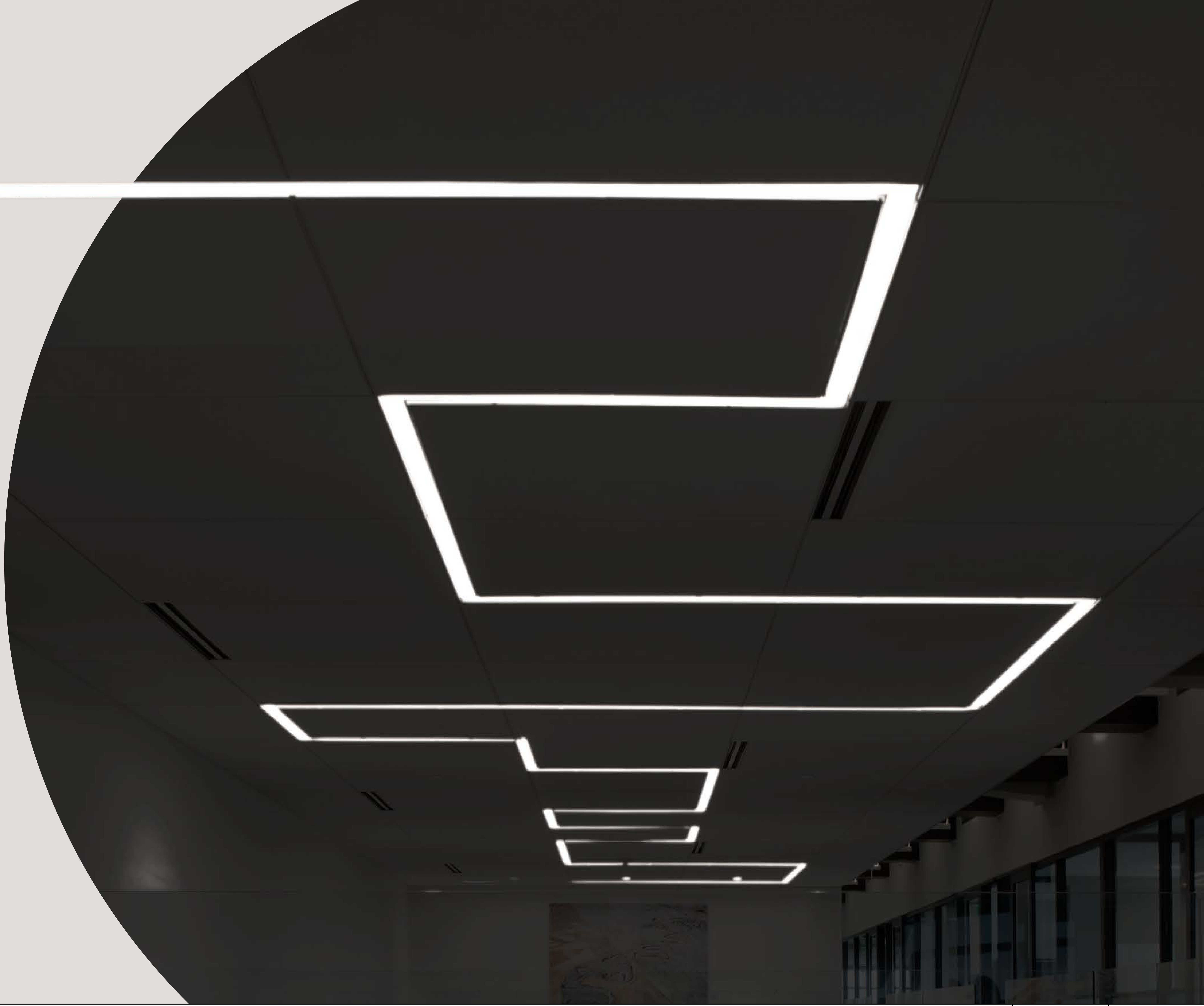
Stantec

Design *Quarterly*

Thoughts, trends, and innovation from Stantec's Buildings practice



ISSUE 23

Technology update

Action required

Technology surrounds us.

It's so interwoven in our lives that our phones update their systems automatically while we sleep. But most of the world doesn't update automatically. It requires thoughtful action for us to accommodate change.

In this issue, we're looking at the ways we can design, engineer, and plan for technological change. How can we accommodate new electrical infrastructure, plan for a low emissions campus, build low carbon data centers, use AI productively in design, and recapture a critical element?

If you're ready to update, read on.

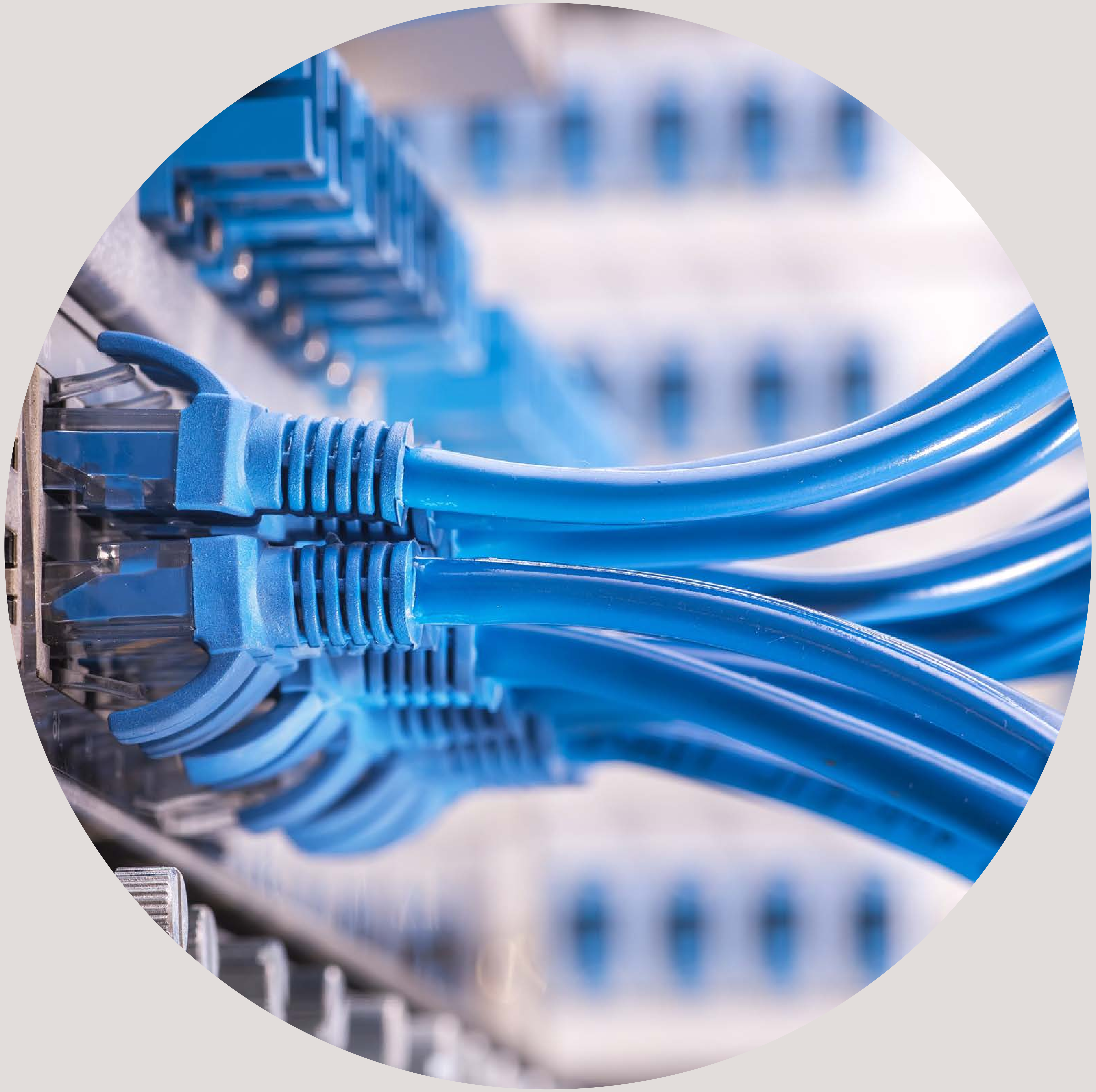
▲ **Oakland University South Foundation Hall Renovation** (Rochester, MI)

Contents

The Stantec Design Quarterly tells stories that showcase thoughtful, forward-looking approaches to design that build community.

With your reading experience in mind, we have built in easy ways for you to navigate this document.

Use the bottom menu, arrows, and the table of contents to flip to different sections. Watch for information icons arrows, buttons, and underlined hyperlinks throughout the document. They will lead you to more information.



Can I get a (data) follow?

Why health data portability is key to a technologically enabled future

By Cathy Junda

Many of us have experienced the frustration of siloed data in healthcare.

At every step of our treatment journey, we must repeat our information: our symptoms, prescriptions, medical history, and the results of our last tests.

Our data doesn't automatically follow us where we go. However, with emerging technological advances arriving in healthcare, unlocking new possibilities for care, the importance of health data portability is coming to the forefront.

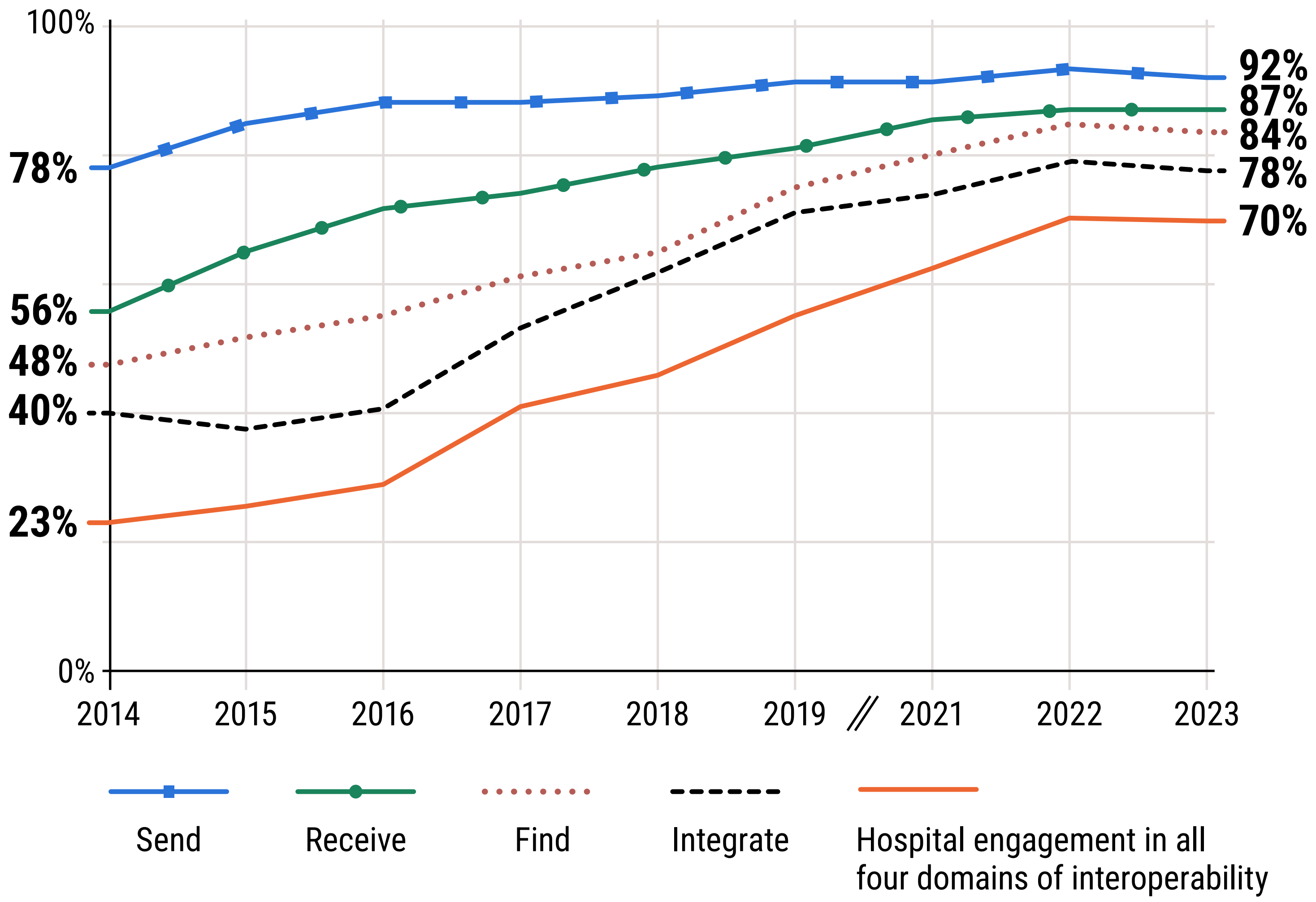
Why is the U.S. health data system so fragmented?

The U.S. healthcare system is designed around competition. It's a fragmented system. Health systems often use a mix of databases and data management tools that have been customized to their needs. When hospitals or systems merge, they frequently acquire legacy systems that don't integrate seamlessly.

It's common for a single health system to have multiple systems managing different departments. These data management systems were historically built for customization rather than interoperability, which is why healthcare data has been slow to flow across platforms.

Today, while our records have been digitized, true digital integration is still a long way off. However, we're beginning to see glimmers of progress with platforms like Apple Health and Epic's MyChart, where patients can access their health data. Yet, the complexity of creating a fully integrated system remains.

U.S. hospitals engaging in interoperable exchange of electronic health information (2014-2023)[1]



Emerging global trends in health data portability

Around the world, countries are beginning to recognize the value of centralized, portable health data systems. Several trends are shaping the future of healthcare data portability:

Centralized health systems and data portability
Countries like Denmark and Estonia have established centralized health records that follow citizens throughout their care journey. These systems create a more cohesive healthcare experience, allowing data to move with patients as they access different providers.

Estonia, for instance, has implemented a highly secure e-health system[2] where 99% of the country's health data is digitized and accessible to both doctors and patients. This model provides smoother transitions across the continuum of care and eliminates redundancies in data entry.

Blockchain for data security and portability
Blockchain technology is emerging as a solution for secure and portable healthcare records. In Europe, projects like My Health My Data[3] leverage blockchain to enable individuals to share health data securely, ensuring privacy while making data accessible across borders.

Blockchain provides an immutable ledger that can be accessed by authorized healthcare providers, enabling better coordination of care without compromising security.

Interoperability through FHIR standards
Globally, the Fast Healthcare Interoperability Resources (FHIR) standard,[4] developed by Health Level 7 (HL7), is gaining traction as the foundation for exchanging healthcare information. In regions like Australia and the UK, FHIR standards are helping to connect systems, facilitating data sharing between hospitals, clinics, and primary care providers. This interoperability is crucial for enabling health data portability, ensuring that no matter where patients go, their data can seamlessly follow.

How will health data portability affect outcomes and staff efficiency?

Health data portability is not only about convenience; it's about improving care outcomes and transforming the healthcare workforce.

Improved patient outcomes
In countries like Finland, where the healthcare sector adopted centralized health records,[5] studies show a marked improvement in patient outcomes.[6] When healthcare providers have access to a patient's full health history, they can make more informed decisions, leading to fewer medical errors and faster diagnoses. This continuity of care is particularly impactful for patients with chronic conditions who require long-term monitoring and intervention.

Reduced redundancies and enhanced care coordination
A portable health record eliminates the need for repeated tests and assessments, significantly reducing healthcare costs. In Canada, provinces like Ontario have begun centralizing health records through systems such as Ontario Health,[7] which enable care teams to share test results, diagnoses, and treatment plans seamlessly. This reduces the duplication of work and allows for more coordinated care across different providers.

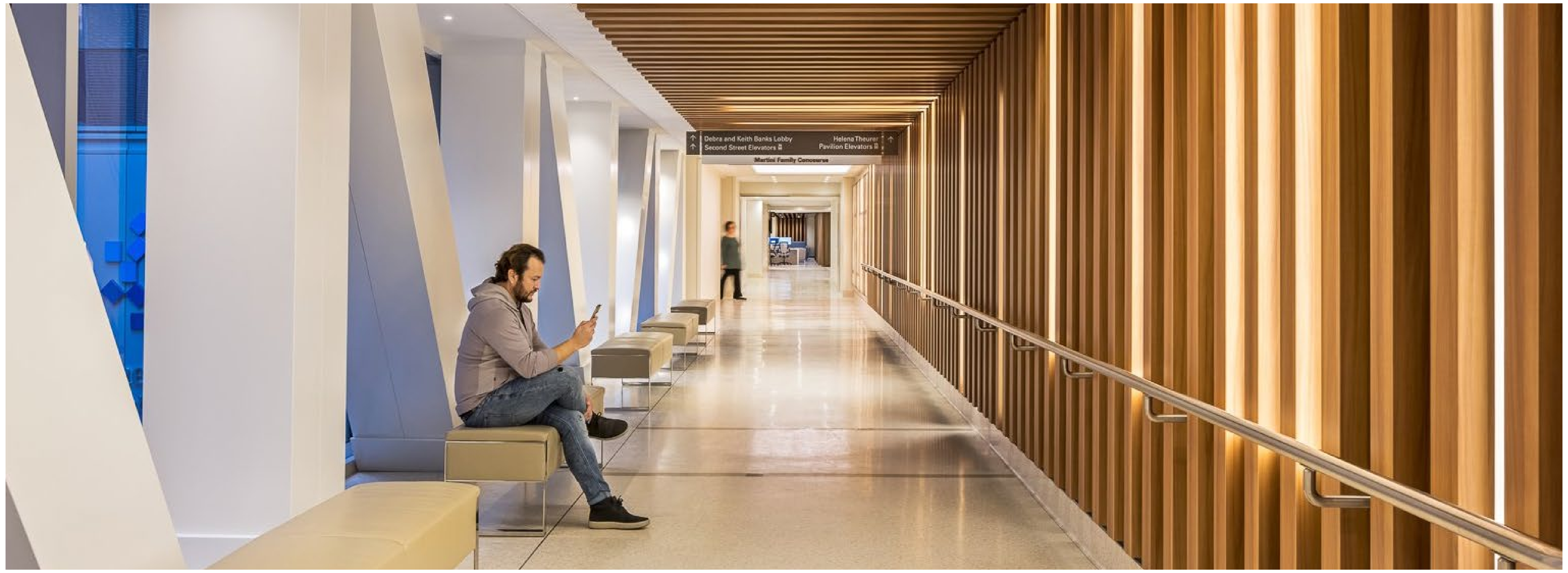
Efficient use of health staff
Health data portability also improves the work environment for healthcare staff. In systems that are fully integrated, clinicians spend less time gathering and entering data, reducing administrative burdens. With the rise of AI-powered decision support tools, care teams can process health data in real time, offering them actionable insights. In the UK, for example, care teams are using AI to analyze portable health records and provide predictive analytics to help nurses and doctors anticipate patient needs before symptoms escalate.

Empowering patients and their caregivers
Data portability gives patients control over their health information, empowering them to take an active role in their care. Wearables such as Apple Watch and Fitbit and their health monitoring apps collect a wealth of personal health data. Through integration with centralized health systems, this data can provide a real-time, comprehensive view of a patient's well-being, shared easily with their care team. This promotes more proactive healthcare management, preventing emergency visits and hospital readmissions.

▲ **British Columbia Institute of Technology (BCIT) Health Sciences Centre** (Burnaby, BC)

Digital health twins are the future of personalized medicine

A key frontier in healthcare technology is the development of digital twins. These are virtual replicas of patients built from their health data that can be used for predictive modeling and personalized care. By using digital twins, healthcare providers can simulate treatment plans, test potential drug interactions, and predict outcomes before any physical intervention takes place. Countries like Singapore are pioneering research in this area, using data portability to create detailed digital twins for individuals participating in clinical trials, accelerating the discovery and deployment of new treatments.



▲ **Hackensack Meridian Health, Hackensack University Medical Center Bed Pavilion and Central Utility Plant** (Hackensack, NJ)
Photo by Jonathan Hillyer

Design implications of health data portability

The shift towards health data portability has significant implications for the design of healthcare environments. As data becomes more integrated into every aspect of care, patient rooms and clinical environments will need to accommodate the technology that supports this seamless flow of information.

Three aspects of health data will influence design:

Enhanced connectivity
Health spaces will need to be equipped with high-speed Internet, secure data access points, and large display screens that allow doctors and patients to review health data in real-time.

Continuous monitoring
As wearables and in-room monitoring devices become more prevalent, clinical spaces will need to support continuous data collection, requiring more bandwidth and infrastructure to manage this data flow.

Rethinking patient interactions
With remote monitoring and virtual consultations becoming standard, the traditional setup of in-person consultations may shift. Examination rooms could be designed to facilitate hybrid care models, where data review and virtual interactions play a central role.

Data portability in numbers

Achieving true data portability and interoperability in healthcare can lead to significant cost savings and improved care outcomes.

50 petabytes

Average amount of data produced by hospitals each year, of which 97% goes unused[8]

30%

Approximate percentage of the world's data volume that is generated by the healthcare industry

36%

The compound annual growth rate of healthcare data by 2025,[9] which is faster than manufacturing, financial services, or media & entertainment[10]

$30 billion annually

Amount interoperability can reduce healthcare costs in the United States[11]

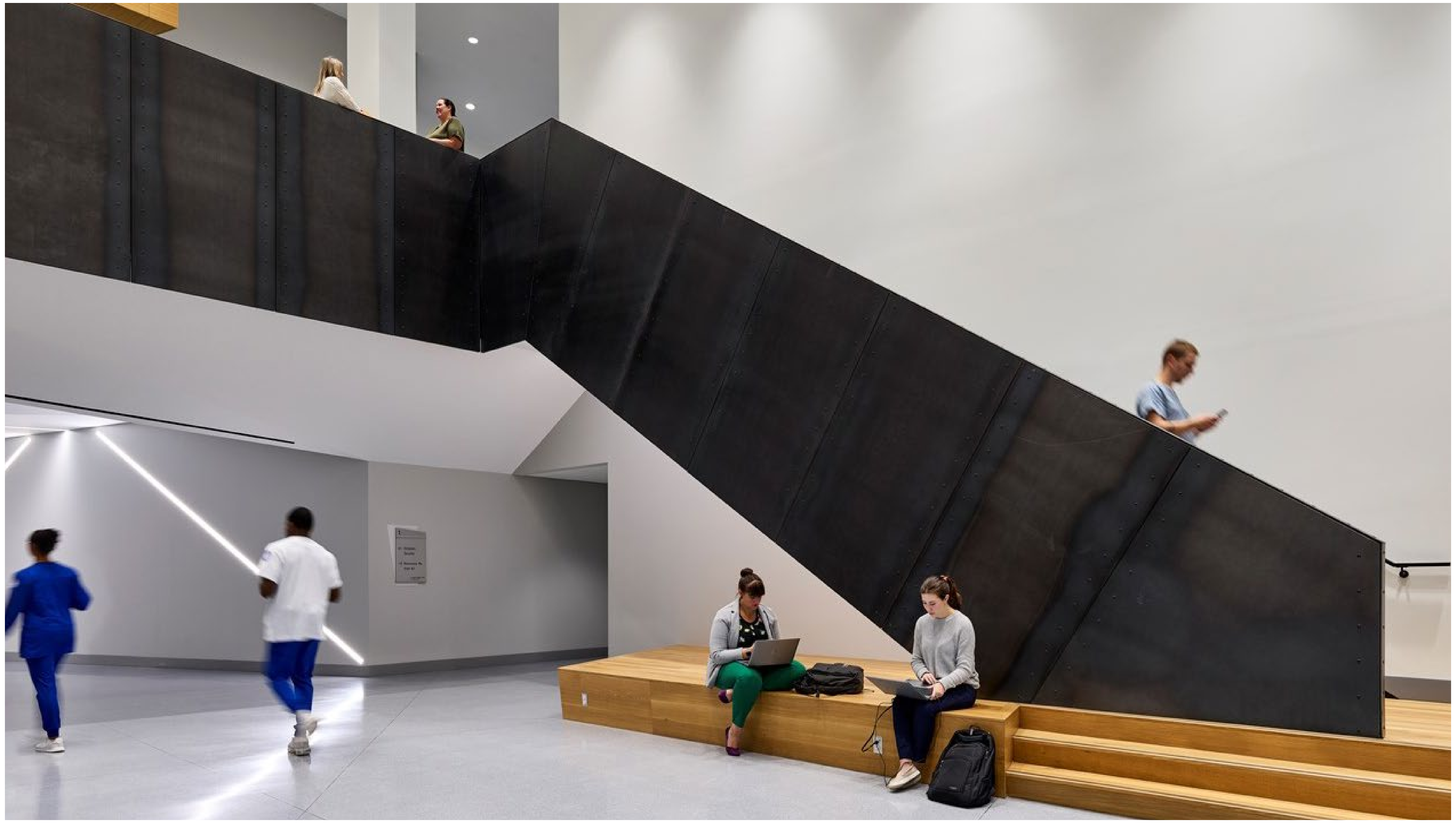
Building upgrades enhance health data accessibility

Previously, Alberta Health Services (AHS) and its partners stored health information in hundreds of databases across the province. Alberta established Connect Care to implement a Provincial Clinical Information System. With Connect Care, AHS health records will be accessible from any AHS and partner location in the province. The consolidation of standards and clinical applications required upgrades to the underlying technologies, hardware, physical spaces and connectivity.

Stantec was engaged as the prime consultant for multiple projects including active treatment, extended care and lab facilities across Alberta. Upgrades included Wi-Fi system, power connectivity and network infrastructure installation including fixed and mobile workstations. It required modifications to existing telecommunication rooms and the addition of new ones with necessary power, network, HVAC, fire suppression and security.

Stantec provided architectural, electrical, mechanical and structural services and participated in the planning, design, coordination and contract administration for the physical renovations and additions. The renovations to occupied facilities required extensive coordination to minimize the disruption and maintain infection prevention and control.

Project information courtesy of Ronald Bonnett, Stantec Buildings Engineering, Calgary, AB



▲ **Harrisburg University, UPMC Health Sciences Tower** (Harrisburg, PA)

A technologically enabled health future

The future of healthcare is undeniably digital. Health data portability will be essential to unlocking the full potential of technological advancements, enabling care that is more personalized, efficient, and accessible.

By embracing global trends and ensuring interoperability, we can build a healthcare system that benefits patients, clinicians, and the entire ecosystem.

As we continue to generate more health data through wearables, smart devices, and other digital tools, the ability to seamlessly share this data will become increasingly vital. In this future, healthcare will not just be delivered at the bedside but through an integrated, continuous flow of information that provides a 360-degree view of our health.

Cathy Junda is the technology practice leader for our Health group and guides clients through the complex process of integrating modern technologies into existing healthcare environments, helping equip facilities to meet current and future needs.
Denver, CO

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GETTING STARTED

Decarbonization for higher education

Why university and college campus decarbonization requires a carbon neutral master plan

By Ghina Annan & Jeff Schroeder

Higher education institutions (colleges, universities, community colleges and other post-secondary schools) are feeling the need to decarbonize their campuses.

They are feeling new pressure from multiple directions to reduce their fossil fuel consumption. What's motivating them and how can they get started?

▼ Detail of John Galsworthy Building, Penrhyn Road Campus, Kingston University (Kingston-upon-Thames, UK) Architect: John McAslan + Partners, Stantec provided structural and civil engineering services for the building.

Reputation
Higher education providers see themselves as leaders. They want to show the public, their staff, student body, and alumni that they take climate change seriously and are pioneering sustainable practices on campus. Positioning themselves as leaders on decarbonization will benefit them in public perception, student applications, and alumni support. The arrival of new low carbon campuses from their rivals puts pressure on these competitive institutions to reduce their own carbon footprints.

Mission and commitments
Higher education institutions hold themselves to high standards. They know that decarbonization is essential to meeting Paris agreement goals. So, they're making public commitments to decarbonize.

In 2021, 1,050 universities and colleges from 68 countries joined the United Nation's Race to Zero commitment to reach net-zero emissions by 2050.[1] And the 2023 Race to Zero report showed that 97% of members had a net zero target in 2023 and 22% of members also have an interim target. And 45% of these institutions have published transition plans and 47% are publicly disclosing progress.[2] Over the past decade or so, voluntary sustainability reporting has begun to catch on with colleges and universities using tools such as STARS (The Sustainability Tracking, Assessment & Rating System). But it still has a long way to go to become a widespread standard.[3]

Living laboratories
Some institutions are looking at ways to incorporate campus decarbonization into the curriculum. It's for students to research the ways their campus could reduce its fossil fuel dependence—as students in MIT's Technology - Carbon Reduction Pathways for the MIT Campus class did recently.[4] Leading universities and colleges compete for talent globally, both students and faculty. Demonstrating leadership in climate change mitigation and adaptation can be a powerful story to tell for recruiting.

Institutions are often autonomous when it comes to energy—running their own district energy systems and power plants on campus. From an emissions point of view, however, some campuses are shockingly dirty. Many in North America depend on aging coal-burning technology or carbon-intensive fuels like fuel oil and coal for their supply of energy.[5]

Three-quarters of Canadian universities monitor their greenhouse gas emissions according to Universities Canada's Action for Net Zero. But many are challenged to track their supply chain emissions.

Budget and resiliency
Higher education institutions are intrigued by decarbonization's potential to reduce or stabilize their energy bills and increase the climate resiliency of their campuses. They are more likely to justify a decarbonization investment that will lower their operating expenses. For these reasons universities and colleges need to show progress on decarbonization.

But what do they need to do it?

Getting started with decarbonization on campus

Some higher education institutions have asked us to sort their existing buildings from worst energy performer to best energy performer so that they can start working on the poorest buildings. We don't recommend this approach.

Rather than piecemeal, ad-hoc decarbonization, we strongly suggest creating a holistic carbon neutral master plan. In 2023, we completed a carbon neutral master plan for **The University of Windsor's** campus which is comprised of more than 50 buildings and a district energy system.

An institution that has just completed a master plan but hasn't accounted for its net zero carbon targets can create a carbon neutral master plan. We're working with an academic institution in this situation. It developed a master plan but had not accounted for its 2030 and 2050 emissions targets. Another campus may have identified some inefficient buildings but lacks a carbon neutral plan for the campus as a whole. We also have projects like this.

▲ **Hydronic heating pumps at the University of Windsor** (Windsor, ON). Stantec completed a carbon neutral masterplan for the University of Windsor, its 50 buildings and district energy system.

What is a carbon neutral campus master plan and what should it do?

The carbon neutral master plan is a comprehensive plan for the campus and its buildings that helps a university meet goals for decarbonization and resiliency while supporting its mission. A carbon neutral master plan for higher education should:

- ✓ Create a roadmap to achieving the school's sustainability objectives
- ✓ Give the school an understanding of where its energy use and carbon emissions are taking place, and which systems or buildings are inefficient
- ✓ Identify cost effective approaches to GHG reduction
- ✓ Show the decarbonization investment and predict potential savings from reducing energy use
- ✓ Reflect the priorities and options for decarbonization investment and provide guidance on implementation
- ✓ Be updated regularly and be flexible enough to adapt to the institution's changing needs to be effective
- ✓ Feature practical implementation guidance

Getting campus to net zero carbon is a holistic process

There's a holistic, circular process for creating a carbon neutral master plan. So, universities and their facilities management can start anywhere in the circular process, but they will need to stay flexible as conditions change.

Wherever they do start, the carbon neutral master plan will need to include the following five elements:

1. Identifying decarbonization goals
What are the institution's goals for decarbonization? How ambitious are they? Are they targeting net zero carbon by 2050? What are its commitments? And what are the code requirements in its jurisdiction? We need to answer these questions.

For example, because of its commitment to environmental sustainability, The University of Windsor embarked on a mission to achieve carbon neutrality and engaged us to develop its carbon neutral master plan. Stantec has developed a specific tool that looks at the commitments of various regions within North America to understand the mandates and commitments regarding greenhouse gas emissions.

2. Creating a campus master plan
Before we layer in decarbonization strategies, we need to take a look at the university's existing long-term master plan. If it doesn't exist, we need to collaborate with the university and develop it. This conventional master plan should account for the university's capital budget, building and system lifecycles, development plans, and support its overall mission.

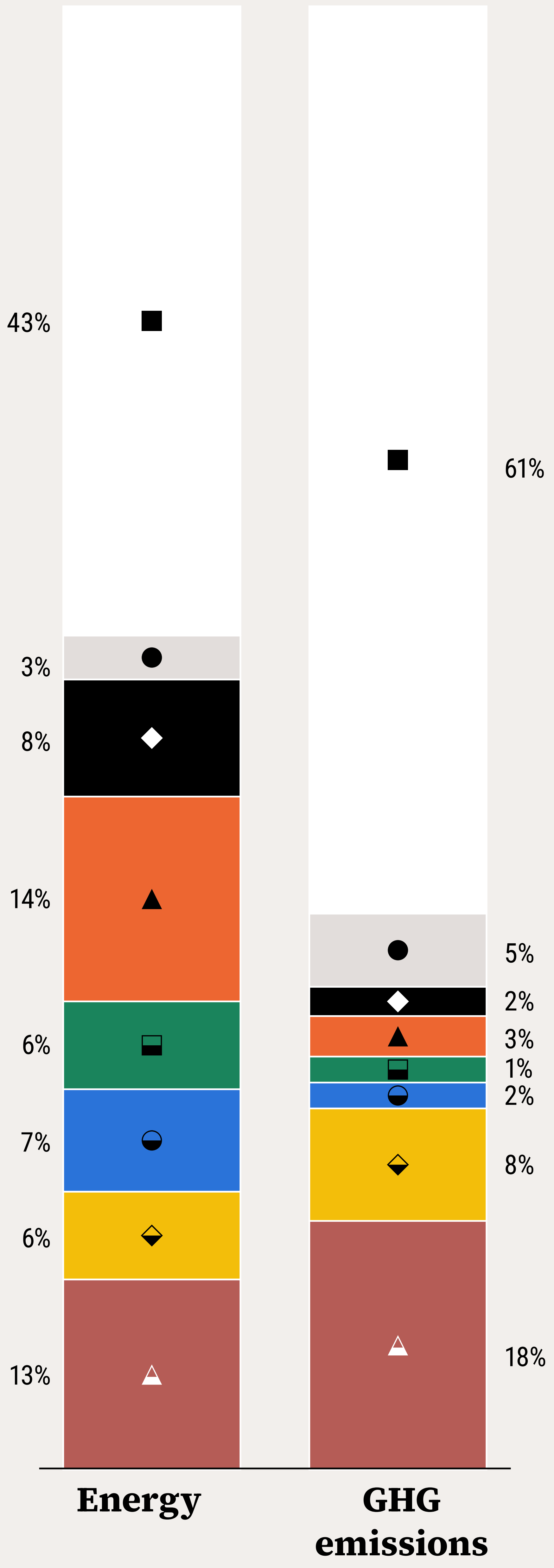
3. Auditing, metering, & modeling campus energy use
We need to know where and how energy is being used on campus so we can establish a baseline to track progress. So, we'll need to audit their existing buildings and systems to see the hot spots.

At the University of Windsor, we developed a detailed picture of campus energy use through site visits and accessing available data. When data isn't available or isn't reliable as it was on a recent project in Canada, Stantec can turn to another source of data. We have used building archetype modeling based on publicly available data created through federally funded projects.

We can audit the campus but associating each building with one of the many archetype data sets, we can access and produce a useful energy audit. Universities and colleges have an emerging need for tools and methodologies to help them monitor and report emissions and track their progress towards decarbonization goals. These institutions have an opportunity to leverage technology in artificial intelligence and the Internet of things to optimize energy management and reduce emissions.

Example of campus energy and GHG emissions by end use

A carbon neutral master plan requires us to create a detailed picture of campus energy use and GHG emissions.



- Space heating & humidification
- Service water heating
- Space cooling
- Lighting
- Plug loads & miscellaneous
- Ventilation
- Steam distribution system
- Steam idling

"No two campuses are quite the same. Each will need a custom-tailored plan to decarbonize."

4. Identifying strategies
The carbon neutral master plan needs to outline the strategies that the institution will implement to meet their goals. We look at four categories of strategies for decarbonization:

Conservation: Reducing energy use in day-to-day operations can cut campus emissions. This ranges from implementing LED lighting to updating outdated HVAC systems at end-of-life to high efficiency, low emissions models. A key element of the plan is a retrofit guideline, establishing a consistent strategy to conservation.

Energy transition: This could include implementing combined heat and power (CHP) systems and renewable microgrids in the university's district energy systems to enhance energy independence. It could mean adding carbon capture technologies to their energy centers. A campus district energy system (where campuses generate their own energy) makes it possible to deploy modern low carbon technologies and energy exchange to all buildings at scale. This gives campuses flexibility in how they grow.

Renewables: Can we implement onsite systems, geoexchange or solar photovoltaics perhaps, to provide a low carbon source to satisfy their energy appetite? Prominent institutions such as the University of Toronto and Princeton University have turned to geoexchange systems to replace their fossil fuel systems. Simply put, these geoexchange systems use the earth as a "bank" for depositing and withdrawing heat throughout the year. Ball State is building America's largest ground-source, closed-loop district geothermal energy system. The University of Notre Dame is installing 7,000 tons of geothermal closed-loop systems on campus. Together these systems can meet approximately one-half of the University's current peak demand during the cooling season.[6]

Institutions that aren't ready to implement renewables on campus can look to offsite renewables to bridge the gap in their energy supply.

Carbon offsets: The institution can also buy carbon offsets to mitigate its emissions, but hopefully in small amounts.

▲ **UC Davis Student Housing: The Green at West Village** (Davis, CA) UC Davis brought us and our public-private partnership (P3) team in to plan, design, engineer, and manage the largest student housing development in the US at the time—The Green at West Village. With more than 3,300 beds, The Green is currently one of the largest net zero energy communities in North America.

◄ **Walsh Hall Geothermal Plant, University of Notre Dame** (Notre Dame, IN) Stantec designed and coordinated the geothermal energy center in the University of Notre Dame College of Architecture and tunnel connections to infrastructure and Raclin Murphy Museum of Art and the future School of Art, Art History, and Design. ARUP was our consultant on this project. *Photo courtesy of Craig Tiller, University of Notre Dame*

◄ A new low-carbon district energy system, designed by Stantec in collaboration with Creative Energy and BC Hydro, is underway at Thompson Rivers University (Kamloops, BC).

5. Presenting options
When we're working on campus decarbonization, we harmonize the emissions goals, local requirements, and developmental mission in the master plan. Then we present a variety of options for meeting targets. These options offer multiple pathways for reaching targets at various spending levels with timelines that range from aggressive to longer term.

As a first path, conservation, the plan emphasizes reductions in campus energy consumption through a combination of renewable energy sources and building improvements. We prioritize reducing energy demand in campus buildings with retrofits, usually to lighting, the building envelope, and HVAC systems.

We monitor building energy use and then we convert the district energy system to low carbon based on a reduced campus energy demand. At the University of Windsor, the carbon neutral master plan emphasizes conservation and some energy transition in the near term to meet 2030 targets, before phasing in complete energy transition measures to hit 2050 targets.

As a second path, energy transition, we phase in a switch to low carbon energy sources across a campus. Buildings are retrofitted to work with the new energy systems as we go. We optimize existing systems and plan for low carbon energy transition as major equipment reaches its end of life.

In British Columbia we are collaborating with several institutions on master plans that pursue an energy transition path to meet their decarbonization targets. Thompson Rivers University (TRU) recently broke ground for a new low-carbon district energy system designed by Stantec in collaboration with Creative Energy and BC Hydro. This district energy system will help TRU become one of the first universities in North America to reach zero carbon.

In a hybrid approach, the carbon neutral master plan combines elements of conservation and energy transition on a path to net zero carbon. No two campuses are quite the same. Each will need a custom-tailored plan to decarbonize.

Sources

1. Race to Zero for Universities and Colleges
2. Race to Zero Progress Report
3. United Nations Environment Programme (UNEP)
4. MIT News
5. Reuters
6. University of Notre Dame

Ghina Annan serves as our decarbonization business lead and senior sustainability specialist with more than a decade of experience in high-performance building design.
Ottawa, ON

Jeff Schroeder is a practice lead with a diverse experience ranging from institutional to commercial facilities to healthcare and education with a focus on district energy systems.
Ottawa, ON

Look for part two of carbon neutral master plan for campuses on the Stantec Ideas blog. In it, we will talk about some of our go-to solutions, the importance of occupant behavior, new tools for monitoring and reporting emissions, and implementation and its challenges.

Sustainable data centers are here

The tech sector is pushing for innovative low-carbon structures in sustainable data centers

By David Weihing

▸ **Vancouver Community College Centre for Clean Energy and Automotive Innovation** (Vancouver, BC)

In the not-so-distant future, your email, online banking, and social media activity may flow through a data center with a sustainable mass timber structure built on a foundation of low-carbon concrete.

The tech industry continues to heavily invest in improvements in sustainability, corporate responsibility, and energy consumption, especially in the data center world. Hyperscalers (providers of large-scale data centers for cloud computing and other services) and multi-tenant or colocation data center developers are taking steps to offset some of the consumption that's required to offer their product. Often, they are exploring a combination of energy savings, material savings, and carbon savings in their mission critical facilities. They are investing further in sustainable data centers.

Many data center developers are focusing on ways that their data center campus buildings can be more sustainable. How can they consume less energy and power? Can they perform better from a structural and embodied carbon perspective? Because of this, they have corporate responsibility targets and aggressive sustainability goals to meet. These goals are influencing their construction decisions, including the use of mass timber framing and low-carbon concrete mixes as part of their overall strategy to reduce their carbon footprint.

A challenge to innovate in sustainable data centers

Hyperscale and multi-tenant data center developers tend to be savvy about the low carbon possibilities. Their decision makers are highly informed about the latest innovations, and passionate about hitting their sustainability targets. This sets them apart. The tech sector wants to push innovation while managing risks in the mission critical building's structural systems. They want low-carbon approaches that perform. As we design and engineer a variety of structures for numerous hyperscale and multi-tenant data center clients, they often ask us to study cutting-edge systems and new ideas for accomplishing that same goal and evaluate them for risk.

They're challenging us as structural designers to take a deeper look at materials that are less carbon-intensive and those that can even sequester carbon. Together, we regularly engage with material subject matter experts to push the edge of sustainability in structural design. With these important goals in mind, we must also remain confident that the innovative material or approach will perform.

There are three focus areas, where in collaboration with our clients, we are pushing structural innovation in sustainable data center design.

▶ **Vancouver Community College Centre for Clean Energy and Automotive Innovation** (Vancouver, BC)

There are three focus areas, where in collaboration with our clients, we are pushing structural innovation in sustainable data center design

1. Mass timber structures
Mass timber is a renewable resource. When we use it as a structural component, it can significantly contribute to the reduction and sequestration of carbon emissions. Data center developers are choosing mass timber for current building projects. They often consider it for administrative and support spaces on data center campuses where humans interact with the material. These facilities are great entry points for mass timber because these buildings are modest in size with reasonable structural demands. People tend to enjoy being in environments with wooden structural materials, so it makes sense to apply them to occupied workspaces.

Data halls occupy large footprints on hyperscale data center campuses. And these facilities have very specialized and intense loading conditions. The most ambitious and sustainability-minded companies are beginning to use mass timber in balance with structural concrete and steel in these environments. We are collaborating with them to explore opportunities to efficiently incorporate these sustainable materials in data halls and mission critical facilities.

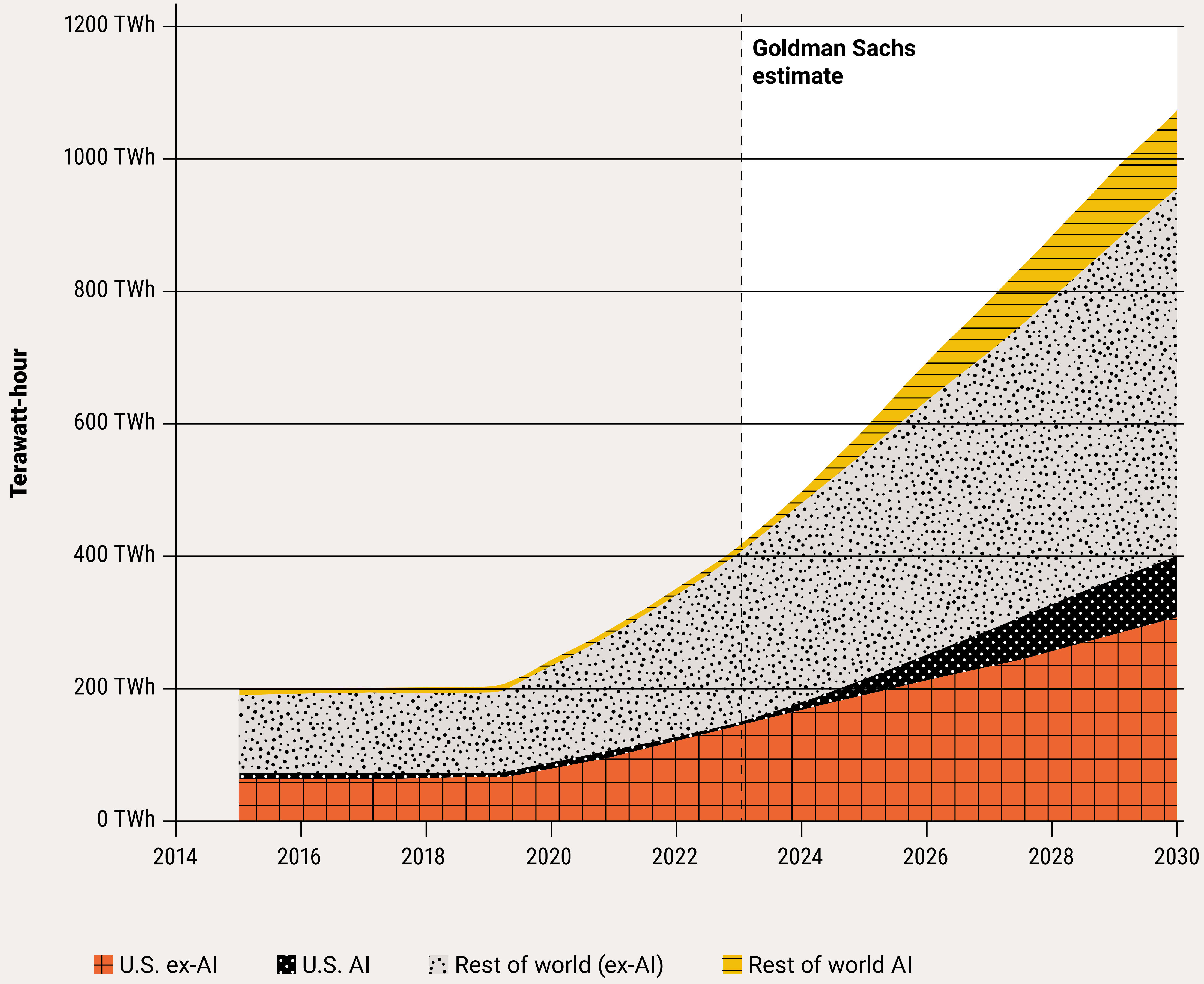
The broader industry is pushing the use of mass timber in a variety of ways throughout building systems. We're already using glulam mass timber as an additional option to steel or concrete columns and beams. CLT (cross-laminated timber) floor and roof panels are becoming viable alternatives to concrete slabs, precast planks, composite floor systems and roof decks. Each of these systems offers a capacity for flexibility, durability, and sustainability worth evaluating. In the coming years, we expect to see more timber and hybrid timber wall panels and hybrid timber roofs. We will continue developing balanced structural and sustainable solutions for our friends in the tech sector.

There are additional opportunities to further innovate by integrating mass timber or CLT together with low-carbon concrete. We already see commingling CLT panels with concrete to achieve hardness rivaling that of concrete or composite concrete and steel systems. We're excited to see how the application of mass timber and CLT can help further expand the industry's sustainable floor, roof, column, bracing, and wall panel systems options.

Studies have shown mass timber design and construction can yield significant embodied carbon savings. Transition Accelerator, a think tank, notes that mass timber use in place of conventional materials could cut embodied carbon by 40 percent. One study found that a mass timber building had 198 kg CO_2 equivalent emissions per square meter, compared to 243 kg CO_2 equivalent for a steel structure.[1]

Data center power demand[2]

While previous computational efficiency gains leveled off energy demand, data center power consumption is trending up again. And increased use of AI will increase the energy demand for computing.



Data center inventory, market comparison[3]

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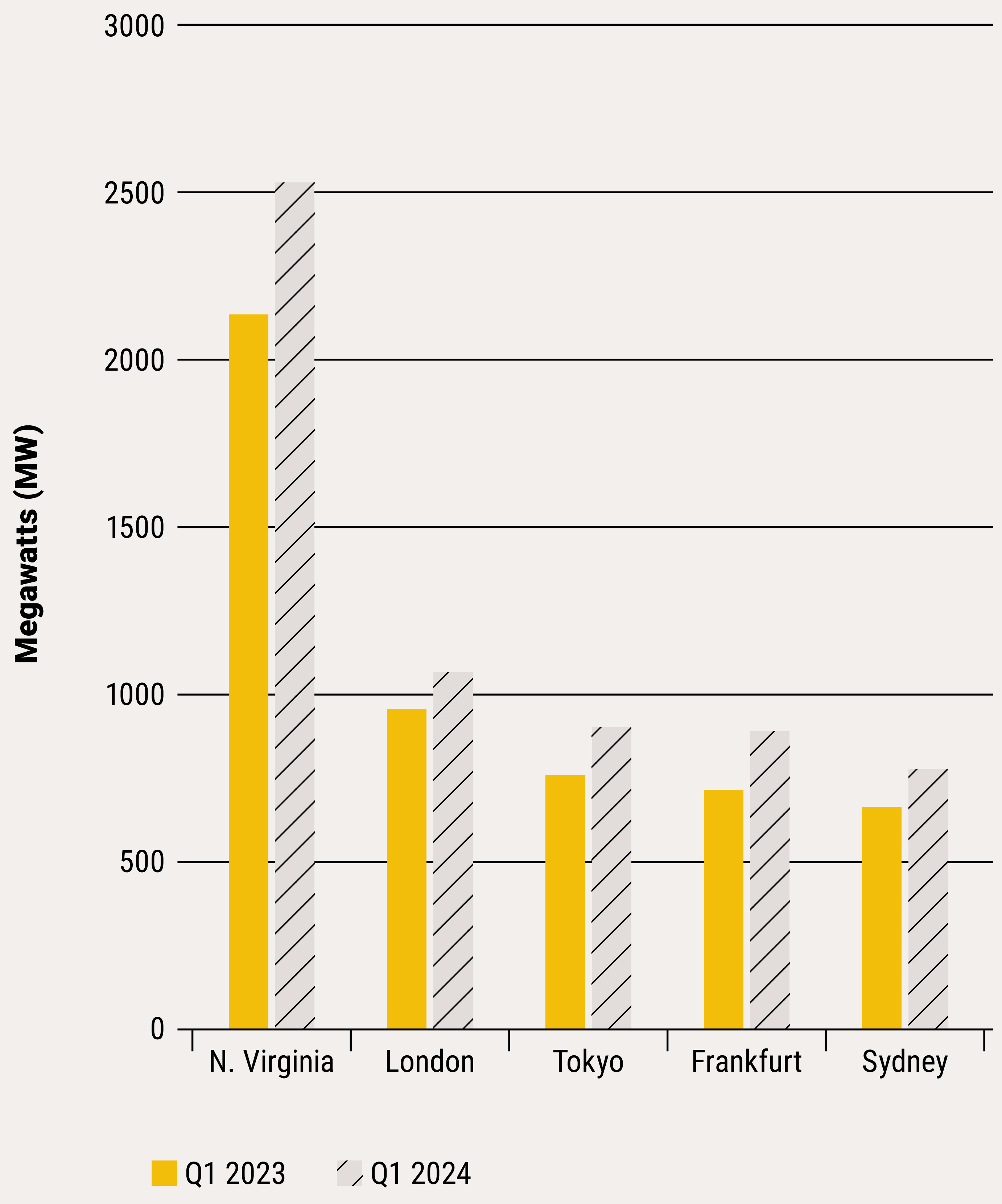
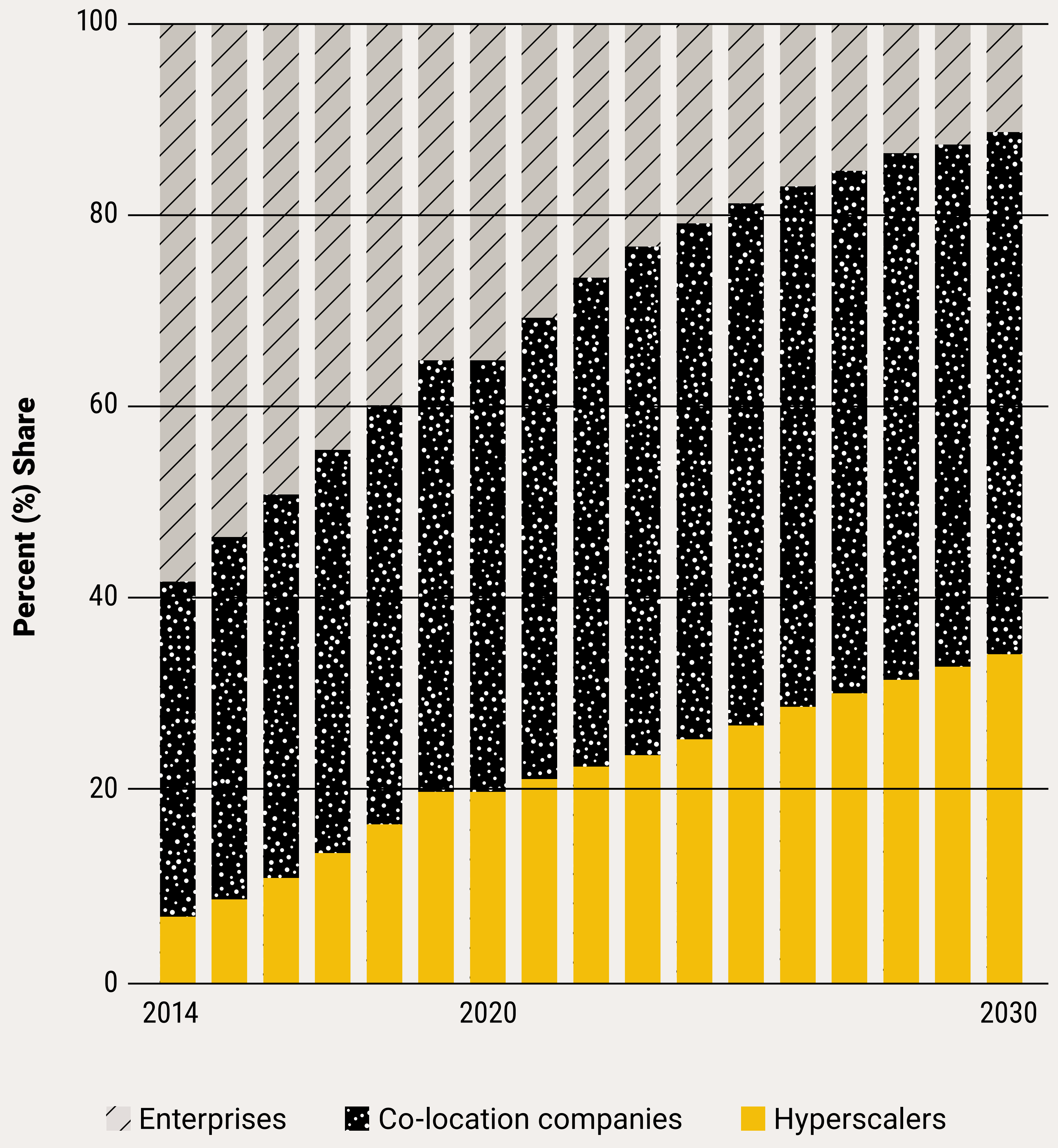


Data center power consumption by providers/enterprises[4]

McKinsey & Company predicts that hyperscalers and co-location of companies will account for the vast majority of data center power consumption by 2030. This will drive construction. Data centers are in unique position to be drivers of sustainability in the market.



Demand is measured by power consumption to reflect the number of servers a data center can house. Demand includes megawatts for storage, servers, and networks.

Bunker Hill Redevelopment Project (Boston, MA) Stantec's designs for the first two buildings incorporate a hybrid structural system of prefabricated light gauge metal framing and mass timber.

2. Low-carbon concrete mixes

Concrete is durable, strong, and reliable. Data centers will continue to use concrete for many structural components. But the tech sector is looking beyond traditional concrete. It demands high-technology solutions for concrete mix designs in sustainable data centers.

That's because, according to the World Economic Forum, cement manufacturing is responsible for about 8% of global CO_2 emissions. At the current pace, emissions from cement will reach 3.8 billion tons per year[5] by mid-century.

Decades ago, the building industry started to turn to fly ash as an ingredient in concrete mixes to reduce carbon emissions as compared to the energy-intensive traditional Portland cement mix. A new standard emerged. For years, we confidently substituted 25% fly ash in our concrete to reduce its carbon intensity when appropriate. We now commonly use type IL cements, offsetting a portion of the carbon-intensive cement with limestone, lowering concrete's overall embodied carbon. We even push cementitious substitution with fly ash and other pozzolans to even greater limits. Solutions such as CarbonCure which sequester carbon are gaining traction in the building industry.

Hyperscale and multi-tenant data center developers continue pushing for a higher degree of material substitution in innovative concrete mixes. Our clients are asking us to consider mixes that substitute 50% or even 90% of the conventional cementitious materials with lower carbon alternatives.

These high-performing mixes use reactants and other additives that take a substance like fly ash, silica fume, or slag and supercharge its cementitious properties. These innovative mixes can significantly reduce the carbon intensity of the concrete in administrative buildings or server suites on data center campuses. And the early adoption of these materials sets a high bar for the industry, with potential implications beyond the mission critical facilities market.

3. Optimization

These carbon-conscious clients are also pushing for innovation and optimization in design, engineering, and construction approaches.

In the recent past, robustness or strength indicated quality of engineering in these building types. But now, we regularly look for opportunities to optimize engineering and construction to balance robustness with sustainability. This means deploying the materials we use efficiently, using the right amount of the right materials for the job in tailored ways while maintaining the building's expected structural integrity.

Optimization requires more customized analyses and sometimes buy-in from the project team. Close collaboration with data center developers gives us a chance to share the rationale for innovative approaches to tune the optimization strategy. For example, our appreciation for lighter structural systems, such as using open web bar joists, reduces the requirements for investment in steel. This aligns with the sustainability priorities of these organizations.

We engineer these sophisticated mission critical facilities with some flexibility so that they'll continue to perform as their electrical and cooling systems are updated or replaced over the years. We expect these sustainable data center campus buildings to be in a constant state of improvement as technology evolves. So, engineering them to accept these improvements with limited re-work reduces the carbon investment required down the road.

Optimizing lighter structures with steel, concrete, or mass-timber offers additional knock-on benefits, as well. Designing lighter building structures can lead us to use smaller foundations, simpler seismic resisting systems, and even lessen site preparation requirements. By reducing the carbon cost in these systems, we can lower the overall energy consumption of construction.

◄ **Coast Mountain College Trades Building**
(Terrace, BC) The new learning center addition includes heavy timber structure of cross-laminated decking with glulam columns and beams.

Global data centers

We are seeing hyperscale and multi-tenant data center developers push for these data center campus building innovations in North America, but this commitment also has global implications for design. The supply chain in North America offers us a wide array of options in terms of steel and concrete products when it comes to building data center campuses. But what about areas where the manufacturing supply chain is more limited?

Mass timber and CLT products are made in factories, are lightweight, and can be shipped via cargo ship and rail or truck with low energy impact. Small construction crews can assemble them relatively quickly. The prefabrication and transportability of mass timber make it an appealing option for mission critical facility design and construction globally, especially in regions where the supply chain is not as strong. Portable or shippable low emissions concrete mixes would increase sustainable construction on a global scale. Optimized structural designs can minimize material consumption and align with sustainability goals.

It's inspiring to collaborate in a sector that's pushing the envelope for decarbonization. We are excited to explore the possibilities for structural materials and building optimization that can help data center developers meet their sustainability goals. It won't be long before today's frontier, mass timber and low-carbon concrete, will become a new standard. And we can't wait to see what comes next.

▶ **Brock Commons, University of British Columbia** (Vancouver, BC)
At Brock Commons, UBC students and researchers use the building to understand movement in wood structures, effects of moisture, and the benefits of using mass timber as a key design component. Architect: Acton Ostry Architects; Mechanical, Electrical, Sustainability: Stantec

David Weihing has served as the lead structural designer on a wide range of large and complex projects.
Chicago, IL

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09 things you need to know about America's new underground substation

Electrification will require novel design solutions in our communities

By Mark Whiteside

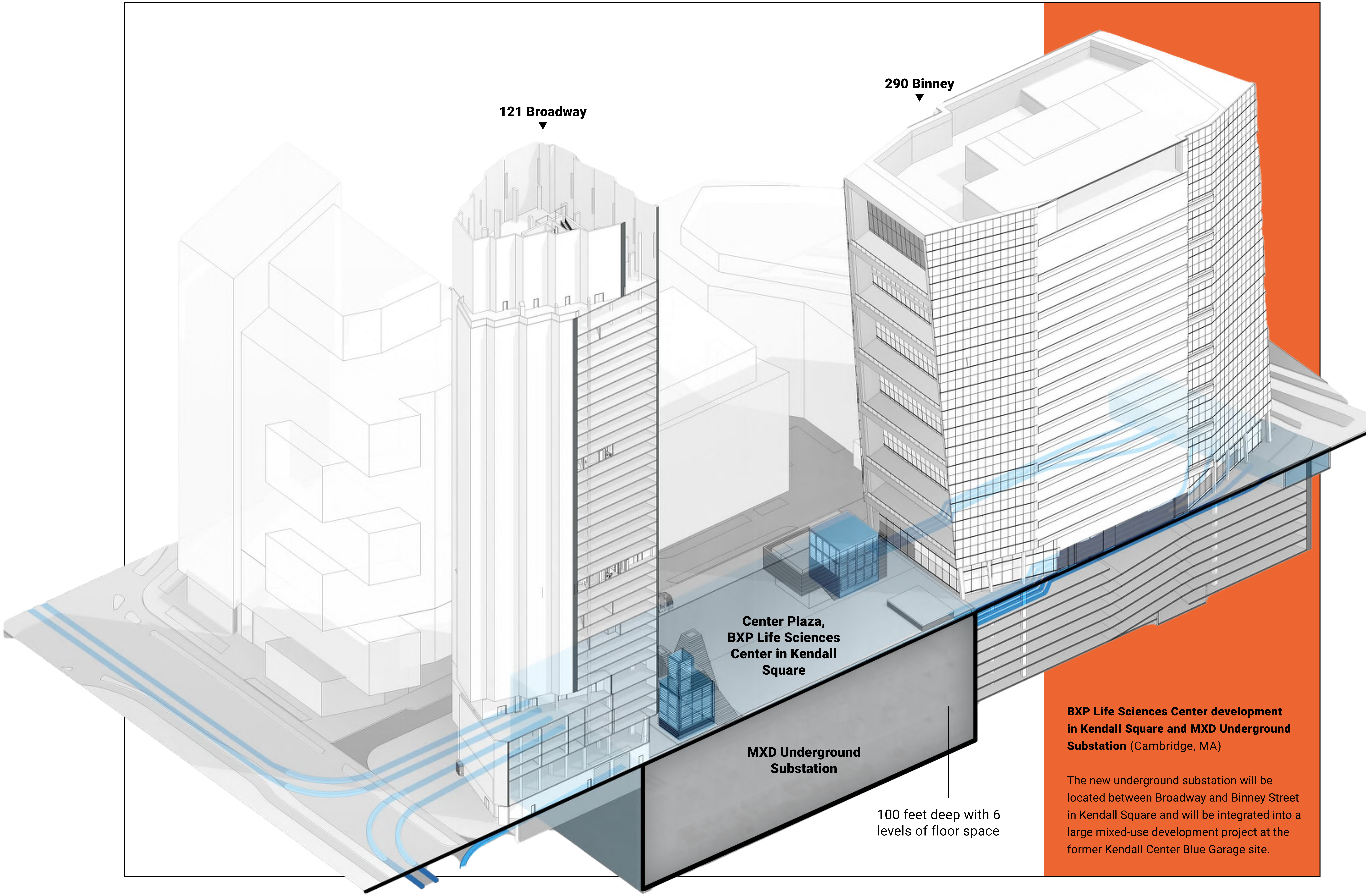
121 Broadway
(Cambridge, MA)
Stantec/Pickard Chilton
Plaza renderings courtesy of Sasaki and NBBJ

As cities across the country are looking to move towards electrification and away from fossil fuels, they will be met with a new set of questions. The biggest ones are where is all this power coming from and is the grid going to be ready to support it?

Look at the BXP Life Sciences Center development in Kendall Square, Cambridge, Massachusetts for example. Stantec is the architect of record for two new life sciences buildings (250 and 290 Binney Street – Kendall Square MXD Commercial Towers) and the design architect and architect of record for a new residential building (121 Broadway) there.

We are also the architect of the new electric substation, which will be located underground. We are collaborating with the local utility, Eversource Energy, and its designers to increase power capacity in the area. On the surface, above the substation, we are coordinating the design of the plaza with multiple designers, including architects and landscape architects. It will be the second underground power station in North America and the first fully underground substation in the United States.

Why are we designing this underground substation? And what does this first-of-its-kind project tell us about how decarbonization will require new types of buildings?



BXP Life Sciences Center development in Kendall Square and MXD Underground Substation (Cambridge, MA)

The new underground substation will be located between Broadway and Binney Street in Kendall Square and will be integrated into a large mixed-use development project at the former Kendall Center Blue Garage site.

Center Plaza,
BXP Life Sciences Center
(Cambridge, MA) *Renderings courtesy of Sasaki and NBBJ*

01

It helps towns and cities like Cambridge go all electric.

New developments in many urban cores are going 100% electric. They will need new forms of infrastructure and buildings to deliver more electricity to our communities. Stantec is designing what will be the tallest building in Cambridge, a new 100% electric, fossil fuel-free residential building in Kendall Square.

A global life science hub, Kendall Square in Cambridge has considerable and growing power needs of its own. The City of Cambridge is promoting electrification with programs like Electrify Cambridge. Recognizing the increasing power needs of the area, the developer for Kendall Square worked with the utility provider to fulfill the need for a new adjacent substation within a large mixed-use development project on a former garage site.

Because of its adjacency to schools and parks the community was skeptical about locating a conventional above ground level substation in the neighborhood. This led to a partnership between City of Cambridge, Cambridge Redevelopment Authority, Eversource Energy (the energy provider), and BXP (the developer) to look at inventive solutions that could accommodate the area's demand for electricity, and the idea of an underground substation.

The planned underground substation is part of the Greater Cambridge Energy Program (GCEP) to accommodate increased electric demand in the region, enhance resiliency, and support decarbonization.

02

It's an engine for development.

Underground substations can drive development and generate income. The above ground sites that utilities use for power stations often occupy valuable real estate.

With this new model, however, cities can put some of their electrical infrastructure underground. This opens space and allows for development either above or adjacent to the power infrastructure. It can allow for a wider variety of development in the vicinity of the infrastructure. Seen this way, an underground substation can be an income generator and engine for development.

In the case of Kendall Square, locating the 35,000 SF substation underground will enable a more ambitious development on the adjacent site to meet market demands. Two commercial buildings, each with 400,000 SF of life sciences space, and a 420,000 SF residential building with 439 residential units are going in the new development. Once complete, the residential tower will be the tallest building in Cambridge.

03

It sounds like a simple box, but it isn’t.

The building that houses an underground substation is basically a large concrete box, which sounds simple.

But this 100-foot-deep concrete box is not simple. It has six levels, three sets of stairs and an elevator. But most of its complexity comes from its unique role as a new model for more resilient and accessible power infrastructure which connects to the electrical grid in the urban condition. It has lots of connections, and all must go underground. And it must be safe and resilient.

However, it has a secondary role above ground which benefits the public but adds further complexity to its design.

04

It’s a new public plaza.

Now that we have moved the substation underground, we can use the space on the surface for something else—if we can maintain utility access and safety, of course. At Kendall Square, the Cambridge community benefits because the project features a public plaza on top of the substation. Instead of a substation (or the previous parking garage) taking up space, Cambridge will have an outdoor accessible community space.

The plaza project comes with its own design complexities. Our goal was to give Cambridge residents a park-like experience as much as we could while accommodating the large exterior structures that the substation requires. The public space is intended to be multifunctional, serving residents and commercial tenants. We worked closely with our landscape team to create inviting seating areas and nooks that lend themselves to activity.

Our team envisioned a plaza with a mix of hardscape and outdoor green space that could host a food truck festival, yoga classes, or outdoor movies in the park. The design also incorporates a children’s play space that will serve residents of the adjacent residential building and the community at large.

290 Binney
(Cambridge, MA)
Stantec/Pickard Chilton;
Plaza renderings courtesy of Sasaki and NBBJ

05

It has surface structures for a reason.

A substation generates heat year-round. If we can avoid refrigerant-based cooling, we will have a more efficient facility. If we design an air-cooled substation, it needs to take that air in and exhaust it. An underground substation needs to reach above the surface to get fresh air and let out heat exhaust.

The structures serving air intake and exhaust for the underground substation at Kendall Square will be 60 feet tall. We've designed them as integrated features in the plaza design for the public park. Acoustic dampers and designed air flow will mitigate their environmental sound impact. They should enhance the plaza experience by serving as a backdrop for activity.

06

It had to be waterproof.

Water and electricity do not mix. An underground substation built deep into the underground water table must be designed to mitigate leaking and handle stormwater runoff safely.

Cambridge recently revised its flood projections for resiliency. Often new buildings in Boston and Cambridge require a podium to raise the building from grade to protect critical infrastructure in the event of a flood. But our underground substation couldn't be raised that way. Instead, we had to make it impervious to flooding. Every vertical penetration had to be raised above the level of the 100-year sea level rise and storm surge projections, including additional height defined by the utility. To put it simply, there are no holes in the roof where projected flooding could rise above and flood the underground substation.

This underground substation must be safe, so it's designed with extensive coordination with our partners to make sure it will withstand a variety of worst-case scenarios. The process involved third party testing and modeling of fire and smoke propagation, as well as structural analysis for potential events within the substation.

07

It's a node.

The primary role for an underground substation is to bring power to the community. This power substation is a node for a network of distribution lines that will serve the grid in greater Cambridge. It will take high voltage coming in from a remote power generating station and transmit it to local communities.

The new Kendall Square power station will feature five underground duct banks housing eight new high voltage transmission lines. It will be a hub for transmission routes interconnecting to existing substations in Allston/Brighton areas of Boston as well as Cambridge and Somerville.[1]

08

It needs a hatch and a deck.

Technicians from the utility company need access to the underground substation for maintenance and monitoring. In the event of a replacement, technicians may need to remove and install large pieces of equipment.

To do so, the underground substation features a large hatch, inspired by hatches from cargo ships, that allows technicians access from grade down to every level of the substation. The design of the plaza has incorporated a "deck" above this feature. However, the entire deck can be lifted off when the technicians need to use a crane to move massive pieces of equipment in and out of the substation.

09

It's a sign of the times.

We are, generally speaking, in the early days of the electrification era in North America. Many cities, towns, and campuses will find themselves looking for solutions to providing more electricity to their residential and commercial districts while maximizing the use of available land.

This project at Kendall Square likely won't be the last underground substation we design. The electrified future will need many more.

▸ **Center Plaza, BXP Life Sciences Center in Kendall Square** (Cambridge, MA)
Renderings courtesy of Sasaki and NBBJ

Mark Whiteside is an architect and project manager in the Boston office delivering high density, complex urban projects. Working in the residential and commercial sectors, Mark consistently delivers creative solutions for a wide variety of clients.
Boston, MA

MXD Underground Substation collaborators:

Architecture: Stantec

Interior and electric design: Eversource Energy/RCM Technologies

Structural engineering: MKA (Magnusson Klemencic Associates)

Mechanical, Electrical, Plumbing, and Fire Protection: BALA Consulting Engineers

Waterproofing: SGH (Simpson, Gumpertz & Heger)

Acoustics: Intertek

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1. Eversource

ASK AN EXPERT

Deploying new technology in design practice

An interview with Brendan Mullins, Discipline Leader, Design Computing

Interview by John Dugan

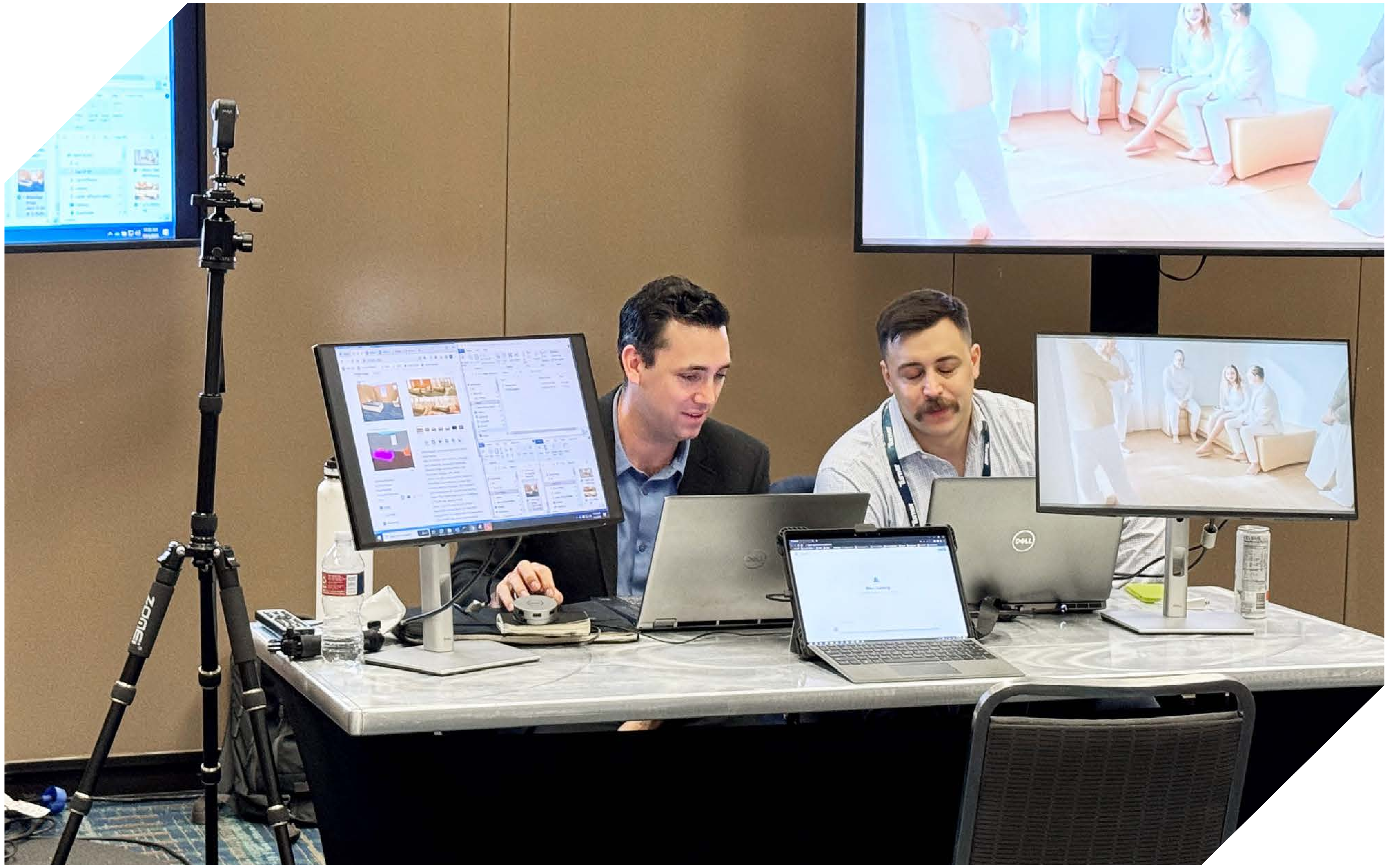
Design technology never sleeps. For a good design firm, the challenge is about which technologies to invest in, but also how, what, where, and when to use them.

Enter the Design Computing Discipline Leader, a new role at Stantec, who oversees technology integration to enhance project design. As our leader for design computing, **Brendan Mullins** sets the vision and strategy for graphics excellence, advanced visualization, computational design, and AI technology across the practice.

Part of his responsibility is keeping an eye on technologies that enhance project design and documentation. He also promotes the wise use of new digital tools in design studios through training, process, and professional development.

Based in San Francisco, Brendan is an architect and technologist with 11 years of experience at Stantec. He has worked on complex projects including the Lucas Museum of Narrative Art, Cleveland Clinic Cancer Building, and San Ysidro Land Port of Entry.

We chatted with Brendan to learn about the new role and get his perspective on how technology is changing the practice of design and expectations for the deliverable.



▲ Brendan Mullins (left) and Anthony Rea employed AI to generate virtual reality prototypes from cardboard mock-ups and real-time user input. **Read more**

"My passion for visualization and technology and the design procession comes from that. How do we communicate faster? How do we work together more collaboratively?"

▲ **Confidential Project** (North America) From sketch to rendering, using AI as a tool for design visualization can enhance the iterative, collaborative communication with the client.

In your new role, you walk and talk computational design, parametric design, generative design, and artificial intelligence tools. How did you get into this?

I'm an architect and my heart is in the practice. I've always loved using technology in the design process, and finding ways that it can bring teams together.

A client, a contractor and an architect standing around floor plans will each have a different mental image of what it represents in three-dimensional space.

My passion for visualization and technology and the design procession comes from that. How do we communicate faster? How do we work together more collaboratively?

More accurately? How do we ensure all collaborators are on the same page?

The days of physical model building and standing around a drafting table have passed but those processes solved a problem. If you get rid of them, they should be replaced with something. Architects have always had a need to understand physical space.

Designers used to render a scene by hand in colored pencils. They could draw very quickly and amazingly fast and create a rendering in seconds. That's uncommon today. Making models in Revit is slow and it's a black box that not everyone understands. And it's not iterative. I'm trying to fill that visualization gap with technology to replace the colored pencil.

What if it had no barriers and was fast? With AI and computational design, I see us closing that gap again, iterating at a rapid speed, the same way we could draw.

“I’m trying to fill that visualization gap with technology to replace the colored pencil.”

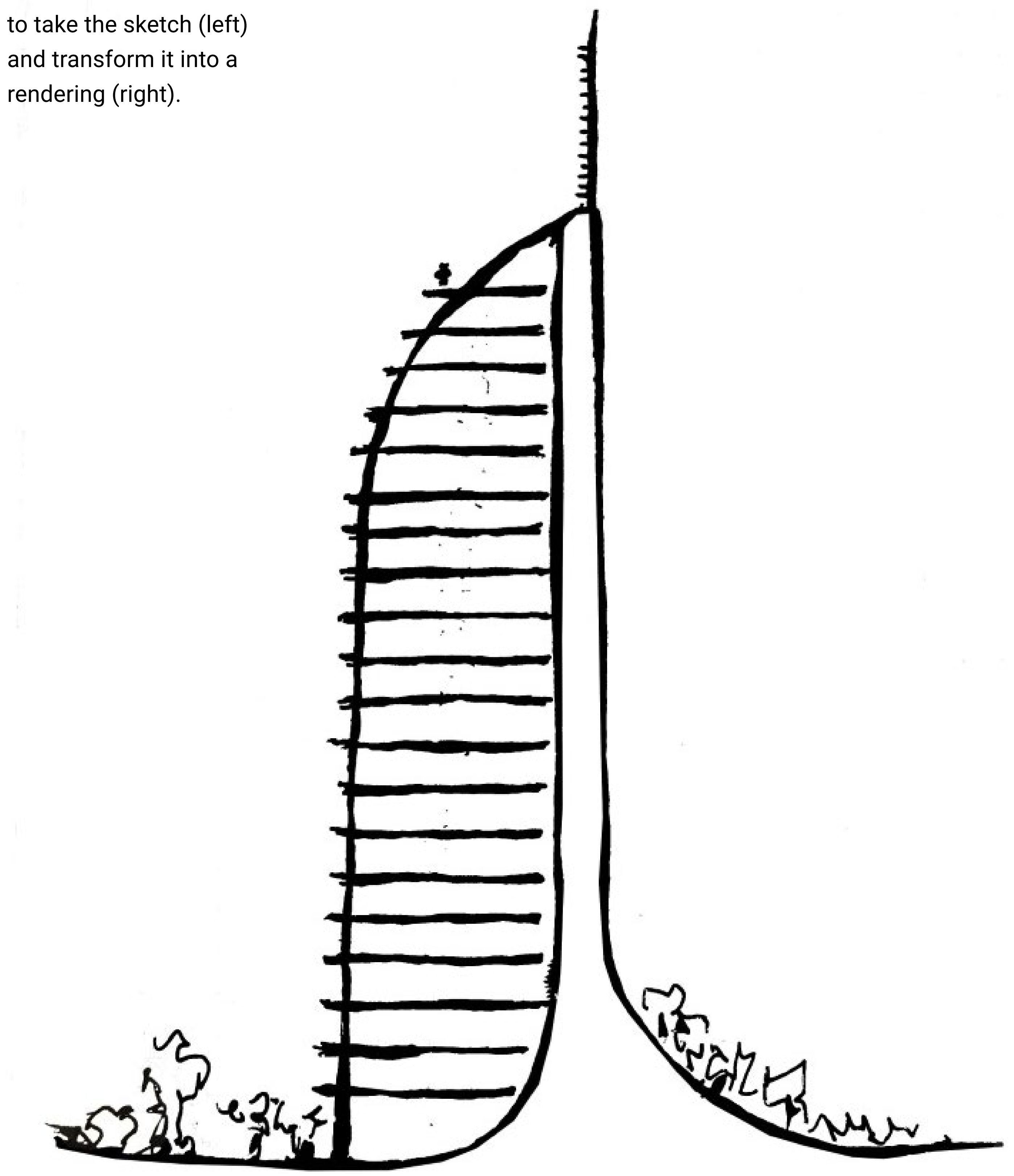
Considering the AI conversation in industry right now, where do you see its current application? And are there areas where we should wait and see before using it? Is there a race in the industry to use it?

Yeah, everybody is saying they’re using it. When you go to a conference it seems like everyone is standing on stage saying they use AI. Many of them are exaggerating significantly. We’re at the point in the hype cycle where expectations are blown out of proportion. It’s all very new to us.

I’m an early adopter. I tell people that you shouldn’t form an opinion on it until you’ve tried it. And that’s why I encourage people to use ChatGPT in their daily lives. Or use the generative AI image making software to help you execute design iteration services and speed up rendering times. Just get used to it so that you can form an opinion. Once you experiment with it, I think that’s when you start to see the connections to where it might solve other problems in your daily life.

Learn its strong points, learn its weaknesses, and you can collectively help the company move forward. I think it’s going to become like the Internet or electricity. It will be part of our daily process, and you won’t even really blink when you use it.

▼ Brendan’s team used AI to take the sketch (left) and transform it into a rendering (right).



Where’s the technological change really happening in our industry? Where should we be paying attention?

To give a data-driven answer, the place where I see the most fees associated with digital change is going on in virtual building design and construction with contractors and facilities management models for owners. This is owner driven because that’s where the financing is. We’re consultants. The owner largely defines the product. And what they want is a highly coordinated 3D building. All these digital tools play into that. And AI will surely help that one day. We’re already coordinating things with virtual reality. But the big push is that our major institutional clients want the exact building replicated in 3D. Essentially, we’re creating as close as possible to digital twins. Significant fees and time go into making that happen. The clients are willing to pay the fee because it saves them money in the long run.

We talked a little bit about VR earlier. From my perspective, it felt like VR filtered into our design process but not through it. It pops up here and there. Some people have embraced it.

When I get that question, I usually pull out my PlayStation VR headset for my PS5. It's the coolest video gaming equipment that's probably ever been created. But sales are low and the consumer market has been weak. That's a telltale sign.

Of course, in architecture and engineering, which tend to be behind the times in relation to technology, adoption will be even slower.

Part of me says it's a change management challenge within our industry. The industry hasn't done enough yet to increase adoption. But the market's still trying to find its place with VR, so it's not completely our fault.

Meta continues to invest extremely heavily into VR, so if anyone will force the change—it is probably Mark Zuckerberg.

◄ Generative design explorations by Daniel Massaro

"The big push is that our major institutional clients want the exact building replicated in 3D."

There are also these cultural tipping points. Something seems odd and then suddenly it seems totally acceptable. It might be generational.

I completely agree. A lot of what's happening in our industry right now is generational.

There's a cultural shift happening slowly where the digital natives are entering leadership within our industry and can make final calls. Things are moving much faster in terms of technology adoption than they were five years ago.

Previously there were people who were never in BIM leading projects. And BIM was essentially a way to make PDF drawings. Now, we're still making drawings, but the 3D world is so much more than that. The digital native generation is coming into a leadership position to define what the tool process is. We are at a tipping point where we're going to see much more adoption of these tools across our industry.

Brendan Mullins is an architect and discipline leader for design computing at Stantec. He focuses on integrating advanced tools into our design processes.
San Francisco, CA

Listen to Brendan talk "Digital innovation in buildings" on the Stantec.io Podcast.

STANTEC.IO

Keep an eye on the Design Hive, our Buildings podcast, for an upcoming episode featuring Brendan on all things design technology.

DESIGN HIVE

Who needs a helium recovery system?

Why laboratories, universities, and hospitals want to recapture this critical raw material

By Adam Brown and Michael O'Herron

Before you pop that floating balloon after midnight on New Year's Eve, give this some thought.

Once the lightweight gas leaves that balloon, it's never coming back. Helium (named for Helios, Greek god of the Sun) is small and light enough to escape from the atmosphere into space. These days, we use helium for a lot more than birthday parties and parade inflatables. And it's getting expensive. That has a lot of its significant users looking at helium recovery systems.

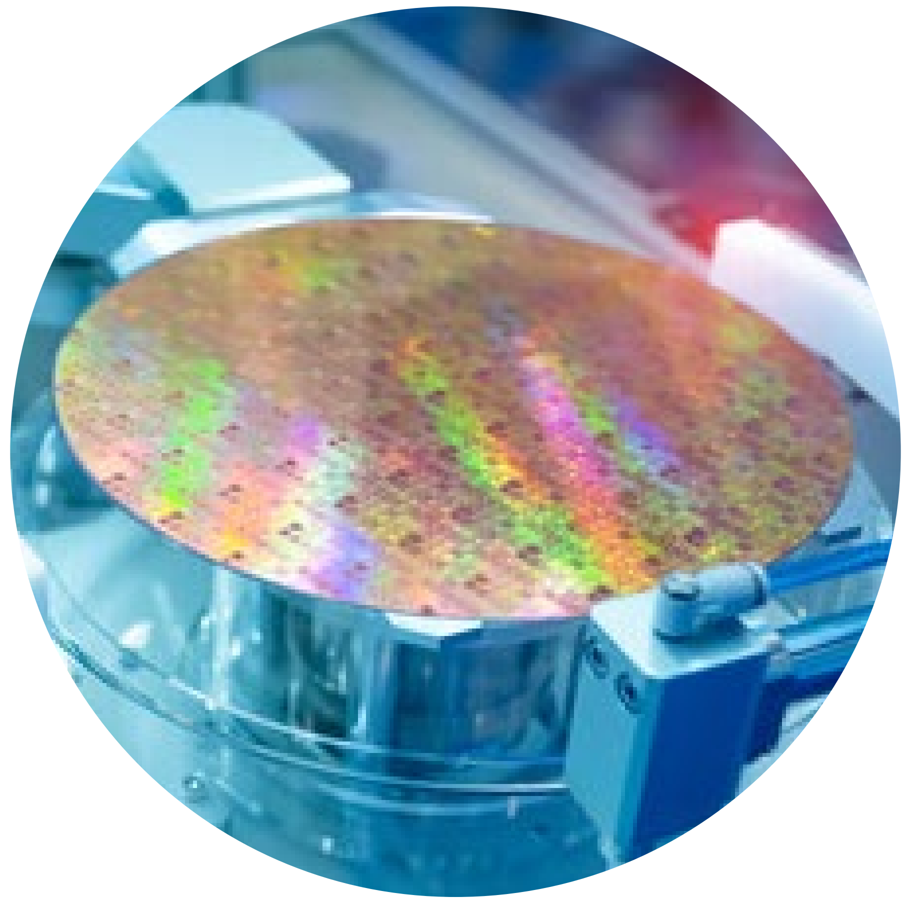
Helium is good at conducting heat. And it has the lowest boiling point of any known material which makes it a great coolant for things that must be kept very cold.

What is helium used for?

Superconducting magnets
Perhaps its most important modern use is in the cooling of superconducting magnets. Cooling certain types of electromagnets with liquid helium allows electricity to flow through them with no resistance.

Superconducting magnets are required for a number of widespread technologies including MRI (magnetic resonance imaging) scanners in hospitals. Research laboratories for universities and industry use liquid helium-cooled NMR (nuclear magnetic resonance) spectroscopy to aide in the development of new drugs. Today, we use most of our helium in these types of cryogenic applications. For example, Pfizer's Pharmaceutical sciences division (PharmSci) uses NMRs for characterization and study of potential new active pharmaceutical ingredients, or APIs.

Space, science, and welding
The space industry is a major consumer, using helium to expel liquid rocket fuel for combustion. We use it for welding. Because it conducts heat well, it offers good penetration and faster speed for welders. Because it's non-reactive, it makes a good shielding gas, protecting the arc from oxygen and contaminants. It's used in science to cool particle accelerators and quantum computers.[1] The Large Hadron Collider uses massive quantities of helium. And NASA's James Webb Space Telescope uses a helium cryogenic cooler to ensure its infrared sensors work.



Semiconductors
The semiconductor manufacturing process requires extreme vacuum conditions. Even tiny leaks can ruin the product. Helium is preferred for detection because it is small enough to reliably find leaks, is inert, and nontoxic. It is also still relatively cheap when compared to other noble gases. With only very small quantities in the atmosphere, ambient helium won't distort measurements.

Not much helium is used for party balloons—5-7% according to the balloon industry. But that's still helium that's gone once it's used.

Where does Earth's helium come from?

Helium is a naturally occurring byproduct of radioactive material in the earth. Found underground, it's mined in just a few places and usually harvested as a byproduct from oil and natural gas production. The supply is limited. It is a non-renewable resource on Earth. The radioactive decay of uranium that produces it takes an awful long time.

Helium prices are going up

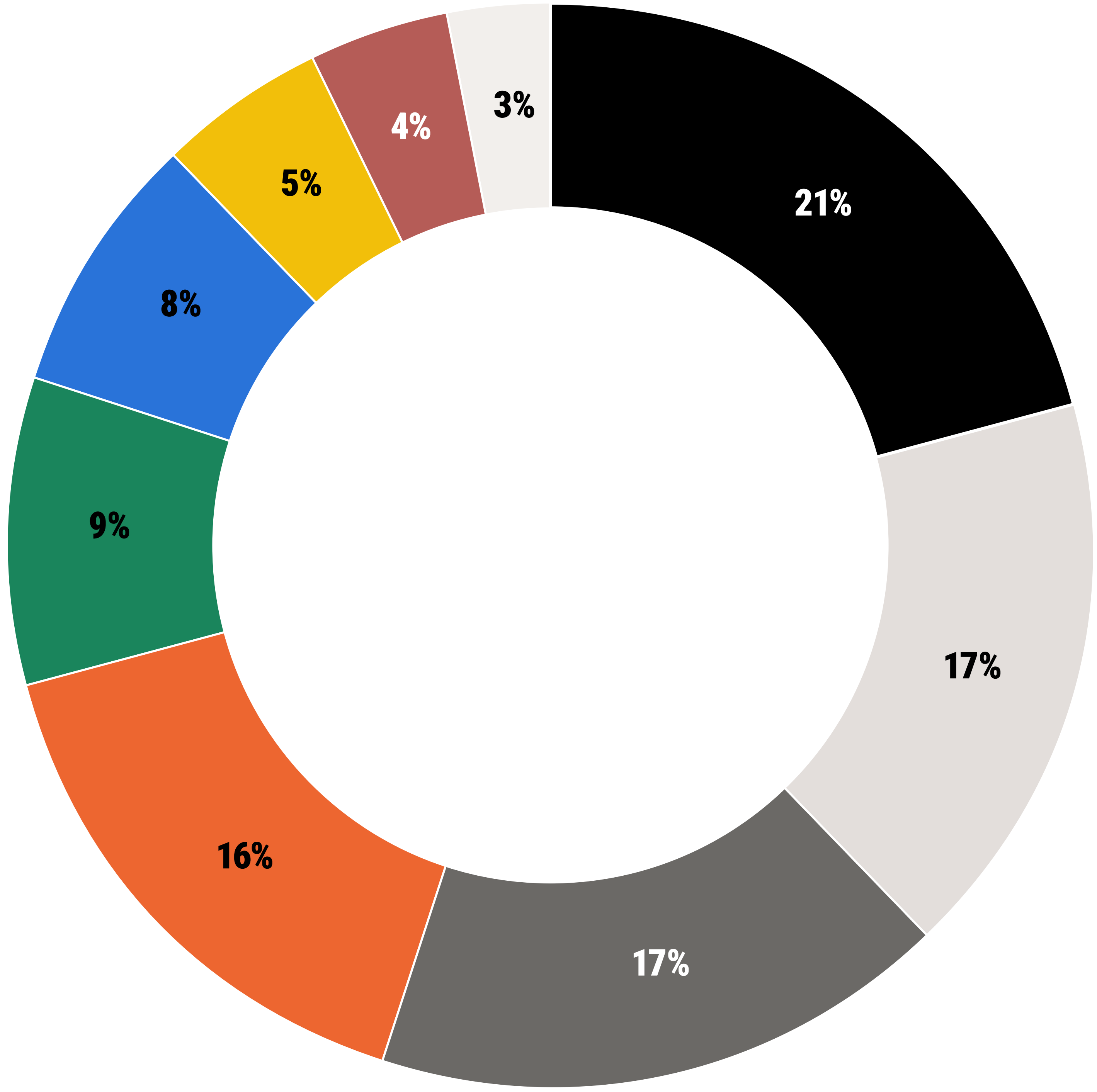
Up until recently, helium was fairly cheap and considered abundant. But the U.S. is producing less even as demand rises. Only a few countries harvest it. So, the price of helium is extra sensitive, impacted by regional conflict, trade wars, even accidents at helium plants. The price surged in 2022 and 2023.[2] With the cost of new helium rising, customers are looking for alternative ways to reduce costs.

Reducing helium costs

Researchers are looking for alternative processes and materials that reduce or eliminate helium altogether for superconducting, cooling, leak-testing, and in MRIs. For cryogens however, helium will remain in use, so users are looking for ways to reduce their consumption.

Closed loop systems are one method larger consumers can use to reduce their helium budget. The U.S. Department of Energy's Linac Coherent Light Source-II at Stanford circulates four tons of helium with low losses, for example. Many hospitals, university labs, and drug manufacturers who currently use virgin helium may benefit from seeking solutions for recapture. Retrofitting existing equipment with a helium recovery system can reduce the helium that escapes from their facility, bring down their annual bills, and likely pay for itself in a decade or less.

U.S. consumption of Grade-A and gaseous helium, 2023[3]



2.1 billion cubic feet

- **21%** Analytical, engineering, lab, science, and specialty gases
- **17%** Controlled atmospheres, fiber optics, and semiconductors
- **17%** Magnetic resonance imaging
- **16%** Lifting gas
- **9%** Aerospace, pressuring, and purging
- **8%** Welding
- **5%** Leak detection
- **4%** Diving
- **3%** Minor applications

Helium by the numbers

August 18, 1868
Astrophysicist Pierre Jules César Janssen observes unexpected lines through his spectroscope, indicating the presence of an unknown element in the Sun.[4]

1882
Helium is first discovered on Earth by Luigi Palmier who was analyzing Mount Vesuvius.

-452 °F (-269 °C)
Temperature the superconducting wire coiled up inside the magnets at Mississippi State University must be cooled to using liquid helium[5]

11,000 acres, **25 miles** of pipelines spanning Texas, Kansas, and Oklahoma, plus about **1 billion cubic feet** of helium. That's the Federal Helium Reserve, sold to a private company in 2024[6]

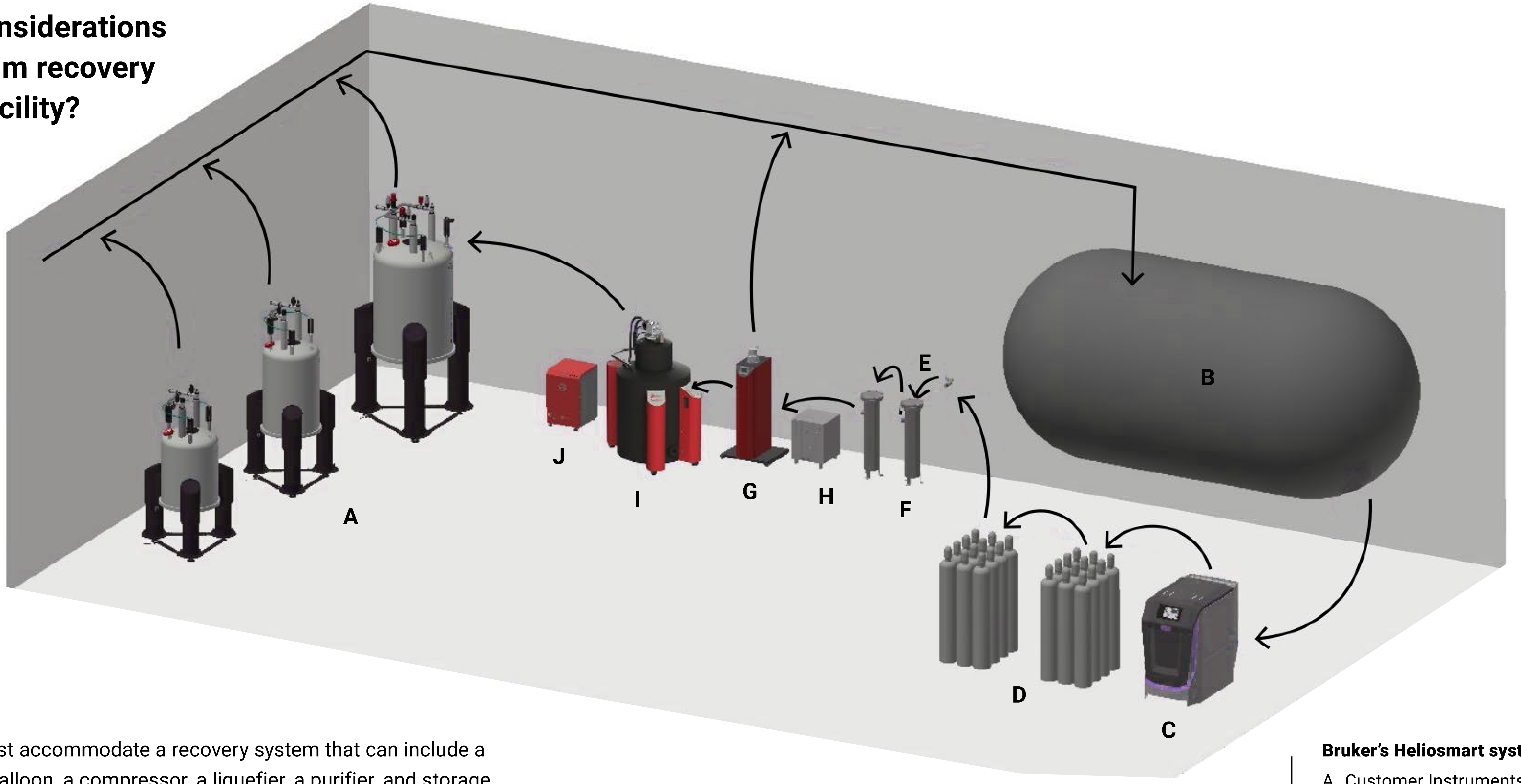
How does a helium recovery system work?

We have recently completed the design for a facility modification to support a new helium recovery system for a pharmaceutical maker that uses dozens of NMRs in its laboratories on multiple floors and labs. NMRs are an essential tool in drug discovery. NMRs can help researchers identify compounds and how molecules interact with each other.

The technology in the new helium recovery system is not new. The bespoke system, aggregated to a complete system by Bruker BioSpin (Billerica, MA), combines a number of off-the-shelf products from several manufacturers. Stantec's job was to integrate the system design into the available space.

The new recapture system we implemented in the research facility connects to a series of NMRs distributed across eight labs on four floors. The helium recovery system collects the helium venting off the NMR magnets in a large neoprene balloon, then compresses, purifies, and liquifies the helium for reuse in the magnets.

What are the main design considerations for a helium recovery system facility?



◄ HelioSmart Liquefaction system by Bruker BioSpin with components from Quantum Design and Bauer. *Diagram courtesy of Bruker, Billerica, MA*

Space
The facility must accommodate a recovery system that can include a large storage balloon, a compressor, a liquefier, a purifier, and storage tanks. Liquid helium's boiling point in the magnet is affected by pressure changes and this can influence research results. To mitigate those effects, the recovery system uses a large low-pressure reservoir to capture the helium. A deflated balloon gradually fills with helium at low pressure. Next, the system compresses the helium and collects it in high-pressure storage tanks, reducing volume. Once the tanks collect enough compressed helium, the system passes it to a purifier and liquefier. Ultimately it captures the liquid helium in a vacuum-insulated dewar flask which can then be used to refill the magnet's supply.

Power
The compressors that purify and liquify the helium use significant amounts of electricity. The recapture process is energy intensive, so we must provide considerable power to the helium recovery system. When considering the cost of system installation, we need to account for the cost of adding or upgrading electrical services required to accommodate the new loads.

Bruker's Heliosmart system:
A. Customer Instruments
B. Helium Gas Balloon including Controller
C. High Pressure Compressor
D. High Pressure Helium Gas Cylinders
E. Pressure Reducer
F. Dryer
G. Purifier ATP30
H. Compressor F70/FA40 for Purifier
I. Liquefier NexGen250
J. Compressor HLC 4900H for Liquefier

Who are the best candidates for helium recapture?

Pharmaceutical laboratories using NMRs, hospitals using MRIs, research facilities, and universities are the likely best candidates for recapture systems. These facilities use large amounts of helium in a fixed, well-insulated location that has a low boil-off rate. The characteristics of these fixed location facilities lend themselves to the use of a recapture system.

Anticipated payback time for helium recovery systems

With the cost of helium rising, the payback time for investment in a helium recovery system is contracting. The most significant users of helium would be wise to investigate implementing a recovery system to control costs in the long-term.

The return on investment is a good argument for helium recovery systems. Sustainability is another. Helium is a precious resource that plays a vital role in medicine, advanced science, and research. The Earth has a limited supply. We should look at implementing helium recovery systems wherever the scale of helium usage will justify the investment.

Adam Brown is a chemical engineer who has experience in engineering design for pharmaceutical, food, waste water and fine chemical industry projects.
Albany, NY

Michael O'Herron is a process designer. He recently worked on the process gas and delivery portions for a solar cell manufacturing plant, which involved piping systems design and material selection.
Albany, NY

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Stantec is a global leader in sustainable architecture, engineering, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

Executive Editor
Summer Heck

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John Dugan

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Edgar Alanis

BUILDINGS

◂ **Southline** (Boston, MA)