Decarbonization in Healthcare

A Practical Approach for the Built Environment

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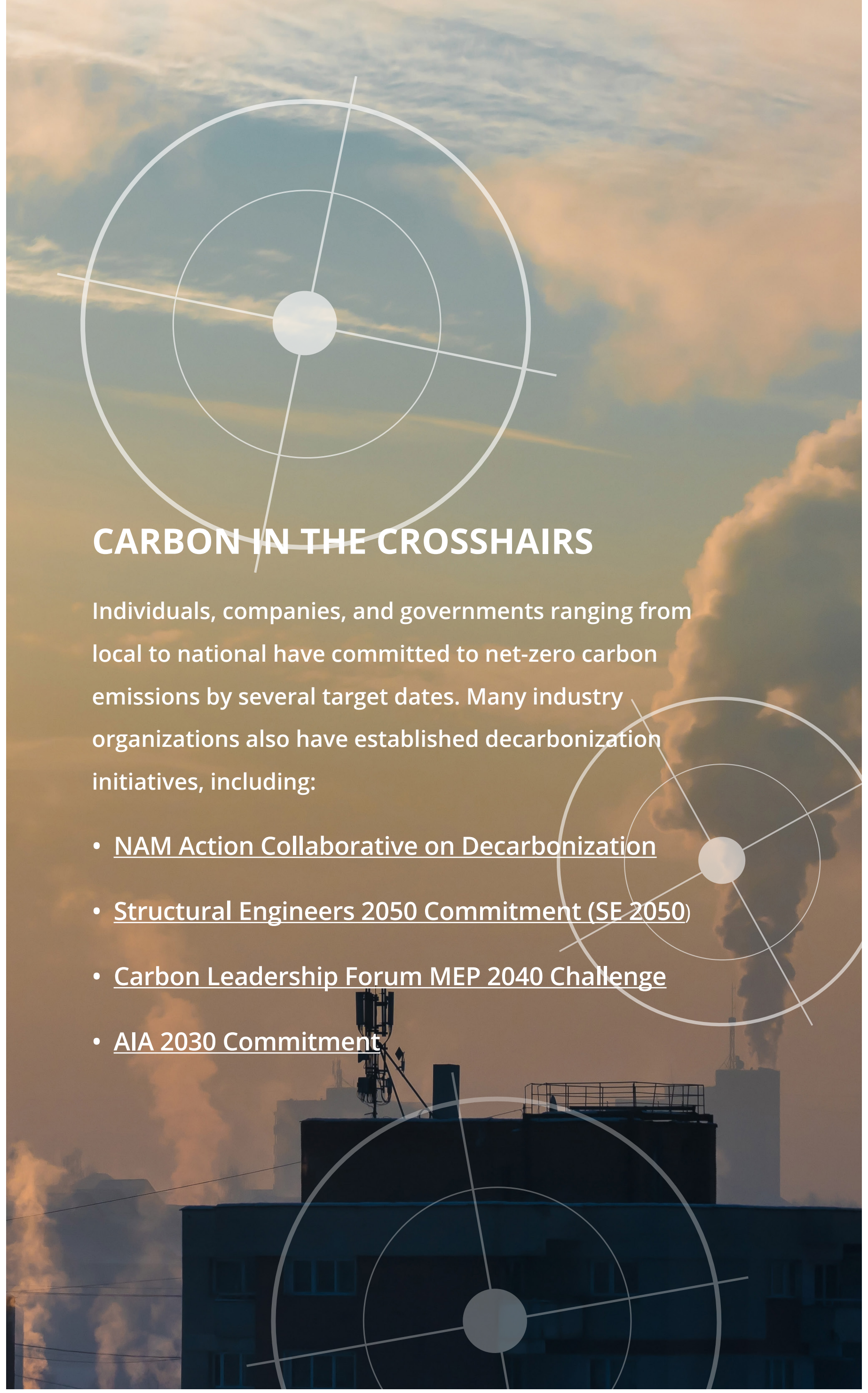
Decarbonization of the built environment is rapidly gaining attention in healthcare. Many in the industry have come to recognize the significant and symbolic role that healthcare organizations, their designers, and builders, can play in reducing the carbon emissions, or greenhouse gases, introduced by the built environment of their facilities. Others are skeptical of the need to decarbonize, dubious of the impact it will have, or, understandably, overwhelmed at the effort and expense it could entail.

On a global scale, the healthcare industry accounts for a yearly average of 5 percent of the total carbon emissions of industrialized nations, according to Environmental Research Letters. Despite having only 4.25 percent of the global population, the United States is responsible for 28 percent of all global emissions. With healthcare responsible for 8.5% of the nation's emissions, doing the math shows that the U.S. healthcare industry is responsible for 2.4 percent of the world's total emissions and nearly 50 percent of global healthcare emissions.

As the scientific data and environmental organizations confirm, per capita healthcare emissions in the U.S. are greater than that of any other country.

Considering the operational burden of U.S. healthcare facilities such as hospitals and clinics—24/7 operation, large consumption of supplies, exacting climate control and electricity needs, 6.6 million hospital personnel driving to and from work every day—it's understandable that the industry owns such an outsized portion of carbon emissions. By rethinking the built environment, however, healthcare—and other industries—can substantially accelerate its decarbonization goals in a path-of-least-resistance toward net-zero carbon emissions.



CARBON IN THE CROSSHAIRS

Individuals, companies, and governments ranging from local to national have committed to net-zero carbon emissions by several target dates. Many industry organizations also have established decarbonization initiatives, including:

- NAM Action Collaborative on Decarbonization
- Structural Engineers 2050 Commitment (SE 2050)
- Carbon Leadership Forum MEP 2040 Challenge
- AIA 2030 Commitment

Although about 60 percent of the electrical grid is still powered by fossil fuels, there is a rapidly growing movement in the healthcare industry to prepare for decarbonization once the entire grid is clean. In 2022, for example, more than 50 healthcare organizations became a Network Organization of the National Academy of Medicine's Action Collaborative on Decarbonizing the U.S. Health Sector, committing to work collectively on solutions to mitigate and adapt to climate change while centering and maximizing human health and equity. In addition, more than 60 of the largest U.S. hospital and health sector companies have responded to the White House and U.S. Department of Health and Human Services' Health Sector Climate Pledge, committing to reduce greenhouse gas emissions 50 percent by 2030.

To provide guidance to healthcare organizations as they begin the decarbonization conversation, this executive guide explains the carbon problem and presents thoughtful, measured, and practical approaches that can ease the burden of carbon mitigation and eventual elimination.

The carbon problem

Carbon molecules are everywhere and form the basis for all life. But only a tiny fraction of the planet's 1.85 billion tons of carbon is naturally introduced to the atmosphere (mainly from volcanoes, but also from the oceans, which also naturally absorb it).

Since the 1800s, however, human burning of fossil fuels on an industrial scale has done much to destabilize the natural state of the earth's carbon, transitioning much of the terrestrial carbon into atmospheric carbon.

When carbon-based molecules enter the atmosphere as a gas—carbon dioxide (CO2), methane (CH4), etc.—they belong to the category of greenhouse gases. The term, of course, comes from a traditional greenhouse, which allows sunlight to enter the space and then traps its heat energy. Similarly, high concentrations of carbon emissions in the atmosphere allow sunlight to warm the surface of the planet and then keep the heat from leaving. (See Figure 1.) The net effect is an increase of the average temperature of the planet's surface. This leads to climate change—disruptions of carefully balanced climate and weather patterns. This can impact everything from soil arability to hurricane severity to mosquito populations—conditions that have a huge effect on human life and civilization. The most dire consequences of climate change involve the melting of long-stable ice plains in the polar regions, where temperature changes due to greenhouse gases are felt most acutely. These melting ice sheets could raise ocean levels and reshape coastlines—major centers of human settlement.

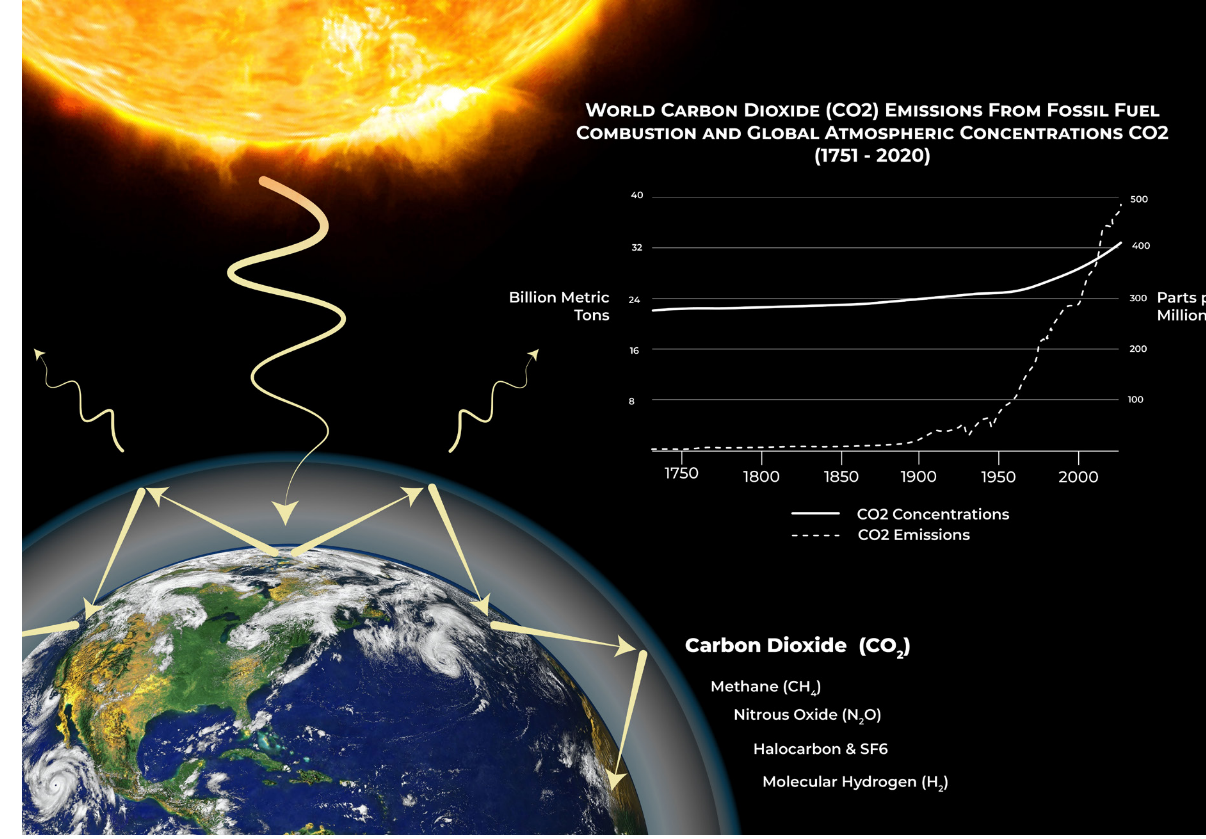


Figure 1 | The greenhouse effect of carbon dioxide

There's little doubt within the scientific community that all these environmental changes are occurring, or that human activity over the past 150 years has been a significant cause. Consider:

- The Intergovernmental Panel on Climate Change (IPCC) estimates that average surface temperatures have increased by more than 1.5 degrees Fahrenheit between 1880 and 2012, and that more than half of this change is likely attributable to human activity.
- Human emissions of CO2 have gone from nearly nothing prior to the Industrial Revolution to roughly 50 billion metric tons per year by 1950—and then skyrocketed to more than 350 billion metric tons per year by the early 2000s.
- Atmospheric concentrations of CO2 have crept upward from a pre-industrial homeostasis of roughly 250 parts per million to over 400 parts per million (and climbing). Examining core samples from ice shelves allows scientists to analyze the atmospheric composition of the prehistoric world. According to the IPCC report, "Concentrations of CO2, CH4, and N2O now substantially exceed the highest concentrations recorded in ice cores during the past 800,000 years."

Wherefore art thou, carbon?

The urgent and escalating nature of climate change has sparked the movement toward decarbonization—the elimination of carbon emissions from human activities, with the goal of reaching net-zero carbon emissions. The main sources of the built environment's emissions—operations and materials—are obvious and not so obvious, respectively.

Operational carbon

Operational carbon emissions consist of the greenhouse gases produced by the day-to-day operation of the built environment. Within the healthcare built environment, these emissions are due primarily to the heating of water and air, which, for most facilities, depends on the burning of fossil fuels.

Even if no fossil fuels are burned on site and all operations run off the grid, many healthcare facilities still produce operational carbon by consuming electricity—61 percent of which, in the U.S., comes from burning fossil fuels. That means that every lightbulb, medical device, and electric heater in a hospital contributes to that building's carbon footprint unless special effort is taken to acquire electricity from renewable sources.

Operational carbon emissions are usually divided into three "scopes" (see Figure 2):

Scope 1: Emissions produced on site (e.g., an on-site gas water heater). Part of the built environment, these emissions can be reduced or replaced by using Scope 2 emission sources.

Scope 2: Emissions produced off site, but related directly to consumption on site (e.g., grid electricity produced by the burning of fossil fuels at power plants). These emissions, also part of the built environment, can be reduced or replaced with renewable energy sources.

Scope 3: Emissions produced off site as part of the total value chain of the facility (e.g., the operation of trucks and ships that transport supplies to the facility). These emissions fall mostly outside of the built environment.

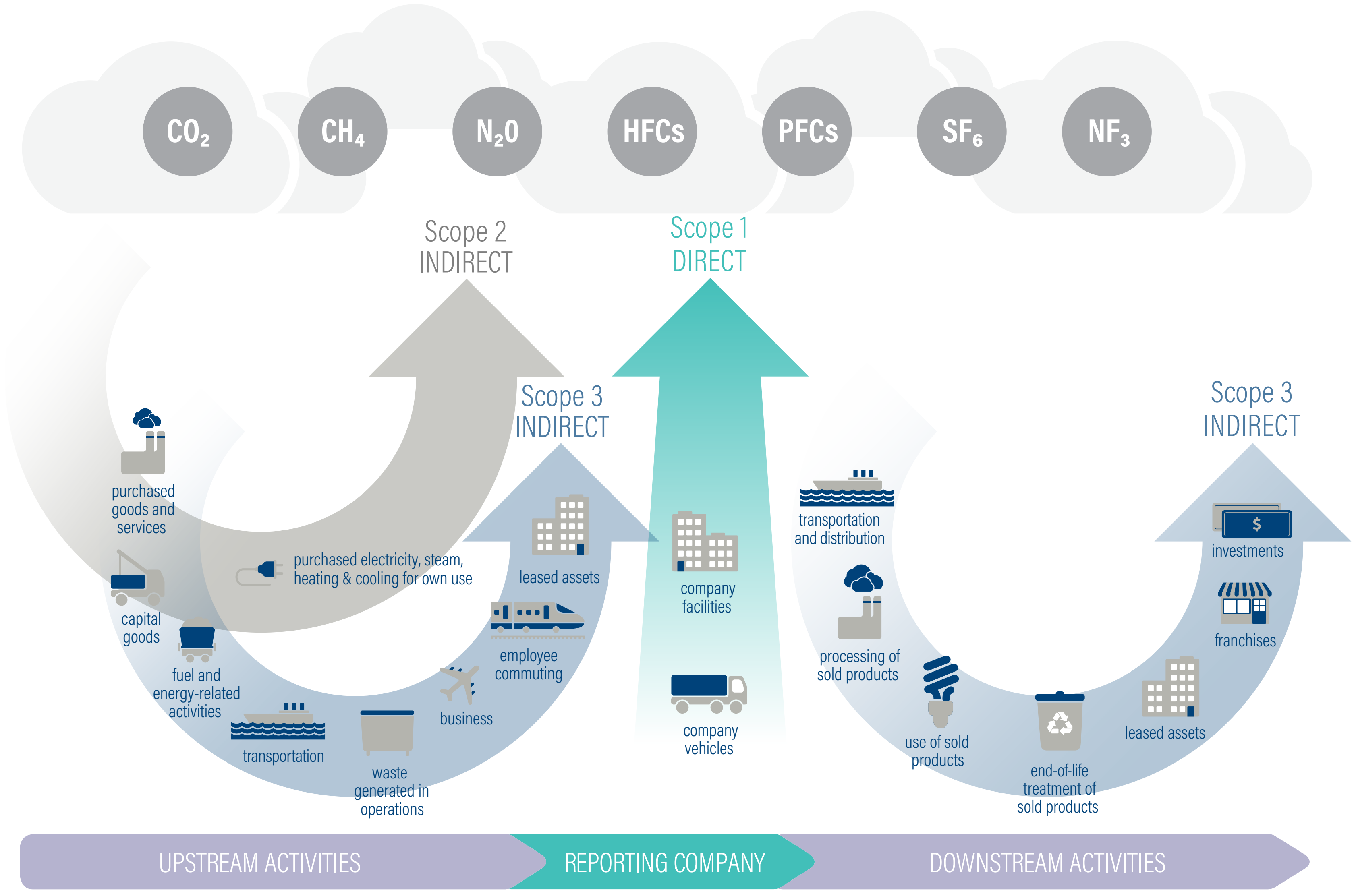


Figure 2 | The three scopes of carbon emissions (Source: Greenhouse Gas Protocol)

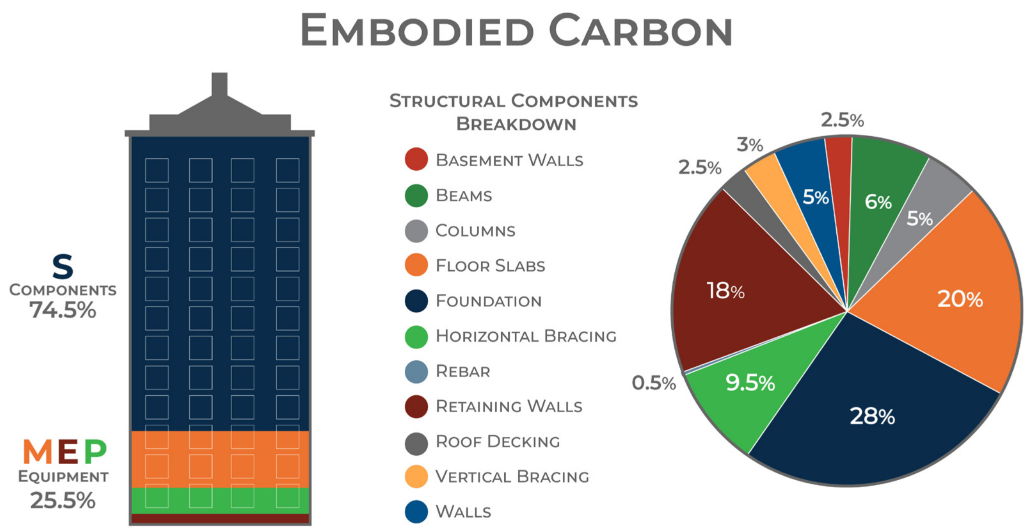


Figure 3 | Embodied carbon in building equipment and structural components

Embodied carbon

The carbon emissions produced by the operations of a building are easy to understand. Less obvious is the carbon emissions it took to build the building—the fossil fuels burned to extract or mine the raw materials from the earth, to refine or fabricate the building materials, transport the materials to the site, and operate the machinery used in construction. This is known as embodied carbon emissions—the greenhouse gases created in the past and released into the atmosphere as a result of the building having been constructed. (See Figures 3 and 4.)

The industry has a few decades of experience with calculating the electricity, oil, or natural gas consumption of a building; it has much less experience determining how much gas was burned to operate the backhoes and cranes that built it, or that went into fabricating the steel beams and plaster. However, best estimates indicate that embodied carbon contributes nearly as much to a building's carbon footprint as 10 to 20 years of operational carbon, and all of it added to the environment within a one- to two-year construction period. Furthermore, once a building is constructed and operational, nothing can be done to reduce embodied carbon.

Therefore, healthcare organizations serious about reducing their carbon footprint must incorporate decarbonization into the very earliest planning stages of construction.

The remainder of this guide focuses on strategies to reduce operational carbon. Embodied carbon reduction strategies will be examined in a separate executive guide in the near future.

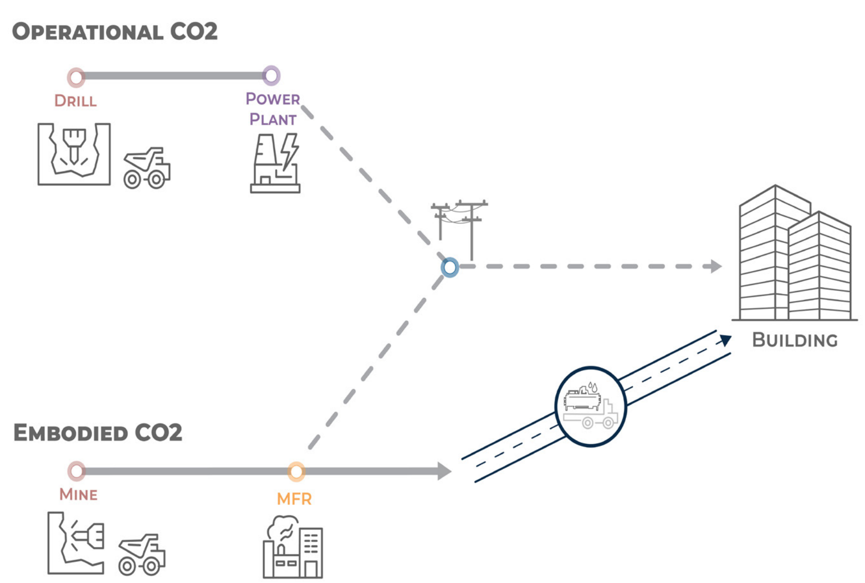


Figure 4 | Sources of operational and embodied carbon

The path to portfolio-wide decarbonization

The best, easiest, and most economical time to address decarbonization in the built environment is before a building is built—and there are many strategies available. For healthcare organizations on a carbon reduction journey, it's likely they will need to simultaneously make existing buildings more energy efficient, transition existing infrastructure to a low carbon approach over time, and make sure new buildings are designed with decarbonization in mind. The Health Sector Climate Pledge suggests a three-part approach for healthcare organizations: 1) Establish goals of 50 percent carbon reduction by 2030 and net-zero emissions by 2050; 2) assign a champion and conduct an inventory of scope 3 emissions (largely the emissions of the supply chain); and 3) create an operations plan to execute these goals over time.

Establishing a decades-long plan to accomplish net-zero carbon emissions can be somewhat overwhelming. The key is to focus on what you now know and get started today. While all the answers aren't available yet, you can begin exploring capital investments through a decarbonization lens to avoid doing the wrong thing. Such a preliminary plan is an effective decision-making tool you can use in the short term.

It is also important for your plan to be a living document, reviewed and updated at least quarterly. This way, your plan will always be up to date and will put you in the best position to maximize your return on investment over the next two to three decades. Finally, it is vital that your plan be integrated with all related initiatives—sustainability, master planning, capital planning, facility management, etc.

Start with the big picture and simple steps

To begin the decarbonization journey, we recommend a three-step approach: 1) Establish your strategy and goals and assess where carbon exists in your current portfolio; 2) optimize the performance of new and existing buildings; and 3) offset the remaining carbon with zero-carbon-generation sources. (See Figure 5.) These are the stepping stones toward campus-wide building electrification—the ultimate destination of the decarbonization journey—which is discussed later in this guide.

Step 1: Assess your carbon footprint

To lay the foundation for long-term planning, it's important to understand your building portfolio as it exists today, and how you think it will evolve over the next 30 years. Begin by collecting, reviewing, and documenting in a living document all data that will impact the future operation and performance of your buildings, such as:

- Building size
- Owned, leased, or leased out
- Utility supply and demand (including central utility plants)
- Building automation systems
- Plans and processes (ESG/sustainability, strategic, master, annual, capital, facilities maintenance, design standards, etc.)

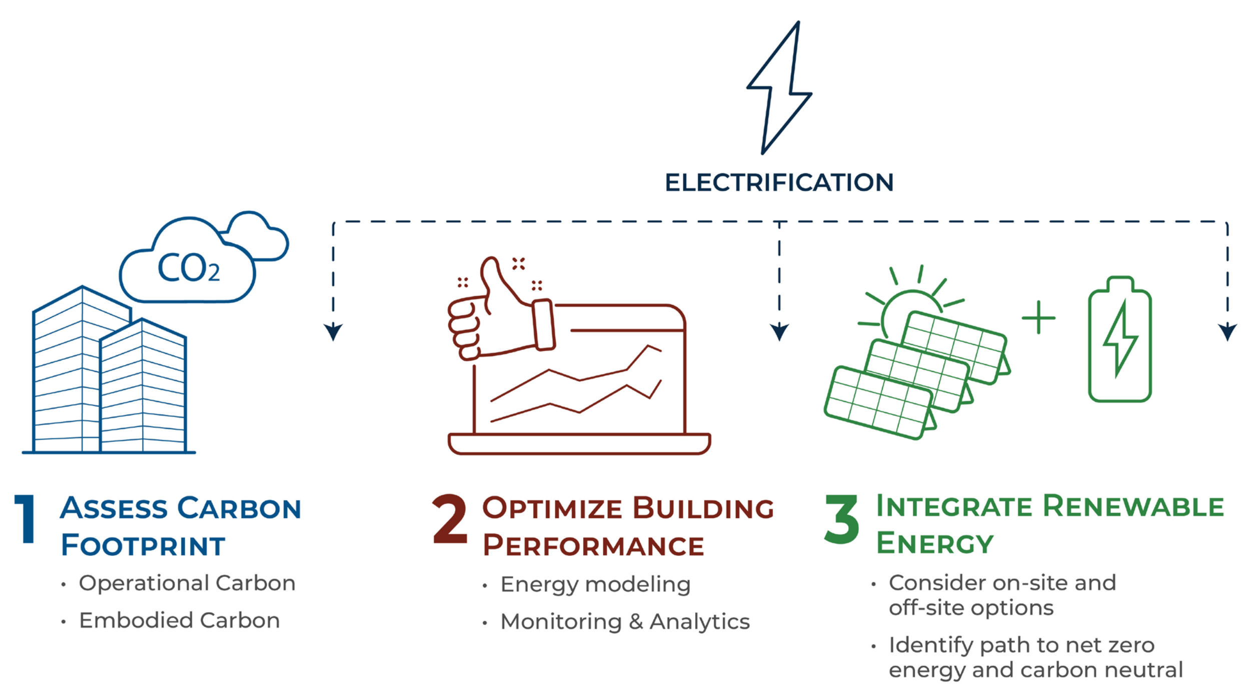


Figure 5 | Three-step approach to decarbonization

Assessing your carbon footprint can initially be accomplished mostly with internal owner resources. The primary goal is to gather utility data consumption from each facility to help quantify and identify the largest energy users. This will help inform the reduction and offset approaches in steps 2 and 3. The basic tasks for carbon assessment are:

- Documenting annual electricity, gas, and district energy (where applicable) consumption and cost for each facility in the portfolio. Gathering two to five years of data is ideal. (It also may be beneficial to collect water data.)

- Converting each utility source into an operational carbon number. For electricity, it is common to use an average factor for the grid that serves the building; these factors can be found using the EPA's Power Profiler. For natural gas, a general factor is often used for all sites across the country; this can be found at the EPA's Greenhouse Gases Equivalencies page. District utilities' carbon conversion factors are a more complex topic. Support from a third party may be required to calculate carbon for these utilities.

- Determining which buildings use the most energy per square foot by calculating the energy use intensity (EUI) for each facility. This involves converting each utility into annual Btu consumption, summing them and then dividing by the total building square footage.

Many carbon reduction plans target the worst-performing facilities first since it can be overwhelming to address all buildings at once. (It is common for 80 percent of a building portfolio carbon footprint to come from only 20 percent of the buildings, so focusing initial efforts on those buildings is a good first step.)

Step 2: Optimize building performance

Eliminating any unnecessary energy usage—the first of two components of building performance optimization—is highly critical for decarbonizing your portfolio. This is because such energy use mitigation reduces the capital-intensive decarbonization that is needed and yields the highest and quickest return on investment, thus helping to fund further decarbonization.

This component typically focuses on low-cost energy efficiency and operational measures that can yield annual savings of 10 percent to 15 percent for a two- to three-year payback. The process uses the building portfolio assessment data collected to:

- Benchmark your buildings' energy usage and carbon footprint
- Establish performance targets
- Conduct retro-commissioning studies and implementation
- Identify capital energy efficiency measures
- Monitor and analyze ongoing performance

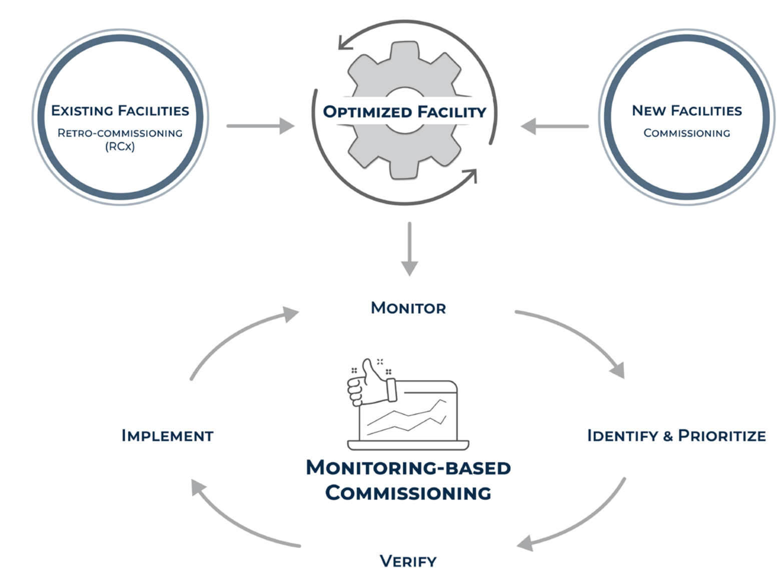


Figure 6 | Monitoring-based commissioning

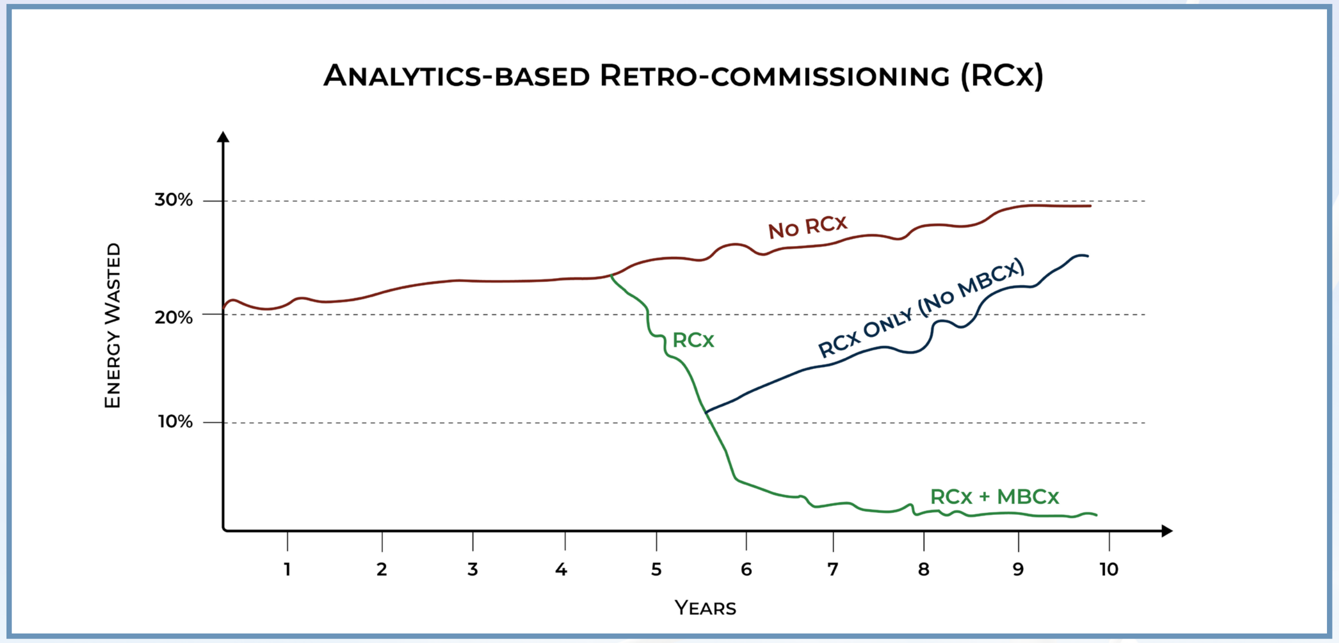


Figure 7 | Analytics-based retro-commissioning

The second component of building performance optimization uses the retro-commissioning studies, along with annual capital programming, to develop additional capital energy efficiency measures that can yield an additional annual savings of 10 percent to 15 percent at a three- to seven-year payback. This process typically includes:

- Establishing or updating design standards
- Setting project performance targets
- Modeling performance as part of the design process
- Commissioning to verify performance
- Monitoring and analytics of warranty period performance
- Monitoring and analytics of ongoing performance

Examples of capital energy efficiency measures include:

- Converting constant volume to variable volume
- LED lighting upgrades
- Demand control ventilation
- Variable exhaust
- Exhaust air energy recovery
- Chiller plant optimization
- Converting primary CHW pumps to variable
- Converting steam boilers to HW
- Boiler burner upgrades
- Steam trap survey
- Pneumatic to DDC upgrade with scheduling and resets (AHU and space)

In addition to these two proactive components to existing building optimization, all infrastructure upgrades should be reviewed for energy efficiency and carbon reduction. The information gained and analysis done during this building performance optimization process will help inform your renewable energy and electrification options.

Step 3: Integrate renewable energy

Ultimately, any energy used should come from renewable sources. This component of your decarbonization plan assesses which renewable energy sources should be developed by the owner versus what the utility's greening of the grid will accomplish. The renewable energy strategy also needs to align with your electrification strategy (see following section). With advances in technology, falling prices of equipment and increasing demand charges from utilities, many solutions are rising to the top. A 30-year planning horizon will likely include solar PV and battery for many sites, combined heat and power (CHP) and fuel cells for large energy-using sites, and wind as part of an off-site solution (likely via a power purchase agreement).

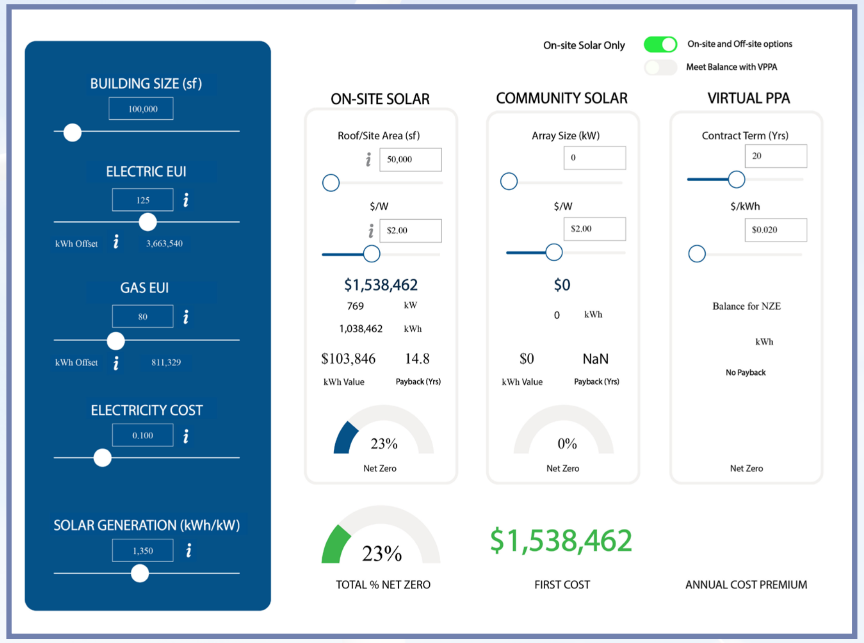


Figure 8 | Quantifying on-site solar PV needed to offset energy consumption

For a 50% reduction goal, on-site solar PV is a very likely approach. Owners should look to gain their first solar project experience as soon as possible to test which approach works best for their organization. This may include owner-procured systems on the roof or ground at their own site or at a remote location. Many owners are also finding success leasing available space to a third-party developer. In this arrangement, the system can be installed, financed, and maintained by the third party. The owner has no upfront capital; instead, the system is paid back over time through a contracted monthly utility billing cycle. To start assessing space and cost requirements for your own sites, see [IMEG's Net Zero Calculator](). (Example calculations shown in Figures 8 and 9)

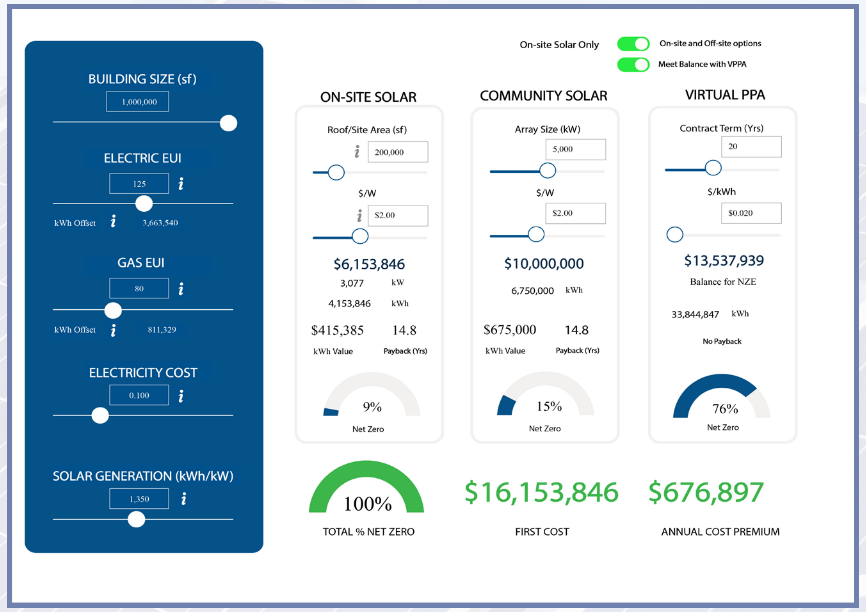


Figure 9 | Quantifying additional off-site renewable and virtual power purchase agreement (VPPA) options to achieve net-zero energy

Many programs also offer incentives, grants, or tax credits for energy savings and/or renewable energy investments, further enhancing your return on investment. In particular, the Inflation Reduction Act passed in 2022 includes $370 billion in clean energy and climate provisions, the largest investment ever by the federal government. [(Find out what technologies and building types may qualify for incentives on your projects.)]()

Electrification

Eliminating all carbon on site will also require that gas-fired equipment be replaced with electricity-based equipment powered by renewable resources. This process (generally referred to as electrification) will be required to reach the goal of zero carbon. When it should occur will vary greatly on a building-by-building or campus-by-campus basis. It may occur before or after you reach a 50 percent carbon reduction goal. As shown in Figure 10, of the electricity and gas delivered to a typical building, two-thirds of the carbon is typically emitted from electricity, while the remaining one-third comes from gas-based sources. Large strides can be made by reducing and eliminating carbon-based electricity, but at some point, the gas will need to be removed as well.

Full decarbonization will require elimination of fossil fuels as an energy source. The only way to do this is to electrify campuses and building systems that use fossil fuels. Therefore, your decarbonization effort needs to identify opportunities for beneficial electrification as part of your master and capital plans and align with your renewable energy strategy.
Note: It is important to conduct quarterly sessions to review the progress and status of all strategies, goals, and plans that are part of your decarbonization process. Once monitoring and analytics are commenced, review sessions for these processes are typically conducted monthly.

Why electrify your building?

According to Health Care Without Harm, roughly 84 percent of the healthcare industry's considerable carbon footprint comes from fossil fuels "used across facility operations, supply chain, and the broader economy." For facility operations, fossil fuels burned on site are used to heat and cool the buildings and operate equipment such as CT scans and MRIs. Obviously, therefore, the most effective way to keep facilities from producing such carbon emissions is to not burn fossil fuels on the premises in the first place.

If you are building from the ground up, you have the opportunity to electrify proactively. If you don't have that luxury, however, you can retrofit your existing building to be prepared for the grid's eventual electrification.

Electrification of a building is the process of increasing its dependence on electricity for its operational needs while simultaneously reducing and even eliminating its dependence on fossil fuels like oil and natural gas—primarily used to produce heat for water, climate control, cleaning, and sanitation. Although 61 percent of electrical grid power in the U.S. still comes from the burning of fossil fuels, electrifying a building at least opens the door for a hospital or healthcare facility to power its operations from renewable sources of electricity. This could be accomplished by on-site sources (e.g., solar panels) or by purchasing from off-site green energy producers (e.g., wind turbines, hydropower, etc.). Furthermore, as the grid becomes cleaner over time, the campus carbon footprint will also become smaller without any investment required by the owner.

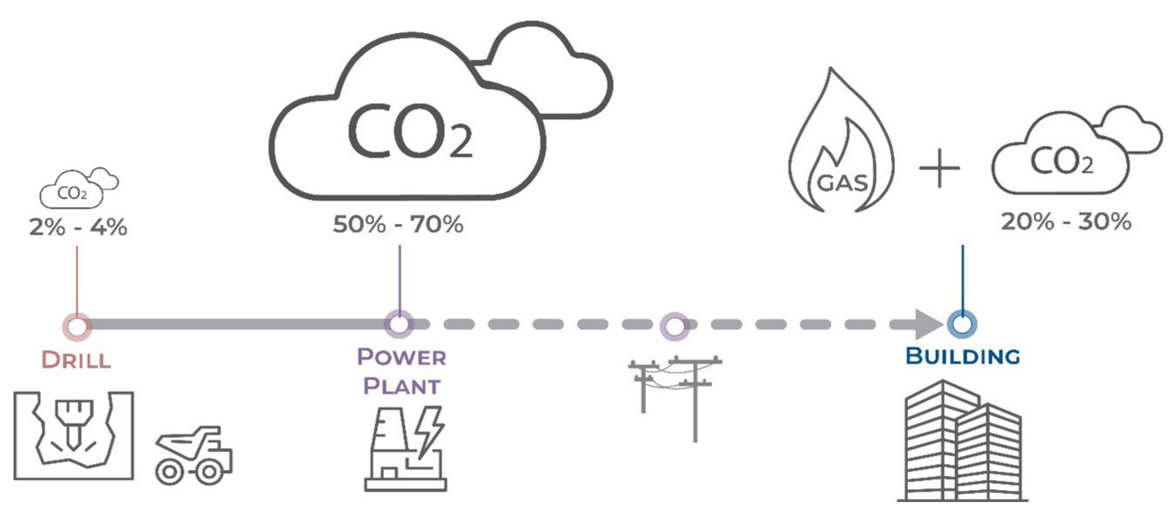


Figure 10 | Percentage of building carbon emissions by gas and electricity

Generating hot air

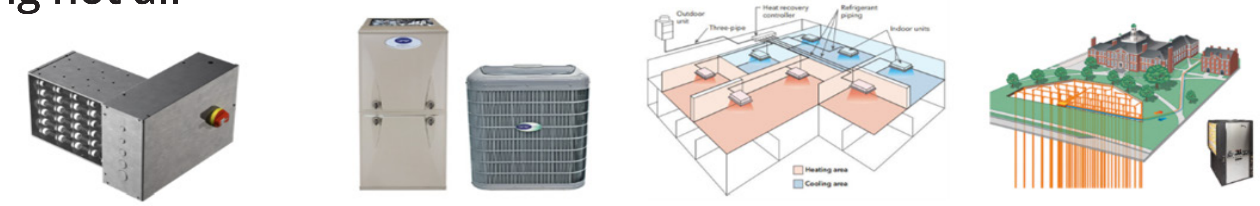


Figure 11

	Electric resistance	Air to Air Heat Pump	VRF	Geothermal with WSHP
Minimum OA Operating Temp	N/A	20-40 F then electric heat	-15 F	N/A
Heating COP	1.0	3.0 - 4.0	3.0 - 4.5	4.0 - 6.0

Generating HWS


Figure 12

	Electric resistance	Air Source Heat Pump	Heat Recovery Chiller	Geothermal with HP
Minimum OA Operating Temp	N/A	0 -15 F	N/A	N/A
Heating COP	1.0	2.0 - 3.5	3.5 - 7.0	4.0 - 5.5
Max HWS Temp	Same as gas	125 - 130 F	130 - 140 F	130 -140 F

How to electrify your building

Building electrification is accomplished by replacing all fossil-fuel-burning appliances—oil- and gas-powered furnaces, water heaters, boilers, linen dryers, etc.—with electric counterparts. One such option would be to use an electric resistance heater. Healthcare facilities can reduce their carbon footprint even more, however, by instead choosing an air-source heat pump (ASHP) as their electric heating solution—one of the biggest boons to decarbonization.

Figures 11 and 12 provide an overview of electrification options for either generating hot water or generating hot air for the HVAC system. Each option varies in capability, efficiency, and operating cost.

While ASHP technology has existed for years, recent technological innovations have conspired for the first time to make them an economically viable alternative to electric resistance heaters and fossil fuel heaters, as well as viable solutions in cold climates. They are best suited for well-insulated buildings, however.

Some additional electrification considerations beyond the HVAC system are included in Figure 13. Each of these end uses will also need to be evaluated for full electrification. The reality for most owners will be a migration from gas burning equipment to all electric over time as operator experience, first costs, and technology advances change in the future.

Note that operating cost impacts are a significant discussion point for electrification. Electricity generally costs more than three times that of natural gas per unit of energy, so this factor needs to be evaluated.

Limitations of electrification

Despite the environmental advantages of electrifying the healthcare built environment, the endeavor is not without its challenges. Key factors to consider include:

- **Electrical load and space:** Adding new, power-hungry electrical equipment will add extra electrical load and back-of-house space needs to a system that was probably not designed to bear it. Mechanical equipment placed outdoors will also require much more surface area and space.
- **Utility power needs:** As you substitute an electrical component for its fossil-fuel counterpart, check the capacity of the electrical system; it may need upgrading to meet the new requirements.
- **Backup generation capacity:** Heating equipment that used to operate on gas will now require electricity. This will impact the sizing of backup generation to power this equipment in the event of a winter utility outage.

Additional electrification options

Figure 13

	Humidifiers	Sterilizers	Domestic Hot Water	Generators	Kitchen equipment
Typical approach	Steam or Gas Fired	Steam	Gas boiler	Gas, diesel, fuel oil	Gas burners and ovens
Electrified Alternative	Adiabatic or Electric	Electric	Electric or ASHP	Battery	Induction tops, electric ovens

- **First cost:** Electrification is not always cheap. Both the new equipment and the upgrades needed for the overall system can carry substantial price tags. C-level executives may be understandably dubious about the cost-benefit balance of the upgrade.
- **Utility consumption cost impacts:** Electricity costs are historically higher than natural gas on a per-unit-of-energy basis. System efficiency of electrical heating equipment is a key consideration to control operating costs.
- **Utility demand cost impacts:** Utilities are increasingly shifting rate structures from consumption-based (kWh) revenue focus to demand-based (kW) revenue focus. As large users, many healthcare facilities are accustomed to this. As this trend continues in the future, it is important to consider it in the electrification discussion. Electrification will also work to move the highest utility demand to the winter months; as this happens, utilities will also look to react through their rate structures accordingly.

Bringing it all together

As healthcare organizations explore all the options for decarbonization, a common approach is beginning to emerge that answers the question, “Where can we act now and where do we start planning for the future?” Many of the solutions, electrification, for example, will take more than 30 years to achieve for an existing campus. Such a transformation also will likely need to be phased in through a series of campus capital funding projects that have nothing to do with decarbonization. Therefore, it will be critical for owners to put the right decarbonization solutions in place as these capital projects move forward.

Upon establishment of an overall decarbonization strategy and goals, and assessment of the building portfolio, several key actions should be implemented. To simplify a campus/portfolio approach, it is useful to separate these actions into two buckets.

Step 1: Initial steps (Figure 14)

a. Standardize low-cost/high-return approaches. These are available for implementation as soon as decarbonization funding is identified or when a new capital project is released. Lighting controls, retro-commissioning/monitoring-based commissioning, and HVAC energy measures generally have a return of less than three to five years—some of them even less than one year.

b. Make solar PV be part of the solution to reach a 50 percent carbon reduction goal. Solar costs are coming down, and with incentives it can often fall to a payback of 10 years or less. We recommend starting a solar project in the near term to learn the best approach for your campuses in the future; doing so will help with planning, determining such things as whether to own or lease the system, locate it on or off site, have it be rooftop- or ground-mounted, or if a virtual power purchase agreement (PPA) is appropriate. Funding an initial project for exploratory purposes on an energy-intensive campus is a low-risk way to start to figure all of this out.

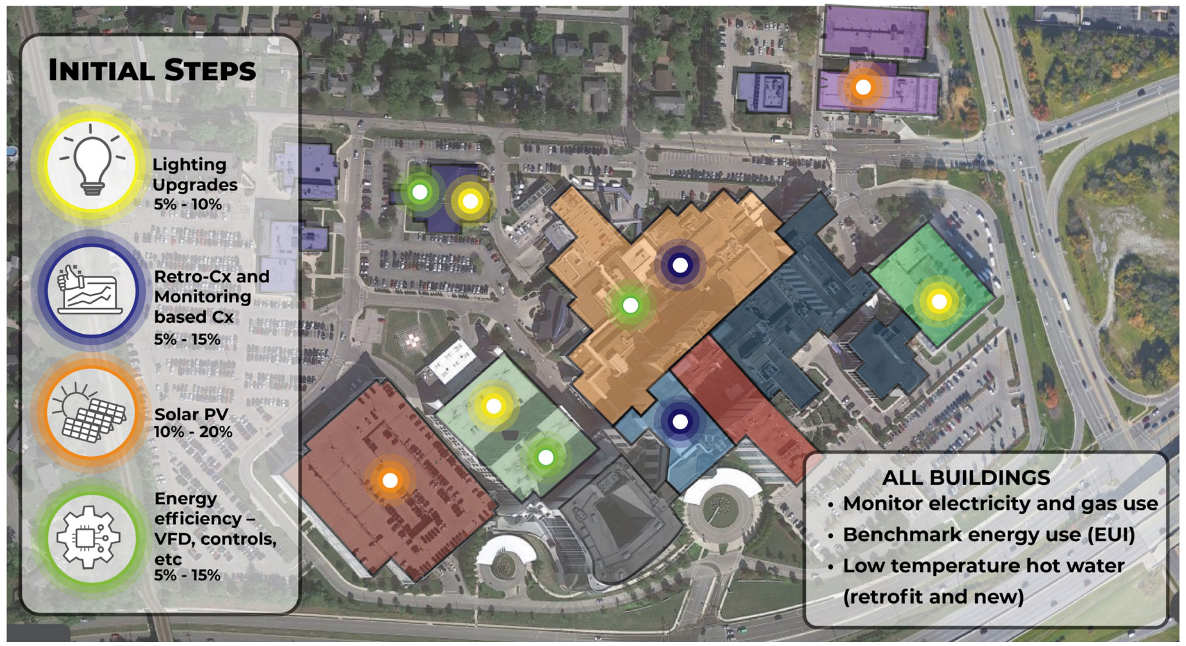


Figure 14

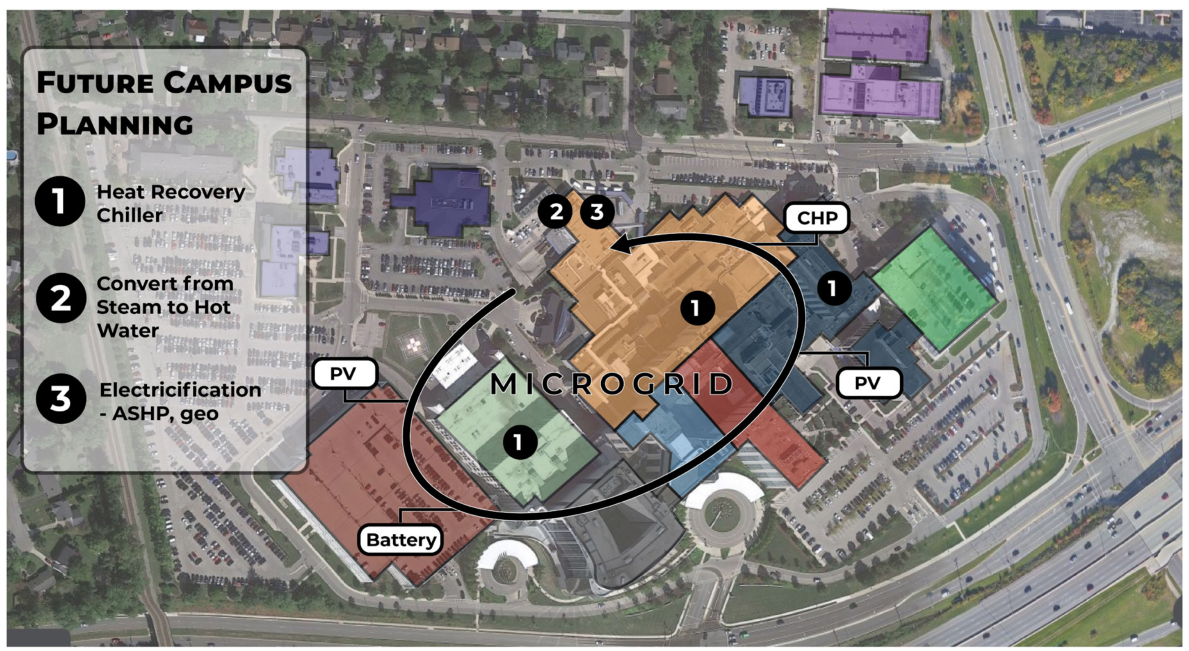


Figure 15

c. Begin monitoring campus energy. Start with monthly electricity, gas, water, and district utilities at the building level, then, ideally, add hourly electricity data. Analyzing this information will allow you to benchmark each building so you know how to prioritize your long-term planning.

d. Switch to low temperature heating water systems. All new construction projects and renovation projects that include steam or hot water as a heating source should incorporate low temperature heating water systems, sizing all heating coils for supply temperature of 135F or less. This is a must for electrification and achievement of zero carbon goals.

Step 2: Future campus planning (Figure 15)

The following actions are likely associated with major retrofit, new construction, and strategic projects on a campus. Planning and standards need to be developed now for success to be achieved in the future. Such planning involves substantial effort, coordination, and collaboration for the unique nature of each campus, and is beyond the reach of this executive guide. However, we provide several important approaches and strategies to consider.

a. Adopt heat recovery chillers. This technology has been used in the past to reduce energy use by recovering heat from the chilled water system to create heating water for reheat purposes, and is receiving increased attention now as a way to start the electrification journey. These chillers use heat pump technology to create heating water and reduce the load on the gas boiler. This can be an early way to achieve 20 percent to 30 percent electrification at a building or central plant without committing to the full conversion of the central plant.

b. Plan to convert from steam to hot water. This initially involves the low temperature hot water described in the initial steps. Next is to consider the remaining life of existing steam boilers. Once coils are sized and heat exchangers that convert steam to hot water are in place, the switch to a low temperature heating source becomes much easier. If you don't plan for the conversion and your existing steam boiler and distribution fails, you may be locked into another 50 years of steam usage.

c. With the low temperature heating water distribution system in place, electrification becomes a viable option for the campus. Air source heat pumps, hot water storage tanks, and geothermal systems can be used as heating water generation solutions. When supplied by renewable electricity, this becomes a carbon-free heating option.

d. Finally, consider the application of thermal and electric microgrids (see Figure 16). A campus that can share both resources between buildings is more resilient in times of disruption for the following reasons:

- When thermal or electrical capacity is short, operators can prioritize which buildings get the available resources.
- Other generation sources like heat recovery chillers and combined heat and power (CHP) have a larger baseload to work with, operate more efficiently, and have a shorter payback.
- Backup resources (generators and batteries) can be shared with any building on the loop.
- Renewable generation can more easily stay behind the meter and be shared across the campus, reducing carbon footprint and payback.
- In times of grid outage, this provides much more flexibility for unforeseen needs for the campus and the community it supports.

Thermal and electrical microgrids require planning on a building-by-building level in addition to the campus master plan. For existing campuses, this will require retrofit as part of a dedicated project or other capital project. For new buildings, it is important to make all new buildings microgrid-ready.

Healthcare microgrid

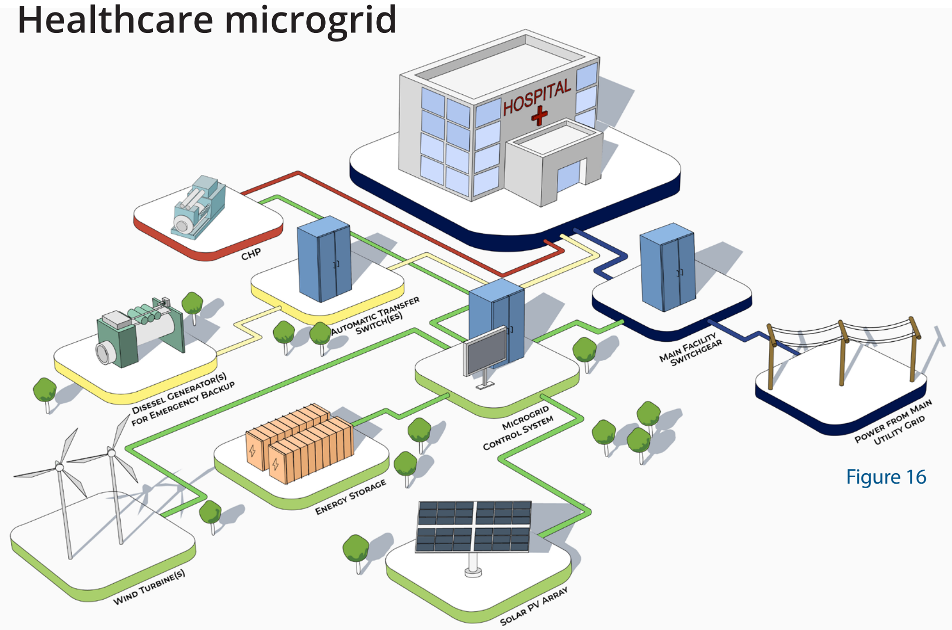


Figure 16

Opportunity to lead the way

Healthcare organizations that want to be "future ready" should begin their decarbonization effort now, knowing that what has started as a pledge by many in the industry could evolve into new building performance standards in the future. With regulations already trending toward reduced emissions, organizations that don't act proactively may find themselves scrambling to keep up.

As for the costs involved, the numbers are on the side of decarbonization. The Commonwealth Fund estimates that reducing energy use and adopting other environmentally sustainable policies can save the healthcare industry as much as $15 billion over the course of 10 years. ENERGY STAR Portfolio Manager is a useful tool for benchmarking commercial buildings and collecting data on the potential cost savings available to a commercial building for its decarbonization efforts.

In addition to reducing and eventually eliminating the substantial amount of greenhouse gas that is an unintended consequence of its vital work, the healthcare industry has a symbolic role to play in the world's decarbonization effort. Its mission to heal—and the oath physicians take to "do no harm"—positions the healthcare industry as the perfect standard bearer in the quest to heal the earth, a role model of a sustainable and responsible business practice for other industries to follow.

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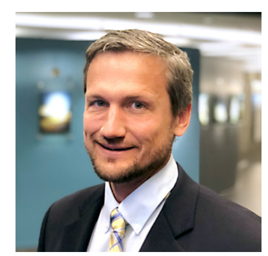

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DECARBONIZATION PODCASTS

Learn more about decarbonization on the IMEG podcast.

- "Decarbonization in Healthcare: Why It's Needed, How to Get Started"
- "Embodied Carbon in the Crosshairs of Designers, Bill Gates, and Girl Scouts"
- "The Chiller Reality: Your MEP Equipment is Full of Embodied Carbon"
- "Cold Climate Electrification: A Path Toward 'Clean' Heating"
- "Call in the Reserves: Thermal Energy Storage to the Rescue"
- "Battery Storage: Clean Energy for a Rainy Day — and Peak Demand Relief"
- "Five Steps to Begin the Process of Decarbonizing Your Building."