturing sectors.[23] Incentives for emission reductions from each of these sectors will contribute to on-site reductions at health care facilities, reduced emissions from electricity used in hospitals and other organizations, and reductions in supply chain emissions.

Policies that target the electric power sector are particularly important. A recent analysis of the health care sector's carbon footprint found that emissions that originate from the generation of electricity contribute to 35% of the health care sectors emissions across all scopes. The authors find that "efforts to fully decarbonize the electricity grid have the potential to bring Scope 2 emissions [from electricity purchases] to zero but will have an even greater absolute effect on Scope 3 emissions, which include electric power-sector emissions resulting from production of goods and services in the supply chain."[24]

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[21] U.S. EPA, Center for Corporate Climate Leadership, Scope 3 Inventory Guidance.

[22] Larsen, John, et al., A Turning Point for U.S. Climate Progress: Assessing the Climate and Clean Energy Provisions in the Inflation Reduction Act, Rhodium Group, August 12, 2022.

[23] For a comprehensive listing of IRA clean energy and climate provisions, see The White House, Building a Clean Energy Economy: A Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action" - The White House," January, 2023, Version 2.

[24] Eckelman et al. op. cit.

II. Overview of Energy Use in Hospitals

Hospitals are among the most energy-intensive commercial buildings; a typical hospital uses three times more energy per square foot than a typical office building.[25] This is because hospitals are open around the clock and have specialized heating, cooling and ventilation requirements, including thermal demands for space heating, humidification control, hot water, steam for sterilization, and laundry services. Hospitals also operate energy consuming medical equipment to diagnose illness and provide therapies; a single CT or MRI examination can use as much as 30 kWh, roughly equivalent to the average daily consumption of a typical single-family home in the U.S.[26, 27]

Hospitals are significant consumers of natural gas for water and space heating and the specialized uses for steam mentioned above. According to 2007 data on large hospitals from the Energy Information Administration's Commercial Buildings Energy Consumption Survey (see Figure 5), natural gas was the most common main space heating fuel, used by 74% of the buildings. In addition, 20% of buildings used district heating--a system in which thermal energy is provided to multiple buildings from a central off-site energy plant or plants. These systems are largely fueled by natural gas.[28] Almost 92% of facilities used electricity for air conditioning and other types of cooling. Water heating in the hospitals surveyed was 74% natural gas and 19% district heat. [29] Although the EIA data is 15 years old, more recent data from Practice Greenhealth on approximately 500 hospitals confirms that natural gas use at hospitals is still significant. Overall,

[25] Sampath, et al. op. cit.

[26] Estimate of energy use by Imaging equipment from Heye, Tobias et al., The Energy Consumption of Radiology: Energy- and Cost-saving Opportunities for CT and MRI Operation, Radiology 2020 295:3, 593-605.

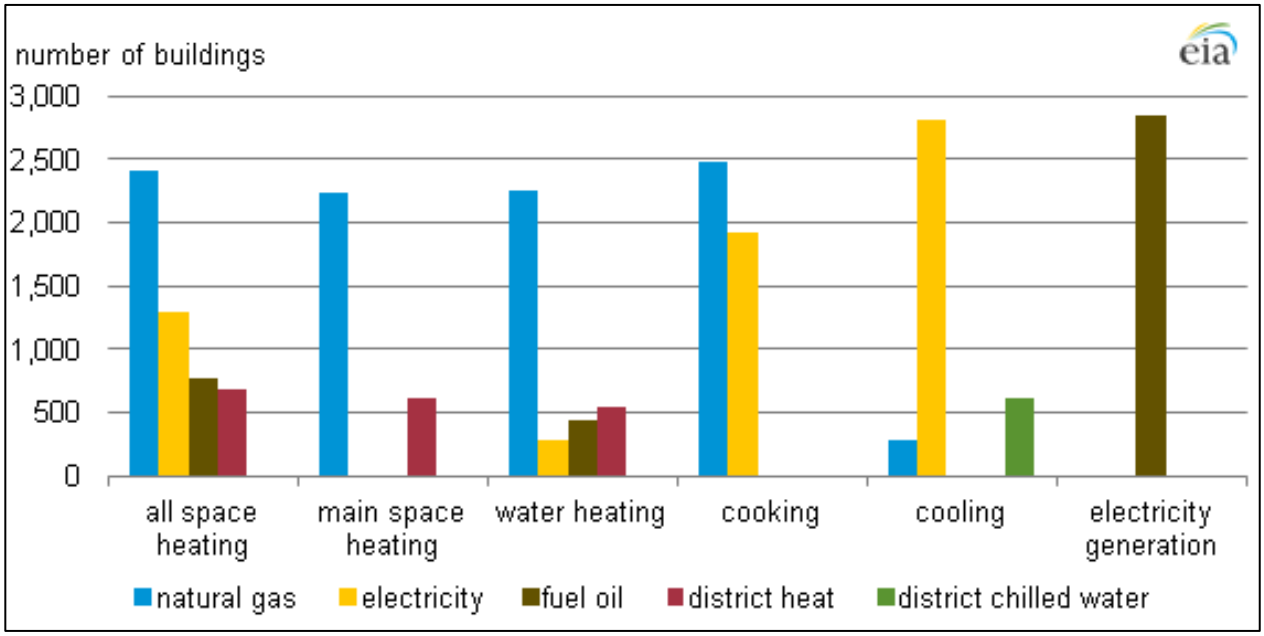
[27] Estimate of typical daily household electricity use from U.S. Energy Information Administration, Frequently Asked Questions, How much electricity does an American home use? Updated October 12, 2022.

[28] District heating systems are a subset of district energy systems, which can provide heating, cooling or both to large buildings or complexes such as university campuses, hospitals, and industrial complexes. In some cases, these systems include combined heat and power systems, which make them significantly more efficient than conventional HVAC systems. On the other hand, most district energy systems usually are powered by natural gas or other fossil fuels. Although separate statistics for hospitals are not available, according to Energy Information Administration data, in 2012, 74% of district energy systems were fueled by natural gas and 16% were fueled by coal. See U.S. Department of Energy, Combined Heat and Power Fact Sheet Series, District Energy, September, 2020, based on data from U.S. Energy Information Administration (EIA), U.S. District Energy Market Characterization, 2018.

[29] U.S. Energy Information Administration, Large hospitals tend to be energy intensive, Today in Energy, August 23, 2012.

for the hospitals represented, 57% of median total energy use (in KBTus), is from natural gas and 42% is from electricity.[30]

Figure 5: Fuels Used by End-Use in Large Hospitals



Some hospital facilities have invested in combined heat and power (CHP) systems, which are significantly more efficient than traditional systems and have resilience benefits in the case of extreme weather events. The Department of Energy's CHP Installation Database lists 229 hospitals with CHP, representing 745 MW of electric capacity. Over 83% of these systems use natural gas; the remainder use other fuels such as oil, biomass, and biogas.[31] Over a quarter of hospital CHP systems were installed after 2012[32], and the expected useful life of a CHP system is

[30] Private communication from Keith Edgerton, Health Care Without Harm, February 10, 2023. Calculated from benchmark data for 2021 calendar year, collected by Practice Greenhealth's award program from participating US hospitals.

[31] The decarbonization benefits from biomass and biogas will depend on a full life-cycle assessment of the fuels. See MIT Climate Portal, Biofuel, and Gasper, Rebecca, The Production and Use of Waste-Derived Renewable Natural Gas as a Climate Strategy in the United States, World Resources Institute, April 25, 2018.

[32] U.S. DOE, Better Buildings, CHP Market Sector: Hospitals, Combined Heat and Power Fact Sheet Series, December 21, 2021.

20 years or more.[33] Thus, investments in new CHP systems by hospitals represent a significant sunk cost that would likely lead to fossil fuel use for the next two decades or more.

As will be discussed later in the paper, the significant use of natural gas by health care facilities raises challenges and tradeoffs for health care organizations pursuing decarbonization targets. Many of these challenges mirror decarbonization issues faced in existing commercial buildings more generally, particularly for space heating[34], while other issues are specific to the unique energy needs of hospitals.

III. Federal and State Policies for a Zero-Carbon Electric Grid

Broad, economy-wide clean electricity policies help health care delivery organizations reduce their carbon footprints by creating incentives or removing barriers to decarbonize the U.S. electric grid. As more electricity is generated by wind, solar, and other zero-carbon sources, the electricity used by hospitals will get cleaner as a matter of course. Larger clean electricity supplies also will make it easier to negotiate low-cost power purchase agreements (PPAs) with renewable energy producers. Finally, as noted above, broader clean electricity policies will help decarbonize the health care sector supply chain because a substantial portion of the sector's indirect emissions come from electricity used in manufacturing upstream materials.

Recent and Emerging Federal Policies

Implementation of the IRA and Additional Actions for Grid Decarbonization

Numerous provisions of the IRA are designed to speed the transition of the electric sector to cleaner electricity.[35] Based on economy-wide energy modeling, the Rhodium Group estimates that incentives in the IRA will lead to reductions of electric power sector emissions of 60-81%

[33] See Fields, Alex, Combined Heat and Power (CHP), Whole Building Design Guide, August 3, 2016.

[34] Nadel, S., and Perry, C., Electrifying Space Heating in Existing Commercial Buildings: Opportunities and Challenges, Washington, DC: American Council for an Energy-Efficient Economy, October 28, 2020.

[35] In addition to the tax credits for renewable energy discussed below, the IRA also has a new production tax credit for existing nuclear power plants that is designed to improve the economics of operating the plants and preserve the existing nuclear fleet. New nuclear plants placed into operation starting in 2025 could receive either the technology-neutral ITC or PTC tax credits. See U.S. Department of Energy, Office of Nuclear Energy, Inflation Reduction Act Keeps Momentum Building for Nuclear Power, September 8, 2022.

below 2005 levels in 2030, compared to 46-72% if the law had not passed.[36] Analysis from other organizations, including Energy Innovation[37], Princeton University's Zero Lab[38], and Resources for the Future[39] show similar results. In addition, researchers at Resources for the Future estimate that the IRA will provide significant health benefits from reduction of conventional air pollution. Their analysis projects that sulfur dioxide emissions will fall by 37-63 percent from 2022 levels by 2030, and nitrogen oxide emissions will fall by 36–53 percent of 2022 levels. Nationwide, RFF estimates that these reductions in pollution will reduce premature mortality by 692–1300 lives annually in 2030.[40] Energy Innovation projected even greater health benefits, including between 2,900 to 4,500 avoided deaths and 76,000 to 119,000 avoided asthma attacks in 2030.[41]

Even with the incentives in the IRA for cleaner electricity, there are still numerous actions that must be taken for effective implementation of broader clean electricity policies. Unprecedented amounts of new infrastructure must be planned, sited, and built to achieve the ambitious goals of the IRA and the even more challenging U.S. national decarbonization goals for 2030 and 2050. Princeton researcher Jesse Jenkins estimates that to fully decarbonize the U.S. electric grid by 2050, the U.S. will need to build the equivalent of two additional electric power grids over the next 30 years. This is because at the same time that the grid would replace fossil energy generation, the overall supply of clean electricity will need to more than double as the U.S. electrifies much of the economy, including the transportation and buildings sectors.[42]

Virtually every analysis of the IRA has emphasized the need for additional policies at the federal, state, and local levels to achieve the full emission reductions potential of the law as well as the additional reductions necessary to fully decarbonize the electric grid. For example, referring to their analysis of the IRA, the Energy Innovation researchers note:

> *. . . the modeling assumes that necessary transmission will be built, interconnection delays are addressed, supply chains provide the necessary*

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[36] Larsen, John, et al.

[37] Energy Innovation, Updated Inflation Reduction Act Modeling Using the Energy Policy Simulator, August 2022.

[38] Jenkins, J.D., et al., Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022, REPEAT Project, Princeton University, August 4, 2022.

[39] Rennert, K., et al., Modeled Effects of the Inflation Reduction Act of 2022, Slide Presentation, August 10, 2022.

[40] Roy, N., et al., Beyond Clean Energy, The Financial Incidence and Health Effects of the IRA, Resources for the Future, Report 22-11, October 2022.

[41] Energy Innovation op. cit.

[42] New York Times, Transcript: Ezra Klein Interviews Jesse Jenkins, The New York Times, September 21, 2022.

> *materials to deploy these levels of clean electricity, and a sufficient workforce can supply the labor. Each of these represents a potential barrier to scaling electricity deployment at the rates our modeling envisions.*

Regarding grid interconnection, before new sources of electricity can be connected to the grid, grid operators must study the impact of these sources on grid operating and reliability to determine if new transmission equipment or upgrades should be added. The need for detailed studies of new projects to ensure the electric grid stays reliable has led to long delays—as much as 4 years in some regions-- and a large backlog of projects. In some cases, grid operators may require significant upgrades to the transmission system.[43] The Department of Energy has launched an initiative to provide analysis and technical assistance to improve and accelerate the grid interconnection process[44], and the Federal Energy Regulatory Commission (FERC) has issued a proposed rule with reforms to address the interconnection backlog.[45]

More generally, Princeton researchers estimate that if new transmission infrastructure continues at its current pace of approximately 1% per year, over 80% of the potential emissions reductions from the law will be lost. To achieve the full emission reduction envisioned by the law, the pace of building new transmission infrastructure must more than double to an average of about 2.3% per year. The analysis notes that this rate of expansion is comparable to the average annual rate from 1978-2020.[46]

Finally, to examine what it would take to achieve a net-zero U.S. power grid by 2035, the National Renewable Energy Laboratory (NREL) modeled four scenarios.[47] This study, which does not reflect the impact of the IRA, found that in all scenarios, significant new transmission would be required, and the total transmission capacity in 2035 would need to be approximately one to three times current transmission capacity. This would require between 1,400 and 10,100 miles of new transmission lines per year starting in 2026.

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[43] Plumer, Brad. Wind and Solar Energy Projects Risk Overwhelming America's Antiquated Electrical Grids. The New York Times, February 28, 2023.

[44] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, DOE Launches New Initiative to Improve Clean Energy Interconnection, October 17, 2022.

[45] Federal Energy Regulatory Commission (FERC), News Release, FERC Proposes Interconnection Reforms to Address Queue Backlogs, June 16, 2022.

[46] Jenkins, J.D., et al., "Electricity Transmission is Key to Unlock the Full Potential of the Inflation Reduction Act," REPEAT Project, Princeton, NJ, September 2022.

[47] Denholm, P. et al., Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035, National Renewable Energy Laboratory. NREL/TP6A40-81644, 2022.

NREL concluded that several key actions will need to take place in the coming decade:

- Significant acceleration of electrification and energy efficiency efforts;
- Rapid installation of new energy infrastructure throughout the country;
- Expanded manufacturing capacity and supply chain for clean technology, including developing the labor force and new sources of raw materials; and
- Continued research, development, demonstration, and deployment to lower costs and improve performance of emerging technologies.

Putting all of these actions in place will not be easy, and will take significant efforts to make the changes to the U.S. energy economy that will be necessary to achieve U.S., sectoral, and organizational greenhouse gas commitments.

U.S. Environmental Protection Agency (EPA) Power Plan Rulemakings

The Environmental Protection Agency is in the process of developing new regulations for power plants that could further decarbonize the nation's electric grid. These regulations, which cover both carbon dioxide emissions as well as conventional pollutants, are at various stages and will be proposed and finalized over the next two years.[48] In the case of CO_2 standards for new and existing power plants, there continues to be some uncertainty in the wake of recent Supreme Court decisions. Although the Court did not foreclose the option of EPA regulation, the opinion in the *West Virginia vs EPA* case raises a variety of legal, technical, and political issues for EPA and for states that will implement federal power plant greenhouse gas regulations.

New IRA tax credits improve the cost-effectiveness of technologies such as CCS and hydrogen that could form the basis of EPA regulations and could lead to more stringency.[49] At the same time, revisions to the Mercury and Air Toxics (MATS) Rule and other regulations that affect power plants will be promulgated by EPA over the coming months and years.[50] Reducing SO_2 and NO_x has significant health benefits and is a high priority for environmental justice communities and stakeholders.[51] Moreover, these rules could change the economics for existing coal-fired power plants, which could lead to early retirements of these plants and associated reductions in CO_2

[48] Harvard Law School, Environmental and Energy Law Program, Regulatory Tracker.

[49] Powell, A., How inflation act may help rescue greenhouse-gas goals of repealed Clean Power Plan, Harvard Gazette, November 15, 2022.

[50] Environmental & Energy Law Program, Harvard Law School, Power Plant Emissions Regulations, 2023.

[51] WE ACT, 2023 Policy Agenda, Campaigns and Initiatives, 2023.

emissions. For example, EPA estimates that the Good Neighbor Plan ozone rule released in March 2023 will reduce CO2 emissions by 16 million metric tons in 2026 alone.[52]

State and Local Actions

Although the IRA's funding and incentives are national in scope, many of the actions discussed in the previous section must take place at the state and local levels. This is because electricity generation is regulated at the state level in many states and retail electricity sales are regulated at the state level in all 50 states. A recent report by the think tank Energy Innovation noted: "The IRA's potential economic transformation will not happen without new state policy." Energy Innovation recommends that Public Utility Commissions (PUCs) revisit cost assumptions for renewable energy based on the new tax incentives and reflect these new assumptions in power procurement, renewable energy contracts, and where required, integrated resource plans (IRPs). EI also recommended that PUCs should also ensure that the lower costs of new clean generation are included in planning.[53]

In addition to actions by state electricity regulators, governors and state legislatures can support policies to further decarbonize the electricity grid, including adopting or increasing clean energy standards and considering mandates for utility storage. Regarding clean energy standards, an analysis by Lawrence Berkeley National Laboratory found roughly half of all growth in U.S. renewable electricity (RE) generation and capacity since 2000 has been associated with state RPS requirements.[54] LBNL found that the influence of RPS on renewable energy growth has declined in recent years, representing 23% of all U.S. RE capacity additions in 2019, but the RPS remains the most important driver of renewable energy in the Northeast and MidAtlantic regions. Meanwhile, states continue to pass new laws to strengthen clean energy targets, including a February 2023 bill enacted in Minnesota that requires utilities operating in the state to receive 100% of their electricity from clean energy sources by 2040.[55]

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[52] U.S. EPA, EPA's "Good Neighbor" Plan Cuts Ozone Pollution–Overview Factsheet, March 2023.

[53] Energy Innovation, Implementing The Inflation Reduction Act: A Roadmap For State Electricity Policy, October 12, 2022.

[54] Barbose, Galen L., U.S. Renewables Portfolio Standards 2021 Status Update: Early Release, Electricity Markets And Policy Group, Lawrence Berkeley National Laboratory, February 2021.

The analysis found that the other drivers for renewable energy growth were voluntary green power markets; economic utility purchases of renewable energy, often under an integrated resource plan; and net metering of electricity from solar panels.

[55] Teirstein, Z., Minnesota's New Climate Bill Is Ambitious: 100% Clean Energy by 2040, Canary Media, February 6, 2023.

Regarding utility storage, as of April 2022, ten states had set energy storage targets.[56] States have used or are exploring a variety of mechanisms and incentives to achieve these targets, including financial incentives for commercial and residential customers and rate design.[57]

IV. Policies to Reduce Onsite Emissions

There are numerous examples of health care organizations that have undertaken projects to reduce electricity consumption and overall energy use at their facilities and increase use of renewable energy.[58] Nevertheless, many hospitals and other health care delivery organizations have historically faced particular financial challenges to achieve their decarbonization goals, including the considerable up-front costs of shifting to renewable energy sources and implementing energy efficiency measures. This section will (1) describe examples of energy-related projects that reduce emissions at hospitals; (2) discuss current approaches for financing onsite measures to reduce energy use, including internal financing and state programs; and (3) address new potential financing opportunities under the IRA.

Projects for Reducing Hospital Emissions

Hospitals have reduced their carbon footprints through a variety of energy efficiency measures, including installing more efficient lighting[59] and upgrading HVAC systems[60]. Many hospitals participate in voluntary energy efficiency programs such as the Department of Energy's Better Buildings Program[61] or the Environmental Protection Agency's EnergyStar Program[62], which provide analytical software, product information, and other services.

An increasing number of hospitals have installed solar panels to provide partial electric power for their facilities. For example, the University of Nebraska Medical Center installed nearly 1500 solar

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[56] Colthorpe, A., Michigan ready to become 10th US state with an energy storage target, Energy Storage News, April 25, 2022.

[57] Plautz, J., As States Ramp up Storage Targets, Policy Maneuvering Becomes Key, Utility Dive, February 7, 2022.

[58] See examples at Practice Greenhealth, Energy.

[59] Morgan, J., Hospital lights the way to savings, Health Facilities Management Magazine, October 19, 2020.

[60] U.S. DOE, Building Technologies Program, Hospitals Save Energy and Money by Optimizing HVAC Performance, July 2011.

[61] U.S. DOE, Better Buildings Initiative, Healthcare.

[62] U.S. EPA, ENERGY STAR Commercial Buildings.

panels on several buildings.[63] In Northern California, Kaiser Permanente's Richmond Medical Center has installed a solar powered microgrid system with 1 megawatt-hour of battery storage and a 250-kilowatt solar power system. The project can provide backup power in the event of an outage, which reduces the need for pollution-heavy backup fossil fuel generation, including diesel, natural gas, or propane generators.[64]

Power Purchase Agreements

Some healthcare organizations use renewable energy power purchase agreements (PPAs) to reduce the carbon emissions of their electricity use.[65] There are two basic types of PPAs, Physical PPAs and Virtual PPA's. Under a Physical PPA, the buyer has a long-term contract with a specific third-party renewable energy facility that may be located onsite or offsite. The buyer receives physical ownership of the electricity and must own the renewable energy credits (RECs) from the renewable generation to credit the cleaner electricity in its calculation of Scope 2 emissions.[66] Physical PPAs are possible only if a facility is located in a state with a competitive electricity market where electricity is regulated at the wholesale level.[67]

States not located in competitive electricity markets can use Virtual PPAs (also known as "Financial PPA's"), which do not require renewable electricity to be delivered to a specific facility. Instead, the buyer contracts for a long-term price for electricity and the renewable electricity is delivered to the grid. Under the contract, the buyer owns the RECs from the renewable

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[63] U.S. DOE, Better Buildings Initiative, UNMC: Maurer Center for Public Health.

[64] U.S. DOE, Better Buildings Initiative, Kaiser Permanente Pioneers California's First Medical Center Microgrid.

[65] Note that a PPA also could be onsite if a 3rd party contracts to own and install renewable energy generation equipment on a hospital site. See U.S. DOE, Better Buildings Initiative, Better Buildings Financing Navigator, Power Purchase Agreement.

[66] EPA defines Renewable Energy Certificates (RECs) as "the legal instruments used in renewable electricity markets to account for renewable electricity and its attributes and are issued in megawatt-hour (MWh) increments. The owner of a REC has exclusive rights to the attributes that MWh of renewable electricity." See US EPA, Green Power Markets, Solar Power Use Claims, Updated February 5, 2023.

More generally, note that there are both voluntary and mandatory or compliance markets for RECS. Unlike RECs used in PPAs, electricity service providers use RECs to demonstrate compliance with mandated renewable energy requirements such as renewable portfolio standards (RPSs). See US EPA, Green Power Markets, U.S. Renewable Electricity Market, Updated February 5, 2023.

[67] Walker, B. and Mininberg, M., Financing hospital energy sustainability, Health Facilities Management, February 22, 2022.

generation as this represents the "green attributes" of the power sold to the grid. Health care facilities would need to own these RECs to claim reductions in their Scope 2 emissions.[68]

In some cases, healthcare organizations have combined on-site and off-site generation for their facilities. For example, Partners HealthCare, one of the largest healthcare delivery facilities in Massachusetts, entered into three-year, fixed term, low impact hydroelectric power purchase agreements, which allows it to potentially save around 10-15% in costs. This is combined with on- and off-site reliance on solar power and a 22 MW direct delivery purchase of wind energy from a farm in New Hampshire. Partners HealthCare estimates the procurement of renewable energy and the energy efficiency upgrades at its facilities will reduce emissions by around 80%.[69]

Financing On-Site Measures

Transitioning a healthcare organization to more efficient and cleaner energy requires a significant capital outlay for upgrading facilities and equipment. The DOE Better Buildings Program's Health Care Financing Primer cites several common methods for financing energy efficiency or other clean energy infrastructure.[70] These include:

- internal funding sources, such as capital budget allocations or green revolving funds;
- energy savings performance contracts, in which an energy service company (ESCO) installs and maintains energy efficiency measures at a healthcare facility and is paid back out of energy savings;
- leasing energy equipment; and
- debt or loan financing to purchase energy equipment.

In addition to the financing methods described above, some state and local governments have provided incentive programs and financing mechanisms for energy efficiency and distributed solar projects, either through their regulated electric utilities or directly. These include:

Commercial Property Assessed Clean Energy (PACE) Finance:

With PACE financing, a municipal or state government provides upfront capital for energy efficiency or renewable energy projects and requires repayment through tax bills (in the case of for-profit entities) or new voluntary bills for non-profit entities that do not pay taxes.[71]Legislation

[68] US EPA, Green Power Markets, Financial PPA.

[69] Health Care Without Harm, Safe haven in the storm: Protecting lives and margins with climate- smart health care, January 2018.

[70] U.S. DOE, Better Buildings Financing Navigator.

[71] ACEEE, Health Care Without Harm, and Practice Greenhealth, Energy Efficiency Financing for Hospitals: A Discussion of Both Tried-and-true and New Opportunities, March 9, 2016.

enabling commercial PACE has been passed in 38 states and the District of Columbia. In some states and localities, including Connecticut[72], District of Columbia[73], and Montgomery County, MD,[74] green banks administer these financing programs.

On-Bill Financing:

Under on-bill financing programs, electric utilities provide the capital for energy efficiency improvements or distributed renewable energy projects, either from their own funds or from 3rd parties, and then customers repay the loans on their utility bills. In many cases, the value of the energy savings is greater than the loan payments.

Grants, Rebates, and Other Incentives:

Some states provide grants, rebates, and other incentives for energy efficiency and solar energy programs for commercial buildings.[75] For example:

- The Mass Save Program in Massachusetts, through a consortium of electric and gas utilities, has provided incentives for energy efficiency upgrades to several healthcare facilities.[76]
- Washington state recently passed legislation that set performance standards for existing commercial building and provides incentive payments for early adoption of the standards.
- The New York State Energy Research & Development Authority (NYSERDA) provides grants for solar projects through its NY-Sun program, including projects at health care facilities.[77]
- The Illinois Solar for All Program provided a grant to Advocate Health to help fund a solar array in a field near their Advocate South Suburban Hospital, supplying about 5% of the hospital's electricity.[78]

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[72] Connecticut Green Bank, About Us

[73] DC Green Bank, DC PACE: Financing for Building Upgrade and New Construction.

[74] Montgomery County Maryland, Department of Finance, Commercial PACE.

[75] For a comprehensive listing of energy efficiency and renewable energy incentives by state, NC Clean Energy Technology Center, DSIRE, Database of State Incentives for Renewables and Efficiency.

[76] Mass Save, Healthcare

[77] Mullaney, M., New Solar Project to Provide Green Energy for St. Peter's Hospital, St. Peter's Health Partners News, February 8, 2016..

[78] Illinois Power Agency, Solar for All, Selected Project Summaries, September 2022.

Inflation Reduction Act: Tax Incentives

Overview

The Inflation Reduction Act contains significant incentives for energy efficiency and renewable energy that can be used to fund projects to reduce direct on-site emissions and electricity used at health care facilities.[79] This new source of financing will make it easier to invest in the up-front costs of measures that also can help hospitals and other organizations reduce their energy costs. The tax credits are "uncapped", in that there are no limits on the overall amount of incentives that can be provided to eligible entities.[80] In addition, for the first time, the direct payment provision discussed below will allow not-for-profit hospitals to benefit from clean energy tax credits and could facilitate significant new investment in renewable energy projects at health care delivery organizations.[81] Finally, the renewable energy incentives in the IRA have been authorized for 10 years, providing more certainty to inform long term investment planning decisions. In the past, tax credits required extensions every few years, which created uncertainty for facilities and investors. The director of the Cleveland Clinic's Office for a Healthy Environment characterizes the provisions in the new law as follows: "It will make funding of renewable energy more feasible and will dramatically lower the cost of some projects."[82]

Although there are a variety of new tax credits in the IRA, three pre-existing tax credits or deductions have been strengthened by the IRA and are particularly relevant for health care organizations. These are:

- **The Investment Tax Credit (ITC)**, which provides a one-time credit based on the costs of a project;
- **The Production Tax Credit (PTC)**, which is an annual credit per kWh based on the amount of electricity produced over 10-years. (A clean energy project may take either the ITC or the PTC, but not both); and

[79] Congressional Research Service, Tax Provisions in the Inflation Reduction Act of 2022 (H.R. 5376), R47202, Updated August 10, 2022.

[80] Meyer, R.. The Climate Economy Is About to Explode, The Atlantic, October 6, 2022.

[81] Lombardo, C., et al., What Healthcare Organizations Need to Know About the IRA to Leverage Financial Incentives, Mazzetti, December 20, 2022.

[82] Pennar, K., 'If I Were a Hospital, I'd Be Reading the Tea Leaves': Pressures Grow on the Health Care Industry to Reduce Its Climate Pollution, STAT, November 1, 2022.

- **The Section 179D Energy Efficient Commercial Buildings Tax Deduction**, which provides a deduction for expenditures to improve the efficiency of commercial buildings.

The IRA changes these tax incentives in several important ways:

- **Eligibility for non-profits:** Unlike past clean energy tax credits, which could only be claimed by tax-paying entities, some of these provisions have a "direct pay" option, which would allow non-profit hospitals with no tax liability to take advantage of incentives to install clean energy systems at their facilities. Previously, tax exempt entities were not eligible for these credits because they pay no taxes. Through the direct pay option, these entities can receive a payment from the federal government for the value of the credit. For the ITC, starting in 2024, the amount of the credit that could be received as direct pay will be limited to 90% for large facilities not meeting domestic content requirements (discussed below). This limit would be waived if materials are not available domestically or if including domestic materials would increase the facility's construction cost by more than 25%.
- **Value of energy efficiency deductions can be passed to non-profits:** In the case of the 179D energy efficiency deduction, which is not a direct pay measure, the deduction can be taken by project designers–architecture, engineering, and construction firms–which can pass on the value of the credits to not-for-profit entities. Previously, only commercial building owners and project designers for government buildings were eligible for these credits. In addition, the IRA increases the deduction allowed for energy efficiency measures in new buildings and adds a new provision for retrofits of existing buildings.[83]
- **Labor requirements:** There are labor provisions that must be met to receive the full ITC and PTC tax credits, including prevailing wage and apprenticeship requirements. However, the higher credit rates would also be available without the labor requirements to any project with a maximum net output of less than one megawatt of electrical or thermal energy, which may apply to some projects at smaller health care facilities.
- **Bonus provisions:** Bonus provisions for the ITC and PTC allow recipients to receive additional incentives if certain conditions are met. An important example is projects conducted in an "energy community", which includes (1) communities with brownfields; (2) areas with employment or local tax revenues related to fossil fuels and above average unemployment; and (3) areas in which a coal mine or coal-fired power plant has been closed. There is an additional bonus if projects utilize domestic content such as U.S.-made steel and cement.

[83] For a good summary of the new 179D provision under the IRA, see American Council for an Energy Efficient Economy (ACEEE), Commercial Building Efficiency Incentives in New Federal Laws, February, 2023.

- **Environmental Justice Credits.** The revised ITC would allow for the allocation of 1.8 gigawatts for "environmental justice solar and wind capacity" credits. Specifically, projects receiving an allocation that are located in a low-income community or on Indian land will be eligible for a bonus investment tax credit of 10 percent, while projects that are part of a low- income residential building project or qualified low- income economic benefit project would be eligible for a 20 percent bonus investment credit. Qualifying solar and wind facilities would include those with a nameplate capacity of 5 megawatts or less, and qualifying property would include energy storage property installed in connection with the solar property and interconnection property.
- **Additional technologies supported:** Additional technologies are incentivized by the revised ITC provisions, including stand-alone battery storage, geothermal heat pumps, fuel cells, microgrid controllers, and other energy equipment. In addition, starting in 2025, both the ITC and PTC provisions become "technology-neutral", and clean energy generating projects can receive credit if they have a GHG emissions rate of not greater than zero. Project developers can choose between the ITC or the PTC for all eligible clean power projects.

Inflation Reduction Act: Greenhouse Gas Reduction Fund

The Greenhouse Gas Reduction Fund (GGRF) provision of the IRA provides funding for green banks and other financing entities to make grants or low-cost financing available for clean energy measures. This fund could potentially leverage private capital for additional financing opportunities. The GGRF, which provides initial funding to EPA for regranting to different potential recipients, has three funding components:

- $7 billion will be distributed by EPA for competitive grants to States, municipalities, Tribal governments, and eligible recipients (discussed below), as defined in the statute, to provide subgrants, loans, or other forms of financial assistance. There is also funding for technical assistance to enable low-income and disadvantaged communities to deploy or benefit from zero-emission technologies, including distributed technologies on residential rooftops, and to carry out other greenhouse gas emission reduction activities.
- Approximately $12 billion will be distributed by EPA for competitive grants to eligible recipients for the provision of financial and technical assistance to projects that reduce or avoid greenhouse gas emissions and other forms of air pollution.
- $8 billion will be distributed by EPA to make competitive grants to eligible recipients for the provision of financial and technical assistance to projects that reduce or avoid greenhouse gas emissions and other forms of air pollution in low-income and disadvantaged communities.

Many issues about the design, organizational structure, and potential recipients of the grants have yet to be resolved. For example, the IRA states that an eligible recipient of the funds must be a nonprofit organization that:

- is designed to provide capital, leverage private capital, and provide other forms of financial assistance for the rapid deployment of low- and zero-emission products, technologies, and services;
- does not take deposits other than deposits from repayments and other revenue received from financial assistance using the grant funds;
- is funded by public or charitable contributions; and
- invests in or finances projects alone or in conjunction with other investors.

In other words, an eligible recipient could be one of the more than 20 existing state and local green banks, a non-profit community financial development institution, a credit union, or some combination of these institutions. Another option would be to set up a national green bank with portions of the GGRF, an approach that is supported by the Coalition for Green Capital.[84]

Projects funded by GGRF could provide multiple benefits for communities, including reductions of greenhouse gasses and conventional pollution and increased resilience of health care facilities. The GGRF includes a preference for projects in underserved communities, which could potentially be relevant for hospitals that serve low-income or otherwise disadvantaged populations.

V. Addressing Onsite Natural Gas Use

As discussed in Section II, hospitals are significant consumers of natural gas to fuel boilers that provide space heat, hot water, and steam. Addressing emissions from burning natural gas is one of the strategies with the highest emissions-reduction potential for hospitals because burning natural gas for energy is the sector's largest source of direct, Scope 1 emissions. As discussed below, most of these emissions come from heating, ventilation, and cooling (HVAC) systems that are powered by natural gas or other fossil fuels. However, reducing natural gas use at hospitals poses numerous challenges. Some of these challenges are specific to hospitals and medical facilities, while other challenges are shared with other types of commercial buildings. This section will describe (1) how hospitals and other health care organizations are exploring new approaches to balance reducing energy used for ventilation with the critical need for safe indoor air quality; and (2) more general challenges to electrifying facilities and reducing gas use.

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[84] Coalition for Green Capital, Letter to Environmental Financial Advisory Board, U.S. EPA, Regarding Greenhouse Gas Reduction Fund, October 11, 2022.

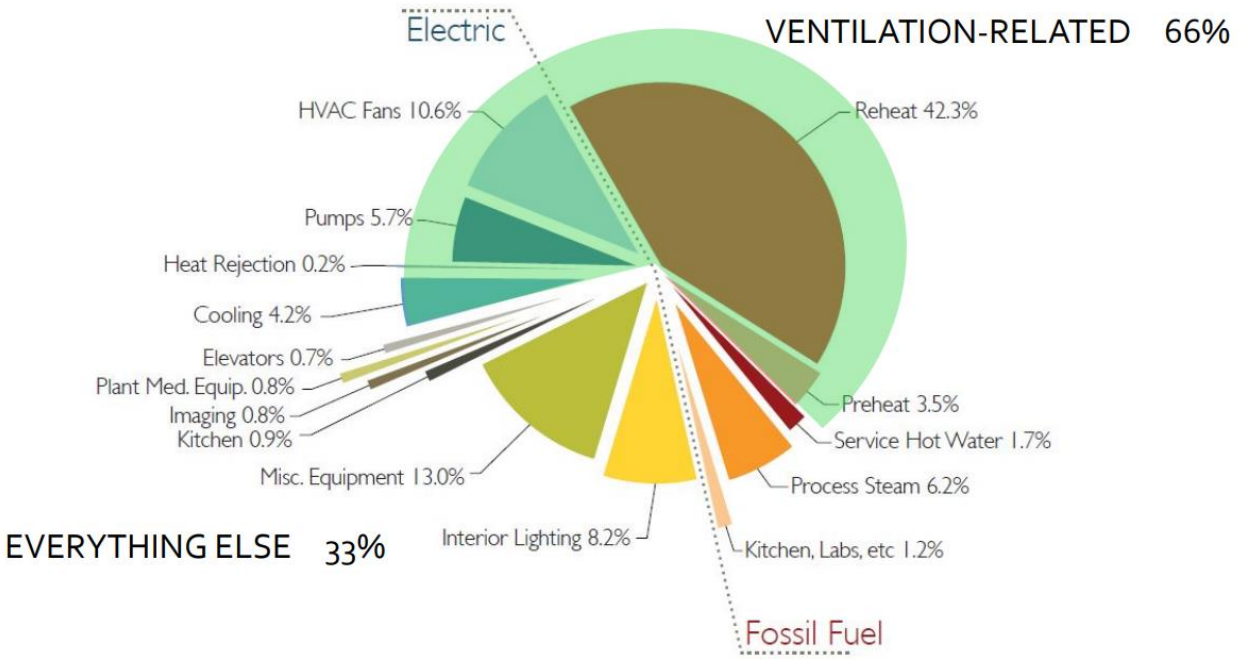
Building Standards in Hospitals and Health Care Facilities

Health care facilities are subject to a variety of state and federal regulations designed to ensure that they are safe and protect the health of the vulnerable populations they serve. In some cases, existing regulations may conflict with decarbonization and energy efficiency goals. In particular, hospital ventilation systems are governed by standards designed to require increased air flow and ventilation to reduce potential airborne contaminants. These ventilation standards for hospitals require the consumption of significant energy, and are a primary reason that hospitals use as much as three times more energy per square foot than a typical commercial office building.[85]

Ventilation contributes to the majority of energy used in hospitals. For example, a detailed study of a hospital in Vancouver, WA found that 66% of energy consumed was ventilation-related and based on fossil-fuel use (see Figure 6).

[85] Delgado, A., Keene, K.M., Wang, N., Federal Energy Management Program, Integrating Health and Energy Efficiency in Healthcare Facilities United States, March 2021.

Figure 6: Detailed Example of Energy Use in a Hospital[86]



Increasingly, health care organizations are evaluating new approaches that can ensure that health and safety goals are met while employing lower-carbon technologies and practices. In part, this has been driven by findings that some hospital building standards designed to protect indoor air quality are outdated and not based on empirical data. An analysis undertaken for the American Society of Healthcare Engineering and the Facilities Guidelines Institute examined the basis for more than 886 hospital ventilation requirements and found that 73.5% of the standards "did not have evidence or conclusive evidence and are recommended for further study."[87] A study of a California hospital sponsored by the California Energy Commission found that there was no relationship between ventilation rates and airborne contamination. The study found that modifying ventilation rates in the hospital could reduce natural gas use by 21% and electricity use by 25% without sacrificing indoor air quality.[88]

Finally, a recent letter to HHS from the Chair of the multi-disciplinary committee that develops the relevant set of standards for hospitals (ASHRAE Standard 170, Ventilation for Hospitals) notes

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[86] Burpee, H. et al., Targeting 100!: Advanced Energy Efficient Building Technologies for High Performance Hospital Buildings, Web Tool Print Version, University of Washington's Integrated Design Lab, 2013.

[87] Mousavi, E., et al., RP-CO-RP3 -- Academic Research to Support Facility Guidelines Institute & ANSI/ASHRAE/ASHE Standard 170, ASHRAE, 2019.

[88] Barolin, A. et.al, 2020. Advanced HVAC Technology Demonstration Project to Reduce Natural Gas Use in Hospitals (Draft Version), California Energy Commission, Publication Number CEC-500-2020-XXX.

that standards that increase air flow may be justified in some cases, but that there is little evidence for the exact basis of the standards. As a result:

> *These ventilation requirements of health care facilities have an unintended consequence – they compel these facilities to operate as some of the highest intensity energy consumers in their community, and more than half of that energy is consumed by the heating ventilation and air conditioning (HVAC) systems. Embracing a "do no harm" credo, many health care systems have recognized how their energy impacts affect the macro-environment and have thusly committed to numerous initiatives including energy transitions and zero net goals. These goals and the ability to improve energy efficiency of all health care facilities toward conceivable decarbonization are hindered without the evolution of safe and smart ventilation efficiency.*[89]

The letter calls for research to help inform the next generation of standards, which should be specifically calibrated to achieve both indoor air quality and energy efficiency or carbon reduction goals.

In addition to ventilation standards, HDOs and other stakeholders and experts have called for updating other health care-related building standards to address decarbonization goals, including allowing the use of non-fossil fuel health care microgrid systems for emergency backup power.[90, 91] On March 31, 2023, CMS issued a waiver that allows hospitals and other health care facilities to elect to use these systems.[92] This provides an additional decarbonization opportunity for HDOs, because microgrids can now be financed with the help of the Investment Tax Credit provision of the IRA.

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[89] Letter from Michael Sheerin, Chair ASHRAE Standing Standard Project Committee 170, to Arsenio Mataka, Senior Advisor for Climate and Health Equity, Office of Climate Change and Health Equity, Department of Health and Human Services, March 6, 2022.

[90] Guttmann, S., Turning the Health Care Sector toward Decarbonization, U.S. Green Building Council, January 6, 2023.

[91] Letter from Health Care Climate Council to Xavier Bacerra, HHS, Regarding Request for Waiver to Apply NFPA 70, Article 517, January 3, 2023.

[92] Centers for Medicare and Medicaid System, Categorical Waiver – Health Care Microgrid Systems (HCMSs), Memo # QSO-23-11-LSC, March 31,2023.

The Electrification Challenge and Policies to Reduce On-Site Natural Gas Use

Studies of how best to decarbonize the buildings sector focus on the potential for electrification as a critical strategy.[93] However, electrifying some types of commercial buildings, particularly reducing the use of natural gas in existing buildings, is challenging. Replacement of boilers with electric heat pumps for space and water heating may be possible for some buildings, but the economics and applicability of technologies often depends on specific building types and characteristics as well as the local climate (i.e., warm vs. cold weather.) These challenges are significant for hospitals, which have special, patient-care-related requirements for thermal heat and steam for equipment sterilization, laundries, and other purposes. The special thermal needs of hospitals have been reflected in recent laws passed that exempt hospitals from bans on natural gas hookups in the construction of new buildings in New York City[94], Montgomery County, MD[95], and Boston, MA .[96]

In addition, as discussed previously, some hospitals have invested significant funds in gas-fired combined heat and power systems (CHPs), which are a very efficient way to provide electricity and steam and, in some cases, provide resilience benefits from extreme weather events. Despite their significant benefits, most CHPs require burning natural gas, which may lead hospital systems with decarbonization targets to avoid investments in new CHP systems.

Nevertheless, there are a growing number of examples of technologies and practices that can utilize electric heat pumps and other technologies to reduce natural gas use in existing and new hospitals.[97] For example, some hospitals have used geothermal loop systems, which transfer heat

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[93] See, for example Rocky Mountain Institute, Medium-Size Commercial Retrofits, RMI, December 7, 2022; and Deason, J. et al., Electrification of buildings and industry in the United States: Drivers, barriers, prospects, and policy approaches, Lawrence Berkeley National Lab, Electricity Markets and Policy, LBNL-2001133, 2018.

[94] For example, exemptions for hospitals are in natural gas ban laws in New York City, Montgomery County, Maryland, and Boston, MA. See Disavino, S., New York City Bans Natural Gas in New Buildings,Reuters, December 15, 2021.

[95] Clabaugh, Jeff, Montgomery County Approves Bill to Ban Fossil Fuel Use in Most New Buildings, WTOP News, November 29, 2022.

[96] Wintersmith, Saraya, Boston Moves to Ban Fossil Fuels in New Construction, WGBH News, September 14, 2022.

[97] See, for example, "Heat Pumps / HR Chillers | Decarb Healthcare."

from below ground and can reduce natural gas and overall energy use.[98] In addition, solar thermal technologies may be promising to meet a variety of water heating needs in health care facilities.[99]

More generally, an ACEEE report finds that partial electrification could be a valuable strategy for some commercial building types:

> *For some buildings with challenging economics, electrification may not be an all-or- nothing proposition. Meeting a substantial majority of the heating load with electricity and using a small amount of fuel backup could still result in major carbon and energy savings while also, in some cases, improving electrification economics.*[100]

Among the policies that have been suggested for commercial building electrification are programs to promote electrification incentives, research and development to reduce electrification costs, and encouraging or requiring bids for an electric heat pump when an existing heating system needs to be replaced.[101] In the shorter-term, policies and incentives to improve the energy efficiency of hospital HVAC systems may have the most impact on natural gas use. These energy efficiency actions will reduce emissions while new electrification technologies are developed, demonstrated, and deployed.

VI. Conclusions

With a sustained and integrated effort, the health care sector has an opportunity to reduce its own carbon footprint, improve health and welfare for local communities, and provide leadership for the broader clean energy transition in the U.S. economy. New policies and incentives in the IRA to decarbonize onsite energy use and increase energy efficiency have significant potential to help health care organizations make progress towards achieving ambitious commitments, if they are implemented swiftly and effectively.

Nevertheless, it is unlikely that many health care organizations will be able to reach ambitious targets such as those in the HHS Health Sector Climate Pledge without additional broad economy-wide initiatives to decarbonize the electric power and commercial buildings sectors. It will take

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[98] Ryzner, J., Hospital's Geothermal System Cuts Energy Use Nearly in Half, Health Facilities Management, April 4, 2018.

[99] U.S. Energy Information Administration (EIA), Solar Explained, Solar Thermal Power Plants.

[100] Nadel, S., and Perry, C., Electrifying Space Heating in Existing Commercial Buildings: Opportunities and Challenges, American Council for an Energy-Efficient Economy, October 2020.

[101] Ibid.

time for health care organizations to ramp up to meet their 2030 goals; broader electricity policies can help meet these goals as their local electricity supplies become lower-carbon over the next several years. It will be even more challenging and take more time for health care delivery organizations to address supply chain emissions that are not under their direct control. There are thousands of products in a hospital supply chain that are manufactured by a wide variety of companies. A future paper in this series will address specific policies to address supply chain emissions, including procurement of lower carbon health care supplies and the deployment of lower-carbon manufacturing of primary materials needed for these supplies (e.g., chemicals and plastics). That said, the fastest and most impactful short-term approach for reducing these indirect emissions is to pursue policies to decarbonize the broader electricity grid and reduce the embedded carbon in the electricity used to produce these products.

There are numerous policies and actions focused on the electric power and commercial buildings sectors that could be supported or implemented to help health care delivery organizations meet ambitious targets. Some of these policies can be deployed or implemented directly by health care delivery organizations to reduce emissions. Other policies must be enacted or implemented by state or federal policymakers, but could benefit from the engagement and leadership of health care delivery organizations and the wider health care sector.

Recommendations for federal and state energy policymakers

Prioritize policies to decarbonize the electric grid.

As discussed in the paper, there is a critical need for policies that will decarbonize the electricity that powers health care organizations and their suppliers. Efforts to implement the IRA will be stalled without additional state and federal policies to help build and site an unprecedented amount of new generation and transmission capacity. These policies, including new state and federal regulations, state public utility commission actions, and in some cases new laws, will be critical for health care organizations to meet their ambitious greenhouse gas commitments and for the U.S. to meet its national commitments for 2030 and 2050.

Recommendations for health care delivery organizations

Take full advantage of the incentives in the IRA to finance on-site decarbonization efforts.

Health care delivery organizations can deploy provisions of the Inflation Reduction Act to finance on-site decarbonization measures. This primarily includes tax credits for energy efficiency and

renewable energy measures. In addition, based on a March 31, 2023 waiver from the Center for Medicare & Medicaid System, hospitals and many other health care facilities now can elect to use non-fossil fuel health care microgrid systems for emergency backup power. Eligible HDOs can explore using IRA tax credits to help finance these new systems. Finally, there may be opportunities to finance projects via the $27 billion Greenhouse Gas Reduction Fund (GGRF). Although the specifics of the GGRF are still under development, the fund may be particularly appropriate for financing more complicated and costly energy efficiency or electrification projects that will benefit low-income communities. More generally, as federal agencies flesh out implementation details for the IRA, health care delivery organizations and the broader health care sector will have opportunities to contribute input and insights on a range of important issues.

Collaborate to explore approaches to decarbonize heating and on-site fuel use at hospitals and health care facilities.

Natural gas use at hospitals is the most difficult to address component of direct health care facility emissions. To a certain extent, challenges faced by hospitals for reducing natural gas use through electrification are similar to the broader challenge of addressing natural gas use in existing commercial buildings. However, as discussed earlier in this paper, hospitals have additional thermal needs that further complicate reductions of on-site emissions from natural gas. In addition, some hospitals have invested significant funds to install efficient CHP systems, which have helped to reduce overall emissions and energy use, but still utilize fossil fuels. Because of their unique mission to protect public health, health care delivery organizations could play an important leadership role in identifying technologies, roadmaps, and policies for decarbonizing direct fuel use in their own facilities and in the broader commercial buildings sector. To that end, a health care sector-wide initiative to identify approaches to building decarbonization may be particularly valuable.

Recommendations for the Department of Health and Human Services

Help resolve health and indoor air quality questions associated with less energy-intensive ventilation systems.

As discussed in this paper, there have been ongoing efforts by professional associations such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the American Society for Healthcare Engineering (ASHE) and others to research and develop new approaches that will balance critical health-related requirements for hospital ventilation systems with energy efficiency and emission reduction imperatives. To the extent that new approaches can meet hospitals' indoor air quality safety requirements and achieve energy efficiency

objectives, they could have a significant impact on reducing energy use in hospitals. Additional funding of this research could help facilitate these new approaches.

Next Steps:

With support from the Commonwealth Fund, the Georgetown Climate Center is reviewing federal and state energy policies that could help health care delivery organizations meet ambitious greenhouse gas reduction targets. This includes policies to reduce fossil-fuel use at health care facilities and shift to clean electricity, reduce transportation emissions from health care-related vehicles and fleets, increase resilience from extreme weather events and provide cleaner air for communities near health care delivery facilities, and drive reductions in supply chain emissions.