Insights Series

A thought leadership publication

Saving energy in radiology

Practical steps to improve energy efficiency

SIEMENS
Healthineers

Introduction

The healthcare sector consumes significant amounts of energy. This represents a major cost for providers and can contribute to harmful emissions which, paradoxically, contribute to illnesses the healthcare sector works to combat. Energy consumption is responsible for well over half of the healthcare sector's carbon footprint.[1] The largest sources of power consumption within hospitals are heating, ventilation, air conditioning, and lighting, which often account for as much as two thirds of an organization's energy use.

Another significant energy consumer is radiology equipment – primarily MRI, CT, ultrasound, X-ray, and other medical imaging equipment. These are vital pieces of technology, and their performance and availability cannot be compromised; yet as the climate changes, the demand for imaging also increases.[2]

Fortunately, much of today's technology is designed with lower energy requirements as well as with features that can reduce energy consumption when not in use. Investments in such technology can quickly pay for themselves, helping healthcare providers to reduce costs while also helping them to meet their sustainability goals.

Diagnostic imaging equipment in radiology alone can account for as much as 7.5% of a hospital's total energy consumption.[3] For freestanding medical centers, imaging equipment can represent up to 19% of their total energy costs.[4] Older medical devices often have even higher needs for power than newer equipment, raising energy costs even further.

When broken down by modality, some imaging modalities consume significantly more energy than others:

The greatest energy consumer in radiology by far is MRI, which requires approximately ten times the power needed for CT. This is due to the unique cooling requirements of the magnets essential to MRI machines. The duration of the imaging sequence also contributes to MRI's heavy energy needs.

Research has shown that one-third of an MRI's energy consumption occurs while systems are in an off-state because of ongoing helium cooling, and more than 70% of the energy consumed by CT scanners takes place while they are in a non-productive, idle state.[5] For C-arm systems, more than 90% of energy is consumed while systems are in an idle, non-productive state.[6]
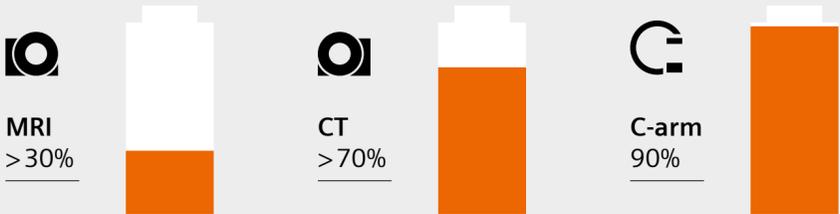
But the good news is, there are ways to optimize the energy efficiency of MRI as well as other imaging modalities.

*Data are based on Siemens Healthineers own measurements and assumptions.
 Actual consumption can vary depending on use pattern, system type and configuration.

Approximate energy consumption of imaging modality per year*

MWh

100	15	10	2	1	5
MRI	C-arm	CT	X-ray	Ultrasound	Household with four people
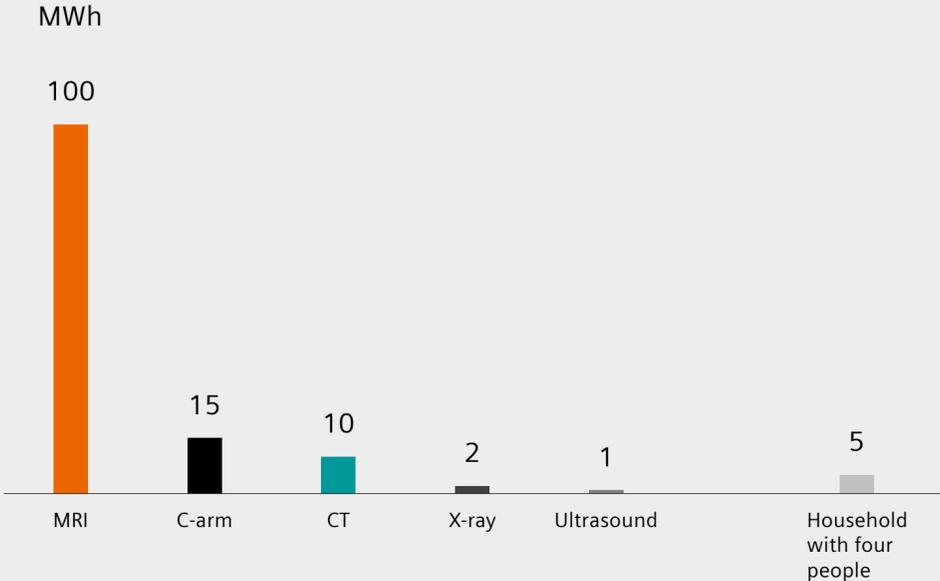
Energy consumption during non-productive system states

MRI >30%

CT >70%

C-arm 90%

Reducing energy use – MRI

1 **Switch off systems during non-working hours**

One of the simplest and most effective measure to reduce MRI energy consumption is turning scanners off during non-working hours. The magnet refrigeration is not affected by turning off an MRI scanner, and start-up times on new MR scanners are now less than six minutes. Further innovations such as a Start-Up Timer can ensure that systems are already up and running when the radiology department comes to work in the morning. Up to 20 MWh* in energy can be saved per year by turning off scanners when not in use.

2 **Use Eco Power Mode**

While 60–70% of an MRI's total energy consumption is used for magnet refrigeration, this could be further optimized. Eco Power Mode manages the cooling cycle by temporarily shutting down the cold head compressor to conserve energy when in standby or off mode. Using Eco Power Mode can reduce an MRI's energy consumption by up to 12%* per year. To check eligibility and activate this feature, contact our service engineer – who can enable it free of charge during the next planned maintenance.
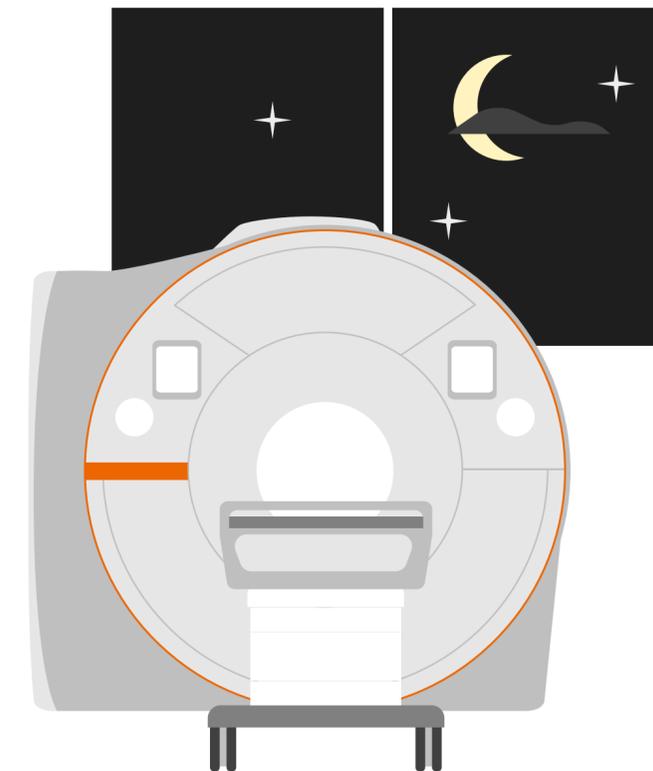
Exact energy saving could vary depending on the system.

Estimated energy savings

Up to 20%*

When switching off MRI systems during non-working hours

Up to 12%*

When using MRI Eco Power Mode

3 **Use fast protocols**

With MRI, the longer the scan time, the higher the energy consumption.[5] An "eco" set of often-used protocols can be implemented specifically designed to reduce a system's energy consumption. Many MRI scans address musculoskeletal questions and for such scans, where less resolution is sufficient to answer the clinical question, fast protocols can shorten scan times by up to one minute per sequence. These time savings translate into energy savings as well a higher patient throughput.

4 **Use AI-powered tools**

Deep learning image reconstruction technology such as Deep Resolve can further enable shorter scan times for brain MRI by up to 70 percent and deliver images of extraordinary clarity. Applied consistently, this can help save up to 13% energy per scanner annually.*

Discover how using Deep Resolve can enable significantly shorter MRI scan times. – › **Learn more**

Data on file.

Estimated energy savings

Up to 13%*

When using AI-based tools to enable shorter MRI scan times

Sustainability in MRI

Discover how innovations in MRI technology and workflow design are helping healthcare professionals reduce their energy consumption and environmental impact.
› **Learn more**

Reducing energy use – C-arm Angiography

1 **Switch off systems during non-working hours**

A recent study showed that the energy consumption of seven different interventional imaging systems have a projected combined annual energy consumption comparable to 23 four-person households (115 MWh). Nonproductive energy consumption, or energy consumed during idle state, accounted for as much as 93% of overall energy consumption.[6] Powering down the systems when not in use is therefore the most effective way to save energy.

This study calculated that by shutting down all seven systems for 12 hours overnight on weekdays and for 48 hours on weekends would yield annual savings in energy consumption of 145 MWh, in carbon emissions of 18.6 MtCO$_2$eq, and in electricity costs of more than $37,000.

Estimated cost savings
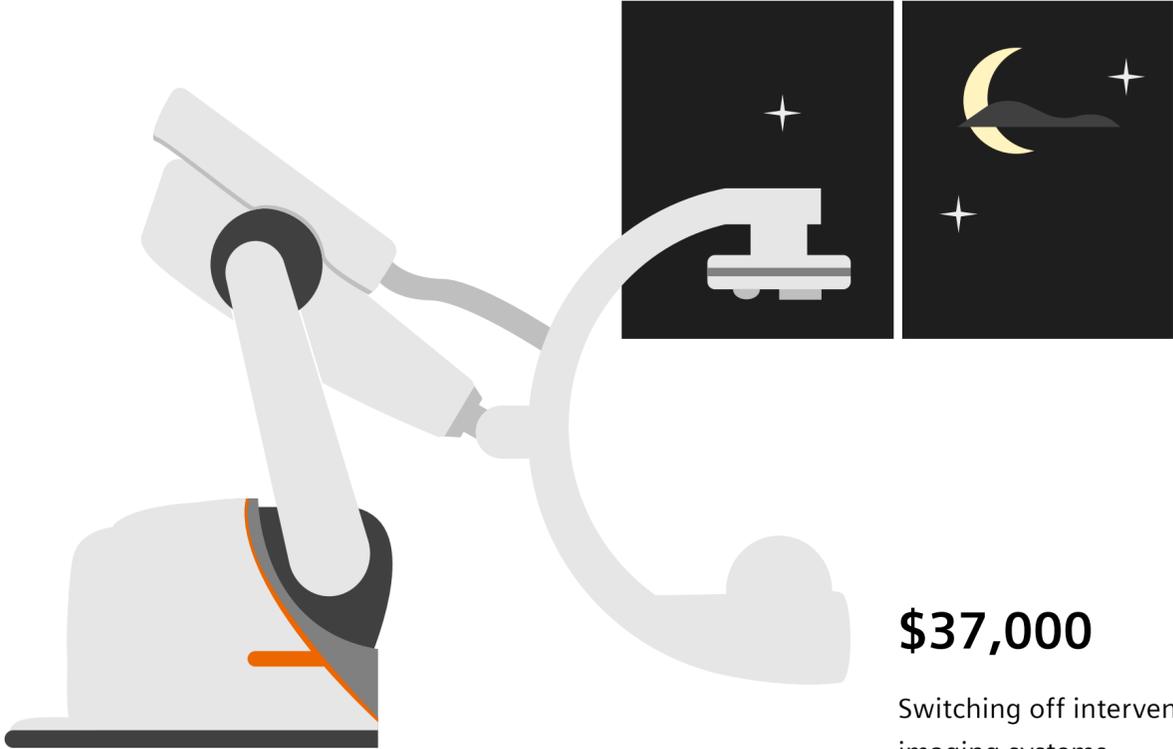
$37,000

Switching off interventional imaging systems during non-working hours

Reducing energy use – CT

1 Use Eco Power Mode

The average energy consumption of a CT scanner at the University Hospital of Basel is about 26,000 kWh per year.[2] Two-thirds of this energy is consumed when the system is idle, which means that a significant amount of energy is essentially wasted.

For a system equipped with Eco Power Mode,* which automatically optimizes energy usage during idle state between patient scans, it could save up to 60%** energy compared to a system without the capability of having such feature. The Eco Power Mode can be activated and deactivated automatically without impacting the workflow.

2 Use automatic gantry shutdown for longer breaks

Auto Comp[†] is another feature that can reduce power consumption by shutting down the gantry automatically after a predefined time in which the system was not used while the computer remains in operating state. The Auto Comp feature can reduce energy use by up to 68%.[‡]

Estimated energy savings

Up to 60%**

When using
Eco Power Mode

Up to 68%[‡]

When using
Auto Comp

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* Available for the following systems with syngo.CT VB20 or higher: NAEOTOM Alpha class, SOMATOM Pro.Pulse, SOMATOM X.cite, SOMATOM X.ceed, SOMATOM go.Top, SOMATOM go.All. Not available for SOMATOM go.Now, SOMATOM go.Up and SOMATOM On.Site. The product/feature and/or service offerings mentioned herein are not commercially available in all countries and/or for all modalities. Their future availability cannot be guaranteed.
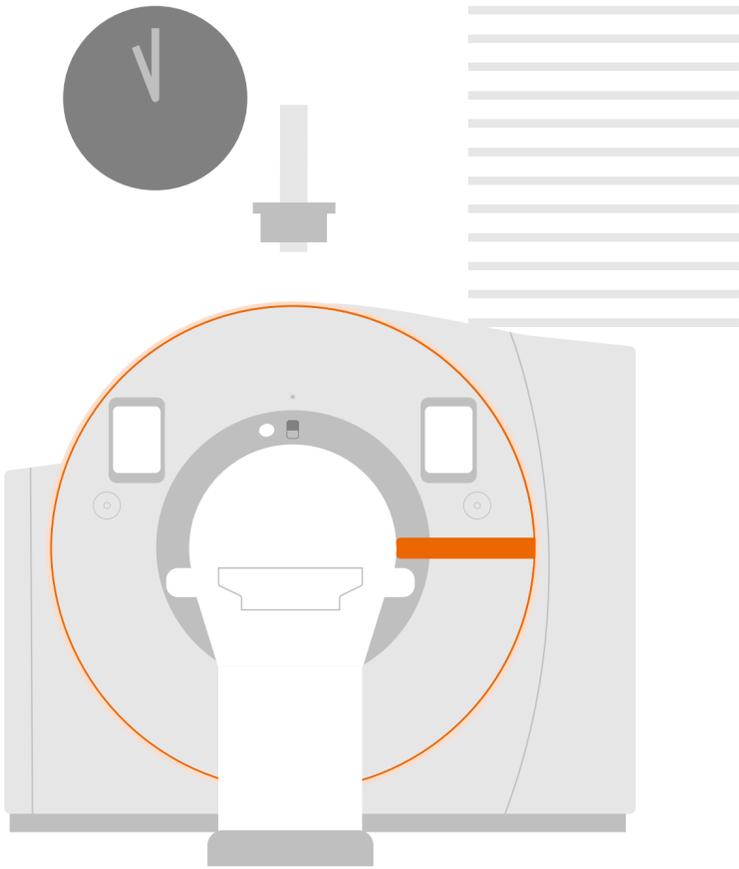
** Depending on CT system: 60% saving when comparing SOMATOM Perspective 128 to SOMATOM go.Top. Base of comparison is Low Power scenario according to COCIR.
† Available for SOMATOM Drive, Edge Plus, Edge, Confidence, Definition AS, Flash and Force. This mode must be activated under service mode for SOMARIS/7 based systems
‡ Exact energy saving could vary depending on system: 68% for SOMATOM Definition Edge

3 **Switch off systems during non-working hours**

Similar to MRI scanners, switching off the CT system when not in use for an extended period of time such as overnight is an easy and effective way to conserve energy. Doing so can save up to 39%* in energy per day.

4 **Use the wall switch**

Even when the system is switched off, there is still power being drawn. Use the Site On/Off switch to disconnect the system from the main power supply can save up to an additional 16%** of energy per day.

Sustainability in CT

Discover how innovations in CT technology and workflow design are helping healthcare professionals reduce their energy consumption and environmental impact.
> **Learn more**

Estimated energy savings

Up to 39%*

When switching off
the CT system overnight

Up to 16%**

When using the Site
On/Off switch

* Calculation based on SOMATOM Force switched off for 12 hours
** Calculation based on SOMATOM Force switched off for 12 hours, including wall switch

The products/features (mentioned herein) are not commercially available in all countries. Their future availability cannot be guaranteed.
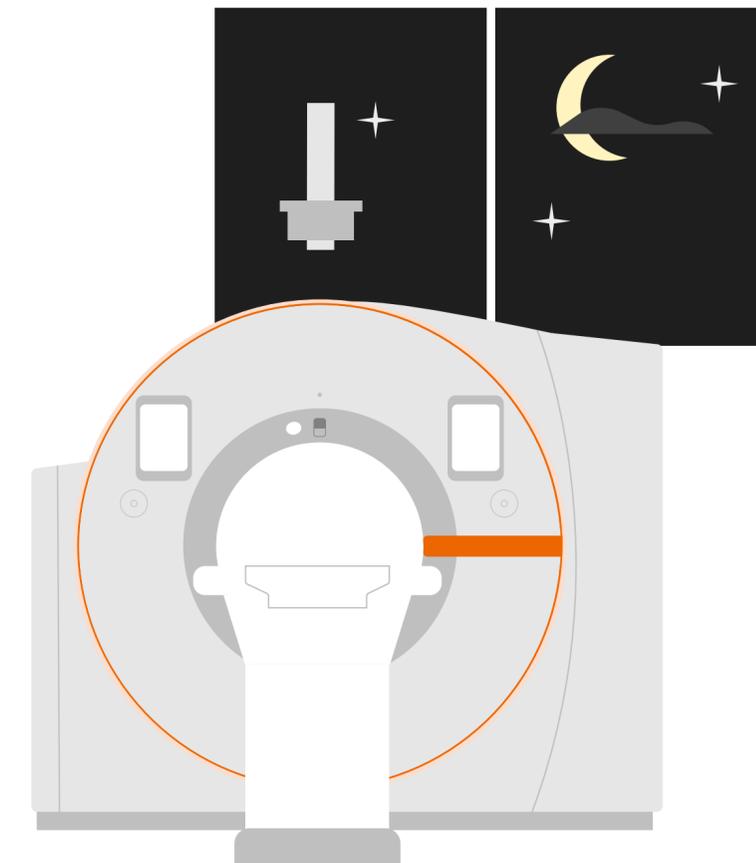
Further strategies

In recent years, numerous new energy-saving features have been introduced on a range of medical devices. When replacing legacy systems, it is worthwhile to look for new systems with energy efficiency features which serve to lower the Total Cost of Ownership (TCO). An example of how a new system could reduce TCO is summarized > **here**.

Upgrades to existing equipment, offered by many manufacturers, can also provide access to the latest technologies and extend product lifetime. Siemens Healthineers provides Energy Savings Analysis as part of Asset Planning Sessions to help customers learn what kinds of energy-saving features could be attained through upgrades. > **Learn more about Asset Planning Sessions**

The total energy consumption of a hospital or health network encompasses far more than just medical equipment. A comprehensive consultation can improve energy efficiency and reduce environmental impact by identifying energy-intensive processes, defining measurements, and optimizing operations, resulting in decreased energy consumption and increased patient throughput on the existing medical technology suite, thus driving energy efficiency.
> **Learn more about ActGreen Energy Efficiency Services**

The combination of simple changes to daily routines, utilization of new technologies – often available as upgrades to existing equipment – and expert advice and analysis can deliver significant results when it comes to reducing energy consumption within radiology departments.

Radiology plays a vital role in hospital operations. At the same time, addressing sustainability and energy efficiency is increasingly essential. Fortunately, these priorities are not mutually exclusive. Innovative and inexpensive solutions exist to ensure that both of these priorities are met, reducing energy consumption in radiology departments without compromising the quality of care.

Results were achieved by Siemens Healthineers using both standard and optional features. There can be no 'typical' hospital setting (case mix, system type, etc.) and so results by users may vary with no guarantee that the same results can be achieved.

Checklist of actions

Practical steps to cut energy use in radiology today:

☑ Switch off systems during non-working hours to significantly reduce unnecessary energy use.

☑ Enable automatic energy-saving features to minimize power consumption during idle or standby periods.

☑ Implement optimized scanning protocols that shorten scan times without compromising image quality.

☑ Utilize AI-based tools to accelerate scans and further decrease energy consumption.

☑ Conduct an energy-saving analysis to identify upgrade opportunities and access the latest energy-efficient innovations.
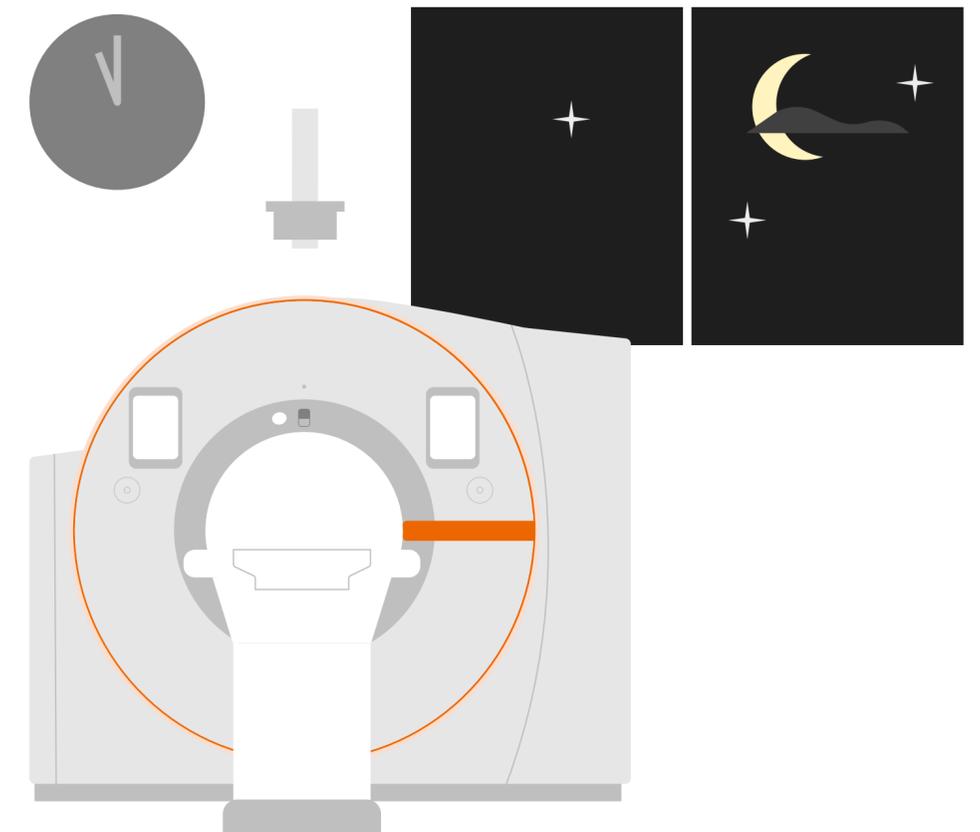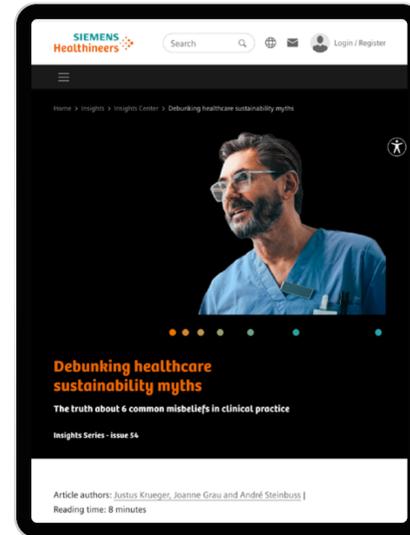
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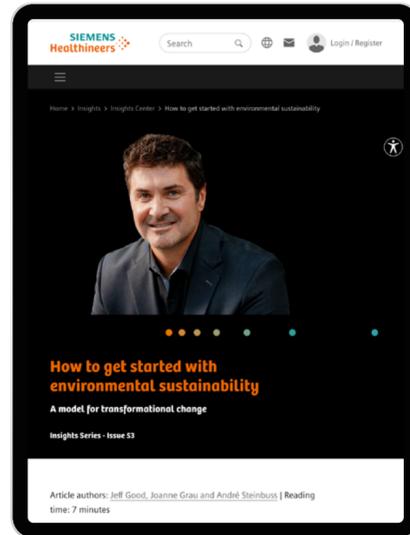
Insights Series – issue 53

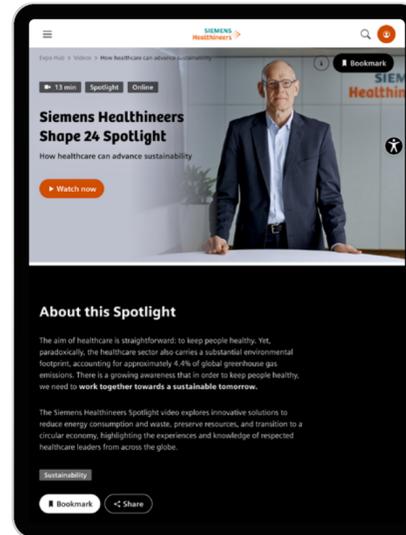**Sustainability in action:** How Northwestern Medicine implements sustainable solutions.

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Debunking myths: How six beliefs are holding back sustainable healthcare, and the solution to it.

> **Discover now**

Insights from thought leaders

Together toward a sustainable tomorrow: Innovative solutions to reduce energy consumption, preserve resources, and transition to a circular economy.

> **Watch now**

About the Insights Series

The Siemens Healthineers Insights Series is our preeminent thought leadership platform, drawing on the knowledge and experience of some of the world's most respected healthcare leaders and innovators. The Series explores emerging issues and offers practical solutions to many of today's most pressing challenges in healthcare:

> **siemens-healthineers.com/insights-series**

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At Siemens Healthineers, we pioneer breakthroughs in healthcare. For everyone. Everywhere. Sustainably. As a leading medical technology company, we want to advance a world in which breakthroughs in healthcare create new possibilities sustainably. We've been pushing the boundaries in medical technology for more than 125 years. Today, we are active in imaging, diagnostics, cancer care, and minimally invasive therapies – augmented by digital technologies and artificial intelligence.

With our unique combination of strengths in Patient Twinning[1], Precision Therapy, and Healthcare AI, we take on the greatest challenges in healthcare.

We help improve access to healthcare for underserved communities worldwide and overcome the most threatening diseases: Neurodegenerative and cardiovascular diseases, stroke, and cancer. We partner with healthcare providers to address their most pressing challenges so that they can deliver high-quality, patient-centered care, efficiently.

Motivated by our purpose and guided by our values, we foster an inclusive and innovative workplace for our diverse and engaged teams globally. We are a team of around 74,000 Healthineers in over 70 countries passionately pushing the boundaries of what is possible in healthcare so that patients can live with hope, not fear of disease.

[1]*Early detection, accurate diagnosis, individualized therapy selection, simulation and planning, continuous monitoring, and aftercare.*

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