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November/December 2021

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The Infrastructure Magazine

NOVEMBER/DECEMBER 2021

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Top100
Canada's Biggest
Infrastructure Projects

View this year's Top100 Projects at top100projects.ca

For details regarding our annual celebration visit renewcanada.net/top100-projects



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GIVING INFRASTRUCTURE THE RESILIENCE IT NEEDS

By John Tenpenny

The Green Party of Canada may have fallen short in September's federal election, but the topic nearest to their hearts got lots of play on the campaign trail.

Now that the Progressive Conservatives have finally admitted that climate change exists and that it must be mitigated, we can all move on to the business of ensuring Canada's infrastructure is up to the task.

A recent report from the Canadian Institute for Climate Choices, found that climate change impacts could damage public infrastructure, while the Financial Accountability Office of Ontario (FAO) estimated nearly half of municipal assets are not in a state of good repair, pegging costs to bring those assets into a state of good repair at \$52 billion.

According to the FAO, municipal roads represented the largest share of the infrastructure backlog at \$21.1 billion, followed by 'other' buildings and facilities (\$9.5 billion), wastewater (\$7.3 billion), potable water (\$5.3 billion), and bridges and culverts (\$4.3 billion).

"Climate change is a massive threat to the public and private infrastructure that underpins Canada's prosperity," said Ryan Ness, the Canadian Institute for Climate Choice's research director, challenging governments to shift how infrastructure decisions are made so that a changing climate is a factor.

The report focused on three types of climate change impacts to infrastructure: flooding of homes and buildings, damage to roads and rails, and impacts on Canada's electricity grids. Among its findings were flood damage to these types of infrastructure could cost upwards of \$30 billion annually by the end of the century.

"As Canada wakes up to the reality of a rapidly changing climate, there's

no better or more urgently needed investment than in climate-resilient infrastructure that helps us reduce carbon emissions," stated the report.

Investments in clean energy technologies including renewables and nuclear energy to address climate change were also discussed during the election campaign. According to the panelists of a recent ReNew Canada INFRAIntelligence discussion, as an energy-dense, carbon-free, and reliable energy source available around the clock, nuclear energy can play an integral role in fighting climate change. (See our article on page 12.)

As Canada looks forward to building a decarbonized future, how we can meet that need is with more clean power, says Michael Powell, vice president of government relations for the Canadian Electricity Association.

"The commitment that was put forward will probably need two to three times the amount of clean power that we have, and it will have to be affordable, and it will have to be reliable."

There is no universe where Canada is going to be able to do that without having a healthy role for nuclear, he added.

Infrastructure systems are the critical lifeline of social and economic activity, connecting communities, industries, and markets and providing the essential services that underlie daily life. Investment in public infrastructure, particularly investments that make it resilient to the effects of climate change, will be crucial as Canada heads towards a zero emissions future. 🍁

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actualmedia

ReNew Canada is published
six times a year by Actual Media Inc.

actualmedia.ca

150 Eglinton Ave. E, #806, Toronto, ON M4P 1E8

Phone: 416-444-5842

Subscription/customer services: 416-444-5842 ext. 1

ReNew Canada subscriptions are
available for \$39.95/year or \$64.95/two years
and include the annual Top100 Projects report.

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Printed in Canada

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Undeliverable mail return to:
150 Eglinton Ave. E, #806, Toronto, ON M4P 1E8

Canadian Publications Mail
Product Sales Agreement 40854046
ISSN 1715-6734

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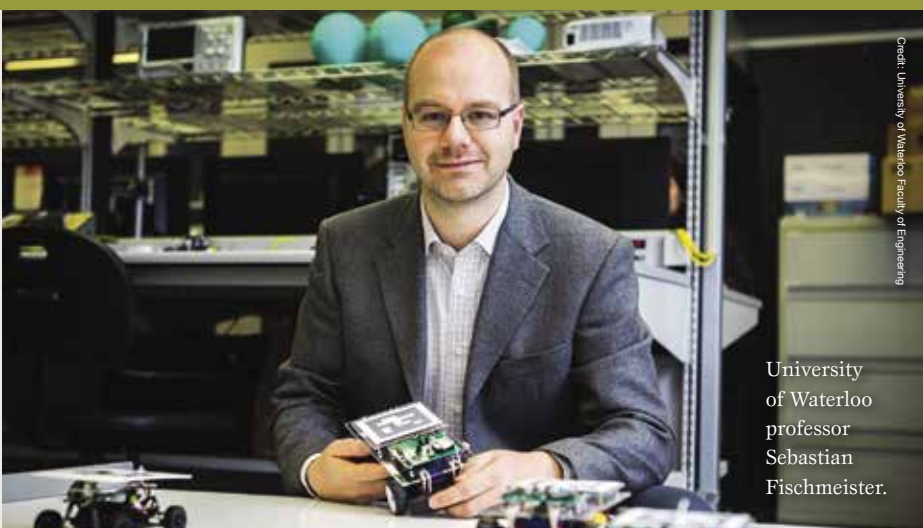
ReNew Canada

Bruce Power workers inspect a low-pressure turbine rotor using ultraviolet light and specialized tooling at the Bruce B generating station.

To read our article on Canada's nuclear future, see page 12.

Cover Photo: Riley Smalling/Bruce Power

PROTECTING CANADA'S ENERGY INFRASTRUCTURE FROM CYBER THREATS



Credit: University of Waterloo Faculty of Engineering

University of Waterloo professor Sebastian Fischmeister.

Natural Resources Canada announced \$407,000 in funding for the University of Waterloo to develop an enhanced cyber security system to protect Canada's critical energy infrastructure.

Sebastian Fischmeister, a professor of electrical and computer engineering, heads a six-member team developing the hardware assurance system that detects compromised parts and devices, ensuring the safety and reliability of Canada's energy delivery by mitigating risks in its supply chain.

"In today's world of connected safety-critical systems, it's no longer enough to deliver just safe systems; systems must now be safe and secure," said Fischmeister.

"As a part of a comprehensive research agenda on safety and security in my group, this project creates and tests new technology to mitigate security threats in the supply chain when sourcing parts and systems out of region."

Bruce Power will provide equipment, evaluate machine learning processes, and evaluate the overall performance of the new system, while Palitronica Inc., part of University of Waterloo's innovation ecosystem, will provide hardware sensors to enable the technology development.

The University of Waterloo and Bruce Power also contributed to the project, bringing the total investment to over \$830,000. 🍁

NEXT ISSUE: JANUARY/FEBRUARY THE TOP100 PROJECTS ISSUE

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A new eight-lane immersed-tube tunnel will replace the George Massey Tunnel on B.C.'s Highway 99.

TUBE TUNNEL TO REPLACE GEORGE MASSEY TUNNEL

A new eight-lane immersed-tube tunnel will replace the George Massey Tunnel on Highway 99, providing people a toll-free crossing that aligns with regional interests and improves transit, cycling and walking connections across the Fraser River.

The announcement for the tunnel replacement comes almost four years after NDP Premier John Horgan scrapped the previous B.C. Liberal government's 10-lane, \$3.5 billion toll bridge.

The new eight-lane tunnel will be in operation in 2030, with the cost estimated at \$4.15 billion. Two of the eight lanes will be dedicated for bus rapid transit, and there will be separated pathways for cyclists and pedestrians. In the interim, the province has started work to reduce traffic congestion by launching projects to improve transit and cycling infrastructure along the Highway 99 corridor and replace the Steveston Interchange.

Two options were presented in the business case—an eight-lane tunnel and eight-lane bridge. Both options were given serious consideration. The tunnel was chosen as the best option, because it:

- Best meets regional vision/interests, as endorsed by the Metro Vancouver Board.
- Limits any new visual, noise, shading and lighting impacts over the life of the structure.
- Has the fewest impacts to agricultural land and will not introduce new navigational restrictions to the Fraser River.
- Allows for work to start immediately on the bottleneck areas of the Highway 99 corridor.
- Best facilitates the movement of trucks and cyclists with a much lower overall elevation change.
- Provides protection from inclement weather for everyone who uses this crossing. 🍁

\$52B TO FIX ONTARIO'S PUBLIC ASSETS

A new report says almost half of municipal infrastructure needs repairs, with roads making up the largest share of the backlog.

A report from the Financial Accountability Office of Ontario (FAO) estimates 55 per cent of municipal assets are in a state of good repair, with the remaining 45 per cent not in a state of good repair. The current cost to bring municipal assets into a state of good repair is about \$52 billion.

According to the report, Ontario's 444 municipalities own and manage the majority of public infrastructure in the province, more than both the federal and provincial governments combined. Municipal infrastructure assets include

roads and bridges, water systems, transit, and buildings and facilities. The FAO estimates that the current replacement value (CRV) of municipal infrastructure assessed in this report was \$484 billion in 2020.

"Municipal roads represent the largest share of the infrastructure backlog at \$21.1 billion, followed by 'other' buildings and facilities (\$9.5 billion), wastewater (\$7.3 billion), potable water (\$5.3 billion), and bridges and culverts (\$4.3 billion)," stated the report.

"We have long advocated that maintaining

public infrastructure in a state of good repair is one of the most cost-effective ways to manage the lifecycle of an asset," said Nadia Todorova, executive director of the Residential and Civil Construction Alliance of Ontario (RCCAO). "Postponing necessary repairs raises the risk of service disruption and increases the costs associated with municipal infrastructure over time. Municipalities own a large portion of the infrastructure in Ontario and require proper capital investment to address its maintenance and state of good repair." 🍁

Credit: UHN



WASTEWATER ENERGY TRANSFER PROJECT

Noventa Energy Partners announced the delivery of the world's largest raw wastewater energy transfer project at Toronto Western Hospital. The \$38 million project will generate enough thermal energy using raw municipal wastewater from a sewer to supply 90 per cent of the hospital's heating and cooling requirements, reducing its carbon emissions by a quarter of a million tonnes.

"Wastewater is an untapped renewable energy source that is underutilized in North America. With the potential to supply over 350 billion kWh of low carbon thermal energy, wastewater energy transfer can be

used to heat and cool our buildings to help us meet our climate change commitments," said Dennis Fotinos, CEO of Noventa. "This is one of the first projects of this scale to use raw municipal wastewater from a sewer to provide low carbon heating and cooling to a building and serves as a testament to what can be done if we are prepared to challenge convention and reimagine energy to build a more sustainable future for all."

Noventa will use patented HUBER ThermWin technology—and its own proprietary DFSC™ process—to harvest the energy in raw municipal wastewater flowing through a sewer, to provide the

hospital with a source of clean, renewable energy. Over the next 30 years, Noventa's wastewater energy transfer technology is expected to:

- Supply 1.8 billion kWh of energy to the hospital, or approximately 90 per cent of the hospital's space heating and cooling requirements.
- Reduce the hospital's carbon dioxide emissions by 250,000 tonnes—the equivalent of taking over 1,800 cars off the road yearly.
- Save over 141 million kWh of electricity, 130 million cubic meters of natural gas, and 1.3 billion litres of cooling water. 🍁



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We are excited to be working on the Biogas Cleanup System at Metro Vancouver's Lulu Island Treatment Plant. The Lulu Island sewage treatment plant cleans surplus, untreated digester gas (or biogas) by-products and refines them into carbon-neutral renewable bio-methane for Fortis BC's natural gas grid.

The new Lulu Island plant will generate 60,000 gigajoules of biogas, enough to supply 400 homes, with a possible gas production increase to support local community growth. The plant represents a substantial new source in Fortis BC's objective to make biogas 15% of its overall supply by 2030. The project also supports Metro Vancouver's commitment to protect public health and the environment by decreasing the flaring of digester gas, reducing regional greenhouse gas emissions, and providing a sustainable energy resource.

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The Tu-Deh-Kah Geothermal project represents a \$100 million investment in the clean energy future of the Fort Nelson First Nation.

Inset: Irving LeBlanc is Assembly of First Nations' director, Housing, Infrastructure and Emergency Management.



Main image credit: BC Ministry of Energy, Mines and Low Carbon Innovation; Inset credit: AFN

INDIGENOUS INFRASTRUCTURE

Advocating for an inclusive and secure future with
AFN Director of Infrastructure, Irving LeBlanc. *By Connie Vitello*

What are the unique challenges facing Indigenous infrastructure in Canada and how have the unprecedented events of the past year helped or hindered the progress of sustainable infrastructure development for First Nations communities? ReNew Canada recently engaged Irving LeBlanc, the director of Housing, Infrastructure and Emergency Management for the Assembly of First Nations (AFN), to provide insights into upcoming infrastructure initiatives and thought leadership on policies, programs, and best practices to support successful and sustainable Indigenous infrastructure.

How has your background in engineering informed your views on Indigenous infrastructure development and how has your role changed over the years?

As one of the first few First Nations people to attain an engineering degree, my engineering education has given me the opportunity to ensure First Nations have infrastructure that is equal to or better than

that enjoyed by other Canadians. Being First Nations and a professional engineer has given me the ability to see both sides of the equation. The provision of critical infrastructure that ensures safe water and proper sanitation is a basic human right and should not be considered a budget or cost cutting exercise. There is a real need to understand the human aspects of providing these basics needs to First Nations across the country.

I have been involved in advocating for better quality of life for First Nations from a community perspective for more than 26 years. Throughout that time, I have seen that partners are now working with us to make change possible.

The unprecedented COVID-19 pandemic emphasized the infrastructure crisis in First Nations across Canada. What is your team doing to advocate for critical investments to support the needs of these communities? What are the fundamental and systemic changes needed to attain

better security in housing, infrastructure, and emergency planning?

The AFN Infrastructure Sector continues to advocate for major federal government investments in community infrastructure, as well as for federal government support for the creation of First Nations-led policies and solutions related to access to safe, clean, and reliable drinking water and adequate infrastructure. This includes urging the federal government to actively partner with First Nations to share in decision-making processes and to proactively inform First Nations of the financial information relevant to closing the First Nations infrastructure gap. The AFN has long advocated for long-term federal funding commitments and to shift the current infrastructure process to the option of a newly established Indigenous infrastructure bank.

We have also recognized the rise in the cost of construction materials for housing and infrastructure projects, due to the COVID-19 pandemic, which has



The AFN hosts annual events, such as the National Water Symposium, to bring together First Nations and industry experts to discuss priorities, share progress and identify solutions.

made infrastructure projects significantly more costly. First Nations have exercised leadership in pandemic and emergency response efforts and continue to advocate to ensure investments acknowledge the impacts of the significant rise of construction costs on First Nations due to the pandemic.

Infrastructure reform will require a new way of thinking about Operations and Maintenance (O&M) for First Nations. The current policy is outdated and was

Many Indigenous communities in Canada are in need of new and improved infrastructure, including four season roads, modernized schools, and clean energy options. What are you doing to support partnerships between First Nations communities and asset developers to increase opportunities for development?

The AFN's advocacy role includes promoting the importance of strong

that may have technology and operational solutions to their problems.

The AFN also hosts annual national gatherings to bring together First Nations and industry experts to discuss priorities, share progress and identify solutions. The AFN's Water and Wastewater Symposiums, Water Summits and Housing and Infrastructure Forums provide an opportunity for First Nations and industry to network, share and focus on solutions.

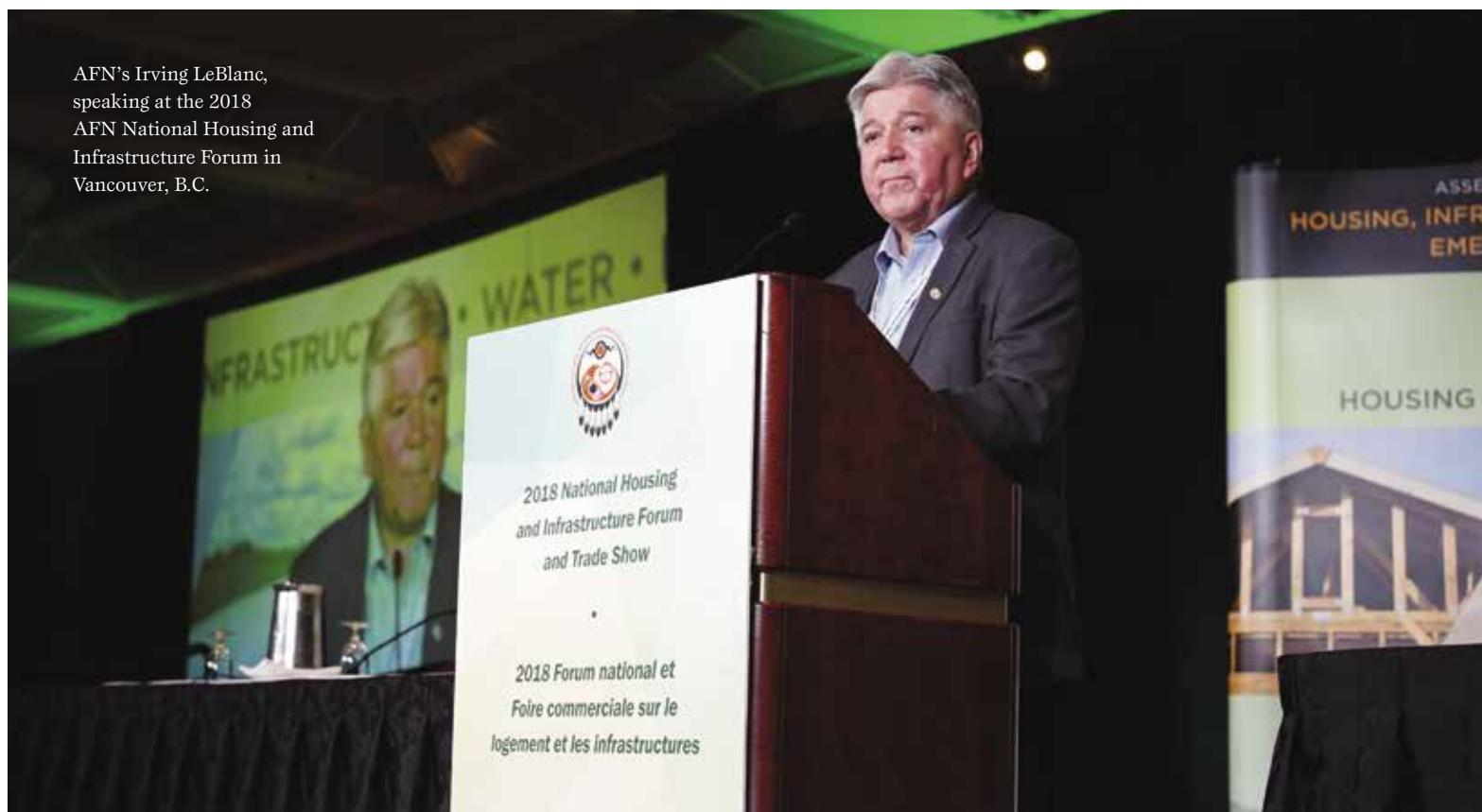
Budget 2021 provides billions of dollars to help close the gaps between Indigenous and non-Indigenous people, including the Canada Infrastructure Bank's new investment target of \$1 billion for Indigenous infrastructure projects in partnership with Indigenous Peoples for priority areas. Is this sufficient investment support and do you have an opinion as to which types of projects should be fast-tracked?

The urgent need for investment in First Nations infrastructure was recognized in Budget 2021, which invested \$6 billion over five years to support infrastructure in Indigenous communities. However, this still falls short of addressing widespread essential infrastructure needs at the

The National First Nations Infrastructure Assessment will help achieve the goal of closing the First Nations infrastructure gap by 2030.

created without First Nations input, and, as such, does not adequately address First Nations infrastructure asset repairs and maintenance costs. A fundamental change that must occur is that First Nations need to be included in federal, provincial, and territorial government program development as decision-makers, every step of the way.

relationships as a basis for any partnership or development, and this includes the implementation of the United Nations Declaration on the Rights of Indigenous Peoples which sets a framework for how we should work together. Our efforts related to infrastructure can include making connections between First Nations or First Nations organizations and industry



AFN's Irving LeBlanc, speaking at the 2018 AFN National Housing and Infrastructure Forum in Vancouver, B.C.

Credit: AFN

community-level. Experts have estimated that up to \$30 billion is needed to close the infrastructure gap.

The work of the AFN's Infrastructure Sector is directly connected to the Truth and Reconciliation Commission's Calls to Action related to health. A healthy First Nation is supported by access to clean drinking water and proper sanitation, which leads to positive health and education outcomes, and improved self-esteem and opportunities for youth. Furthermore, investments into quality communities help to further economic development.

and look forward to their continued strong leadership and action.

The promotion and investment into First Nations infrastructure initiatives are key pillars in National Chief Archibald's 100 Day Plan, specifically the goal of a Post-Pandemic Recovery Plan for First Nations in the promotion of a strong economic recovery for First Nations.

In her former role as the AFN Ontario Regional Chief and Lead on Water, RoseAnne Archibald was a tireless advocate for access to safe and clean drinking water and adequate infrastructure for all First

the spirit of recognizing self-determination, jurisdiction, Treaties and sovereignty. Canada has a long history of making decisions about First Nations without including First Nations. This has especially been true in First Nations housing where federally designed approaches have not resulted in sustainable housing or reliable infrastructure. These approaches have been detrimental to social, economic and health outcomes of First Nations.

The AFN has taken steps with federal partners towards reconciliation by working together on a strategy for fundamental reform to federal housing policy. The aim is that First Nations will control all aspects of their own housing on condition of sufficient, sustainable and multi-year federal investments.

In 2018, the AFN Chiefs-in-Assembly endorsed a resolution for the National First Nations Housing and Related Infrastructure Strategy. The Strategy was developed through a Joint Working Group with Chiefs, Regional Housing Technicians, AFN, Indigenous Services Canada (ISC), Canada Mortgage and Housing Corporation (CMHC) and Employment and Social Development Canada (ESDC). Various projects and initiatives are being implemented to advance First Nations jurisdiction over housing and while working to improve housing programs and services.

Based on an AFN-led national First Nations housing survey, work has begun on developing cost estimates of current and

The urgent need for investment in First Nations infrastructure was recognized in Budget 2021, which invested \$6B over five years to support Indigenous communities.

There has been a positive trend for female First Nations leadership. Mary Simon recently became the first Indigenous person to serve as Governor General. RoseAnne Archibald is the new national Chief of the Assembly of First Nations, becoming the first woman ever to hold the title. How do you think their influence will impact the progress of First Nations infrastructure initiatives?

I stand with many First Nations and Indigenous Peoples in celebrating both Governor General Mary Simon and National Chief RoseAnne Archibald in their new roles

Nations and I know she will continue to fight for our most basic and sacred human right, access to safe water for all First Nations.

The tragic discovery of residential school graves has led to a national conversation on reconciling mistreatment of First Nations communities and the ongoing impacts. What is the AFN doing to advocate for justice and ensure safer, more responsible housing decisions moving forward?

Reconciliation is also about new approaches and new nation-to-nation relationships in

future housing needs of First Nations that will be used in a future budget advocacy initiative.

Overall, the legacy of the *Indian Act* and colonization has created challenges for First Nations. These challenges must be addressed immediately and in the longer term as First Nations do not want to inherit the entrenched dysfunctional legacy of federal housing and infrastructure programs and services.

What milestones in First Nations infrastructure development have you been proud to help achieve and what goals are you focusing on in the short-term and long-term?

As a result of sustained advocacy, the federal government has agreed to work with the AFN and First Nations towards the co-development of a new O&M policy reform, which has been mandated by AFN Chiefs-in-Assembly through Resolution 82/2019 *Support for continuing the development of Indigenous Services Canada's (ISC) revised Operations and Maintenance Policy and full funding of First Nations operations and maintenance needs*. This was a major milestone we were proud to achieve. The current Indigenous Services Canada O&M policy for funded

assets on First Nations is outdated and was created without First Nations input, and, as such, does not adequately address First Nations infrastructure asset repairs and maintenance costs. The AFN's work on O&M policy reform is a high priority towards changing and reforming policies, and broader funding reform.

Infrastructure Canada has entered the First Nations funding area, as demonstrated by the recent announcement on the Green and Inclusive Community Buildings program, a \$15 billion program of which there is a 10 per cent carve out for Indigenous recipients. More broadly, recent program announcements by Infrastructure Canada, which can now be accessed directly by First Nations without having to go through provinces or territories, signaled a shift away from systemic discrimination in programs and policies. Further collaboration with Infrastructure Canada will inform the department of the importance of ensuring First Nations partnership in program development.

The AFN is also focused on the completion of the National First Nations Infrastructure Assessment. The assessment will gather

data, identify current First Nations assets, and prepare analysis of current and future infrastructure needs, including operations and maintenance needs, which are essential to fully protect all assets.

This work will help First Nations achieve the long-term goal of closing the First Nations infrastructure gap by 2030, which requires sustained investments into all asset categories. The AFN continues to urge the federal government to work in full partnership and engage meaningfully with First Nations on First Nations-defined infrastructure needs, and to make long-term and sustainable funding commitments to First Nations community infrastructure and asset management. 🍁



Connie Vitello is contributing editor of ReNew Canada.



Read the full version of this interview online at renewcanada.net

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HERE TO STAY

Canada's nuclear technology has a role to play in fighting climate change.

By John Tenpenny

Climate change was one of the biggest topics of discussion during the recent federal election and many believe the government should invest in clean energy technologies including renewables and nuclear energy to address the issue. As an energy-dense, carbon-free, and reliable energy source available around the clock, nuclear energy can play an integral role in fighting climate change.

Nuclear is already one of the largest producers of clean electricity around the world and in Canada, it accounts for 15 per cent of the country's electricity production.

Are there opportunities for other provinces to develop larger nuclear assets, or has the time for that opportunity already passed? Three provinces are already working on small nuclear technologies. Could others follow suit as they see the potential implementation opportunities for the technology?

During a recent INFRAIntelligence webinar, with support from PCL Construction, ReNew Canada discussed with a panel of experts the future opportunities

to develop larger nuclear assets across the country, as well as other nuclear technologies that hold out the promise of helping Canada reach its 2050 emission targets. This includes small modular reactors (SMRs), which are cheaper and more scalable than traditional nuclear reactors.

Powerhouse

According to John Gorman, president & CEO of the Canadian Nuclear Association, as a nation, Canada is doing just about everything right on the nuclear front.

That includes refurbishment of our existing capacity, as is being done at Ontario Power Generation's Darlington facility and at Bruce Power.

"Because nuclear power supplies Canada with 15 per cent of its electricity and because we know one of the most cost-effective ways to keep clean energy sources like nuclear online is to go through refurbishment, it's important to do that," says Gorman. "In the end it is going to be providing very cost-competitive electricity in Ontario well into the 2060s.

"These projects are enabling Canada to build on its proud history of nuclear operation over 60 years and of safe, reliable, clean electricity generation. It's also enabling us to do some incredible innovation."

Refurbishment is going to extend the life of the units at Bruce Power out to 2064, says Heather Kleb, director, next generation nuclear technology at Bruce Power. "We've provided emissions-free electricity for decades and this will allow us to provide emission-free electricity for many decades more."

As Canada looks forward to building a decarbonized future how we can meet that need is with more clean power, says Michael Powell, vice president of government relations for the Canadian Electricity Association.

"The commitment that was put forward will probably need two to three times the amount of clean power that we have and it will have to be affordable, and it will have to be reliable."

There is no universe where Canada is going to be able to do that without having a healthy role for nuclear, he adds.



After more than a decade, Unit 2 at OPG's Darlington Nuclear Generating Station was recently reconnected to Ontario's electricity grid.



In 2015, Bruce Power reached an agreement to advance a long-term investment program that would refurbish its nuclear fleet and secure the site's operation until 2064.

Credit: Bruce Power

“Variable sources like wind and solar are a huge benefit, but we’re going to need more of everything, and particularly we’re going to need those things that are there when you need them.”

Nuclear power is a powerhouse on that front, says Gorman. “We’re a million times more energy dense than coal for example.”

He points to one of the largest carbon reduction initiatives in the world, accomplished in Ontario when coal was

Small but mighty

One thing that has changed is people’s awareness and acknowledgement of the role that nuclear plays in climate change mitigation and that’s partly due to recent efforts to advance SMR deployment in Canada, says Kleb.

Those efforts led to a historic collaboration between Canada’s nuclear regulator, the federal government and four provinces,

(MW) of electricity or less. Much smaller than traditional nuclear reactors, they are less expensive to mass produce and easier to deploy. SMRs provide a source of safe, clean, affordable energy, while producing the density of electricity and heat needed to maximize the potential of all other energy sources. Their modular design allows for deployment in large established grids, small grids, remote off-grid communities and as an energy source for resource projects.

While much focus on SMRs has been on their ability to supply clean electricity, according to Gorman, new research points to their significant potential to cost-effectively help decarbonize Canada’s heavy industry sector.

The high-temperature heat and steam produced by SMRs can be used to cut GHG emissions in the heavy industrial sector by 18 per cent by 2050, says the report from the Canadian Nuclear Association.

“Collectively, oil sands, chemical manufacturing and mining currently contribute more than 30 per cent of Canada’s greenhouse gas emissions and face enormous challenges in reducing them,” says Gorman. “But the reality is we cannot afford to abandon these industries

I don’t think we fully appreciate the degree to which doubling or tripling the amount of electricity we produce in Canada in the next 30 years is a monumental challenge.

phased out and 89 per cent of that coal was replaced with incremental nuclear energy.

“Nuclear is the only source of clean electricity that we have that is going to be able to complement those intermittent sources of renewables such as wind and solar in a way that allows them to have more room on the grid, greater penetration, while not creating emissions.”

earlier this year when Alberta joined Saskatchewan, Ontario and New Brunswick in signing a SMR Memorandum of Understanding. This MOU calls for the delivery of an SMR Feasibility Study that looks at the business case for SMRs in the four provinces.

SMRs are the next generation of nuclear energy innovation, producing 300 megawatts

Bruce Power's Major Component Replacement (MCR) project began in 2020 and focuses on the replacement of key reactor components in Units 3-8.



SMRs will allow the province to build out more wind and solar and in the process, it will avoid 76 megatonnes (Mt) of emissions that would otherwise come from building out gas.

"It's a perfect example of how jurisdictions need to work together; we need multiple clean technologies to make decarbonization happen," says Gorman.

Cleaner energy

In Canada, 80 per cent of our energy generation is non-emitting, but we need to clean up the last 20 per cent. In Canada, 80 per cent of our energy generation is non-emitting, but we need to clean up the last 20 per cent. What people fail to appreciate is how challenging it will be to double or triple the amount of electricity we produce in Canada over the next 30 years, says Powell. "Nothing gets built quickly."

To get there, he says, we'll have to use every available resource and that's going to mean the way we did things previously in some places will have to be different and inevitably that's going to involve technologies like SMRs that are going to be in places they haven't been before.

Gorman agrees that addressing the climate crisis and decarbonizing Canada's energy system is a daunting undertaking.

"It's going to take every single clean technology that we have on the table right now and every single clean technology we have under development, including, SMRs, hydrogen, carbon capture and storage to be able to tackle this problem and create the amount of clean energy that we need going forward."

There is also an opportunity for other provinces to develop nuclear assets, there is a demand, says Kleb.

"The federal government has given very clear signals, starting back in 2018 when it rolled out the regulations to phase out coal by 2030. And integral to that was the goal of 90 per cent non-emitting electricity sources by 2030."

There remains a fundamental problem though. In Canada we're not coming to terms with the amount of electricity generation we need to plan, says Gorman, who points out that most utility operators are forecasting flat demand.

"There's a disconnect between what we need to do going forward and what is currently in place, and that's troubling." ♣

John Tenpenny is the editor of ReNew Canada.

that form the backbone of our economy. We must focus on decarbonizing them in an environmentally and economically advantageous way. This research demonstrates that SMRs have the potential to be a gamechanger in Canada."

Louie Shouka, director, power generation at PCL Construction thinks SMRs are on the verge of an expansion globally, not just in Canada.

"We've turned a corner in terms of how

we manufacture and build nuclear reactors and almost simultaneously over the last five years, the world seemed to turn towards SMRs as a means of changing the way we actually implement the technology."

Shouka says PCL wasn't involved in the nuclear sector five years ago, "but we are now. He says the company's ability to do large modular construction dovetails beautifully with the SMR industry, which is PCL's area of interest—the greenfield construction of these small modular reactors.

At Bruce Power, a collaboration with Westinghouse Electric Company is targeting an application for off-grid remote communities and industries.

The eVinci micro reactor is a small battery for decentralized generation markets and micro grids such as remote communities, remote industrial mines and critical infrastructure. It is designed to provide competitive and resilient power and superior reliability with minimal maintenance and its small size allows for standard transportation methods and rapid, on-site deployment.

"It has the capacity to produce both heat and electricity and because of that we foresee a lot of potential partnerships to address the needs of these communities," says Kleb.

Another example of how SMRs may be able to speed up decarbonization is happening in Saskatchewan, a province heavily reliant on coal-fired electricity.

Mandated by the federal government to get off coal by 2030, Gorman says the plan is to bring some hydroelectric power from Manitoba and build four SMRs.

The combination of waterpower and

FIGHTING WORDS

We asked recent INFRAIntelligence webinar attendees some questions about their nuclear power. Here's what they had to say:

Is nuclear power going to be a significant factor in the fight against climate change?

Yes 96%

Don't know 4%

What is the biggest concern about nuclear power?

Overall cost to build the reactors 17%

Slow: the amount of time it takes to get up and running 4%

Cost of managing nuclear waste 63%

Other 4%



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CONSTRUCTION

Credit: Providence Health Care

There is currently a robust pipeline of health care projects, including Vancouver's new downtown St. Paul's Hospital.



Credit: BC Hydro



Energy projects like BC Hydro's Site C accounted for \$76.5 billion of investment on the 2021 Top100 Projects report.

One area of investment for the Canadian Infrastructure Bank has been zero emission buses.



Credit: Brampton Transit

TOP100 PROJECTS PREVIEW

A look at the trends impacting megaproject development in Canada.

By John Tenpenny

Since 2006, ReNew Canada's Top100 Projects Report has ranked Canada's largest infrastructure projects based on total dollar investment, which included more than \$250 billion in assets in development listed in the 2021 report.

In light of the COVID-19 global pandemic, there have been delays, innovations and advancements in the progress of Canada's most important infrastructure projects meant to improve the quality of our health care, energy, education, transportation, culture, transit, and water assets from coast to coast.

During a recent INFRAIntelligence webinar, ReNew Canada checked in with infrastructure development experts from across the country to look at provincial and territorial pipelines, and the impact

recent funding announcements will have in pushing these projects towards completion.

The value of the Top100 Projects has risen sharply in recent years primarily due to an increase in multi-billion-dollar transit projects, large-scale healthcare projects and an increase in DBFOM contracts for large-scale construction. From 2017 to 2021 the assets listed under development on the Top100 Projects report rose from \$161.3 billion to \$253.8 billion.

According to Andrew Macklin, external communications specialist with WSP and former editor of ReNew Canada, over that same time there has been a slight decrease in the value of transportation and energy sector projects, "but the value of transit and building projects more than doubled during the same period."

Climate concerns

Part of what is driving government investments in these sectors are environmental concerns.

"The government has been committed to infrastructure investments that focus on climate change and environmental considerations," says Macklin.

And transit projects aim to cut the number of cars on the roads and reduce emissions.

"So, it's no surprise that where we've seen the highest level of megaproject investment recently has been the transit sector," he says.

One area of transit investment that has taken off during the past year has been in zero emission buses (ZEBs).

The Canada Infrastructure Bank (CIB) announced earlier this year a commitment

to invest \$1.5 billion in zero-emission buses and associated infrastructure. In just the past six months, the CIB made loan commitments of nearly \$500 million to help purchase ZEBs for the cities of Brampton, Ontario, Edmonton and Ottawa.

The 2021 Top100 Projects report included \$106 billion invested in LRT (\$58.2B), rail (\$28.9B), subway (\$16.4B) and BRT (\$2.5B) infrastructure.

In the energy sector, climate change and Canada's goal of moving to net-zero emissions by 2050 will drive more investments, particularly in electricity, says Michael Powell, vice president of government relations with the Canadian Electricity Association.

"In the electricity sector it's been estimated that \$1.7 trillion of investment is needed to reach Canada's Paris Agreement targets. And if we need two to three times the amount of clean power by 2050, the pace of investment and the pace of building is going to be unprecedented."

That means the energy sector's portion of the Top100 Project report's total will only grow from the \$75.6 billion listed in 2021, of which \$43.7 billion was invested in hydroelectric, nuclear (\$25.8B), transmission (\$3.4B), natural gas (\$2.2B) and solar (\$500M) projects. Especially in light of the fact that in the electricity industry, "30 years is not a lot of time," says Powell. "It takes decades to get a project approved and built."

The impact of COVID-19

The pandemic has caused uncertainty on construction sites across the country over the past 18 months, affecting the timelines of infrastructure projects. Not all regions were impacted in the same way, says Jeff Good, vice president, health and social infrastructure at Infrastructure BC.

"At first, we expected it was going to have negative impacts on our projects," he says. "But one of the advantages [BC] had over Ontario and Quebec was that our provincial government never mandated any construction lockdowns. What they did do was identify construction as an essential service and therefore allowed work to carry on."

Good says his organization addressed the pandemic head-on by forming a province-wide group that worked on wording for our contracts, which provided relief to the contracting community if there was an order that prevented them from doing their work.

"I don't think any of our projects were materially delayed."

When it comes to large electricity infrastructure projects such as B.C. Hydro's Site C or Nalcor Energy's Muskrat Falls projects, challenges arise because of

their remote locations. In addition to the aforementioned projects—ranked fourth and seventh respectively on last year's Top100 list—four other projects in the top-10 were electricity-related.

"That requires bringing in a large number of workers on site and the process of keeping people on site and keeping people safe has required a tremendous amount of work, whether it's to rethink how you operate a camp or keeping people on site longer, which requires more mandatory testing," says Powell.

Two of those six projects are nuclear plant refurbishments at Bruce Power and Ontario Power Generation's Darlington facility.

"On the nuclear side it's 'on time and on budget,'" adds Powell. "That speaks to the resiliency of planning that has gone into some of these large-scale projects that require many years to complete and have many moving pieces."

Generally speaking, one of the biggest challenges facing projects has been collaboration, says Macklin.

"The fact that you have so many disciplines working simultaneously and not being able to bring people together as efficiently, including clients, has certainly been a struggle during the pandemic."

Is there a silver lining?

"The pandemic has been a stress test on processes," says Powell. "Whether it's procurement for infrastructure or operating facilities in the electrical sector, it's about how we deal with the challenge of not being able to get people together in a room."

"What it's shown is the practices and processes we have in place focus on reliability and focus on safety, and they have worked. And when we've experienced a challenge that we haven't seen before the systems and processes we have in place have allowed us to adapt relatively quickly."

Powell proudly points to the fact that there hasn't been a COVID-related electricity outage during the past 18 months, "and that's a testament to the work that has been done previously."

Transit and transportation are other sectors that were able to take advantage of opportunities presented during the pandemic, particularly the reduction of users.

"We've seen [these sectors] take advantage of these slowdowns and be able to shut down larger portions of track, larger portions of roads for longer periods of time to get more work done and perhaps speed up the timeline for the project," explains Macklin.

Acute costs

Health care is one more sector that will continue to grow. The 2021 Top100 Projects

listed 13 health care projects and that number is expected to climb.

"There is a robust pipeline of health care projects in Ontario, B.C. and Quebec," says Macklin, adding that there are some big projects in the pipeline in other parts of the country, including Alberta.

The South Edmonton Hospital will see construction of a new community hospital and health campus on a 320-acre site, for an estimated cost of \$2 billion.

Currently Infrastructure BC has numerous hospital projects in development, including St. Paul's in downtown Vancouver and the Royal Columbian redevelopment project in New Westminster.

"In addition to our breakneck acute construction program, we're looking at primary care facilities and capital that we can use to help reduce our ongoing health care costs," says Good.

"The province has an acute care cost reduction program and part of that program is looking at making sure people are going to the right facility based on their health care needs."

According to Good, there has been a sort of augmentation in some of the capital delivery to help with the health care costs that are close to 50 per cent of the province's annual budget. 🌱

John Tenpenny is the editor of ReNew Canada.

RISK/REWARD

We asked recent INFRAIntelligence webinar attendees some questions about infrastructure development. Here's what they had to say:

What sector is in the biggest need of funding for large-scale projects?

Health Care 14%

Water-Wastewater 24%

Transit 9%

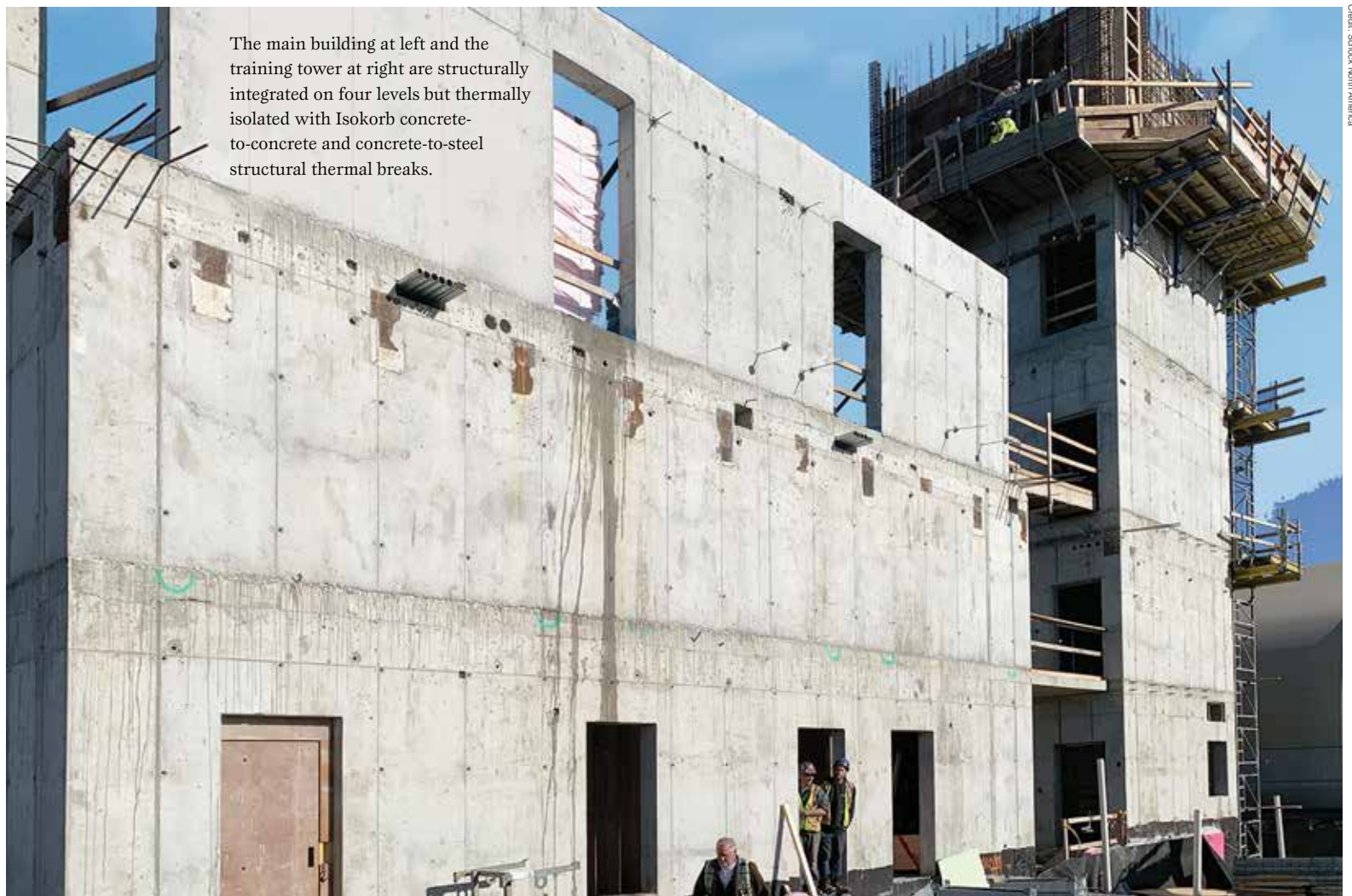
Transportation 43%

Energy 10%

Is climate risk given enough consideration in megaproject development?

Yes 11%

No 89%



The main building at left and the training tower at right are structurally integrated on four levels but thermally isolated with Isokorb concrete-to-concrete and concrete-to-steel structural thermal breaks.

Credit: Schick North America

SEISMIC CHANGES

Vancouver fire hall achieves zero carbon certification and incorporates structural thermal breaks.

Vancouver's new Fire Hall 17 reflects the city's design challenge to build a structure that meets the design certification requirements of the Canada Green Building Council's Zero Carbon Building Program, one of 16 such pilot projects in Canada. The partners are also pursuing LEED Gold certification and, if approved, the building will be the first fire hall in North America to attain Passive House certification. These ambitious targets were set to align with the City's sustainability policies. According to HCMA Architecture and Design, the building will reduce operational carbon emissions by 77 per cent compared with the fire hall it is replacing.

The 1,800 square-metre facility comprises four drive-through apparatus bays, accommodations for two firefighting crews and offices in the main building, and

a six-storey hose storage/training tower. Like all fire halls in Canada, the facility will serve as a post-disaster emergency hub, which requires a resilient building that can withstand seismic events.

To meet the seismic requirements of Canada's National Building code, the

building has a stout reinforced concrete structure with a structural steel frame for portions of the third level. The main building is clad in brick and metal panels that cant outward at the base giving the form a strong and sturdy presence.

Mitigating exterior and interior thermal bridging

Central to meeting zero carbon goals is the building's high-performance envelope, which wraps reinforced concrete walls with a 20-centimetre-thick layer of mineral wool

This project responds to the urgency of the climate crisis.

It shows that even large, complex facilities can lead the way in reducing our industry's carbon footprint.

board having an R-value of 33, and an air barrier that allows a scant 0.6 of air change per hour at 50 Pascals of pressure.

However, structural concrete and steel elements that penetrate the envelope between the main building and tower,

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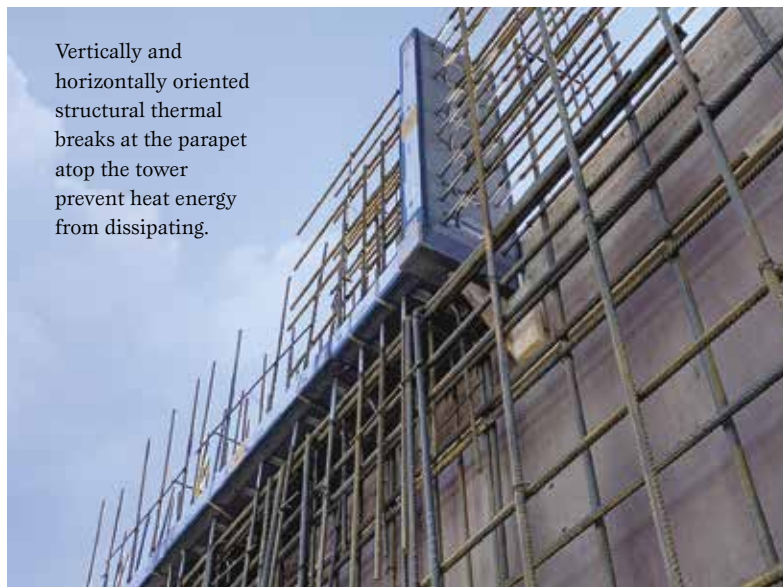
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The fire hall has a sturdy concrete structure that serves as an armature for a steel frame on the upper levels where the exterior walls slope toward the central tower.



Credit: HCMA Architecture and Design

Vertically and horizontally oriented structural thermal breaks at the parapet atop the tower prevent heat energy from dissipating.



Credit: Schöck North America



Schöck Isokorb concrete-to-concrete structural thermal break transfers bending moments and shear forces, while preventing heat energy waste, chilled interior floors, and formation of condensation and mould.

Credit: Schöck North America

maintained at dissimilar temperatures, would allow the unabated passage of heat energy, absent a thermal bridging solution.

“The fire hall has two thermal zones: the administrative offices and living spaces set to 20°C (68°F), and the ground-level apparatus bay and training tower set to 10°C (50°F),” says Elise Woestyn, Passive House consultant with HCMA Architecture and Design. The structures share a concrete frame at ground level and are connected by combinations of steel frame and concrete bridges on levels two and three, and a steel frame at level four. Due to the temperature differences, the designers needed to thermally isolate the two zones, while maintaining structural continuity.

“Our need to address thermal bridging led us to structural thermal breaks,” adds Federica Piccone, architect with HCMA Architecture and Design.

At the connection points, the design team specified Isokorb concrete-to-concrete and concrete-to-steel structural thermal breaks from Schöck North America. Each concrete-to-concrete module consists of a rigid foam block penetrated by stainless steel rebar that is tied into rebar on both sides of the slab or wall before concrete is poured conventionally. Each concrete-to-steel structural thermal break includes stainless steel rebar projecting from one side of the module that ties into rebar of the interior slab, and stainless steel threaded rod projecting from the opposite side of

the module that bolts to exterior steel beam flanges.

Three concrete balconies also project from the tower’s facade. Concrete-to-concrete thermal breaks were installed between each balcony and interior slab to mitigate thermal bridging, while withstanding the rotational and shear forces created by these cantilevers.

In addition to reducing heat energy loss, the structural thermal breaks prevent concrete structures on the warm sides of both the exterior and interior walls from becoming chilled, reaching dew point, or supporting mould growth.

Installed between the concrete-to-concrete thermal breaks are special Isokorb thermal breaks that resist seismic

shear forces in compliance with National Building Code of Canada 2010 standards for seismic resistance.

“The most unusual application for structural thermal breaks was a high parapet wall at the top of the tower,” says Meredith Andersen, associate engineer with RJC Engineers. The parapet changes in height from about 1.2 to 4.3 metres as the top of the building steps down behind it.

A parapet is essentially a vertical cantilever and, because of its height, can encounter significant moment, shear and seismic forces. Concrete-to-concrete thermal breaks were aligned horizontally at each “step” and vertically in the plane of the wall to prevent thermal bridging.

Other energy-saving measures

The high-performance building envelope allowed the designers to reduce the size of the building’s heat pump to one-fifth of that needed for a comparable code-compliant building in Vancouver. The heating/cooling system is supplied by a high efficiency ground-source heat pump served by 15 geothermal bore holes. An 80 kW solar panel array supplements electricity and six energy recovery ventilators transfer heat from outgoing interior air to incoming fresh air, reducing the required capacity of the HVAC system.

Overall energy savings allowed the designers to include elements that reduce energy loads further such as electro-chromatic glass that blocks heat gain and glare by becoming translucent when activated.

“This project responds to the urgency of the climate crisis,” says Darryl Condon, managing partner at the Vancouver architecture firm HCMA. “It shows that even large, complex facilities can lead the way in reducing our industry’s carbon footprint, while still improving the public service they provide.”

Adds Danica Djurkovic, director of Facilities Planning and Development at the City of Vancouver: “This community facility is a leading example of the City of Vancouver’s climate commitments, showing that we can make near zero-emissions buildings the new normal, while enhancing occupant comfort, and reducing energy and water consumption costs.” 🌱

This case study was submitted by
Schöck North America.

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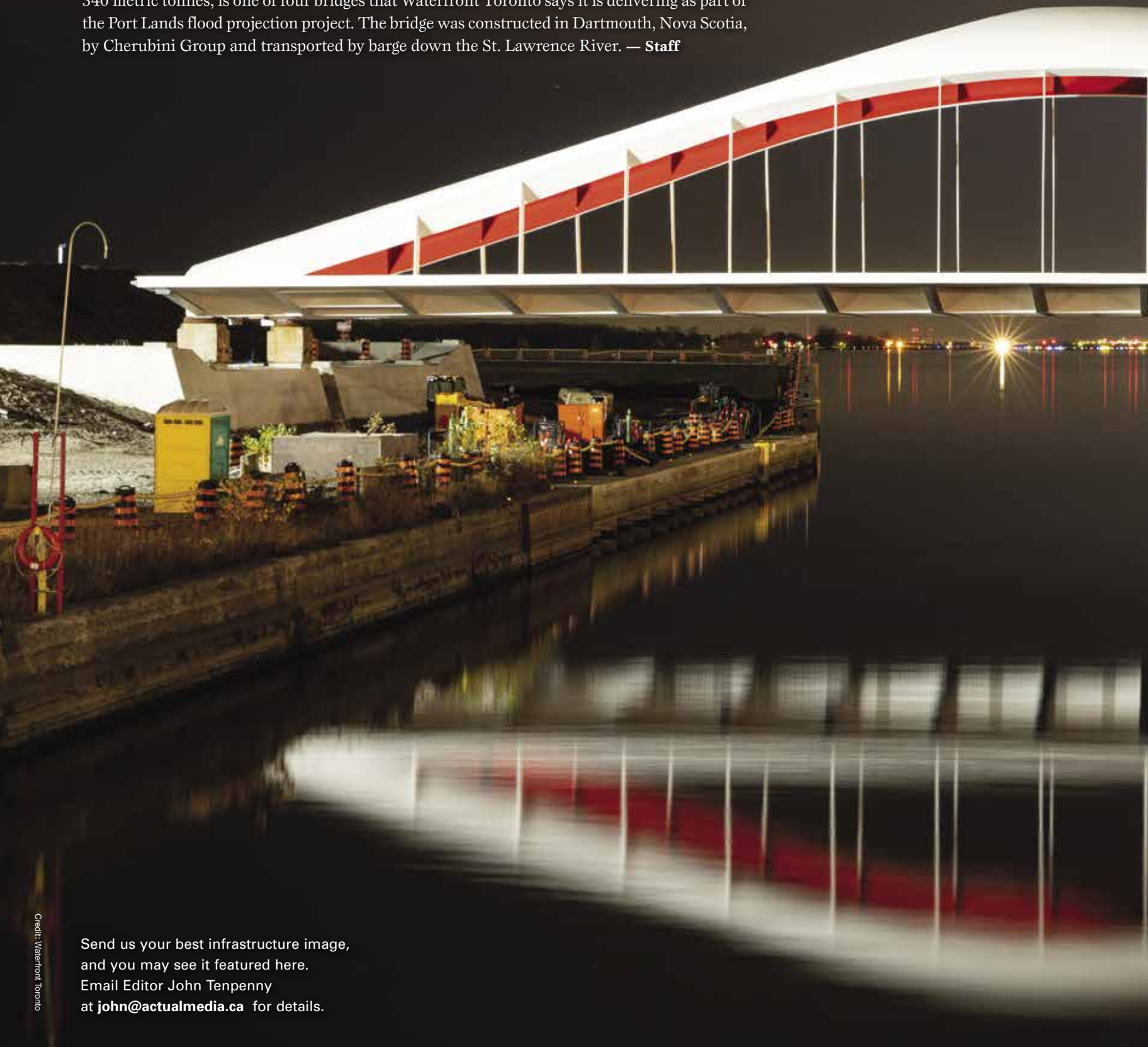
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Toronto's Waterfront Bridges

The Cherry Street North transit bridge, installed in November 2020, is the first of two bridges. The vehicle bridge is scheduled to arrive in 2022. The 57-metre-long bridge, which weighs 340 metric tonnes, is one of four bridges that Waterfront Toronto says it is delivering as part of the Port Lands flood projection project. The bridge was constructed in Dartmouth, Nova Scotia, by Cherubini Group and transported by barge down the St. Lawrence River. — **Staff**



Credit: Waterfront Toronto

Send us your best infrastructure image, and you may see it featured here. Email Editor John Tenpenny at john@actualmedia.ca for details.



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The National Shipbuilding Strategy is driving a renaissance in Canada's shipbuilding industry. *By Carroll McCormick*

Fueled by federal government contracts to replace the Royal Canadian Navy and Canadian Coast Guard fleets, and billions in investments by shipyards eager to perform, Canada's marine and shipbuilding industries are rebuilding, with long-term implications.

When asked to think about our shipbuilding heritage, Canadians likely zero in on the Bluenose, immortalized on the Canadian dime. Yet the original copy of that sailing ship was built in 1921, 20 years before 15 shipyards on the east and west coasts roared into action, constructing over 400 merchant ships for the war effort, according to the 1999 book *A Great Fleet of Ships*, by S.C. Heal.

The war ended and decades of decline in the shipbuilding industry followed. The industry's fate was sealed with the lifting of a 25 per cent import duty on certain types of ships in 2010, says Ted Kirkpatrick, director of business development and government relations with Hamilton-based Heddle Shipyards.

"The year 2010 was the [last] nail in the coffin for the Canadian shipbuilding industry," he says. "All the major shipyards went through periods of closing and opening, closing and opening and there were a number of bankruptcies. A lack of domestic demand, the surge of state-owned, heavily subsidized international shipyards, combined with the removal of the tariff ultimately eliminated what remained of Canada's shipbuilding capacity."

But 2010 also brought the promise of salvation with the launch of the National Shipbuilding Strategy (NSS). Its mandate was to equip the Navy and Coast Guard with new vessels built in Canadian shipyards and repower the industry for the long term.

By the end of 2020 the NSS had awarded \$17.34-billion worth of contracts to Canadian companies, from the shipyard giants on down.

The three pillars

According to the federal government, "The National Shipbuilding Strategy is helping

restore our shipyards, rebuild our marine industry, and create sustainable jobs in Canada while ensuring our sovereignty and protecting our interests at home and abroad."

The NSS has three pillars: Construction of large vessels with more than 1,000 tonnes of displacement; construction of small vessels with less than 1,000 tonnes of displacement; and vessel repair, refit, and maintenance projects.

The largest vessels will be built at Seaspan Shipyards in Vancouver, Davie Shipbuilding in Quebec, and Irving Shipbuilding Inc. in Halifax. All other Canadian shipyards can compete for work under the second and third pillars.

The work will keep Canadian shipyards, thousands of suppliers, and tens of thousands of Canadians hopping for decades. To describe what shipyards, let alone their suppliers, have been up to this past decade would fill a book.

But a few examples: Davie has a maintenance and upgrade program for Navy



Heddle Shipyards docked three CSL vessels in Port Weller last winter.



Sea trials of the HMCS Harry DeWolf, which Irving Shipbuilding Inc. delivered to the Navy last year.



The future HMCS Protecteur under construction at Seaspan's Vancouver shipyards.

frigates and will build six ice breakers for the Coast Guard, among other big-ticket projects; Seaspan Shipyards has built three Offshore Fisheries Science Vessels and will build up to 22 ships in four different classes. This includes one for the Royal Canadian Navy's Joint Support Ship (JSS) program, which "... is the largest naval ship by length ever to be built in Canada," says Amy MacLeod, vice president of Corporate Affairs, Seaspan Shipyards.

NSS is a generational opportunity for shipbuilders as well as marine researchers and innovators in Canada's blue economy.

Last year, Irving delivered the *HMCS Harry DeWolf*, the first of six new Arctic and Offshore Patrol Vessels. At 103.6 metres, the *DeWolf* is the largest Navy vessel built in Canada in 50 years, and the largest combat ship ever built in Canada, according to ISI. Other work on the books at Irving are worth more than

\$60 billion over the next 30 years.

This past May, the federal government announced it would have two icebreakers built—one by Seaspan, the other by Davie—for Coast Guard operations in the high Arctic.

The NSS has far-reaching implications, not only for Canadian shipyards, but for tens of thousands of people with many skill sets, and for the thousands of companies in the supply chain.

"NSS is a generational opportunity for shipbuilders as well as marine researchers and innovators in Canada's blue economy. The building of the new combat fleet is sustaining employment for a current generation of talented shipbuilders as well as generating opportunities for the next generation," says a statement from Irving.

Marine ecosystem

Colin Cooke is the president and CEO of the Canadian Marine Industries Shipbuilding Association (CMISA), formed in 2018 as a more inclusive voice to replace the now-defunct Canadian Shipbuilders Association (CSA). "The CSA was by shipyards, for shipyards. CMISA makes sure that the entire marine sector is included. There is a whole ecosystem."

Kirkpatrick adds: "It takes a village, a lot of support, from consumables, electrical, coatings, interior work, fire safety systems ... the contribution of local suppliers and sub-contractors to any of our projects. There is a lot of expertise in Canada."

Cooke is mapping this ecosystem. He estimates that eight to 12 shipyards are actively involved in the NSS, including, Hike Metal Products Ltd., Canada Maritime Engineering Ltd., MetalCraft Marine, and Ocean Group.

As well, last year, Seaspan and Davie entered into an exclusive teaming agreement, which would see Heddle fabricate ship modules at its three Ontario shipyards if Seaspan wins the bid to build the Canadian Coast Guard's future Polar Icebreaker.

The Resolve Class combat support ship Asterix at Davie Shipbuilding.



Credit: Davie

As for Canadian suppliers, Davie, for example, has posted that it has over 1,300.

Cooke suspects the number of players in the supply chain could be as many as 3,000. As for employment, Cooke says, “I think that what I’ve seen from government documents the total is 20,000 to 25,000. And 10,000 of them are in the shipyards.”

Our shipyards have not been counting seagulls and rattling tin cups since 2010, either. Monaco-based Inoce Group, which purchased Davie in 2012, has invested more than \$1 billion dollars on everything from equipment to IT infrastructure to safety teams.

has been re-equipping both, purchasing Thunder Bay-based Fabmar Metals Inc., which is relocating to the Thunder Bay shipyard—outlays all attributable, in large part, to the optimism created by the NSS, according to Kirkpatrick.

Irving Shipbuilding reports that it and its major subcontractors have more than \$4.3 billion in spending commitments with more than 325 organizations across the country.

Each of the big three shipyards is also giving back in the form of projects such as Davie’s National Icebreaker Centre, a hub for polar technologies and Arctic expertise.

Seaspan recently funded a new faculty

In the supplier base are niche specialists who, Cooke notes, “... can get huge boosts when their tech is included in a Canadian-built vessel. [This] can lead to all sorts of international opportunities.”

The NSS work, while dedicated to non-commercial shipbuilding, is also strengthening shipyards for commercial work. “When Port Weller closed, a lot of Canadian flag carriers took their work to U.S. yards,” says Kirkpatrick. “We dry docked three CSL vessels in Port Weller this winter. This was quite a milestone for us. Our goal, especially with the Canadian flagged commercial fleet, is keeping as much of that work in Canada as we can, and the NSS will allow us to build up our resource base.”

Building ships under the NSS is just the beginning, he adds. “Forty per cent of the cost of a ship is the purchase of it. The rest is maintenance over the life of the ship. When you build a professional base, for example, a support network, there is a longevity to it. The ships will be around for 30 to 40 years, and they have to be maintained. Our hope is that a robust commercial, naval and coast guard fleet will keep us busy in perpetuity.” 🍁

Forty per cent of the cost of a ship is the purchase of it. The rest is maintenance over the life of the ship.

Seaspan Shipyards purpose-built an entire shipyard in Vancouver to deliver ships under the NSS. Irving invested \$350 million to tear down (the old) and build a new facility at the Halifax Shipyard, which, it notes, “is the most modern and largest under-roof shipbuilding facility in North America.”

In 2016 Heddle, which owns the Hamilton Shipyard, purchased the shuttered Lakehead Marine & Industrial Inc. shipyard in Thunder Bay and began leasing the Port Weller Drydock in 2017. Heddle

chair position at the University of British Columbia with \$1 million over five years. The chair will perform research and teach in emerging areas such as hybrid electrical propulsion, shipboard communication and cyber security.

“We are continually investing in the marine and shipbuilding education in Canada, to build a diverse and experienced next-generation workforce, and create a pipeline of home-grown talent,” says MacLeod



Carroll McCormick is a freelance writer based in Montreal, Quebec.



Late utility locates delay work on infrastructure and housing in Ontario: RCCAO

The recovery of Ontario's economy is largely dependent on the health of the construction industry but delays in getting utilities to provide timely locates of underground gas, water and telecommunications lines are presenting roadblocks to building essential infrastructure and much-needed housing.

Contractors continue to regularly face lengthy wait times which can have serious and multi-faceted repercussions, including work stoppage, significant delays in project completion and increased project cost.

Long delays for marking of underground services can be costly. For example, each hour of idle time in the sewer and watermain sector costs \$1,000. Contractors lose \$10,000 a day when they must wait for utility locates, which only adds to the cost of a new home. In the roads sector, the price tag is \$20,000 a day.

Ontario's mandatory One Call system allows homeowners, contractors, developers, builders and other excavators to make one locate request to a call centre instead of separate calls to each utility. The province has a deadline of five business days for locate responses, but utilities often don't respond until weeks after the date. It is estimated that 85 per cent of locate requests are late.

Some of the solutions that RCCAO has called for to improve

the One Call system include restructuring the organization's board of directors to include more non-utility representatives; providing opportunities to safely share locates among multiple contractors for the same job; extending the validity period of locates to at least 60 days; restructuring how locates are delivered; modifying the reporting and record-keeping for locate responses; and eliminating the need for relocates on non-linear excavation construction sites below a certain depth

"We appreciate the fact that there have been updates to One Call by-laws and compliance policies, but much more must be done to ensure that essential infrastructure and housing work across Ontario is not unnecessarily held up," said RCCAO executive director Nadia Todorova. "Substantial delays in getting timely locates continue to be experienced at construction and infrastructure sites across the region, leading to delayed projects, uncertainty and increased project cost. We need immediate and meaningful action to ensure the delivery of timely and cost-effective projects."

Contractors are trying to catch up on projects that were delayed because of COVID-19. They need assurances that there will be a significant improvement in response times for the delivery of utility markings, especially if construction is to help lead the province's recovery efforts from the pandemic.

Visit rccao.com to find out more.



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The Town of Oakville, Ontario's 53,000-square-foot Trafalgar Community Centre was constructed using an integrated project delivery model.

Exceeding program goals with Integrated Project Delivery.

Construction projects and the key parties who carry them out are usually focused on the central challenges of budget and schedule, as well as crucial elements like safety, financing, and risk management. But what about the people who will actually live with the result? The end users: customers, residents, visitors, and workers. How are their interests safeguarded during the process, so that their needs are met when the dust settles and the architects, construction managers, and building trades have left the scene?

Should unforeseen costs arise or construction delays occur in traditional contracting, the useful or enjoyable features planned for the project—what the industry calls “program”—are often the first to go. That is because the things needed for the building to stand up and function—the structure, the engineering, the physical systems—are baked-in at the beginning. One contracting and execution model does, however, lend itself to maximizing program during

project planning and preserving program when challenges arise: Integrated Project Delivery (IPD).

Seamless building

The Town of Oakville, Ontario selected IPD to guide construction of its 53,000-square-foot Trafalgar Community Centre. “The big picture was to create a facility that encompassed what the Town of Oakville was about, the diversity, the inclusion, and to give back to the community,” says Nick Valerio, the Town of Oakville’s manager, Capital Projects, Facilities and Construction Management. “We’re most proud of how it shows the collaboration that occurred. All parts of the building are connected, and the flow is so beautiful, it’s just seamless.”

“It has come out great, people love it,” agrees Rob Piti, Graham’s project manager on the Trafalgar Community Centre. “It’s all beautiful and brand-new, with custom-made steel joists providing a huge span without any columns, and advanced acoustics. IPD helped deliver all of these

aspects successfully.” In particular, adds Piti, IPD helped Oakville not only achieve but exceed its program goals.

Oakville had high hopes and stringent requirements for the Trafalgar Community Centre. It had to be rebuilt on the footprint of the small Oakville Trafalgar Memorial Hospital, which was being demolished. The adjoining and severely aged four-storey parking garage was to be refurbished (not replaced). The Community Centre would need to meet LEED Silver standards, including state-of-the-art energy systems with rooftop solar panels and geothermal heat. The 14-acre site’s green space was to be improved and integrated with the facility. And the budget was a strict \$35 million (with \$4 million in value adds).

Most of all, the Town needed program. A great deal of it, executed to maximize access for diverse users. Inside, the new centre would have a 25-metre six-lane swimming pool, a warm-water therapy pool, a 10,000-square-foot double gymnasium with an NBA-sized basketball court, a fitness centre, an elevated (mezzanine-style) walking/ running track

Inside, Oakville's Trafalgar Community Centre includes a 25-metre six-lane swimming pool, a warm-water therapy pool, and a 10,000-square-foot double gymnasium with an NBA-sized basketball court.



ringing the gymnasium, multipurpose meeting rooms and inter-generational programming space, plus museum and art exhibits. Outside was to include a beautifully designed park with exercise facilities, a playground with splash pad, and an outdoor covered concert pavilion.

IPD proved well-suited to guiding the project participants and staying focused on Oakville's primary goals: delivering an on-budget facility that met its promises

are, and it's in everyone's best interests to bring this project in on budget and on schedule, so that we all walk home at the end of the project having realized our goals."

Lifecycle costs

Unlike in a traditional lump-sum contract, design is evaluated for constructability early on, allowing contractor and trades input, enabling cost-saving improvements before commitments are made. When

get the program requirements, we meet the budget, and we have the finishes and materials we want. IPD allows you to innovate in one area and then move the savings to an area that needs more."

Once an IPD project gets underway, weekly "Big Room" meetings bring together owner, designer, builder, and key trades. Issues are discussed, nascent problems are identified, and solutions are generated. Every aspect of the building is evaluated not just for up-front price but full lifecycle costs, so that things can be built robustly for the long-term rather than requiring costly replacement sooner than necessary. When money is tight, everyone works to find less costly functional alternatives. When savings are generated, the participants are rewarded, and the owner can apply the surplus back into the project.

"IPD changes everything from the design consultants' side, because the contractor and more uniquely, the trades are involved from day one," says Dale McDowell, an associate with Diamond Schmitt Architects in Toronto, the project's architect. "Working with the contractor and the trades from the very beginning means we have their expertise and input

IPD forces you to think outside the box while remaining in the box... and allows you to innovate in one area and then move the savings to an area that needs more.

to its future users. IPD is more than a mere "contract type" such as bid-build or construction management. As the name implies, it integrates participants into an end-to-end process. "What I like about IPD is that it's an open book," says Piti. "We know going in what our expectations are, what the trade partners' expectations

things cost more than anticipated in lump-sum contracting, the owner usually has no choice but to cut features or reduce the quality of the finishes. "IPD forces you to think outside the box while remaining in the box," is how Valerio puts it. "Everyone has skin in the game, a piece of the cheque book, so it's up to everyone to ensure we



The Trafalgar Community Centre meets LEED Silver standards, including state-of-the-art energy systems with rooftop solar panels and geothermal heat.

to draw on while developing the building details. The IPD process is a hands-on, deep dive into the project development for both the design and construction team.” And in the other direction, says McDowell, “The construction team contributes to the project’s core values and vision through their participation in the design development. Not just the owner and design team.” This was Diamond Schmitt’s second recent project for Oakville and its second IPD project on which Graham was the contractor.

Combining IPD, LEAN and BIM

Construction started on the Oakville Trafalgar Community Centre in September 2018 and IPD soon began to shine. Piti notes that IPD also uses LEAN principles. This means “the project’s ‘certain amount

certain rooms to be made smaller without impairing functionality. The combination of IPD, LEAN and BIM saved a total of \$10 million, and generated so much surplus the Town was able to upgrade some of the finishes and exercise equipment. IPD also helped the participants figure out ways to work smoothly amidst new and necessary COVID-19 safety protocols.

Perhaps the most glittering example of IPD in action was the decision-making regarding the swimming pool. It was to be constructed using traditional concrete tank with tile. But the Town discovered that a new approach using a stainless steel tank with PVC liner on the bottom could greatly reduce long-term maintenance costs. “We commenced value engineering and price exercises,” recalls Piti. “While the stainless steel pool tank would cost more

the building’s north face. “The canopy edge along the north cantilevered roof edge was a great example of IPD. The architectural intent was to have a crisp, clean and minimal sharp edge,” she says. “But the detail the design team was after did not meet the project realities of budget and schedule. So, the whole team worked through numerous ways this detail could be achieved. In the end, the canopy edge was flatter and thicker than the original design intent, but our solution didn’t compromise the cost, schedule, or architectural big picture.” The other example was the design of the huge steel trusses that span the double-sized gym plus the suspended walking track, unsupported by columns, at a time of rising steel prices plus U.S. tariffs. Everyone dug in to supply ideas that would be cost-effective, structurally sound and good-looking. Such a result, notes McDowell, would just not have occurred in traditional contracting.

This was Graham’s fourth IPD project (and its second with Oakville), making the company among Canada’s most experienced IPD providers. “Graham showed a very good way of leading the project in times when there was no clear leader,” says Valerio. “They fostered collaboration and kept the project on the rails, really forcing us to look at the numbers, the schedule, and stick to the plan.” McDowell agrees. “We worked very well with the Graham team,” she says. “Graham’s design coordinator was invaluable to the design development process with intimate knowledge of the design process from the contractor’s perspective. The IPD facilitator kept the team focused on the project objectives and moving forward together while building a strong sense of team. The estimator provided regular costing updates that enabled the team to make informed design decisions quickly that helped the project stay on budget.”

Oakville’s Trafalgar Community Centre was completed on-schedule and on-budget. What would have been a glorious opening ceremony in October 2020 could not be held, due to COVID-19, but the Town planned to hold a one-year anniversary celebration in the Fall of 2021.

In February, Graham won an award from the Toronto Construction Association for the project. From its well-managed execution to its impressive results inside and out, the Oakville Trafalgar Community Centre is a facility worth celebrating—most of all by the people who use it. 🍀

What I like about IPD is that it’s an open book. We know going in what our expectations are, and it’s in everyone’s best interests to bring this project in on budget and on schedule.

of money’ can be applied to making it the best project possible, eliminating waste, and saving money without reducing program.” IPD and LEAN target unnecessary components first or look for better ways of building. The team applied sophisticated building information modelling (BIM) to the facility’s complex system designs, allowing the structure and

up-front, it has much lower maintenance costs, therefore reducing lost revenue due to future downtime.” As a result, a Natore pool system was installed. “I’m a swimmer myself,” notes Piti, “so I appreciate a good pool, and this one is gorgeous.”

McDowell especially recalls two other areas where IPD stood out. One was in the redesign of the cantilevered canopy on

**This case study was submitted by
Graham Construction & Engineering
Inc. of Calgary, Alberta.**

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THE FUTURE IS HYBRID

Using materials where they make the most sense.

By Vincent Davenport and Mark Gaglione

In Canada, mass timber construction is literally being taken to new heights, propelled by changing building codes across the country, an increasing awareness of embodied carbon, and a maturing supply chain to deliver competitive pricing.

While the sustainability benefits of using timber are widely recognized, design professionals are often faced with situations where timber alone does not efficiently achieve all of the competing objectives of today's complex projects. In these situations, timber hybrid structures, which use mass timber in combination with more conventional steel or concrete elements, are increasingly being considered to achieve design objectives.

In recent years, mass timber as a structural material has captured the attention of EllisDon's clients, who see it as a way to lessen the carbon footprint of their built assets, while visibly presenting a

differentiated product to the market.

An innovative approach

As mass timber structures gain popularity nationally, the industry is being called upon to utilize timber in situations typically reserved for steel and concrete. This trend has sparked a number of industry-led initiatives to combine materials in new ways, prefabricated into panels offsite, to meet the market's existing needs (clear spans, exposed aesthetics, etc.) while incorporating new mass timber materials.

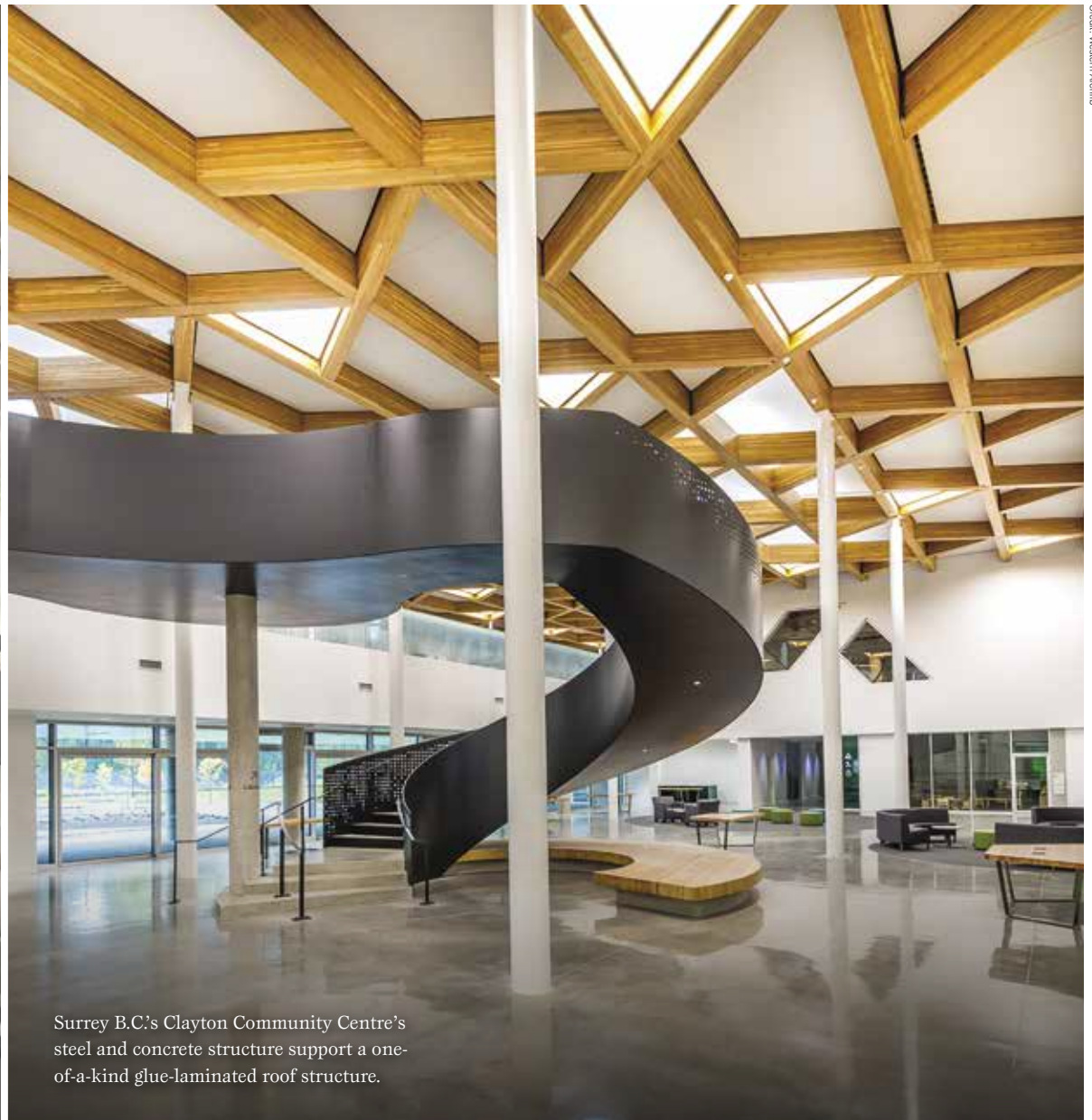
One such initiative is the new Hybrid Timber Floor System (HTFS) being developed by EllisDon and its design partner, DIALOG, to enable mass timber to be utilized within longer span structural grids currently not viable utilizing standard mass timber sections. The concept takes an innovative composite, prefabricated approach to combining cross-laminated

timber (CLT) with post-tensioned concrete in a factory environment off-site.

"The Hybrid Timber Tower project represents DIALOG's beacon of hope in the monumental climate change challenges our world now faces. Wood has significantly less embodied carbon than steel and concrete which reduces the embodied carbon of the tower, and wood also stores carbon. In fact, one cubic metre of wood stores the equivalent of one tonne of CO₂. This means that tall buildings could now be designed to be lower in embodied carbon and store huge amounts of carbon," says Craig Applegath, founding partner, DIALOG.

The patent-pending HTFS consists of steel post-tensioned tendons encased in a concrete band which itself is recessed into a CLT panel. By assembling all of these components offsite in 40ft panels within a controlled factory environment, a number of the challenges of hybrids raised previously can be addressed

DIALOG has designed a prototype for a 105-storey supertall hybrid mass timber structural system using the Hybrid Timber Floor System (HTFS), developed in partnership with EllisDon.



Credit: Western Archib

Surrey B.C.'s Clayton Community Centre's steel and concrete structure support a one-of-a-kind glue-laminated roof structure.

or managed. The panels are shipped to the site and topped with a composite concrete topping cast in-situ. Conceptually, the composite action between the post-tensioned tendons, the concrete and CLT allows for spans of up to 12 meters (40 feet), offering the open floorplate required for Class A office commercial floor space.

As mass timber structures gain popularity nationally, the industry is being called upon to utilize timber in situations typically reserved for steel and concrete.

One of the primary motivations for the study is to develop a timber-based hybrid system that can be utilized in building configurations that are typically reserved for concrete and steel, such as long-span commercial settings. The hybrid timber floor system presents a reduction in embodied carbon and if deployed at scale could benefit the industry by replacing large

quantities of structural steel and cement on a project-by-project basis. Research is underway to assess the HTFS's structural and fire performance and prepare the design for commercial applications.

"Developers always have to weigh out the benefits of the building framing material, by compromising cost or

speed, desirability to tenants, and our common goal of more sustainable buildings. The hybrid panel presents a novel intersection of goals allowing for carbon sustainability, an accelerated construction schedule, and long-span exposed ceilings desired by many tenants," says Phil Jones, vice president, Engineering & Logistics, EllisDon

Hybrids come in many forms

Aside from custom prefabricated hybrid solutions like the HTFS, hybridization of timber structures takes many forms, but when used effectively it enables designers to streamline structures in pursuit of sustainable architecture. Hybrid mass timber structures can be loosely categorized into three groups. Each group varies in the degree of hybridization and the drivers behind the switch to a hybrid system. In some cases, the driver is cost, in other cases the driver is schedule, and in more and more cases the driver is sustainability.

The degree of hybridization and the final system selected, will often be specific to the market, due to local price variations in both material and labour, and even the project, due to geometry, optimal grid layout, and overall building height constraints.

Isolated Elements—In some cases the hybrid element of a building may be localized to a few specific conditions or locations where a different material is better suited. This could be in a corridor for headroom,

a terrace/balcony for long-term durability, or an especially large span for structural efficiency. Due to the complexity and variety of unique conditions within each project, pure “all timber” structures are rare and usually include at least a handful of these hybrid elements as part of their final design.

Hybrid Lateral System—It is very common to see a mass timber gravity system used in combination with non mass timber lateral systems. In this scenario the main beams, columns, slabs would be built out of mass timber products but the members resisting the lateral loads would be composed of an alternative material (structural steel, precast concrete, cast in place concrete). A very common example of this is a mass timber gravity structure coupled with cast in place concrete core(s). Other system combinations include mass timber coupled with structural steel cores, structural steel bracing, or a precast concrete core.

Hybrid Gravity System—Structures where the gravity system (beams, columns, slabs) are made up of a combination of materials in addition to mass timber. These systems typically combine mass timber with other off-site prefabrication systems like

structural steel and precast concrete. In some cases, it's a combination of parts assembled together, in other cases these are actual hybrid elements where the two or more materials are combined through a manufacturing process. These systems usually take advantage of steel and concrete for large spans thinner sections and use the timber in between as a floor panel to keep some of the timber's aesthetic appeal.

Key considerations

The potential benefits of a hybrid structure, whether its cost effectiveness or a floor height consideration because you can't fit a deep glulam beam into your zoning envelope, are typically well understood. The challenges, on the other hand, do not tend to be as clear at first glance, and are typically the key to successfully implementing a

The hybrid panel presents a novel intersection of goals allowing for carbon sustainability, an accelerated construction schedule, and long-span exposed ceilings desired by many tenants.

They can be as simple as a nail laminated timber plank on a W-section beam and as complex as a composite concrete/timber slab system sitting on a composite concrete-steel beam system. These types of hybrid approaches are gaining in popularity and industry proficiency and are the main focus of this article.

hybrid structural approach.

These hybrid structural systems exist at the intersection between multiple conventional (and somewhat siloed) design and sub trade groups. This combination of parts that don't typically get combined can create some complexities that must be overcome in order to ensure a successful marriage of the parts.

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Anytime dissimilar materials are adjoining on site it is prudent to consider the varied manufacturing tolerances and varied physical behaviours through environmental shifts (hot, cold, wet, dry) to ensure that connections and interfaces are designed to be constructable and durable. Timber and steel tolerances are generally quite aligned, however when interfacing with concrete or cast-in elements a larger variation is to be expected and needs to be accounted for through design to ensure smooth construction.

When multiple materials are utilized within a structural system there also needs to be consideration made for the sequence of installation, which subcontractors will be performing each materials installation, and how this impacts the overall schedule. In unionized environments the delineation of scope between contracted parties is also something that needs close attention when multiple interdependent materials are utilized.

Hybrid structures generally involve multiple supply chains and multiple subcontractors. Subcontractor optimization is a very important part of the planning process and should be considered in parallel

to the design. The best design on paper is not the best design if you can't efficiently buy it in your market. Unlike more conventional structural subcontractor trade groups who are very used to working together (reinforcing trade and the formwork trade) many of the combinations required for a hybrid structural system are not only not familiar with each other, they may not even know what mass timber is.

As the market further matures, uncertainty among subcontractors is reducing however it's still very important to educate prospective subcontractors in mass timber constantly to ensure un-sound logic doesn't find its way into estimates. The supply and installation contracts, along with the chosen sequence of work becomes a balancing act between cost, schedule and the project's appetite for risk.

Resistance to change

Resistance comes in all sorts of shapes and sizes, sometimes it yells in your face, other times it takes the forms of conservative assumptions in the background that preclude feasibility. Both are problematic, but the latter is much more detrimental.

This might be the single most difficult challenge for a new innovative hybrid system. While we will not claim to have a solution, we are guided by a few ideas to help chip away at the issue:

- **Pick your partners wisely.** Pick partners both in design and execution who are both willing to get behind a new system and who have experience with hybrid systems previously.
- **The contractor** has to embrace the role as the integrator.
- **Educate educate educate.** Workshops, info sessions, plant visits, reference projects visits, mock-ups, whatever it takes to replace ingrained assumptions in the industry about new approaches with real tangible information. 🍁



Mark Gaglione and Vincent Davenport are both managers at EllisDon's Construction Sciences Division.


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Delivering a better world

Compared with other industries such as health care, and financial services, the infrastructure sector has the lowest share of women in the overall workforce, of Toronto, and InstarAGF Asset Management Inc.



Inset: Renew Canada's INFRAIntelligence webinar discussion on diversity included experts from the Toronto Community Benefits Network, EllisDon, the University of Toronto, and InstarAGF Asset Management Inc.

CLOSING THE DIVERSITY GAP

How the infrastructure sector is cultivating a more diverse workforce.

By John Tenpenny

It is imperative that the leading decision makers in the industry are representative of the wider communities in which major infrastructure projects are planned, built, and operated.

During a recent INFRAIntelligence webinar, ReNew Canada gathered leading experts to discuss how the construction and infrastructure industry can help cultivate more skilled and diverse workforces. What are some of the most innovative ideas for attracting talent and closing the gap that exists for underrepresented groups such as women, people of colour, and First Nations?

Glass ceilings

Matti Siemiatycki, director of the Infrastructure Institute at the University of Toronto, has studied and worked on infrastructure projects for over a decade and during that time it has become increasingly clear to him that the sector has a major diversity gap.

"This moment is the moment where we have to have this conversation and we have to come up with real solutions to increase equity, diversity, and inclusion in the construction and infrastructure sector," he says.

Siemiatycki feels the impacts of this gap have become clear in terms of some of the

horrific racist incidents that have happened just in the last year, which show that the industry needs to do much better.

"We have a talent gap, and we are missing out on a large share of our community who could both contribute to projects and benefit from them."

He points to a wide variety of statistics and indicators highlighting the magnitude of the diversity gap in the infrastructure sector.

cent) after the energy sector, as well as the lowest share of women in senior (nine per cent) and mid-level positions (13 per cent) compared with other economic sectors.

While there has been progress, Jennifer Khan, head of inclusive diversity, people and culture, at EllisDon, believes more still needs to be done.

"The better question to ask is, 'Is it enough?' And the answer is, No it's not enough."

We have a talent gap, and we are missing out on a large share of our community who could both contribute to projects, and benefit from them.

Recent data collected by the World Economic Forum (2016) provide a high-level snapshot of the gender diversity gap. Compared with other industries such as health care, financial services, and media, the infrastructure sector has the lowest share of women in the overall workforce (16 per cent).

The infrastructure industry also has an especially thick glass ceiling for women reaching senior leadership positions. It has the smallest share of female CEOs (two per

Khan remembers her first experience on a job site, where she endured catcalls from workers.

Thankfully, that doesn't happen anymore, yet recently she was walking a site with four other women and that is something that still, unfortunately, still turns heads.

In her role at EllisDon, Khan focuses on training and education and recruitment and retention.

One of the first things she did was create

an inclusive diversity training module that is now mandatory for all employees and something the company is happy to share, and does, on the Canadian Construction Association's website.

"We have a responsibility, as a larger organization, to share, and I don't want us to compete over who has the best inclusion or diversity program, because then it becomes something that divides us when it should be something that unites us," says Khan.

Khan believes the first job with diversity training is to give people the tools to be able to have tough conversations. "What we found was that people really wanted to have the opportunity to be able to talk safely about race and ethnicity, racism and discrimination in the construction industry.

"Discrimination exists and people need to acknowledge that for us to be able to change it."

When it comes to recruitment, the company is now looking in places it never went before, such as newcomers looking for their first jobs in Canada.

"These people may have been overlooked before in the hiring process because they didn't have that Canadian job experience," says Khan.

EllisDon has seen positive impacts numerically, according to Khan. In the first quarter of 2021 the company saw a six and 11 per cent increase respectively, in hiring women and people from diverse backgrounds, compared to the rest of their workforce.

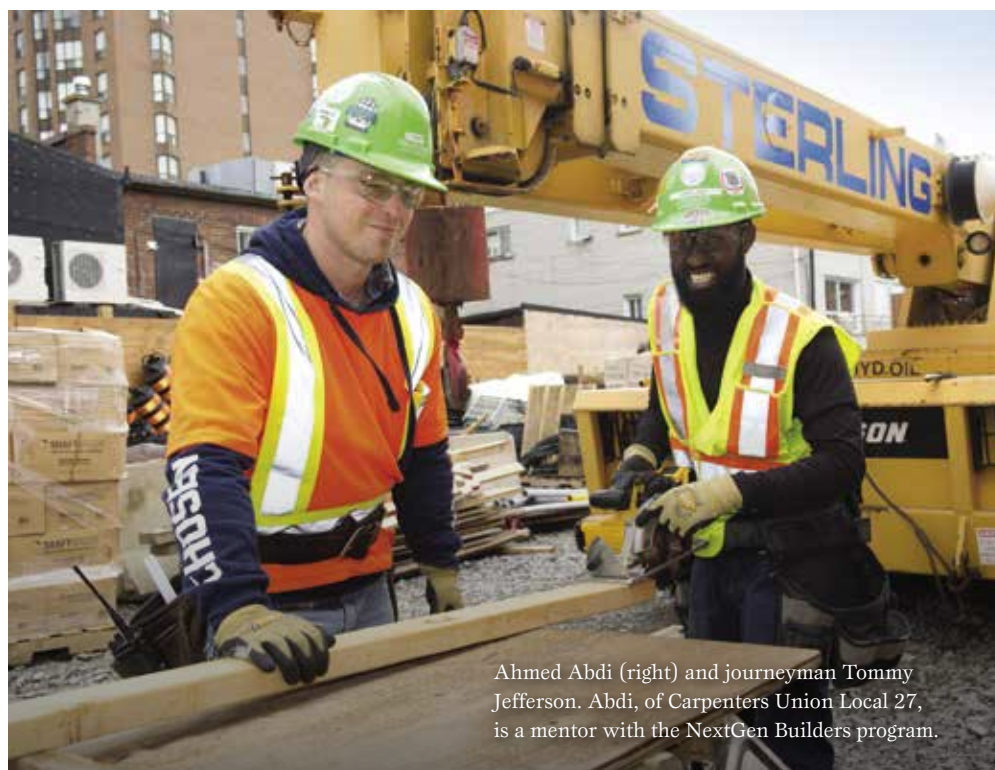
Like many companies EllisDon is still working on a strategy to help propel career development so that they are seeing those levels of diversity at its more senior levels.

Community benefits

Rosemarie Powell, executive director of the Toronto Community Benefits Network (TCBN) thinks the planning process has systemically left out the voices of people who really need it the most.

"As we looked at the amount of investment different levels of government were making in infrastructure, and as we organized across the city, we recognized that the voices of people that have been left out of the economy have really not been centred in the conversation."

In 2014, as part of the final planning stages of Metrolinx Transit Expansion program, including the \$11-billion Eglinton Crosstown LRT, TCBN worked with labour unions, local community groups, organizations and funders from across Toronto to advocate to Metrolinx to negotiate and sign a Community Benefits Framework that would apply to all future transit projects. This framework outlined Metrolinx's commitment to include



Ahmed Abdi (right) and journeyman Tommy Jefferson. Abdi, of Carpenters Union Local 27, is a mentor with the NextGen Builders program.

requirements for community benefits in its project agreements.

"We are working one project at a time to ensure there are benefits for the local community, not after the project is built," says Powell. "We look at jobs and opportunities while the project is being built—construction jobs, construction contracts for small businesses, social enterprises, and minority-owned businesses."

Powell says TCBN is at the table with the key decision makers, like Infrastructure Ontario and the Ministry of Labour, Training and Skills Development to make sure it happens by supporting the implementation of the community benefits agreements programs that they negotiate.

"We have established programs to help fill the gaps within the ecosystem of community benefits," she says. "Our member organizations provide support and services, such as apprenticeship training or employment services. [TCBN] is right there in the centre trying to coordinate that and make sure there is a seamless pathway into the jobs and opportunities that have been negotiated and committed to."

The NexGen Builders Mentorship Program is just one example. It prepares workers who have been historically underrepresented in the construction industry to enter the workforce. The program is geared towards those in their final stages of pre-apprenticeship training, to support them through the intake process with the union and the first year of their apprenticeship.

Mentoring the next generation is also why Cathy Xue, associate VP with InstarAGF Asset Management Inc., serves on the board of the Young Leaders in Infrastructure's

Toronto Chapter, which is affiliated with the Canadian Council of Public Private Partnership. With more than 1,000 members, its mandate is to create an educational and networking platform for young professionals in the infrastructure sector.

FORWARD PROGRESS

We asked recent INFRAIntelligence webinar attendees some questions about their workplace culture. Here's what they had to say:

Have you noticed progress towards a more diverse workforce in your organization over the past 3-5 years?

Yes 58%

No 25%

Not sure 17%

What is the most important benefit of diversity and inclusion as a business strategy?

Accelerate innovation with diverse perspectives 67%

Increase employee productivity and revenue 17%

Reduced employee turnover 8%

Enhance your reputation, expand your customer base 8%

Hearing voices

For Siemiatycki, the gaps in diversity and inclusion along gender and racial lines are just stunning. The low numbers of women, Indigenous and racialized people in senior management levels, he believes start to manifest in terms of whose voices are being heard.

His colleague, Cecelia Pye, did a study for a 2019 article they co-wrote entitled *Closing the Diversity Gap in the Infrastructure Industry*, in which she analyzed publicly posted videos of all the board of director meetings of major transit agencies in three North American cities: Metrolinx in Toronto, TransLink in Vancouver, and the Metropolitan Transportation Authority (MTA) in New York City, and watched who was doing most of the speaking.

“She found that, not only were there disproportionately fewer women on these boards but the spoke less than their colleagues on their time on the boards, they were interrupted more, they had less input on key decisions related to issues of finance and budget and project management,” says Siemiatycki. “This is what systemic inequality does and how it cascades through the systems.”

Inclusive recovery

According to Powell, the ongoing pandemic has stalled progress and left communities of colour devastated. TCBN’s mandate was a way forward, she says.

Earlier this year, the organization launched a national campaign calling on the federal government to commit to an “inclusive recovery” by ensuring community benefits requirements be included in post-COVID-19 infrastructure investments.

“It’s an unprecedented amount of money (being invested) and throughout the pandemic we have been learning more as a community, as a population, as a society about the huge levels of inequities and the disproportionate impact that some communities are facing,” she explains.

“We’ve known historically that the construction industry is a challenge with equity and diversity. We just want to make sure that when government is planning on spending this kind of money, especially taxpayer dollars, that community benefits are central to the planning and to the consideration and to the policies that these general contractors have to commit

to in order to receive the funds.”

Message received.

In its announcement of \$26.8 billion in funding for four transit projects in the Greater Toronto Area in May, the federal government’s press release read in part: “... the federal government’s funding is dependent on satisfying conditions including ... maximizing benefits for communities including through Community Benefit Agreements, and meeting employment thresholds for underrepresented communities including Black, Indigenous and people of colour, and women.”

For Powell, this means construction companies are finally realizing that inclusion and diversity are not something that can be ignored anymore.

“They do have to change their practices and intentionally look at ways, during the bidding process, to include what their commitments to community benefits are going to be and to carve out specific targets that they intend to reach.” 🍁

John Tenpenny is the editor of ReNew Canada.



Credit: West Park Healthcare Centre



For information
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West Park hospital reaches project construction milestone

2021 Top100 Projects Rank: 49
Value: \$1.2 billion

Ontario Premier Doug Ford, Deputy Premier and Minister of Health Christine Elliott, and Minister of Infrastructure Kinga Surma were among the special guests to sign the final structural beam for West Park Healthcare Centre's new, \$1.2 billion hospital.

The 30-foot steel beam, painted white and draped with West Park banners on either side, collected about 400 signatures. The beam was then air-lifted by Crane 3, endearingly named Thunderbird, to the top of the new six-storey, approximately 730,000 square foot building that will overlook the Humber River valley. The Signing of

the Final Beam is a major construction milestone, signifying the completion of the building structure.

"When these doors open, this new facility will provide residents here in the western GTA with access to the high-quality care they deserve...where and when they need it," said Premier Ford. "Our government is fully committed to fortifying our health care sector, and West Park Healthcare Centre will play a major part in helping us achieve that goal."

Scheduled to open in 2023, the pandemic-ready hospital features a dedicated wing designed for airborne containment. West

Park will have similar, smaller containment zones called Airborne Isolation Rooms (AIRs) placed throughout the hospital. The new facility will also feature a state-of-the-art HVAC system ensuring only 100 per cent fresh air is pumped in from the outdoors, eliminating the need for re-circulated air and removing the potential transmission of airborne pathogens.

"West Park's century-long legacy of caring for people with tuberculosis (TB) made pandemic planning a priority from the start," said West Park's president and CEO, Anne-Marie Malek. 🍁

Credit: Ontario Ministry of Transportation



Ontario's Highway 424 extension opens for traffic

2021 Top100 Projects Rank: 73
Value: \$616 million

Months after it was reported there were legal issues surrounding the opening of the Highway 427 extension in Vaughan, the new 6.6-kilometre section opened Sept. 18.

"I am pleased to announce the new and widened sections of Highway 427 will be open to the public on September 18," said Caroline Mulroney, Minister of Transportation. "As part of our vision for the Greater Golden Horseshoe, our government is investing in highway infrastructure to address congestion and keep up with the growing needs of Ontarians."

The expansion of Highway 427, which serves as a heavily-used commuter route to the City of Vaughan and neighbouring communities, is expected to save commuters up to 25 minutes of total travel time for a two-way trip during peak periods compared to driving along parallel municipal roadways.

A 6.6-kilometre extension of the highway includes eight new lanes from Highway 7 to Rutherford Road and six new lanes to Major Mackenzie Drive. Three new interchanges at Langstaff Road, Rutherford Road and Major

Mackenzie Drive have also been constructed to connect roadways without interruption.

A four-kilometre segment has also been widened to eight lanes from Finch Avenue to Highway 7 along with an upgraded full interchange at Highway 7.

"We are proud to have delivered this important piece of transportation infrastructure that will serve people travelling through and around the GTA," said Michael Lindsay, president and CEO of Infrastructure Ontario. 🍁

APPOINTED



Jackie
Pagaduan

Actual Media Inc., the parent company of ReNew Canada, announced that **Jackie Pagaduan** has joined the company as the business development manager for Water Canada and the Environment Journal. “I’m excited to be working in the water and environment industries,” said Pagaduan.

“As the business development manager of Water Canada and the Environment Journal, I’m looking forward to connecting with key players in the water and environment industries,” she said.

As business development manager, Pagaduan will be working with marketers in the water and environment sectors to build effective and creative programs that utilize Actual Media platforms to deliver a range of marketing solutions, from showcasing innovative thought leadership, to lead generation, increased brand visibility, and more.



Dawn
Dalisay

FER-PAL Infrastructure announced the appointment of **Dawn Dalisay** to vice president of finance. Dalisay will be leading FER-PAL’s finance department with responsibility for all corporate budgeting, financial reporting and cash management, among other finance and accounting duties.

Dalisay brings 19 years of industry experience to the role, previously serving FER-PAL as the director of finance. Before joining FER-PAL, Dalisay worked at WSP Canada, MMM Group, and AECOM in several positions including the director of finance for WSP’s Transportation Division and as AECOM’s district finance manager for Ontario.

“I look forward to taking this next step with FER-PAL to further the development of FER-PAL’s practices to ensure it’s growth while maintaining it’s position as a North American leader in sustainable water solutions,” said Dalisay.

“We are extremely excited to have Dawn as our VP of finance,” said FER-PAL’s president **Shaun McKaigue**. “She has been a key team member as a director, and we are pleased to be elevating her into this important role on our executive at a time of rapid growth.”



Kim
Masland

Tim Houston was sworn in as Nova Scotia’s 30th premier on Aug. 31. A 19-member cabinet, in revamped roles and department will help deliver on the priorities of Nova Scotians, he said.

Kim Masland will lead the Department of Public Works, formerly Transportation and Active Transit.

Masland’s mandate letter called for the removal of the tolls from the Cobequid Pass on Highway 104. A spokesperson for the department said the anticipated timeline is late fall, but the date will be finalized when the decommissioning plan is complete.



Heather
Grey-Wolf

Infrastructure Ontario announced **Heather Grey-Wolf** as the newest member of its executive management team, in the new role of chief development officer.

As chief development officer, Grey-Wolf will oversee Infrastructure Ontario’s work on transit-oriented communities, leveraging surplus lands for government priorities such as long-term care, and supporting master development exercises like the redevelopment of Ontario Place.

Grey-Wolf’s experience is a unique blend of development leadership across the public and private sectors. Most recently, as senior vice president at Capital Developments, Heather was responsible for a \$2.1 billion development and construction portfolio. As a senior development leader with the Toronto Community Housing Corporation (TCHC) for seven years, Heather led the revitalization of the 69-acre Regent Park, the largest urban renewal project in Canada.



Monique
Buckberger

PCL Construction announced that **Monique Buckberger** has been promoted to the role of vice president and district manager for the Toronto district. Buckberger will be joining the district management team of **Bruce Sonnenberg**, senior vice president and district manager, and **Marc Pascoli**, vice president and district manager.

Buckberger began her career with PCL’s Winnipeg district in 1995, working on the Norwood Bridge project. Since then, she has held numerous roles in different districts, including that of operations manager in Regina and project director in our B.C. region. Most recently she was district manager for the Winnipeg region.

“Monique brings an extensive skill set in both buildings and civil infrastructure work,” said **Todd Craigen**, PCL’s president, Eastern Canada. “During her career with PCL, she has worked on many notable projects, including the Regina Stadium, Manitoba Hydro Place, the Disraeli bridges, and The Post in Vancouver. We look forward to seeing her future work in Toronto.”



Adam
Lewinberg

Fasken announced that **Adam Lewinberg** has joined the firm as a partner in its Infrastructure and Projects practice.

Lewinberg’s practice focuses on complex procurement, large multifaceted construction projects and structured finance, including public private partnership/alternative finance (P3/AFP) and large complex linear construction. He brings a depth of experience to help clients in the areas of public-private partnerships, procurement, construction and asset finance, with a focus on technology and innovation.

Lewinberg has broad experience in infrastructure and previous experience as a technologist in the banking and telecommunications sectors. He will work across asset classes, having previously worked on projects in the transportation, social infrastructure and energy sectors, including roads, tunnels, bridges, light rail, rail, district energy, energy distribution, hospitals, libraries, courthouses, housing, roads and data centres.



Maged
Abdelsayed

HKA announced the addition of nine executives across its Montreal and Calgary operations.

“The addition of these professionals expands our ability to support clients throughout Canada,” said **Frank Giunta**, HKA partner and Head of Americas.



Michael
Bodnar

Headlining the new additions is **Maged Abdelsayed**, who joins as partner based in Montreal. A professional

engineer with 35 years of experience in the construction industry, Abdelsayed has provided dispute management and claims-related expertise on Canadian and international construction projects. He has also served as an expert witness before various courts and arbitration panels in Canada and the United States in disputes relating to project delays, labor productivity losses, the impact of changes on construction work, and damages assessment.

Michael Bodnar joins as principal based in Calgary. Bodnar has 25 years of engineering experience in a range of technical and leadership roles, specializing in forensic engineering. With an educational and practical background in fluid dynamics, materials science, and fire protection engineering, he focuses on fire investigation and the analysis of other failure incidents, including water loss events.

HDR welcomed a series of new hires and promotions in its transportation highways and roads market sector in Canada.

Heather Templeton, P. Eng. is newly appointed as the Highways and Roads Market Sector Lead for the Canada Region. She has a proven track record of delivering complex infrastructure planning and design projects.

Keyur Shah, P. Eng. joins HDR as the traffic lead for Eastern Canada, with 20 years of professional experience on various transportation planning and traffic engineering studies for public sector clients.

Jared Monkman, M.A.S.C., P.Eng. is the new bridge and structures business class lead for the Canada Region. He has extensive, hands-on experience in structural

design, rehabilitation, maintenance, and project management work.

Brent Gotts, P. Eng. joins HDR as the preliminary design lead in the Highways and Roads Market Sector. He has over 17 years of experience in developing interchange designs in highly constrained locations.

Soheil Kashi, Ph.D., P.Eng. has been promoted to transportation hydraulics lead. In this new role, Soheil will be responsible for the growth of the hydrology and hydraulic services businesses across Canada.

Ron Stevenson assumed a new role as vice chairman of Leducor Group of Companies. In this new role Ron will support Leducor's major operating groups with strategic pursuits. Stevenson's career with Leducor spans over 50 years. He started in the field as an equipment operator in Northern Alberta and went on to hold many field-based positions. In 2002, he took on the role of president Leducor Industries, and in 2016 he was promoted to president Leducor Group of Companies.

Tom Lassu was promoted to president, Leducor Group of Companies. In this role, he will support Leducor's major operating groups with strategic relationships. He will also lead executive succession planning at Leducor and

continue to drive inclusion and diversity initiatives. Lassu, a Professional Engineer has been with Leducor for over 35 years. In 2016, he was promoted to President, Leducor Industries.

Jeff Watt was promoted to president, Leducor Industries. Watt will continue to provide leadership to the executive team of Leducor Constructors, and in his expanded role he will also assume oversight of Leducor's Construction and LTS operating groups.



Grant
Hallam

Tetra Tech announced the appointment of **Grant Hallam** as vice president of Municipal Infrastructure. Hallam brings over 30 years of municipal engineering project and will lead Tetra

Tech's Municipal Infrastructure business group in western Canada.

"Tetra Tech is excited to introduce Grant to our valued clients as we grow our engineering services to design and build world-class municipal infrastructure," stated the company. "Grant's extensive expertise, project leadership and attentive client care support Tetra Tech's approach to deliver technical excellence and unsurpassed client satisfaction." 🍁

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OC Transpo says it doesn't want more riders from Gatineau at Bayview Station, because it needs to protect capacity for future growth.

BUILD IT RIGHT THE FIRST TIME

Credit: City of Ottawa

By Michael Schabas and Peter Harrison

Ottawa's new light rail system has replaced hundreds of polluting buses, speeding travellers on clean, comfortable electric trains. But the system doesn't cross the river, so buses from the Outaouais still clog downtown Ottawa streets.

Gatineau now wants to spend \$3 billion to bring light rail across the river, but their plan has two big flaws.

First, it will only serve western Gatineau (Aylmer), the least populated part of the region. More than a hundred buses from eastern Gatineau and Hull will continue to run across the Portage Bridge.

Second, it wants to build its own system, with its own tracks in downtown Ottawa, probably a tunnel under Sparks Street paralleling OC Transpo's tunnel under Queen Street. Outaouais commuters who want to go beyond downtown, to Tunney's Pasture, Carleton, Ottawa University, or the Airport, will need to climb out of the STO station, walk a block or two on (sometimes frosty) streets, then ride escalators back down to board the O-Train and backtrack through downtown Ottawa.

We think we have a better idea: electrify Ottawa's north-south Trillium line, which will soon run to Ottawa Airport, and extend it across the river on a new bridge, alongside the historic Chief William Commanda

Bridge. Branches can run to Aylmer and up the route of the existing Rapibus, which can easily be converted to electrified rail. Because this approach will use mostly existing corridors, it will cost less to build and avoid years of construction disruption in the heart of the capital. It will also attract many more riders because it will offer shorter, faster and easier trips, not just to downtown but between all parts of the region. Aylmer trains would run through downtown Ottawa to the VIA station, while Hull trains could run to Ottawa Airport. Travellers between Gatineau and south and western Ottawa would change at Bayview, avoiding downtown Ottawa entirely.

Why hasn't this happened?

First, the City of Ottawa refused to let Gatineau run over the Chief William Commanda Bridge, because it wants to refurbish it as a trail for walkers and cyclists. Fine, so why not build a bridge for light rail alongside it?

Second, OC Transpo says it doesn't want more riders at Bayview, because it needs to protect capacity for future growth from Kanata and Barrhaven. Yet even with these extensions, OC Transpo doesn't plan to run more than 24 trains per hour. Similar systems in other cities now run up to 40 trains per hour. Surely OC Transpo could

let STO operate 12 trains onto the system from Gatineau? If, in 30 years, the system really does reach capacity, a second tunnel can be built. But don't spend \$1 billion now on something that may never be needed.

As a funder and planner of the National Capital, the Government of Canada is uniquely placed to show leadership and make sure the right system gets built. Discussion so far seems to have focused on a tramway "loop" to link tourist sites on both sides of the river. This looks attractive in artists' drawings but is unrealistic and does not adequately respond to the transportation needs of residents. People need fast, efficient transit all year round, to get to work, school, and play. We already have a high-capacity tunnel under the city. Let's use it to build a network serving the whole region, regardless of provincial boundaries. 🍁



Michael Schabas and Peter Harrison are consultants at CPCS, an Ottawa-based global management consulting firm specializing in transportation and energy.



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