DESIGN QUAR-TERLY

ISSUE 17

Stantec

NEW DESIGN ESSENTIALS

What matters today

DESIGN QUAR-TERLY

ISSUE 17

THOUGHTS, TRENDS AND INNOVATION FROM THE STANTEC BUILDINGS GROUP.

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

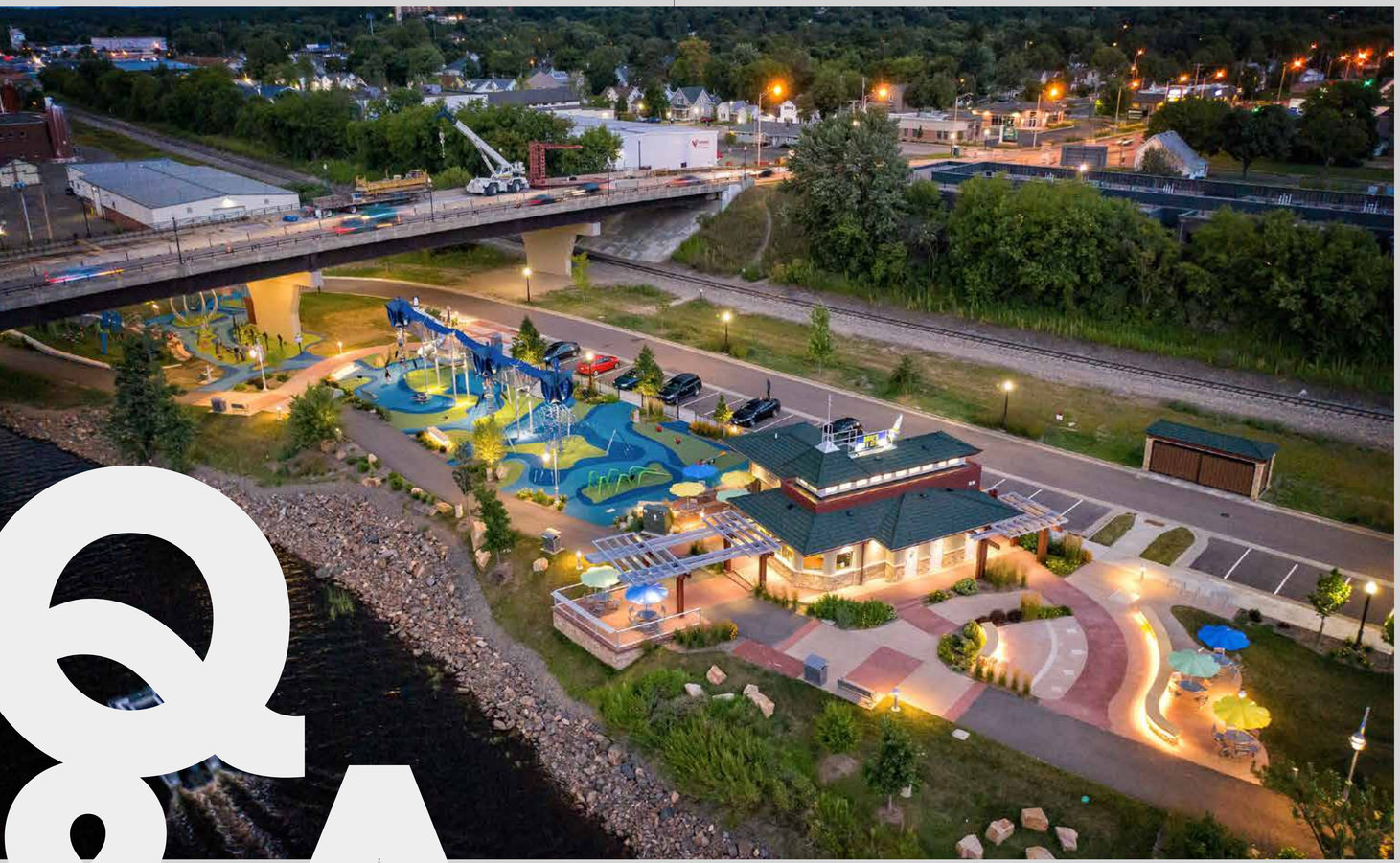
IN THIS ISSUE:
NEW DESIGN ESSENTIALS

Pandemic, lockdown, and remote work have given many of us pause to consider what really matters. Emerging from this collective experience, we see the basics in a different light.

The places society relies on—schools, labs, offices, hospitals, factories, power plants—are as essential as ever. But, seen from a design perspective, they are evolving to serve a broader purpose. We may have newfound understanding of how important they are, but we expect more from them than ever.

Today, we expect the workplace to inspire us to innovate. Our education spaces must connect to culture and create community. We desire health centers that humanize the treatment experience. We want a reliable supply chain. In this issue, we consider how design can refocus and contribute to defining the new essentials for living well.

Wausau East Riverfront Development
Wausau, WI
Stantec / HAF Architects



ASK AN EXPERT:

How does grant writing turn dream projects into realities?

Designing and engineering a new building, retrofitting a campus for sustainability, upgrading a community's resilience to deal with extreme weather—what do these projects have in common? Until they get funding, they are just plans.

In North America, government grants offer significant funding for building projects. Identifying these programs and applying for them successfully is not easy, which is where Stantec's North America Funding Program's grant services come in. **Nerys Parry** co-leads Stantec's funding program efforts with three other funding leads, working closely with our technical team members to match funding opportunities with our clients' prospective projects. We wanted to learn more about how she and her team help clients realize their goals.

INTERVIEW BY JOHN DUGAN

Why are clients coming to us for grant writing?

NERYS PARRY: Clients need financial support to move their projects forward. Grant proposals are increasingly competitive and complex. We can tap our technical expertise in Canada and the US and connect those technical teams with our clients. Our grant writers keep track of the various government mandates in the applications and match them to our client projects. They know how to write an application to the federal, provincial, or state objectives so that the grantor understands how funding the project supports the grantor's broader goals.

What kind of help do our clients need with grants?

NP: It can be any number of things. A client may have been previously unsuccessful in receiving funding and they want us to review and strengthen an application in a subsequent round. Sometimes our clients are just short of people and resources and need to outsource this work.

As well, in the United States and Canada, we're seeing some highly technical submissions required in funding applications. A lot of our clients simply don't have the technical capacity to complete the given application. They need the right level of technical project knowledge to secure real funding. We see that often, particularly over the last couple of years with energy transition and decarbonization becoming important corporate/institutional goals while the technology necessary to achieve goals is evolving at an astronomical rate. So, we can fill that expertise gap for a client because our technical teams have the knowledge to get these applications across the finish line.

How do grant services clients find us?

NP: They come to us in different ways. Our team might be approached internally because an existing client needs funding and wants advice on creating a funding strategy for a new project. Or we might approach a potential client about helping them secure funding to show them the comprehensive services we offer and build a relationship from that trusted advisor position.

Are we hired for grants specifically?

NP: Funding strategies and grant writing are sometimes included in our master services agreements, so that we can come in and out of projects as needed, provide early advice, and help shape strategy depending on how the funding comes through. For buildings projects, we often provide grant writing services as an additional service for a fixed fee.

Wausau East Riverfront Development
Wausau, WI
Stantec / HAF Architects

Stantec's brownfield team helped the City of Wausau obtain more than $2.5 million in federal and state funding to remediate and redevelop 31 acres of vacant and contaminated riverfront parcels. Sources of funding included an Environmental Protection Agency (EPA) area-wide planning grant, two EPA clean-up grants, and numerous public and private grants and contributions. Stantec's team of urban planners, landscape architects, engineers, and scientists worked with the city to implement public improvements for more than 2,200 feet of Wisconsin River shoreline—laying the groundwork for RiverLife Park, a new regional recreation, entertainment, commercial, and residential waterfront destination.

Regional Municipality of Wood Buffalo Transit Facility - Green Transit Incentive Program
Fort McMurray, AB

But we're very flexible, we will work however the client wants to work. We can provide funding support throughout the life of a project alongside our technical experts, which is our favorite way to work with funders and clients. This is because a client may be exploring a multitude of types of technical solutions to a problem, but if funding is available for a subset of these solutions, it may be advantageous to pursue one over another.

How early does this happen?

NP: We can be brought in before project inception to help clients conceive what type of projects might be more attractive and more eligible for funding. We look at the details and make them aware of criteria or unique requirements such as partnering that can make or break their funding. There might be a competitive factor we can highlight early in the project so that the client views the project from the funder's perspective and understands how their decisions will affect access to potential funds.

There are also emerging opportunities for us to create projects with our clients around the grants the government offers, particularly those targeting innovative solutions in green technology.

What is our role in preparing the grant proposal?

NP: It varies based on the client and their budget. If a client needs us to provide some feedback and comments to strengthen an application, we can do that. Some clients say, 'Here's the portal, off you go, handle our submission. We trust you to do the whole thing.' If we already have done a feasibility study and have the specs, that makes sense.

How about schedule?

NP: We also advise clients on which grants are oversubscribed or where there is a large backlog of projects. We can alert them if a particular funder is not that quick, which could affect their project timelines. Government does not run on the same timelines that our industrial clients run on, for instance, and this can impact procurement schedules.

What sort of buckets does funding come from? Are they targeting climate risk?

NP: Yes, in Canada, decarbonization and sustainability are top funding priorities across many funds. And we're starting to see this come out in the States now too.

The government thinks about key targets. Across the spectrum, I'd say the number one right now is climate. The projects our funding team looks at regularly have a greenhouse gas component, especially in the buildings or heavy industry realm. Innovation, particularly for "clean tech," is another large target for grants.

Some other top trends include economic justice or equity. The U.S. takes a place-based approach to justice and equity, awarding grants to communities most in need with disadvantaged populations. In Canada, it's more about Indigenous reconciliation and creating rural opportunities so people can work where they live. Affordability, of housing and lifestyle, is a big one where we see the funds being targeted by government.

In Canada, we're seeing effort put into industries identified as key to economic recovery and growth. For example, there's a big focus on critical mineral strategy emerging in Canada. And we're seeing efforts aimed at giving high emitters in heavy industry a leg up so they can move forward with decarbonization

plans. We see funding for exploring hydrogen and small modular nuclear reactors as well as carbon capture and storage technologies. Those are the technologies in which Canada and certain provinces are investing.

So, these grants are often driven by the government's plans for economic development?

NP: Canada wants to be number one in clean tech, which means technology that helps reduce greenhouse gas emissions and the impacts of climate change. The technology is constantly evolving. So, when we're advising clients on funding matters, we're working with our climate team and integrated design team members who really understand the technical aspects and concerns.

The government funding often targets innovative technologies, energy transitions, and large demonstration projects to bring these technologies to the commercialization stage in Canada. They're funding projects that can prove that these technologies are economically feasible. The idea underpinning this is that we can sell the technology globally.

Big picture items are what drive funding. Our team members need to know the intricacies and details of the funds and the caches that are available, as well as the applicability to clients. We support the client and our design teams in positioning their project, so it connects with the broader goal and ambitions of the government.

Can you share some examples of projects you've helped to fund?

NP: Northern Canada is severely impacted by climate change. The town of Hay River was experiencing flooding issues and the Indigenous community was particularly affected. Our team helped the community apply for Infrastructure Canada's Disaster Mitigation and Adaptation Fund. If successful, our team will make road and berm improvements that will safeguard the community for years to come.

We helped a First Nation startup secure capacity funding under the Smart Renewable Electrification Pathways Program. With this funding, they're developing an Indigenous-focused approach to bringing technology to market that ties into the government's low carbon goals.

On the buildings side, we've helped a client access funding from the Canadian federal government through the Green & Inclusive Community Buildings Program. The GICB is a five-year program supporting "green and accessible retrofits, repairs or upgrades of existing public community buildings and the construction of new publicly-accessible community buildings that serve high-needs, underserved communities across Canada."

BRIDGING THE *FUNDING GAP.*

BY AILSA MCCULLOCH

In 2019, the Global Infrastructure Hub estimated that the world faced a **$15 trillion gap between projected investment and the amount needed to provide adequate global infrastructure by 2040.** In 2021, the American Society of Civil Engineers expressed its concern over a looming $2.6 trillion infrastructure investment gap for the U.S. over ten years. Estimates for Canada's infrastructure deficit vary widely, but as of 2017, most fell within the range of $110 to $270 billion.

In the U.S. and Canada, government has responded with new funding initiatives. In the U.S., the passage of the bipartisan Infrastructure Investment and Jobs Act provides for investment in roads, bridges and trains as well as resiliency, broadband, access, and clean drinking water. The CHIPS and Science Act (CHIPS) invests in revitalizing America's advanced manufacturing, research, and net zero carbon industries. While the Inflation Reduction Act (IRA) boosts the clean energy sector. Together the IIJCA, CHIPS and the IRA authorized more than $1.5 trillion funding for projects over the next decade, with much of that 2023-2027.

In Canada, the federal government has gradually increased investments in infrastructure and launched targeted initiatives such as the creation of the Canada Infrastructure Bank. The CIB and the Strategic Innovation Fund Net Zero Accelerator support private sector investment in infrastructure and the economy, accelerating decarbonization, and reshoring of key industries. As a result, we are seeing unprecedented levels of federal and provincial funding. Many funding initiatives launched in 2021 received new funding in 2022 and are becoming more robust and accessible.

The result of these funding efforts is that our clients have a golden opportunity to access funds they can invest in the infrastructure their communities sorely need.

Wausau East Riverfront Development *Wausau, WI*

Do you get a lot of satisfaction from this, helping people get projects funded?

NP: I like the dreamers, right? I love the visioning. I get to meet a lot of people who push dreams forward. They may not even have a piece of paper with a plan on it, but they have a vision and passion. For me, the joy is working with people who see a way to solve a problem—who see that problem as an opportunity.

It's a big challenge. It's exciting. I see clients when they're often most frustrated and can't figure out a way to get started and move that needle. Then together with our technical colleagues we help them strategize and target the funding that makes their dreams real. When I see them realize there's a path forward for their passion projects that makes me happy. It's incredibly satisfying.

Northern Alberta Institute of Technology Productivity and Innovation Centre Funding Proposal *Edmonton, AB*

With Stantec's help, NAIT submitted a funding proposal for $35 million from the Post-Secondary Institutions Strategic Investment Fund (SIF) to help with funding for the new legacy building. The proposed Productivity & Innovation Centre will enhance training at a higher capacity in areas critical to industry, providing world class education and skill development. The proposed building is planned to use 60% less energy than a comparable NAIT legacy building.

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MORE GRANTS

Ottawa, ON-based **Nerys Parry** provides strategic advice on federal policy implications, government spending plans, and funding program trends.

WALKING IN TWO WORLDS

What we've learned about creating schools for Indigenous communities of the north

BY HEATHER BRETZ, JEFF MOROZ, AND SOUK XOUMPHONPHACKDY

Elizabeth Quintal School
Peerless Trout First Nation
Peerless Lake, AB

Design for education in remote areas is challenging from several perspectives. Geography, history, climate, and culture require us to bridge significant divides to design, and nowhere is the opportunity for design to contribute to the community so apparent. With a portfolio of completed schools in Indigenous communities, we've collected our thoughts on the approaches, the mindset, and the strategies that we believe result in great design.

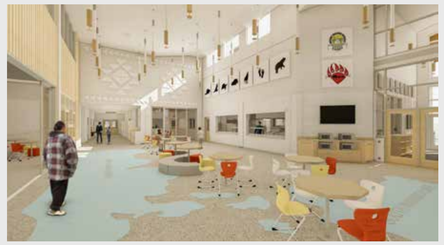
CONTEXT

You can't work on a school for Indigenous people without acknowledging the history of residential schools in Canada and the Sixties Scoop (when authorities removed Indigenous children from their families and placed them in foster homes). The influence of residential schools is not in the past. The legacy and impact of these policies cannot be overstated; they still shape the lives of generations of Indigenous people and all Canadians. As designers, it's important for us to take the Truth and Reconciliation Commission report and its findings to heart as we undertake any work for Indigenous communities, especially schools.

Chief Charles Audy Memorial School
Wuskwi Sipihk First Nation, Birch River, MB

Immersive experiences

When working with the community to design **Bigstone Cree Nation High School**, shown below, and other schools for Indigenous communities, we utilize immersive three-dimensional experiences to elicit real-time feedback.



RIPPLE EFFECTS

In most small towns, the arrival of a new school building is a significant event. This is true for remote Indigenous communities, too. We approach these buildings as schools, but also as community centers. Often, they are the only multipurpose public buildings in the area and must serve many functions. They require large cafeterias and kitchens to allow for various after-hours gatherings and community events where food figures prominently. Resiliency and survivability features are a must, as well as design solutions responding to government guidelines for weathering extreme climates. Schools also serve as critical gathering spaces in times of crisis.

WHAT'S AT STAKE

Collaborating with Indigenous communities, there is often more at stake in a new school project. Many communities have been waiting for a new school for years. A new school is an opportunity to express pride and sense of identity, invigorate traditions, and even stimulate the local economy. So, it is incredibly important to listen closely and get the design right.

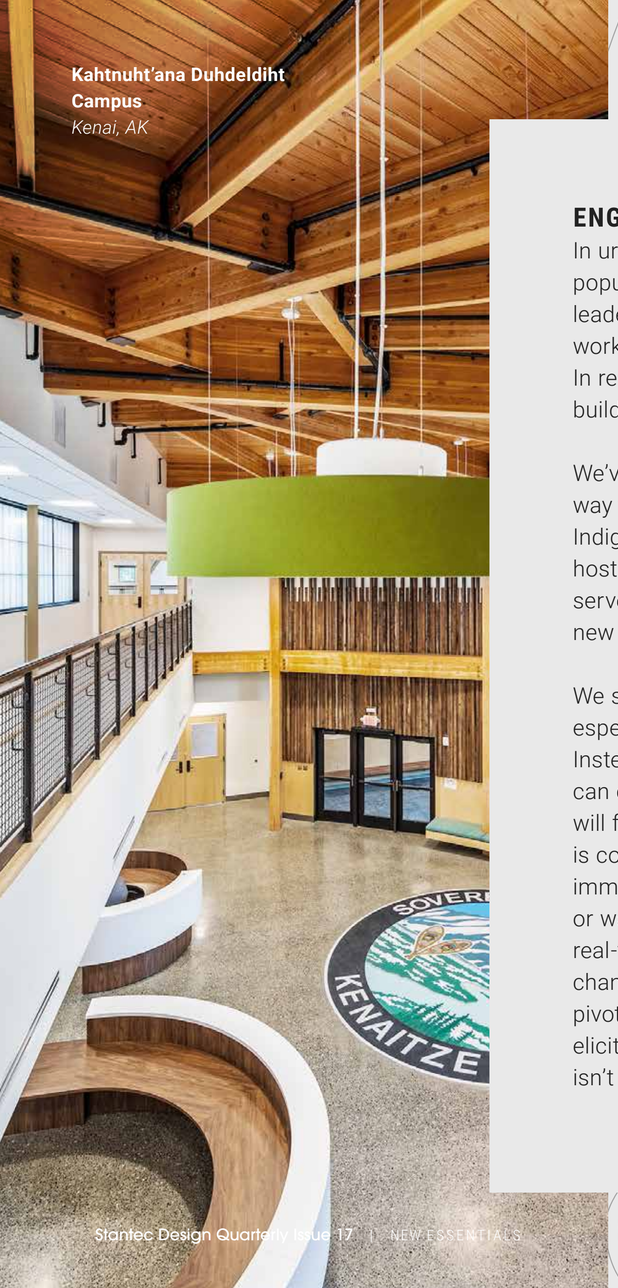
LOCAL ECONOMIC DRIVER

A new school can be an economic driver for remote communities. We strive to source materials, such as ground material that can be crushed locally. And we encourage the successful general contractor to utilize as much local labor as possible by connecting with the local trades, sharing their capabilities and facilitating onsite training opportunities. If certain trades are particularly robust in that community, we work to maximize their opportunity to contribute to the project.

LISTENING

To set the stage for an open and fruitful collaborative dialogue with the community, we need to build trust. To build that trust and establish a new level of comfort with our team, we must be highly conscientious about how we engage.

Building that relationship and trust starts with listening. The process of working with Indigenous communities moves slowly compared a more linear engagement process we would apply in urban areas. It requires us to listen, to circle back, and make sure that we've heard correctly before moving forward. It's about listening and respecting what we've heard, pursuing some threads and tangents that are brought forth in discussions, rather than following a strict timeline driven by project management.



Kahtnuht'ana Duhdeldiht Campus
Kenai, AK

ENGAGEMENT ACTIVE, SENSE OF OWNERSHIP

In urban areas composed of primarily non-Indigenous populations we might combine workshops with the leadership of the educational institution with some workshops with the students and principals of the schools. In remote Indigenous communities, with listening and trust building in mind, we engage somewhat differently.

We've found that events like social dinners are a great way to build relationships and get the conversation on Indigenous schools flowing. Working with our partners, we host community-wide events where traditional foods are served—moose stew and Bannock at a kick-off event for a new school for Bigstone Cree Nation, for example.

We steer clear of floor plans which can be alienating, especially in places where new buildings are rare. Instead, we strive for an immersive experience so we can communicate to all community members what it will feel like when this school we've designed together is completely built and activated. We take them into immersive three-dimensional experiences of similar spaces or walk them through a highly developed design to elicit real-time feedback. We sometimes adapt on the fly and change how we engage to get the right level of comfort—pivoting to smaller groups of activity-based workshops to elicit feedback, for example, when a larger group exercise isn't working out.

For meaningful engagement, we start with the students. We talk with the adults. We talk with the elders. We talk with the teachers. We talk with the bus drivers. We talk with everyone. We want to get everyone's point of view. Engagement is as much about creating a sense of ownership and pride as it is harvesting ideas and goals for the design.

STUDENT INPUT

Student input is rich and often unfiltered. Once we sift through the daydream ideas like waterslides, we uncover important insights. For instance, the students have told us they wanted a bigger library, they wanted a science lab (having seen them elsewhere), and they wanted living plants in their classrooms. One student asked us if we could make the building two stories because they had never been up a set of stairs. All these ideas from young people led to new design solutions, including a larger library, an innovative science lab, living plants in the classrooms, and even a staircase leading to a cozy reading nook.

GIVING BACK

Interacting with students in the design workshops is a lot of fun. It also gives us a chance to give back to the community. We find joy in providing educational workshops in STEM and sharing our passion for architecture, interior design, and engineering.

Students of Manto Sipi Cree Nation participate in a design workshop, part of the Manitoba Schools Initiative Project featuring collaboration from the God's Lake First Nation, Manto Sipi Cree Nation, Bunibonibee Cree Nation, and Wasagamack First Nation communities.

IMPLEMENTATION AND ADVOCACY

Listening doesn't mean much if we can't translate what we are hearing into design solutions. We must execute. We strive to express what our collaborators have shared with us back to Indigenous community stakeholders in the form of design. We're advocates for their community. Our challenge is to realize their wants on a government-approved budget and timetable.

FIRST NATIONS APPROACH

First Nations differ in language, traditions, and history. It's critical to approach each nation on its own terms. Because of displacement, geography, and history, neighboring nations can have much, or little, in common.

Kingfisher Lake First Nation School
Kingfisher Lake First Nation, ON

WALK IN BOTH WORLDS

First Nations communities consistently tell us they want a space where teachers can teach their kids how to maintain a connection with their traditions. They say the younger generation wants to walk in both worlds.

EMBED AND REVIVE TRADITIONS

With these communities, we embed local traditions, that may or may not have been lost through time, into the design. The sense of identity is not something that we can infuse into a school ourselves, it is driven innately by the project stakeholders and the knowledge keepers within the community.

LAYER MEANING AND SYMBOLISM

Our designs can be the vehicles for cultural symbols which carry layers of meaning forward in the built environment. This is a means to recognize culture, customized to each nation. At Kingfisher Lake, we used iconography and colors that connect to the natural world. Elsewhere, we refer to the seven sacred animals, which is a big part of learning for a lot of First Nations across Canada.

ELDERS

Our designs can acknowledge the importance of elders as teachers in Indigenous cultures. We proposed "an elders' room" on various school projects where community members and students can connect across generations.

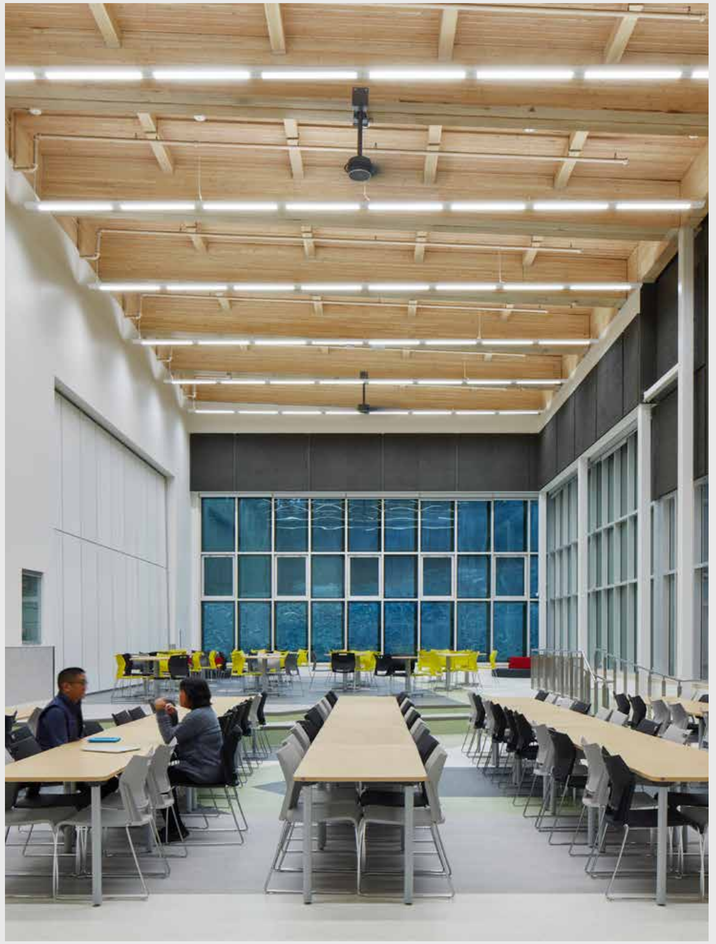
SPACE FOR BOTH TRADITIONAL AND WESTERN LEARNING

For many people in northern Canada, hunting is a way of life, even a must just to put food on the table. Hunting can also be educational. We're designing educational spaces for programs where hunting is part of the curriculum and rendered wild game is used for biology class, gifted to elders, and used as food within the school. So, we create freezers for storing wild game and provide space in the kitchen for preparing it. We're designing schools to accommodate hunting, fishing, or even building traditional Birch bark canoes. We design spaces that allow for an intermingling of Western and traditional learning to occur.

REMOTE LOCATION DEMANDS

Designing for remote locations has its own set of challenges. We often must design far beyond the property line that defines a school. Our designers are expected to know what roads are accessible or need to be built, how water and sewage tie in, and if they don't, we need to specify what roads or utilities need to be built. Sometimes we even design major upgrades of water treatment plants.

God's Lake First Nation *God's Lake Narrows, MB*



We may have to design housing and associated program elements for teachers who will be relocating to the area to teach at the new school. What will they need and expect? Whether we are designing for fly-in/fly-out communities or towns connected to the rest of Canada by hundreds of kilometers of unpaved roads, we must consider how building materials will reach the site and when construction will take place.

Designing schools for Indigenous communities in remote locations adds a new layer of responsibility and meaning to our work.

PERPETUAL LEARNING

The biggest lesson we've taken from design for Indigenous schools is about the importance of listening, building trust, and forging deep relationships (deep enough that laughter can become a feature of the design process where mistrust once existed). This process elicits powerful design that can change lives in northern communities and lessons which we can take forward and apply on our next project. DQ

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MORE EDUCATIONAL DESIGN

Based in Calgary, AB, architect Heather Bretz leads Stantec's Alberta Education team. Architect Jeff Moroz leads the K-12 Education studio in Manitoba from Stantec's Winnipeg studio. Architect Souk Xoumphonphackdy is based in Stantec's Winnipeg studio.

God's River, MB

Manto Sipi Cree Nation School

SMALL MODULAR REACTORS 101

The next generation of nuclear power will be small, nimble, and built in a factory.

BY LANCE GOODICK AND MARK GRIFFITHS

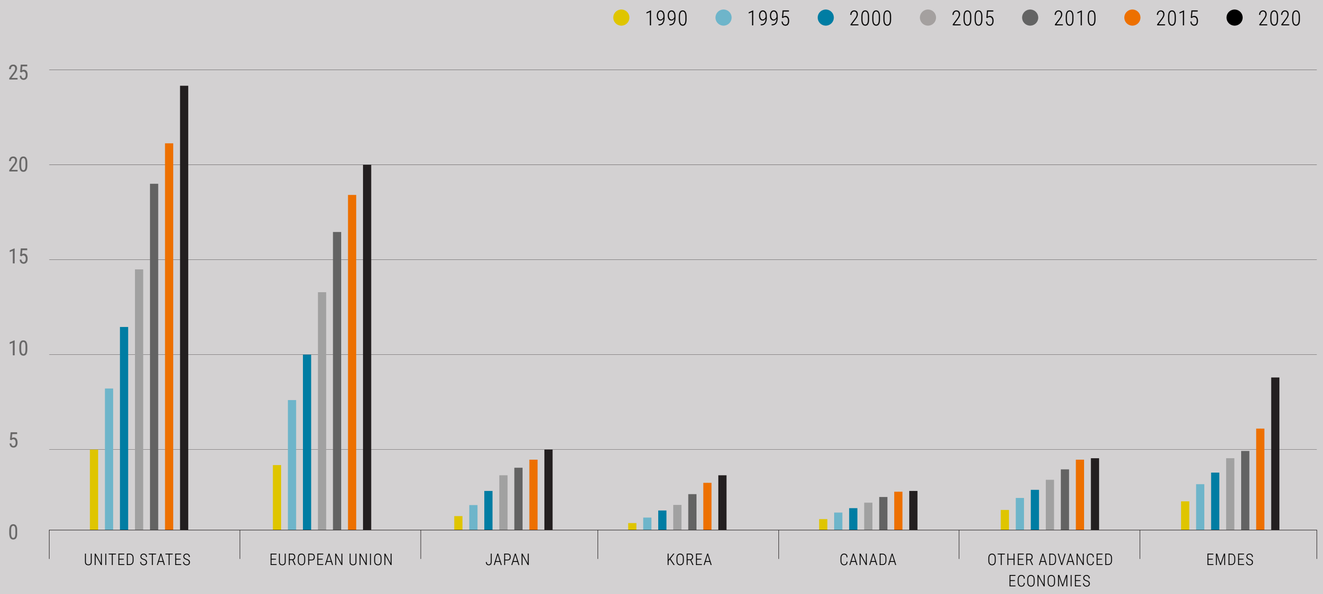
Climate change and its adverse effects are driving a global turn to renewable sources of energy and electrification. But without a drastic change in our day-to-day lifestyle, society's power needs and the human thirst for electricity will remain considerable. As we transition away from fossil fuels to ease climate change and provide a better tomorrow for future generations, the question of how to provide clean and reliable energy persists. How are we going to power a decarbonized and electrified industrialized consumer society? We must look for greener forms of generating and delivering power.

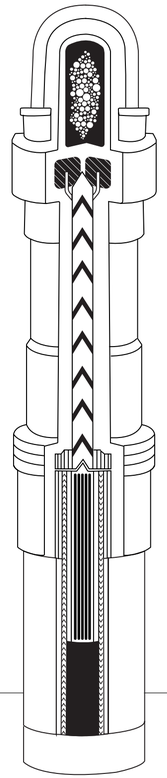
Nuclear power has a smaller carbon footprint than fossil fuels. NASA researchers calculated that nuclear generated power prevented an average of 64 gigatons of CO_2-equivalent net greenhouse gas emissions globally from 1971 to 2009. In recent years, nuclear power generation has made safety, security, technology, reliability, affordability, and adaptability advances. It has emerged as an important clean power option. Nuclear power—specifically small modular nuclear reactors (SMnRs or SMRs)—is potentially the missing puzzle piece for decarbonization in North America and Europe.

Let's dig into some key aspects of the technology.

CUMULATIVE CO_2 EMISSIONS (GIGATONS)

Gigatons of CO_2 emmisions avoided by nuclear power, organized by country or region, 1990-2020. Source: IEA.ORG





WHAT IS AN SMR?

They're small nuclear reactors.

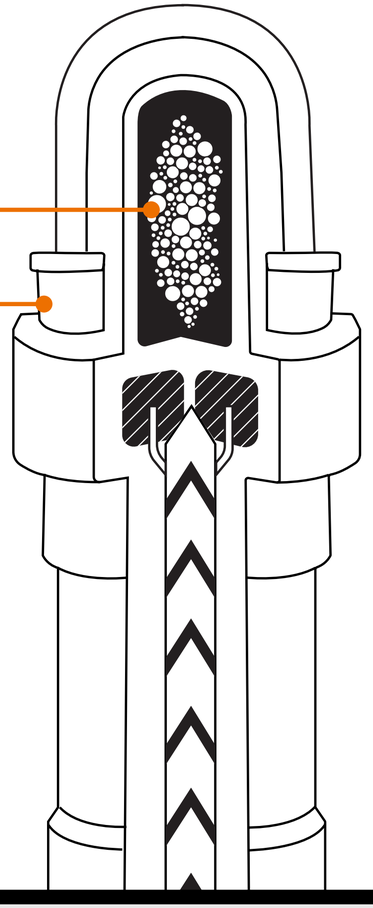
SMRs produce thermal energy, which is then converted to electricity. Relative to a massive conventional nuclear reactor, SMRs are small, starting at about the size of a typical stacked washer/dryer. SMRs are advanced nuclear fission reactors with a power capacity of up to 300 megawatts (MW) per unit. Smaller units, known as micro modular nuclear reactors, provide up to 50 MWs and can work in an off-grid setting. Compare that to a typical conventional nuclear power plant unit, which has a capacity of 580 to 1,100 MW. Traditionally, energy providers have built large nuclear power-generation facilities in remote locations with access to water and central to large urban centers, then distributed the electricity over great distances via new transmission lines. Now SMR technology providers can place SMR facilities closer to the end users.

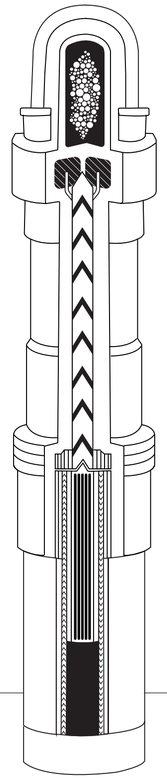
PRESSURIZER
Keeps coolant from boiling

REACTOR COOLANT PUMPS
Circulate coolant

HOW SMRS WORK

A typical SMR could be housed in a vertical containment vessel as seen here. Small Light Water Reactors (SLWR) are likely to be among the first SMRs that come online. In the reactor core, the SLWR splits atoms in a nuclear fission reaction, creating a chain reaction, releasing energy as heat. Control rods regulate the chain reaction. Reactor coolant water picks up heat from the reactor core and is pumped through a generator to create superheated steam in a second loop which drives a turbine to generate electricity.





THEY CAN BE BUILT IN A FACTORY.

Unlike conventional nuclear reactors, which are mostly enormous custom designs, SMRs make use of proven technologies and adapt them to a smaller, simpler, and lighter package. With their simplified, repeatable designs, manufacturers can develop production lines to build SMRs in large quantities. Conventional nuclear power plants take years, even decades, to plan, build, and certify. Now technology providers can fabricate and precommission SMRs offsite at an assembly plant and deliver them by traditional semi-trucks to the operational site with minimal impact on transportation corridors. Then they can place them on prefabricated foundations, plug them in, and switch them on all in a fraction of the time (potentially months) it takes to build and commission conventional nuclear power plants. While the industry is making strides, it's still too early to determine how long SMR certification will take.

STEAM GENERATOR

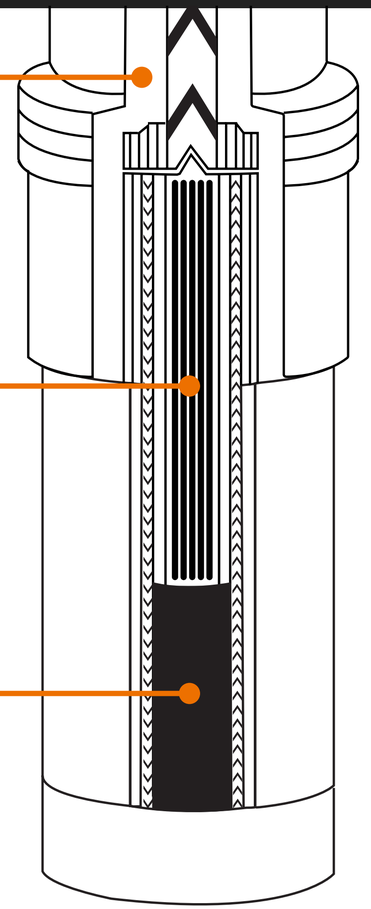
Converts water to steam to power a turbine

CONTROL RODS

Regulate the nuclear reaction

NUCLEAR CORE

Generates heat from a nuclear fission reaction



THEY'RE MODULAR, CONNECTABLE, AND SCALABLE.

Utilities can hook SMRs up to the existing grid and place them in locations where they can provide reliable 24/7 base power and service the energy demand of new and existing consumers with only minimal upgrades to existing infrastructure. Providers can add additional SMR units to increase power supply as these needs grow.

Alternatively, SMRs can connect to microgrids for industrial facilities, neighborhoods, or campuses. Because end users can place SMRs close to where they are needed, they require far less infrastructure and can be more reliable than traditional forms of power generation which require spans of thousands of kilometers of overhead power cables. Potential customers for SMR clean energy technology include power utilities, municipal governments, university campuses, research and healthcare campuses, power-intensive industries, and remote diesel generator-dependent communities.

THEY SUPPORT ENERGY TRANSITION.

Utility providers or communities can slot SMRs into brownfield sites in place of decommissioned coal-fired and natural gas-fired plants as an element in their energy transition. Vendors also envision SMR use in non-electric applications such as district heating, water desalination, green house heating, and hydrogen fuel production.

PRICE

The simplified design of SMRs will allow manufacturers to develop production lines to build SMRs at scale. This gives SMR providers repeatability in build, materials, testing, quality assurance, and assembly, thereby reducing the cost to manufacture and assemble SMRs on site. As vendors scale up their SMR production, SMRs will become more affordable.

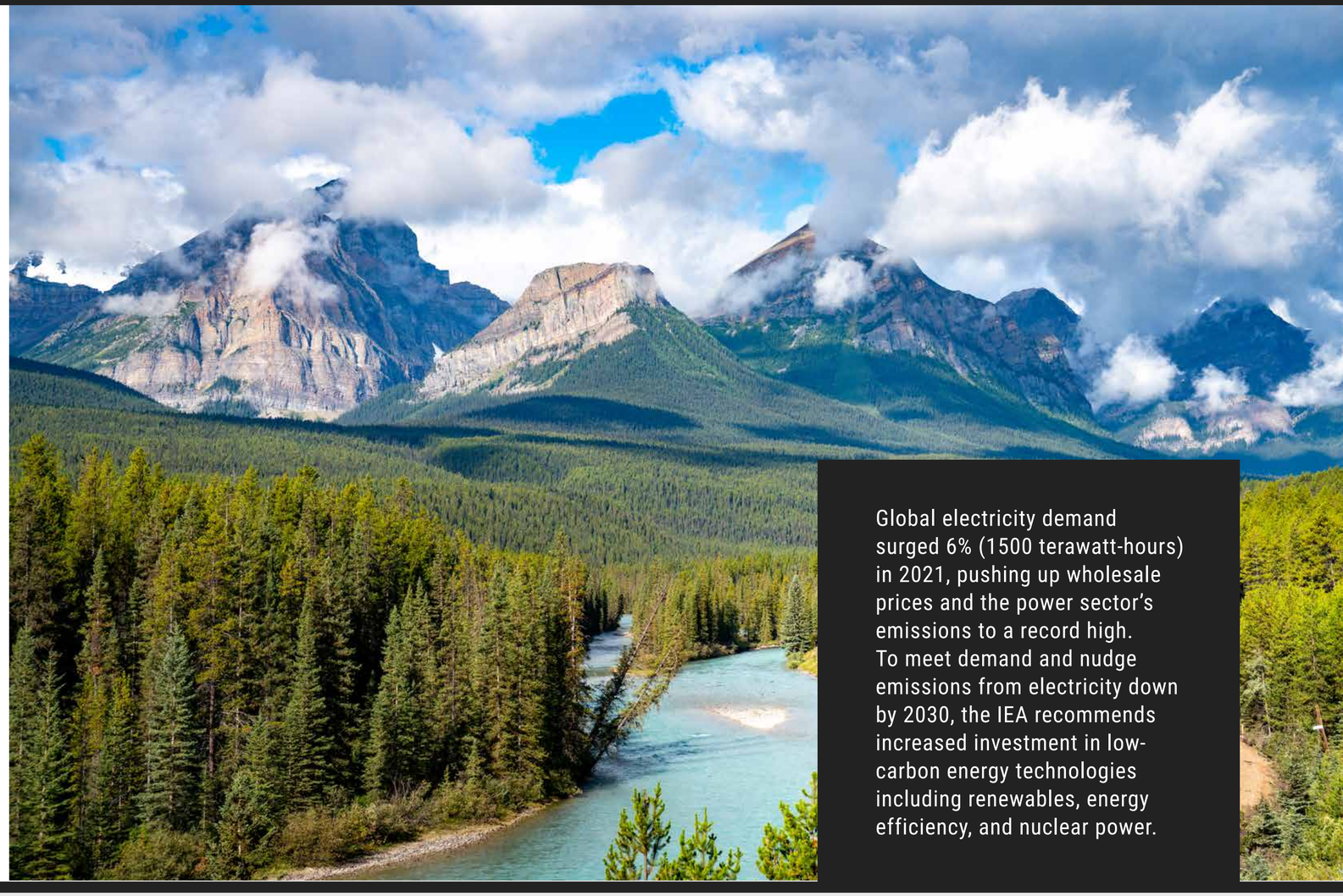
FOOTPRINT

SMRs have a small footprint, even smaller than renewables such as wind and solar, and require less investment in real estate. They are designed to fit inside and/or replace traditional coal, diesel, and natural gas plants without expansion of the overall plant footprint. They will be small enough for providers to ship in sections, in a standard shipping container or on a flatbed truck, to the site for final assembly.

WHAT KIND OF BUILDINGS ARE REQUIRED FOR SMRS?

We usually recognize the large conventional nuclear power plants we are familiar with by their massive cooling towers. SMRs have a smaller footprint, minimal staffing requirements, and a modern look. They will look more like small warehouses or industrial buildings you see along the roadside.

Whether they are servicing industrial or other large facilities with large energy requirements or connecting to a microgrid or power utilities, SMRs will be housed in buildings. SMR facilities will also require support buildings to house offices, maintenance, training facilities, as well as a water supply/treatment plants for intake and discharge.



Global electricity demand surged 6% (1500 terawatt-hours) in 2021, pushing up wholesale prices and the power sector's emissions to a record high. To meet demand and nudge emissions from electricity down by 2030, the IEA recommends increased investment in low-carbon energy technologies including renewables, energy efficiency, and nuclear power.

FUEL AND WASTE

There are dozens of SMR designs in the works, but it's likely the first to reach the market will adapt existing technology such as that of light water reactors (LWR) which use water to cool the fuel rods controlling the fission reaction. The fuel and waste streams for LWRs are well understood by regulators and most countries with nuclear power have existing systems for managing this type of spent fuel.

However, SMR vendors are developing a variety of new technologies which use more advanced fuel types and different coolant methods such as liquid metal, gas, and molten salt. SMR vendors promise that these new reactor types won't need to be refueled as frequently as conventional reactors: 5-6 years or more for SMRs versus 1-2 for traditional nuclear power plants. Researchers are refining the SMR refueling process in which spent fuel is replaced and shipped offsite to be refurbished for reuse or sent to a long-term waste repository.

The most disputed aspect of SMRs concerns their production of nuclear waste. Proponents for SMRs argue that they are designing SMR fuel to be recyclable, and that the overall volume of waste SMRs will produce is small and manageable. Critics argue that because of factors such as neutron leakage, SMRs will create more waste and more types of waste than conventional reactors and require new management streams. This remains a focus area for the industry. In order to gain acceptance, SMR vendors will need to address questions about spent fuel management to the satisfaction of the public and regulators such as the Canadian Nuclear Safety Commission. Clearly, the wide deployment of SMRs will require strict safeguards on managing nuclear waste.

PASSIVE SAFETY

SMR technology providers are designing these new reactor types with passive safety systems. In the unlikely event of an incident, passive systems allow the reactor to cool itself down without dependence on external power or water. Safety is built into the operation of the SMR, not alongside it.

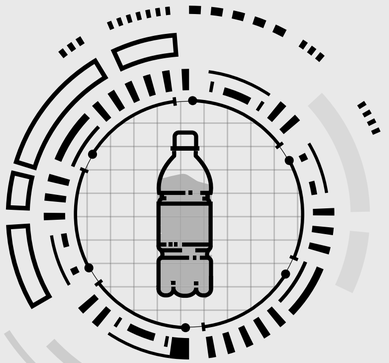
SECURITY

SMRs have numerous potential advantages regarding security. Firstly, vendors can build them in structures and facilities engineered for high resiliency and security, often below grade. And vendors can build and deliver them sealed to operate for extended periods without refueling. Alongside safety and waste management, security will be a key area of interest for regulators certifying SMRs.

ARE THEY REGULATED?

Authorities are still developing the regulatory roadmap for the deployment of SMRs as well as the criteria for licensing SMRs. The SMR market will benefit from and insist upon a clearly outlined path to licensing and regulatory review. Regulatory bodies for nuclear energy

One kilogram of uranium fuel **(roughly the size of a water bottle)** can supply 24 gigawatt hours of electricity, **that's roughly a lifetime's worth of energy for 14 people.** 24000 Mwh, or 1714 mwh per person.



in the U.S., Canada, UK, and Europe are adopting (and converging) existing nuclear regulation and oversight in partnership with the technology proponents, preparing for the arrival of SMRs. For SMR technology providers to gain licenses to produce and market SMRs, they will need to build the strictest of safety mechanisms into the SMR reactor, overall plant design/ function, fuel, and operation.

ACCEPTANCE

SMRs have the potential to play an important role in industrial, commercial, urban, rural, and residential applications as society transitions away from fossil fuels.

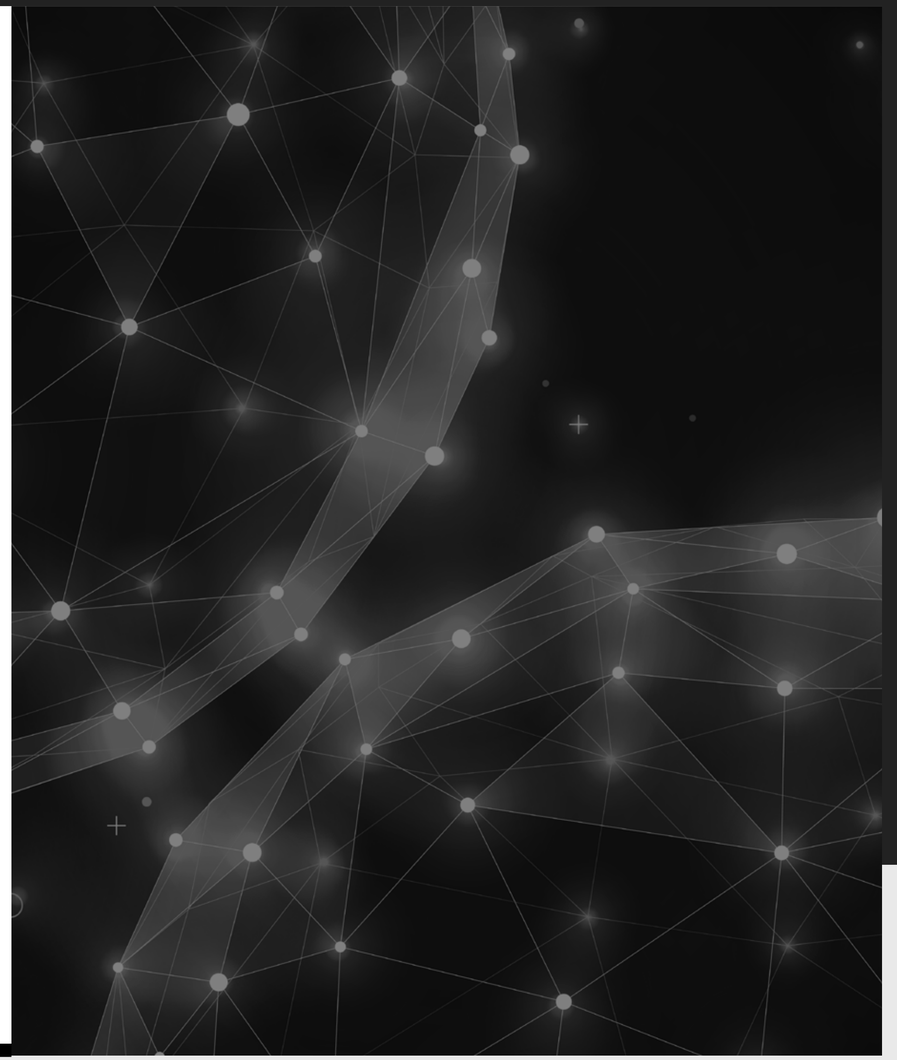
To succeed and gain acceptance with the public, government entities and private clients, however, SMR technology providers must show that they can build SMRs that are cost competitive, well-regulated, with practical and safe provisions for dealing with waste and safe in operation.

ARE SMRS AVAILABLE YET?

While no one has yet deployed SMRs for commercial energy generation, SMRs have been used by nuclear submarines for decades. There are several SMR pilot projects underway in the U.S., Europe, and Russia. And there are currently several SMR vendors seeking certification for their designs from Canadian and US agencies.

WHEN WILL THEY BE AVAILABLE?

Experts say the first commercial SMRs are likely to come online in Canada and the U.S. between 2028 and 2030.



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MORE BUILDINGS ENGINEERING

Based in Winnipeg, electrical engineer Lance Goodick led the design and construction of a new $20M+ laboratory at Canada's premier nuclear site. Energy Discipline Lead Mark Griffiths manages complex energy projects from Regina, SK.

Why innovation centers are a new office essential.

The multi-platform new normal requires deeper collaboration.

BY CHRIS MILLER

Southline (formerly The BEAT)
Boston, MA

Designers of research spaces are fond of referencing Bell Labs, the New Jersey research campus which gave us 20th Century innovations such as the laser, the transistor, fiber optics, and cellular phone technology.

The layout of its headquarters featured a massive corridor which encouraged its researchers to bump shoulders and compare notes. And Bell encouraged employees to work with the doors open to encourage knowledge sharing. They had a hunch that sharing ideas, organically, across research groups would lead to collaboration and breakthroughs. Bell Labs showed us how space could influence innovation. You can see the influence of Bell Labs in today's new research spaces which feature cafes, lounges as well as corridors that bring staff together—even the transparency at Guy's Hospital owes something to Bell Labs.

Confidential
Technology Company
Madison, WI

Microsoft
Azure East
Reston, VA

→

Smart designers create research spaces that allow for serendipity and cross disciplinary contact. In a similar way, taking a page from the tech sector, we've seen open meeting and collaboration space emerge as the new essentials for firms who want to encourage creativity, collaboration, and flexibility.

The Bell Labs lesson was about more than the environments suited to technological innovation. It speaks to how almost every business does work today. Where companies once developed physical products to be sold in storefronts, they're now planning and developing for the user experience (UX) of online commerce. Today, bringing a product to market is a data driven enterprise which requires teams working across multiple platforms and touchpoints and communicating with clients through a variety of media. The creative environments needed to meet the demands of this kind of work require a new space in the workplace: innovation centers.

What are innovation centers?

Simply put, innovation centers place people from different departments and disciplines together based on the project they are working on. The innovation center is a fluid, cross-disciplinary effort to shake up the organization. It is meant to be flexible and adaptable with tools and equipment that teams can reconfigure to meet new project needs. It's also meant to be budget-friendly, the innovation center fosters creativity without the hefty renovation costs each time it turns over for a new project.

University of Lethbridge - Science Commons
Lethbridge, AB
KPMB/Stantec Architects in association

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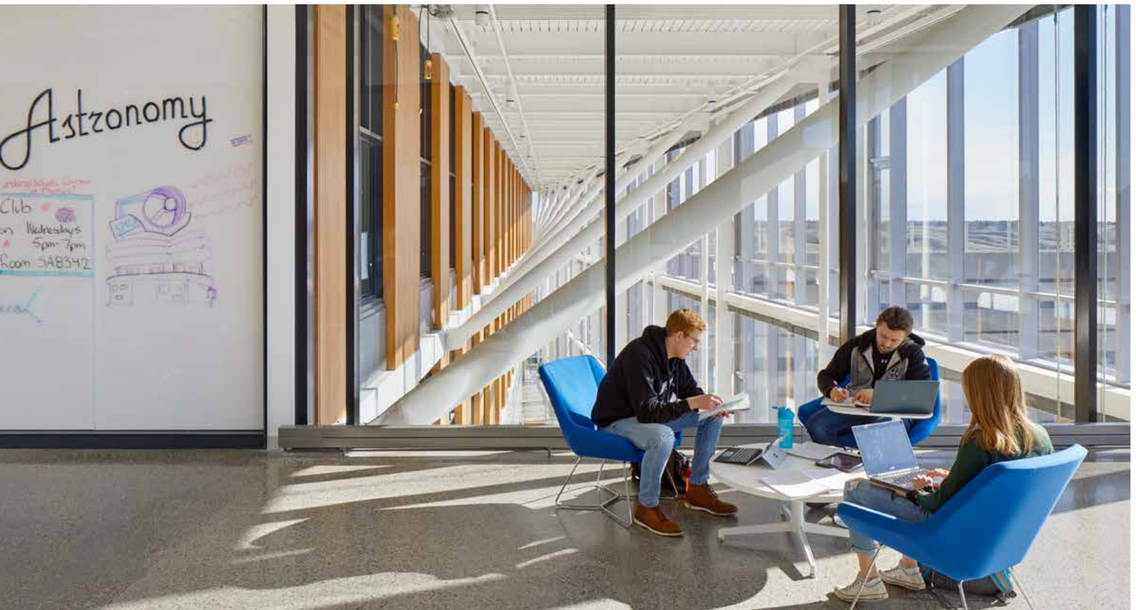

Downtown Commons Residency Lounge
Sacramento, CA

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Pre-Pandemic, the dawn of innovation centers

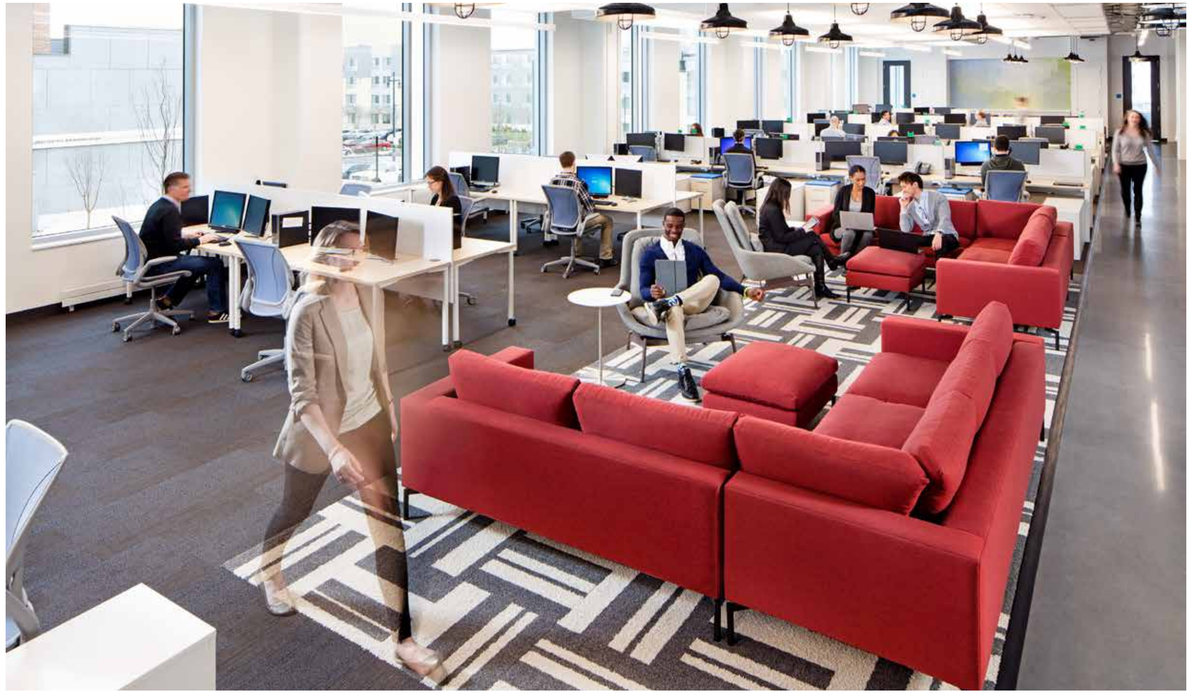
As in the Bell example, research shows that innovative ideas tend to flourish when encounters outside of normal working conditions are encouraged. Running into a colleague in the halls or heating up lunch in the communal kitchen are opportunities to build stronger bonds or exchange ideas. Companies saw this and started to create areas for collaboration to continue after meetings; a sitting nook outside of a meeting room to continue a conversation after a meeting, the whiteboard paint on walls outside of conference rooms to harness energy from a spontaneous exchange. But these approaches were limited by the silo structure most companies are organized around: departments sit together believing there is more to be gained from those who do similar work.

Firms want to do everything thing they can to set the stage for innovation, testing ideas, creating new products, finding efficiencies, and they desire spaces that do more than suggest the possibility of chance encounters. Before the pandemic, some adventurous clients were trying to excite their staff to think differently about how they work. They were moving away from departments toward team-based organization. They hoped to spark more synergy by putting groups that had not been next to each other in proximity. The idea was to break down the silos and create new relationships.

An answer to the new normal

Innovation centers answer some of the questions posed by the new normal regarding office work. Clients, especially those which have embraced the work from home hybrid as the norm, tell us they are looking for ways to encourage office use. If staff can come into the office, the frequency and duration of their presence unspecified, why do staff come in and where do they go? The answer from an innovation point of view is that they come into the office to work with a team on a specific project, usually for a specific duration and frequency.

Add this to the idea of fostering innovation by breaking up the conventional departments, and it is no wonder that encouraging workers to come back to the office has given firms the opportunity to embrace the innovation center.



Johns Hopkins Technology Ventures Incubator Space
Baltimore, MD
Stantec/Design Collective

Space for teams, scalable

A current client is asking us for advice on innovation centers because they're implementing new team-based groupings around projects. Teams of twenty are focused on implementing new offerings. This new endeavor is typical of what companies do today—pulling from various disciplines: marketing, IT, web design, user experience, accounting: all the people required to make everything work smoothly behind a digital façade or storefront.

So instead of a physical layout requiring these professionals to walk long corridors, sometimes even drive to neighboring buildings to collaborate with those in other, sometimes unfamiliar, departments, the innovation center brings the team together in a "bullpen" or team room. Innovation centers often require us to create team rooms at multiple scales because teams can vary in size. They may need team rooms for 6, 20, or 40 people, all on the same floor if possible.

The benefits

Innovation centers are intended to pay off, like Bell Labs, in various ways.

Collaboration space has become a primary feature in the workplace, but for many it can still mean walking across campus to meet. Innovation centers come with adjacent collaboration spaces. Team members can meet easily.

The frequency of those serendipitous contacts and chance conversations is increased. And team members are tuned in to each other–overhearing conversations related to the project or even unrelated topics—and able to offer solutions and skills. Ideally, this speeds up the problem-solving process and results in a better product, whatever that might be.

There's further benefit in that the team-based approach creates a group that can more easily interface with other internal groups and with third parties, collaborators, and clients. Whether it's students at a university seeking services, or a client that is having a product developed, they needn't bounce around between different department hubs and floors to uncover solutions. The innovation center becomes a one-stop location.

Upside Foods
Engineering, Production and Innovation Center
Emeryville, CA

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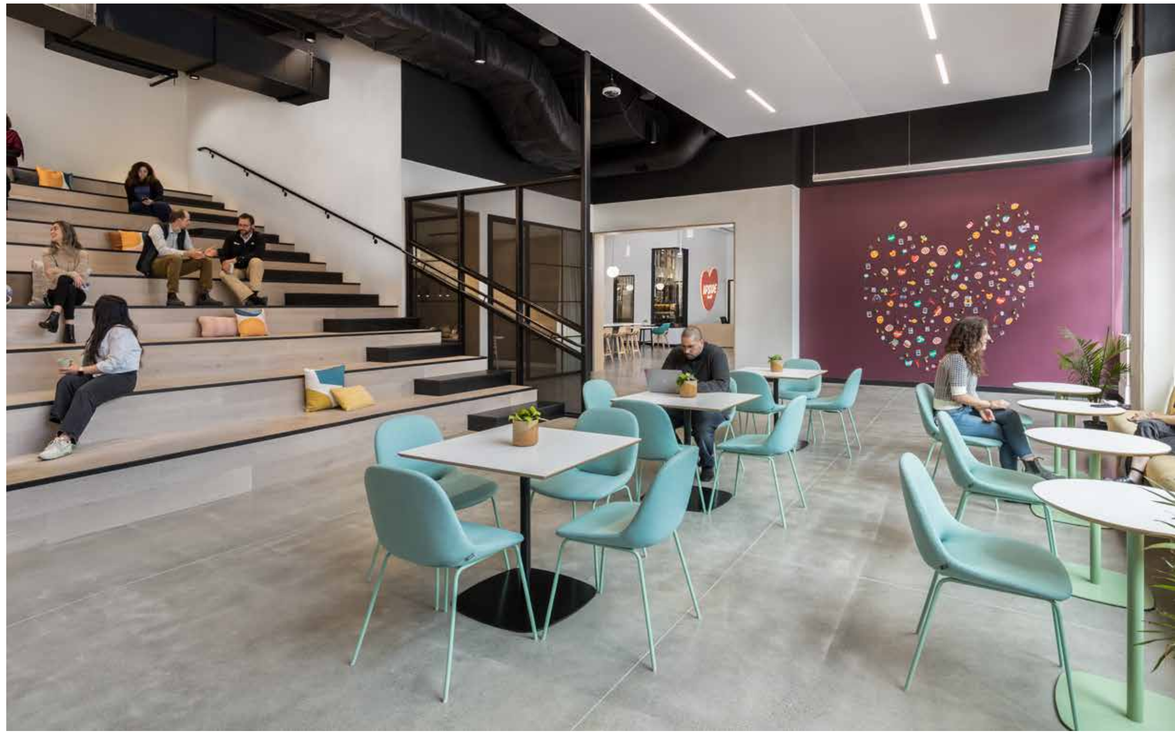

Open work spaces, usually with hot desking

The desire to put people on teams together, even temporarily, is new. But in the past, it was often hindered by permanently assigned desks. People tend to take them over, personalize them, and between personal office technology, infrastructure, and personal knickknacks relocation becomes onerous. The hot desk scenario is a key ingredient for innovation centers. Because staff members don't have an assigned desk it's much easier for a firm to assign them to a team bullpen for a specified period.

A conceptual makerspace, a blank slate

Innovation centers are akin to makerspaces. In a makerspace, the idea is to put a lot of people together in a space where they have the raw material and tools to make things as they take cues and get ideas from other people in the space. Rather than a physical prototype for a product, however, the innovation center makers might be delivering innovative processes, approaches, concepts, solutions, or digital campaigns. The tools, technology, number and size of screens, and seating available at the innovation center is relative to the industry or the team's project at hand.

Reduces internal silos

The checks and balances in a departmental organization can limit possibilities and create rivalries and tribalism. "You can't do that, we don't have the budget for it" can easily be misinterpreted. Ideally, the innovation center lets camaraderie and social connection flourish, building trust and a willingness to find solutions that satisfy collaborators.

Fosters team ownership of ideas

In theory, innovation centers let good ideas travel further. Instead of a single department presenting ideas to others who may tear it apart, with innovation centers, there's an opportunity for individuals from multiple departments to take an idea borne of casual conversations, develop it and present it as an alliance, one that has already been tested from multiple points of view.

Which industries are embracing this?

We're seeing industries such as financial services embracing the innovation center. They've already discovered that offering new products and services on the web is a complex multidisciplinary undertaking that involves the integration of user experience design and engineering, marketing vision, business and accounting perspective. In today's office, innovation isn't just for the tech industry.

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MORE WORKPLACE & OFFICE

Architect **Christopher Miller** designs for the commercial and education markets from Stantec's Philadelphia office.

↑
Johns Hopkins Technology Ventures Incubator Space
Baltimore, MD
Stantec/Design Collective

Humanizing cancer care

While technology advances, people remain central to design.

BY CATHERINE ZELIOTIS

National Center for Cancer Care and Research
Doha, QAT

In recent decades, the headlines around cancer care have centered on technological advancements in treatment and the emergence of standalone cancer centers to meet demand. Whether cancer centers are standalone or embedded in a general acute hospital, new technology, new treatments, clinical trials, and applied research are influencing the design for cancer care spaces. Design for cancer centers, which we now see stretching out to facilities of 120K SM (1.3M SF), has been about keeping pace with new technology and making sure that treatment can be accessed efficiently. Accommodating this technology requires an empathetic approach that prioritizes the human experience—that of patient, caregiver, team, and family—*at the core of the design.*

Since the cancer mortality rate for Canada peaked in 1988, it has decreased by 37% in men and 22% in women.

Source: Canadian Cancer Society

Cancer diagnosis and treatment is a stressful experience. Those seeking care and their supporting family members experience fear, anxiety, and stress. The staff is stressed, too, making retention a significant issue for cancer care providers and hospitals. By focusing on humanizing and enhancing the cancer center experience for all users we can promote well-being and comfort, while reducing stress. Starting with the entry, how do we make that welcoming, not overwhelming? We want to create a first step in the patient journey that sets the tone for the experience to come. If we reduce stress here, we are on the right track.

Inova Mather Proton Therapy Center
Fairfax, VA

Creating a journey

Cancer patients are on a journey , we must view the treatment center design from their perspective. We must balance this journey against the demands for technology and efficiency that come with cancer care, but we're always looking to create a certain level of comfort that can positively influence the patient and their family when they're most vulnerable. This can require challenging perceived efficiency solutions to create spaces that speak to the human scale. These humanizing touches are greatly appreciated and elevate a design solution from good to great.

Cleveland Clinic Taussig Cancer Center
Cleveland, OH
Stantec/William Rawn Associates

39.5% of Americans will be diagnosed with cancer at some point in their lifetime.

Source: Cancer.gov

Finding views to nature, maximizing daylighting, and natural ventilation

We want a design to provide access to views of nature, landscape, or even small pockets of green space in an urban setting to reduce stress and promote well-being. And we believe providing users with access to daylight promotes healing and comfort. In the UK, where code allows it, we promote natural ventilation and rooms with operable windows.

Creating spaces for consultation and rest

We aim to create non-clinical spaces for consultation and rest along the patient journey. At Guy's Hospital, we teamed with Rogers Stirk Harbor + Partners who designed the first Maggie's Center in the UK, a charity which provides non-clinical spaces for cancer support where patients can talk, think, and consult regarding their treatment. Thus, at Guy's and subsequent projects, we incorporated support spaces for non-clinical aspects of cancer care-consultation, which could mean access to a small terrace where a discussion with or among family members can comfortably occur. Cancer caregivers consistently ask us for spaces where they can grab ten minutes to themselves to gather their thoughts and recharge.

Making rational, agile, flexible spaces

Today healthcare is all about change, flexibility, and adaptability because health science and treatment never sit still. Through a thoughtful and future-forward design approach to cancer care buildings, we create solutions that respond to the patient experience but are also very agile. The healthcare institution must be able to reconfigure spaces as treatment and equipment evolve.

We can't design bespoke structure systems that respond only to today's needs. We must think a decade or more ahead and future proof these healthcare spaces. But just how flexible do these spaces need to be? It's important to discuss the options as a part of the design process. Does the institution want to over specify a space to ensure that it can be easily adapted in the future, that it has the services to become a treatment room? These are just a few considerations for future-ready design.

Cleveland Clinic Taussig Cancer Center
Cleveland, OH
Stantec/William Rawn Associates

New Cancer Centre at Guy's Hospital *London, UK* *Stantec/RSHP*

Once we've established a common goal for the facility's future adaptability, we build in an appropriate level of flexibility through our design approach to services (water, vacuum, gases, power, network, etc.) which account for roughly 40% of the costs for a new hospital today. How we service an area can determine how hard it will be to adapt to a new use. At Guy's, our innovative solution included modular service towers that reach every floor so that extending and adapting services to rooms as needed won't be costly or disruptive. This approach provided the high level of flexibility our client wanted.

The nature of care and community

Cancer treatment requires repeat visits that can sometimes span years. Patients and their families will return to a cancer center again and again. From this viewpoint, cancer care facilities offer a significant opportunity to make a difference in lives, by achieving a design that resonates with patients and their communities. This long-term relationship also affords designers many chances for harvesting design input from the users of the space. At both Guy's and Calgary Cancer Centre, patients joined us for design concept meetings from the word go and well into design development.

The long-term aspect of this care also allows a community to grow with camaraderie and connection. We carefully consider spaces that allow patients to connect with their peers and draw strength from shared experiences and the greater support community.

National Center for Cancer Care and Research *Doha, QAT*

Transparency and connection

Cancer centers are hubs for cancer research with staff regularly conducting clinical trials. This research aspect informs our efforts to increase cancer care visibility and accessibility. Cancer researchers want to attract patients to join their clinical trials. At Guy's Cancer Centre, we organized the hospital in five vertically stacked “villages,” each with its own distinct identity relating to a particular patient need or clinical function. We designed the villages for transparency each with its own three-story atrium, reception, waiting area, and access to the outside space. Each village has its own color that is expressed both in the interior design and in the external facade for enhanced wayfinding. The chemotherapy village includes, apart from patient areas, a research floor that focuses on breast cancer and conducts clinical trials. The research areas are clearly visible from the waiting area and village entry.

We discovered this level of transparency benefited patients, visitors, and researchers in unexpected ways. Patients were more open to trial participation and had a stronger sense they were being treated with the latest and greatest available methods because the researchers were visible to them and their families from the moment they reached reception.

The staff said rather than being hidden in the lab, they felt seen by the patients, which gave them a feeling that their research was relevant and meaningful to people. It inspired them daily. D

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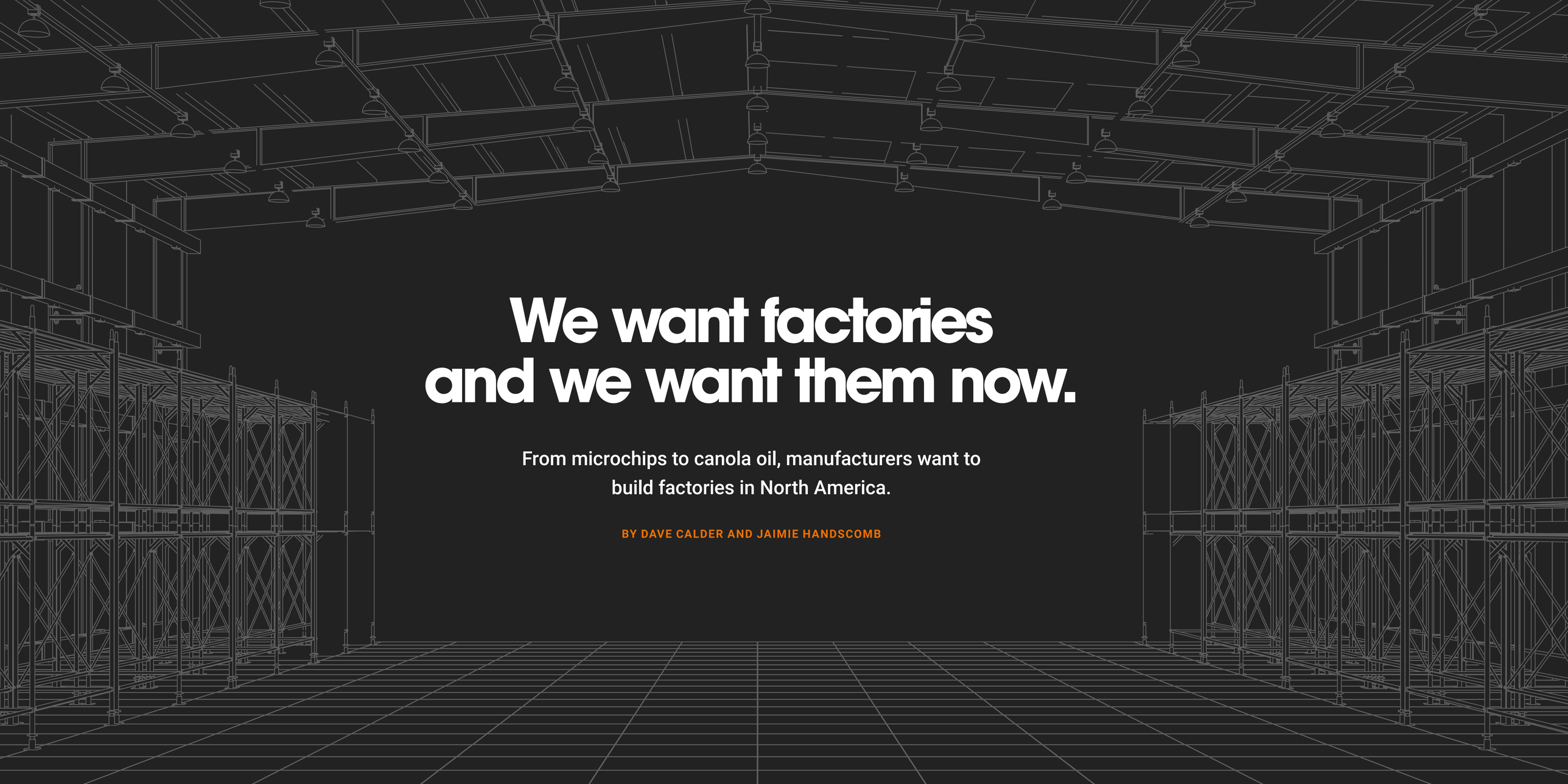
MORE CANCER CARE

Based in London, **Catherine Zeliotis** led the clinical design for the new Cancer Centre at Guy’s Hospital in London, The London Clinic Cancer Centre, Calgary Cancer Centre, and the Imaging and Cancer Center for Taussig Cancer Institute in Cleveland, Ohio.



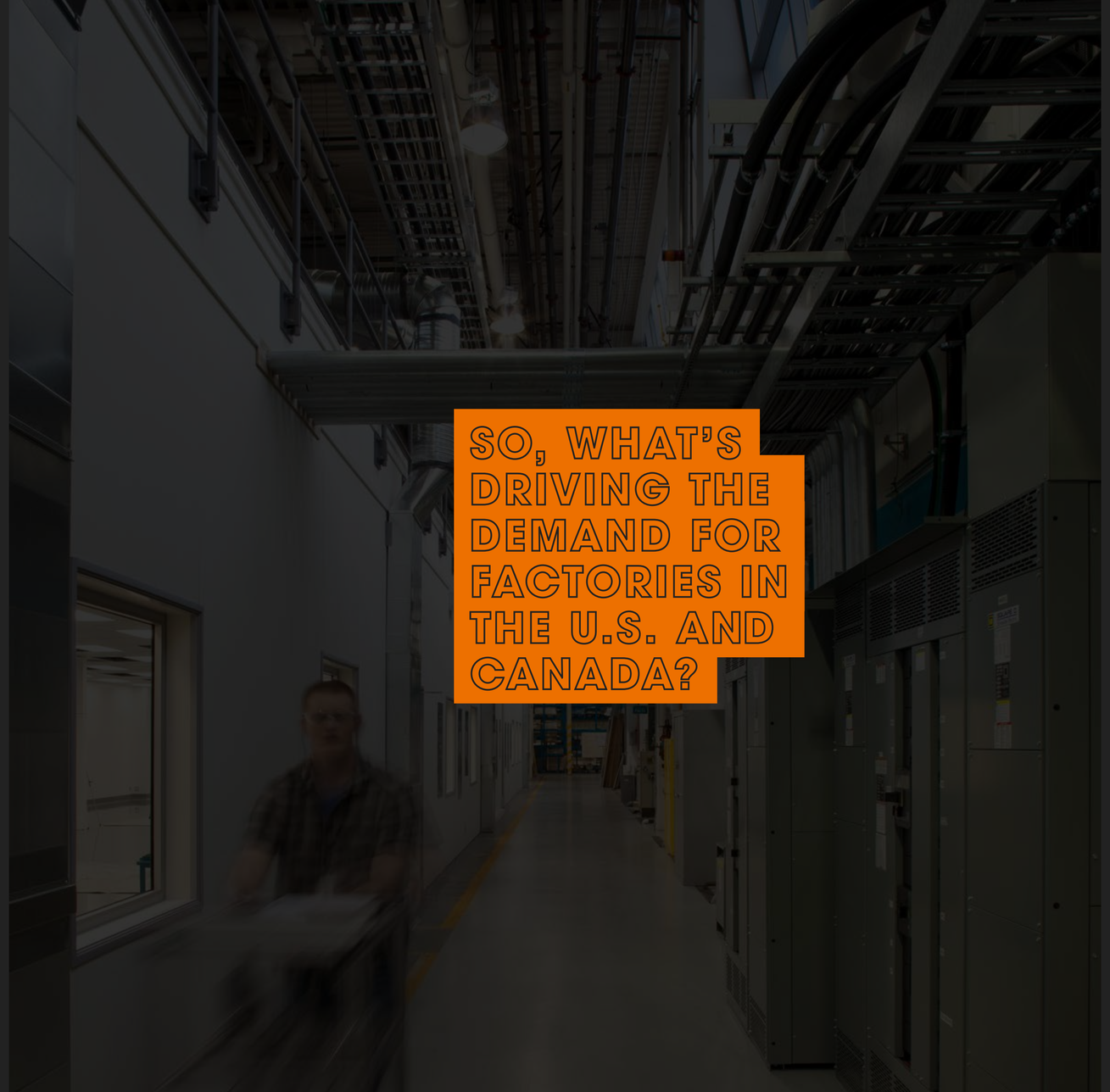
We want factories and we want them now.

From microchips to canola oil, manufacturers want to build factories in North America.

BY DAVE CALDER AND JAIMIE HANDSCOMB

Until recently, the story of manufacturing in North America has been one of decline and relocation. Many in the business community considered offshoring manufacturing to developing countries with lower labor costs a sure route to greater profits for North American brands. While absolute manufacturing output for the United States grew during the 21st century, the U.S. share of global manufacturing gross domestic product (GDP) and gross sales fell. Much has changed recently. Today, manufacturers are keen on bringing production back to North America. They want new factories, and now.

In many cases, North American companies are reshoring—bringing production back to the country where they're based or adding additional domestic manufacturing capacity.



SO, WHAT'S DRIVING THE DEMAND FOR FACTORIES IN THE U.S. AND CANADA?

Mercedes-Benz Canada - Fuel Cell Stack Manufacturing Clean Room *Burnaby, BC*

DRIVERS:

Resiliency, carbon, cost, legislation, quality control

Canola Processing Plant *Lethbridge, AB*

RESILIENCY

The COVID-19 pandemic showed society just how dependent consumers and producers are on a very global, and in some ways delicate, supply chain. The supply chain had been "optimized" and pushed to its limit by manufacturers and didn't sufficiently account for global crises. We learned that disruptions such as extreme weather, conflict, trade war, or deadly virus could bring the supply chain to a shuddering halt. For example, many people felt the shortage of semi-conductors (one tiny, but critical and ubiquitous part) when it disrupted automobile manufacturing, pushing up vehicle prices in North America.

Thus, manufacturers are increasingly looking for simpler supply chains, and in many cases that means production closer to demand, or factories that can meet customer demand without crossing oceans or even international borders.

CLIMATE CHANGE AWARENESS

Every physical product made overseas and destined for North America gets put on a ship. Those ships use oil and create carbon footprint. A simple approach for companies who want to be carbon neutral is to shrink the gap between the user of the product and where it's made. If they can make it closer to its destination, they add less to the carbon bill for that product. Lowering your carbon appetite helps meet government regulations, vendor requirements, and responds to shareholders' interests by minimizing risk.

COSTS

Shipping and logistics are not only more fragile than we realized, they have become far more expensive. Energy price volatility results in high oil prices, increasing shipping costs which hit manufacturers in their bottom line. Meanwhile the cost of labor in many developing countries is rising, making offshoring less enticing. This also means increased demand in emerging markets. Many companies aren't planning to move existing factories back to North America, but rather add new net capacity in North America.

VERTICAL INTEGRATION CYCLE

For years, there was a trend toward using an OEM (original equipment manufacturer) and putting your sticker on a product someone else produced to your specifications. Brands pushed various aspects of their process out of their building to subcontractors. But to paraphrase an industry axiom, "The only way to get your suppliers to care as much about your product as you do is to (over) pay them to or buy them outright." Right now, the cycle is swinging back toward making things in-house to achieve quality control and simplify the supply chain.

2 billion tons AMOUNT OF CO_2 WE COULD REDUCE GLOBAL EMISSIONS BY 2030 BY IMPLEMENTING INDUSTRIAL ENERGY EFFICIENCY MEASURES. SOURCE: UN INDUSTRIAL STATISTICS

LEGISLATION

Many policymakers have come around to seeing robust manufacturing as key to a resilient economy, with positive economic and social effects. Recent analysis by the McKinsey Global Institute suggests that "transforming the US manufacturing sector could boost GDP by $275 billion to $460 billion while adding up to 1.5 million jobs."

Governments are writing laws to promote more domestic manufacturing. The United States passed the CHIPS law to boost domestic manufacture of microchips and established the Supply Chain Disruptions Task Force (SCDTF) to strengthen the supply chain. Plus, the Inflation Reduction Act boosts domestic manufacturing. The government's efforts to build at home are already bearing fruit. The CHIPS funding encouraged Intel to break ground on a $20 billion factory in Ohio. While Ford, GM and others have announced new U.S. plants for the battery cells required in electric vehicles.

Canada promotes domestic manufacturing through a wide range of grants and loans to support strategic growth projects. Groups such as Canadian Manufacturers and Exporters and Ontario 360 are encouraging Canada to do more to promote manufacturing during economic recovery.

Frito-Lay Distribution Center
Rochester, NY
Stantec/William McDonough + Partners

TRENDS:

Rooftop consolidation, localization, reshoring

ROOFTOP CONSOLIDATION

Having seen how the pandemic can shut down a complex global supply chain, companies are keen to simplify. Others want less shipping for environmental reasons or to ensure they can maintain production in the face of climate shocks or shortages of energy, labor, or materials. Many conclude they need to do more under one roof and bring production back home.

LOCALIZATION

Companies aren't just reshoring, they're looking to build factories in their consumers' markets. They want both a factory in North America to serve that market and a factory in Asia to make products for consumers there. While they may have had one global factory per product in the past, they may make the same product at multiple locations with multiple suppliers in the future.

WHICH INDUSTRIES ARE RESHORING?

The pandemic reminded us about the essentials and that our resiliency to a certain extent depends on producing some things right here at home. Expect to see production of everything from ibuprofen to food staples returning to North America (toilet paper is already domestically produced, by the way). But canola oil is an example of a crop the industry grows in North America then ships elsewhere to be finished. Today, we're seeing construction of massive canola oil factories in the U.S. and Canada . Reshoring production when certain raw materials are required (natural rubber in tires, for example) will be challenging, however.

What will these factories look like?

HIGHLY AUTOMATED

Production operations are coming back to North America, but there will be fewer humans in the factory than before. Manufacturers are implementing digital technology and automation because it is highly capable and enables them to manufacture domestically at a lower cost.

Automation extends beyond manufacturing to suppliers, material handling, inventory, shipping, warehousing, and logistics. In response, we're going to see a lot more digital connectivity between factories and suppliers.

PREDICTIVE AND SENSOR-EQUIPPED

In the past, manufacturing relied on materials requisitions. For example, a manufacturer sends a request for X number of parts, and then another request for the following day based on the need for the finished product. Now, that work is automated.

Manufacturers are also using technology to control quality and keep an eye on their process, to ensure the equipment's running well and anticipate its service or replacement. While most factories are not yet highly sensor-equipped smart buildings themselves, we will see more controllers and sensors on the assembly line that can detect or predict failing conveyor belts, doors, and other components.

THE MANUFACTURING OUTLOOK

24%

ARE CONSIDERING MOVING OPERATIONS CLOSER TO END CUSTOMERS IN DIFFERENT REGIONS.

41%

WILL FURTHER ADD OR DIVERSIFY SUPPLIERS IN EXISTING MARKETS.

53%

PLAN TO ENHANCE DATA INTEGRATION FOR SUPPLY-AND-DEMAND VISIBILITY AND PLANNING.

45%

EXPECT FURTHER INCREASES IN OPERATIONAL EFFICIENCY FROM INVESTMENTS IN INDUSTRIAL INTERNET OF THINGS (IIOT) THAT CONNECT MACHINES AND AUTOMATE PROCESSES.

82%

WILL INVEST MORE IN CYBERSECURITY.

SOURCE: DELOITTE 2022 MANUFACTURING INDUSTRY OUTLOOK, SURVEY OF 500 U.S. MANUFACTURING EXECUTIVES

U.S. + CANADA MANUFACTURING

U.S.

Employed in manufacturing: **12.1 MILLION OR 9.9%**

Manufacturing value added: **$2,337,545.62 (MILLIONS)**

MVA per capita: **$7,343**

Manufactured goods share in exports: **71.9%**

Percentage of GDP: **10.8 %**

CANADA

Employed in manufacturing: **1.5 MILLION OR 9.2%**

Manufacturing value added: **$170,222.21 (MILLIONS)**

MVA per capita: **$4,347**

Manufactured goods share in exports: **63.5%**

Percentage of GDP: **9.9%**

SOURCE: STATCAN.GC.CA AND NIST.GOV

Gregg Distributors *Edmonton, AB*

Expect a high level of digital automation, control, and metrics in the factory, including artificial intelligence systems that can anticipate and coordinate factory inputs to meet demand.

HIGHLY CONNECTED AND SECURE BUILDINGS

The highly connected factory introduces new complexity into manufacturing. Cyber security is emerging as a new issue that manufacturers will need to address to maintain their resiliency. Nothing is fully safe from cyber-attacks.

POWER NEEDS

When factories have huge demand spikes that the system can't handle, manufacturers pay a penalty for their excess energy use. Because they need more power for the robotics and conveyor belts in the automated factory, they need control to manage that power. The goal is predictable power usage. Many want to be fully electric as part of a decarbonization program, which also drives up the power requirements. It will be challenging for manufacturers, especially those in energy-intensive heavy-industrial sectors, to switch to low-carbon sources. Innovation will be required to uncover new solutions that deliver low carbon and resilient solutions.

BUILDING REUSE

The high cost of commodities and construction makes building reuse for factories attractive. In evaluating a building for reuse, manufacturers are balancing priorities of location, size, orientation, and adaptability.

Look beyond the electrical and mechanical issues, and you'll find that the building structures and sizes of older buildings are often good. They have good bones. Purpose-built buildings, however, even if recent may not be flexible enough for designers to repurpose as industrial facilities. With suitable factory sites in short supply, we will see a mix of building reuse and replacements to meet demand for industrial facilities.

URGENCY

Reshoring is happening as we speak. The industrial sector has run the numbers and calculated the payback time. It wants domestic manufacturing capability, and it wants it now. D

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MORE MANUFACTURING

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