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² Statistics Canada, "Household spending, Canada, regions and provinces," November 25, 2019.

³ CMHC, "Mortgage and Consumer Credit Trends National Report – Q4 2019," December 2019.

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In memoriam

PEO mourns the loss of East Central Region Councillor Peter Cushman, P.Eng.

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To protect the public, PEO investigates all complaints about unlicensed individuals or companies, and unprofessional, inadequate or incompetent engineers. If you have concerns about the work of an engineer, fill out a Complaint Form found on PEO's website and email it to

complaints@peo.on.ca.

If you suspect a person or company is practising engineering without a licence, contact PEO's enforcement hotline at 800-339-3716, ext. 1444, or by email at enforcement@peo.on.ca.



EXPLORING SUSTAINABLE SOLUTIONS

By Nicole Axworthy



We've all heard climate experts' warnings and experienced the planet's signals via harsh and ever-changing weather conditions—both fueling the need for more sound

strategies for environmental protection. Fortunately, engineers have been working to address our world's environmental challenges for decades and in all areas, from renewable energy to biodegradable materials.

In recent years, the circular economy has become a buzzword for its potential to advance sustainability efforts and transform our throw-away economy into one where waste is reduced, resources are circulated and nature is regenerated. So much more than just teaching consumers to recycle and reuse, this more sustainable means of production and consumption is integrated directly into business models. In this issue, we're delving into what that means for both food and transportation.

In "The electric vehicle's biggest drawback: its battery" (p. 20), Associate Editor Adam Sidworth explores the massive industrial shift to electric vehicles—and what the production of their accompanying lithium-ion batteries will mean for the environment. Over the years, I've received dozens of emails from concerned engineers questioning how we are going to power the world's transportation sector if it goes electric, but our research has uncovered an equally concerning issue: Is mining the raw materials for hundreds of millions of batteries sustainable long term?

Another challenge when it comes to sustainability is our food production. While we've previously covered the issues of food waste and our finite food supply, the latest innovation in this area—and one in which engineers play a key role—is cellular agriculture. Specifically, this means we are now able to reinvent the way we produce meat without the countless resources required to farm animals. But is this option even viable? In "Engineering meat for a sustainable future" (p. 26), Associate Editor Marika Bigongiari explores this very question.

Now that the 2022 Council elections season is upon us, I encourage you to support your fellow engineers who are running for PEO's 2022–2023 Council. Flip to this issue's insert to find out more about this year's candidates, and then head over to www.peovote.ca to submit your vote before February 18.

On that note, I'd also like to acknowledge former East Central Region councillor Peter Cushman, P.Eng., who passed away last month. As an engineer, he contributed to the fields of cellular networking, cybersecurity and fraud management. At PEO, he was a dedicated councillor and, as inaugural chair of the Anti-Racism and Anti-Discrimination Exploratory Working Group, played a critical role in the regulator's ongoing efforts to identify, study and address issues of systemic racism and discrimination that fall within our mandate. He will be fondly remembered. **e**

THIS ISSUE Engineering's contribution to environmental stewardship and sustainability is an evolving discussion as new concepts and solutions are brought to the forefront. This issue, we delve into the profession's implementation of the circular economy model to help make the food and transportation sectors more sustainable.

FAIRNESS IN REGULATION

By Christian Bellini, P.Eng., FEC



At the November 2021 Council meeting, two items on the agenda directly addressed one of our primary responsibilities as a regulator: fairness. The items I am referring to are the final report of PEO's 30 by 30 Task Force and the proposed next steps for PEO's Anti-Racism and Anti-Discrimination Exploratory Working Group (AREWG).

The 30 by 30 goal is an initiative of Engineers Canada that aims to have 30 per cent of newly licensed engineers be women by the year 2030. It recognizes that female representation in the engineering profession does not match the makeup of the society our profession serves. Although movement on this initiative also requires progress along the full length of the educational and employment pipelines, PEO has focused its efforts on the licensing process. As part of this work, Council approved a gender audit study to investigate whether systemic bias may exist in the current licensing system and recommend changes if any such biases are discovered. This study is being carried out by the University of Toronto's Rotman School of Management under Sonia Kang, PhD, associate professor of organizational behaviour and Canada research chair in identity, diversity and inclusion, and Joyce He, PhD. At Council's November meeting, the 30 by 30 Task Force was stood down and its responsibilities transferred to PEO staff.

PEO's latest initiative is the AREWG, which was struck by Council at its November 2020 meeting with a goal to develop recommendations to enable PEO to identify, study and address any issues of systemic racism and discrimination that fall within PEO's mandate. The working group, which was proposed by former councillor Peter Cushman, P.Eng., engaged a consultant and embarked on an exploratory study that culminated in a report that was presented to Council in June 2021. The report identified numerous risks to PEO related to racism and discrimination, and its recommendation was that risks be further scoped out and policy be developed to mitigate these risks. At its November meeting, Council approved launching the next phase of the AREWG's work.

WHAT FAIRNESS MEANS IN LICENSING

Both initiatives are directly tied to investigating fairness and cut to the core of how we do our work regulating the practice of engineering. On the website of Ontario's Office of the Fairness Commissioner (OFC), fairness is identified as one of four main principals used in assessing registration practices. In part, it defines fairness as removing obstacles when assessing candidates for licensure, pointing out that:

"The assessment must be rational and above board and not place unnecessary and ill-conceived obstacles in the way of success. Everyone must have the same prospects

irrespective of their country of origin or background. The process must be expedient. And there must be a chance for an arms-length review if the individual disagrees with a decision. Those running the processes must embrace their responsibilities with a spirit of purpose, wisdom and empathy."

Over the last decade, the OFC has been critical of some aspects of the fairness of our licensing process, including application processing times and the 12-month supervised Canadian experience requirement. Recently the government has gone further, passing legislation that could eliminate the Canadian experience requirement across a large cross-section of professions and trades (see p. 10).

Both the 30 by 30 and AREWG focus on components of fairness in our licensing process by identifying systemic biases in the process that may lead some applicants to experience inconsistent outcomes when they come to PEO seeking to be licensed. Any instances of these biases, if found, must be addressed. This is fundamental to our duty to serve and protect the public interest for all of society.

As we continue to undertake our enterprise-wide transformation at PEO, we need to look deeply at all the areas where fairness is affected by our processes. Based on the OFC definition, these areas include our licensing requirements, the process by which applications are submitted, the timeliness of processing and assuring consistent outcomes. Our licensing process has evolved incrementally over decades, with responsibility for different aspects of it (experience or academic assessments, for example) traditionally focused in silos at both the volunteer and staff levels.

We have made iterative changes to small components of the licensing process as issues have emerged. What has been missing is a high-level, integrated view of how our entire process works. And fairness is a key lens through which we need to analyze and advance the licensing process as we transform. Input from the work of the gender audit and from Phase 3 of the AREWG will provide critical information to inform this work. I am looking forward to seeing these results and the improved licensing system that will ultimately emerge.

Lastly, by the time you read this message, we will be well into our Council elections. I urge you to play your part in our self-regulated profession by engaging with the issues and with the candidates to help guide our profession into our next 100 years. Now is the time for all of us to help set our future course. **e**

DEFINING OUR PLAN

By Johnny Zuccon, P.Eng., FEC



I hope all our readers enjoyed a safe and restful holiday break. With so many stress points seemingly around us these days, I think it's important to pause and reflect on our true priorities—those involving our families and loved ones. My best to you and yours as we begin a new year.

I must admit, however, that I'm often guilty of not following my own

advice, having spent many waking (and some sleeping) hours thinking about the comprehensive transformation journey PEO has embarked on—one that touches every aspect of our operations, organization and governance. It's no small task but one that is necessary to ensure PEO continues to effectively fulfil its mandate as regulator of Ontario's engineering profession.

OUR ROADMAP FOR 2022

The high-level direction for this journey was reaffirmed by Council in November 2021 through PEO's 2020–2022 *Strategic Plan: Roadmap to Transformation (Clarity of Purpose)*. The key elements of the plan are rooted primarily in the action plan that Council approved in 2019 to address the recommendations from PEO's external regulatory performance review, as well as Council's two-year Governance Roadmap, which is scheduled to be completed mid-year. The 2020–2022 Strategic Plan provides us with an official document to communicate to stakeholders the critical elements of our ongoing enterprise-wide transformation. The plan also outlines the foundational steps required to transition to the next-generation strategic plan for 2023–2025. Council will start the related work this month as it begins to define our longer-term vision and goals associated with becoming a professional and modern regulator.

Perhaps the most significant change on the horizon is the implementation of a mandatory continuing professional development (CPD) program (see p. 8). In February 2021, Council approved a motion that allowed PEO to move forward with the creation of a mandatory CPD program for licence holders based on the current voluntary Practice Evaluation and Knowledge (PEAK) program. This news was shared at the time with licence holders through an e-blast, website posting, social media and the pages of *Engineering Dimensions*. Since then, work has continued in accordance with a detailed and evolving project plan. Staff are now beginning to scope out potential changes to the regulation as well as some of the operational issues to be addressed over the coming months, with an intent to introduce the mandatory program early in 2023. Establishing a mandatory CPD program supports the action plan and aligns with our objectives of maintaining public trust in the profession and serving our public interest mandate as a regulator. Watch



I MUST ADMIT, HOWEVER, THAT I'M OFTEN GUILTY OF NOT FOLLOWING MY OWN ADVICE, HAVING SPENT MANY WAKING (AND SOME SLEEPING) HOURS THINKING ABOUT THE COMPREHENSIVE TRANSFORMATION JOURNEY PEO HAS EMBARKED ON.

for further updates on the program throughout the year on all our communications channels.

FURTHER PRIORITIES

Incorporating diversity, equity and inclusion best practices into all PEO systems and operations continues to be a critical element in our journey to become a more modern regulator and is prioritized in our 2020–2022 Strategic Plan. Staff recently completed training on inclusive communications and leadership that was facilitated by the Canadian Centre for Diversity and Inclusion. The session focused on best practices that can be adopted for inclusive language in our workplace. We have also created a multicultural calendar that reflects the observances celebrated by various cultures and celebrates the rich diversity in our community.

Also aligning with the focus on our regulatory mandate was the decision to transition the Ontario Professional Engineers Awards program to the Ontario Society of Professional Engineers (OSPE), beginning with the 2022 event (see p. 10). For nearly 20 years, PEO and OSPE have co-hosted this annual recognition of professional engineers in Ontario who have made outstanding contributions to their profession and their community. Previously, PEO held sole responsibility for the program since its inception in 1947. We wish our friends at OSPE success as they continue to recognize the achievements of those in the engineering community.

Continuing with our modernization efforts, you may be aware that *Engineering Dimensions* will be going fully digital beginning with the March/April 2022 issue. This transition supports our modernization efforts and resolves concerns related to the current paper supply crisis. Please ensure PEO has your current email address so you can continue to receive our official publication.

I continue to be encouraged by the progress made throughout our three pillars of transformative change, due in large part to the commitment from staff, Council and our volunteers. Our likelihood for success is far greater if we're all striving for a common goal. My thanks to all. **e**

PEAK INTRODUCES NEW ETHICS MODULE, PURSUES TRANSITION TO MANDATORY PROGRAM

By Adam Sidsworth

Element of the PEAK program	Year 1 (March 2017 to March 2018)	Year 2 (March 2018 to March 2019)	Year 3 (March 2019 to March 2020)	Year 4 (March 2020 to March 2021)
Of all PEO licence holders				
Declared a practice status	33%	22%	18%	16%
Of all PEAK participants				
Declared as "practising"	76%	79%	81%	83%
Declared as "non-practising"	24%	21%	19%	17%
Completed the ethics module	60%	72%	70%	67%
Of all practising PEAK participants				
Started reporting continuing knowledge activities	22%	47%	53%	41%

A graph showing licence holder participation in the voluntary PEAK program since its inception in March 2017

In its continuing mandate to guide PEO licence holders through their continuing professional development (CPD), PEO's Practice Evaluation and Knowledge (PEAK) program recently introduced a new ethics module.

The module is an interactive, online refresher designed to reacquaint practitioners with the statutory professional and ethical obligations associated with their professional practice activities as described in the *Professional Engineers Act* (PEA) and its regulations. Called "Responsibility for professional engineering work," the refresher course covers topics such as professional engineering practice, PEO's Code of Ethics, licence holder responsibilities for professional engineering work prepared by them or others, supervision of professional engineering work, quality management and reviews of professional engineering work.

"Since PEAK launched in 2017, we have been able to add an ethics module each year to the library of modules available to licence holders in the PEAK portal, and in 2020, we provided a two-part module," explains Arden Heerah, P.Eng., PEO's professional development lead. "Licence holders complete just one module each year by selecting from the available modules in any sequence. However, at any time they can review previously completed modules."

PEAK TRANSITIONS TO A MANDATORY PROGRAM

PEAK began in March 2017 as a voluntary reporting program to allow PEO—and, importantly, the public—to gauge licence holder participation in an individualized CPD program. Practising licence holders complete a declaration of their practising status and a practice evaluation questionnaire, which provides them with an individualized continuing knowledge target of up to 30 hours to complete and report to PEO throughout the year. Non-practising licence holders, on the other hand, complete just the practice declaration. Both practising and non-practising practitioners are also encouraged to complete the ethics module. Although participation in PEAK is voluntary, licence holders' completion—or incompletion—of PEAK is noted on PEO's directory of licensed practitioners,

which is available to the public on PEO's website.

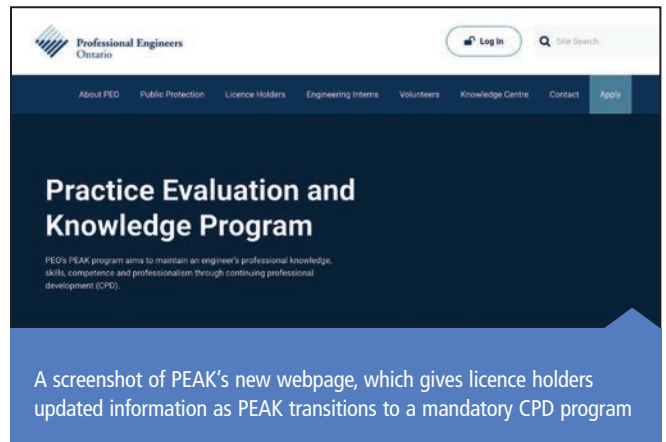
This could be the last year that PEAK remains a voluntary program. Council agreed at its February 2021 meeting to begin the process of transitioning PEAK to a mandatory CPD program (see "PEO to move forward with mandatory CPD program," *Engineering Dimensions*, March/April 2021, p. 41). This is notable because since July 2021, PEO has been the lone engineering regulator in Canada to not completely implement mandatory CPD, and licence holder participation in the voluntary program has plummeted during PEAK's four-year existence, with just 16 per cent of practitioners declaring their practice status in PEAK's 2020–2021 operating year (see chart). And of those PEAK participants in the same time period, two thirds completed the ethics module, and 41 per cent of participating practising engineers started to report their continuing knowledge activities.

In moving forward with mandatory CPD, Council and PEO staff referenced

several factors, including recommendations for mandatory CPD from a coroner’s report stemming from the 2012 Radiohead stage collapse in Toronto, ON, and the commission of inquiry into the 2012 Algo Centre Mall collapse in Elliot Lake, ON. Additionally, a 2019 external review of PEO’s performance as the provincial engineering regulator recommended a mandatory, effective and measurable CPD program, which has also been asked for by PEO’s advocacy partners, notably the Ontario Society of Professional Engineers and the Association of Consulting Engineering Companies–Ontario.

Heerah refers to the project charter for the implementation of mandatory CPD, which states that CPD is mandated by the PEA, including subsection 2(4), which dictates that PEO maintain a threshold of standards, knowledge and skill among its licence holders; while subsection 28(3) of the act requires licence holders to be competent and knowledgeable in their areas of practice. “A mandatory CPD program is expected to support PEO efforts to encourage licence holders to engage in CPD to maintain their engineering competence and to improve the regulation of the practice of professional engineering in the public interest, thereby strengthening public trust in PEO and the engineering profession,” the charter states.

Mandatory CPD is expected to be implemented by January 2023, once the province has incorporated the necessary legislative changes and PEO has assigned the accompanying operational requirements. However, until then, Heerah encourages all licence holders to complete PEAK, which will help them prepare for when mandatory CPD becomes a



reality. “The mandatory CPD program will be based on the PEAK program, including its guiding principles and program elements,” Heerah says.

STAY UPDATED ON PEAK

Heerah notes that licence holders seeking further information on the PEAK program should visit the PEAK webpage (www.peopeak.ca), which was recently revised to provide practitioners with more details on PEAK’s upcoming transition to a mandatory CPD program. The PEAK team is also available by phone at 416-224-1100 or 800-339-3716 or by email at peopeak@peo.on.ca. Requests for PEAK materials and seminars can be submitted by phone or email.

BITS & PIECES



wastewater treatment plants that would otherwise be released into the atmosphere. It can be used to fuel transit, power industry and heat homes and businesses.

Photo: Thzorro77

Renewable natural gas, or biogas, is a carbon-neutral fuel that converts organic waste to renewable energy by capturing methane emissions from organic waste, landfills and



day. Bamboo can be harvested approximately every three years and doesn’t require replanting, making it a highly sustainable building material with many applications.

Photo: Basile Morin

Bamboo has long been considered a sustainable alternative to wood. A member of the grass family, bamboo is one of the fastest-growing plants on Earth, with a growth rate of approximately three feet per

OSPE TAKES THE REINS OF THE ONTARIO PROFESSIONAL ENGINEERS AWARDS

By Marika Bigongiari



The Ontario Society of Professional Engineers, the province's engineering advocacy body, is taking over the Ontario Professional Engineers Awards. Since 1947, the annual awards program has recognized professional engineers in Ontario who have made outstanding contributions to the engineering profession and community.

Although founded by PEO,

the awards have been jointly hosted by PEO and OSPE for nearly two decades.

The decision to transition the OPEA to OSPE occurred in advance of the 2021 virtual awards gala in November 2021 (see "Meet the 2021 winners of the Ontario Professional Engineers Awards," *Engineering Dimensions*, November/December 2021, p. 10) and was made as part of PEO's ongoing transformation efforts to narrow its focus to regulatory activities.

"OSPE is pleased to continue the tradition of celebrating the achievements of Ontario's engineers through our annual awards gala," said Sandro Perruzza, CEO of OSPE. "Our staff have organized this event for more than 15 years, and we know it will continue to be the most anticipated evening of the year for professional engineers. We look forward to hosting an in-person gala once again in 2022."

PEO REFOCUSSES ITS ACTIVITIES

PEO's firm commitment to a new way of doing things stems from a 2019 external audit of its regulatory per-

formance, which resulted in a report that levied 15 recommendations and a high-level action plan to improve and refocus PEO's role as a regulator. The action plan included the development of an activity filter to assess 93 activities of PEO committees, subcommittees, chapters and working groups to determine whether they fit into PEO's regulatory mandate, Council's governance role or neither.

While working through the action plan, it was determined that the OPEA falls in the "neither" category, and an operational decision was made to hand the reins of the awards program to the willing hands of OSPE.

"It was easy to facilitate the transition and work collaboratively with OSPE, the profession's advocacy group, to move the awards over to them," explains Liz Maier, PEO's vice president, organizational effectiveness. Maier anticipates a seamless transition, considering OSPE's long-time involvement in the OPEA. "The OPEA and gala are still going to exist," Maier observes. "The event will simply be managed entirely by OSPE."

PEO's participation in this year's awards program will be limited to the call for nominations, and OSPE will take over all other activities as they relate to the OPEA, including the selection of the 2022 OPEA recipients, the creation of all marketing materials and continued planning and execution of the OPEA gala event. All relevant awards content has been transitioned from PEO's website to OSPE's OPEA website. More information about the awards can be found at www.opeacewards.ca and on the call for nominations on page 15.

PROVINCE MOVES TO ELIMINATE CANADIAN WORK EXPERIENCE REQUIREMENT FOR LICENSING

By Adam Sidsworth

In a bid to make it easier for internationally trained professionals (ITPs) to become licensed and employed in their chosen professions in Ontario, the province has introduced a new law that may compel many of Ontario's self-regulated professions to eliminate their mandatory Canadian work experience requirements.

Bill 27, the *Working for Workers Act, 2021*, was introduced in the legislature by Monte McNaughton, minister of labour, training and skills development, on October 25, 2021. It subsequently received royal assent on December 2, 2021. The omnibus bill introduces amendments to six labour-related bills, including the *Fair Access to Regulated Professions and Compulsory Trades Act, 2006* (FARPCTA). Under the FARPCTA, Ontario's regulators must have transparent, objective, impartial and fair procedures. The FARPCTA creates the Office of the Fairness Commissioner, which also advises regulators on their policies and practices, particularly in relation to licensing and registration. Bill 27 amends the FARPCTA to prohibit most non-health regulators from requiring

Canadian work experience as a condition of licensure unless it can be justified on the basis of public health and safety. However, both the definition of what constitutes a Canadian work experience requirement and the nature of the public health and safety exemption will be likely introduced once the province has the chance to consult with the affected regulators.

Under its legislative authority to regulate in the public interest, PEO currently requires four years of engineering work experience, of which one year must be under the supervision of a professional engineer licensed in Canada. And it is that one year of supervised Canadian engineering experience that can be a significant obstacle for international engineering graduates (IEGs) to obtain full licensure, since IEGs typically have a more difficult time securing the required Canadian experience than those who receive their engineering education in Canada. The Institute for Canadian Citizenship reported in 2018 that IEGs face barriers to licensure and engineering employment in Canada due to a complex licensing process, higher unemployment rates, persistent wage gaps and employers' preference for Canadian-born engineering talent (see "Institute for Canadian Citizenship releases report on barriers faced by international engineering graduates," *Engineering Dimensions*, November/December 2018, p. 7).

LEVELLING THE PLAYING FIELD

With Bill 27's amendments to the FARPCTA, the Progressive Conservative government is reaffirming its commitment to help ITPs become adequately licensed and employed in their field of training. "All too often, newcomers in this province struggle to find jobs in their regulated profession for no other reason than bureaucracy and red tape," McNaughton stated. "These are folks who often have the training, experience and qualifications to work in booming industries where Ontario desperately needs help but are being denied a chance to contribute. If these proposed changes are passed, Ontario would become the first province in Canada to help level the playing field in certain regulated professions so that workers coming here have the opportunity to build a better life for themselves and their loved ones and build stronger communities for us all."

Among the factors informing the province's decision to make it easier for ITPs to become licensed in their chosen profession are the fact that:

- In 2016, only one-quarter of ITPs were employed in the professions for which they were trained;
- Over 300,000 jobs were left unfilled in Ontario in the summer of 2021; and
- ITPs face multiple barriers to licensure in addition to required Canadian work experience, including language tests and lengthy processing times, with some regulators taking up to 18 months to license ITPs.

PEO's WORK EXPERIENCE REQUIREMENT

The mandatory one year of supervised Canadian engineering work experience has long since been the subject of various exchanges between PEO and the Office of the Fairness Commissioner. Notably, in 2018, the then fairness commissioner noted that PEO's mandatory supervised Canadian work experience failed to meet the standards of an Ontario Human Rights Commission policy that requires regulatory bodies to prove that Canadian work experience is a "bona fide



requirement" and that PEO was failing to live up to its duties under the FARPCTA. However, PEO at the time responded that the one year of mandatory Canadian work experience is in place for all applicants for PEO licensure, regardless of country of origin, to ensure they meet rigorous standards of competency and professionalism. It also cited the provisional licence, which was designed to help IEGs who meet all other licensing requirements fulfill the Canadian work experience requirement (see "PEO responds to the fairness commissioner on mandatory Canadian experience," *Engineering Dimensions*, November/December 2018, p. 11).

The current fairness commissioner, Irwin Glasberg, however, is supportive of the government's efforts to force regulators to remove the Canadian work experience requirement. "I am very pleased the government intends to propose several important amendments that would, if approved and passed, better the lives of new Canadians," Glasberg said. "These proposed changes would help to improve registration practices, address unfair Canadian experience requirements and remove related barriers for internationally trained professionals and tradespersons."

ATTORNEY GENERAL EXPRESSES SUPPORT FOR PEO'S ANTI-DISCRIMINATION, ANTI-RACISM WORK

By Marika Bigongiari

During the PEO president's annual meeting with the attorney general, which was held virtually on November 22, 2021, Attorney General Doug Downey, LLM, LLB, acknowledged the regulator's anti-racism and anti-discrimination work, in addition to its other major strategic initiatives related to licensure, governance and organizational structure. Downey's expression of support came after he was updated on the ongoing initiatives of PEO's Anti-Racism and Anti-Discrimination Exploratory Working Group (AREWG), which aims to address potential vulnerabilities to systemic racism and discrimination in all aspects of PEO's work as a regulator, employer and organization.

Under the *Professional Engineers Act*, the attorney general has statutory responsibility for overseeing PEO in its capacity as Ontario's engineering regulator. At the November meeting, PEO President Christian Bellini, P.Eng., FEC, was accompanied by CEO/Registrar Johnny Zuccon, P.Eng., FEC; Dan Abrahams, LLB, vice president, legislation and policy; and Jeannette Chau, P.Eng., manager, student and government liaison programs.

PEO Council established the AREWG in November 2020 with a mandate to scope vulnerabilities and propose best practices for identifying, studying and addressing any such vulnerabilities that exist (see "Council approves anti-racism and anti-discrimination strategy," *Engineering Dimensions*, January/February 2021, p. 46). The AREWG worked with expert consultants Patricia DeGuire—who was named chief commissioner of the Ontario Human Rights Commission in August 2021—and Shashu Clacken to help identify potential vulnerabilities and provide recommendations on how to best address them. The consultants produced a report, *Anti-Racism and Anti-Discrimination: A Bridge to PEO's More Successful Future*, which was presented to Council at its meeting in June 2021 and subsequently made public and shared with stakeholders such as the attorney general. In November 2021, Council instructed the AREWG to continue its work, which includes creating an implementation plan for the recommendations and establishing an anti-racism and equity code.

PEO UPDATES AG ON MODERNIZATION EFFORTS

At the meeting, Bellini also updated Downey on recent PEO activities, which included a discussion of the recently passed Bill 27, *Working for Workers Act, 2021*, which introduces amendments to six labour-related bills, including the *Fair Access to Regulated Professions and Compulsory Trades Act* (FARPCTA) (see p. 10). The amendments could limit the ability of regulators such as PEO to impose Canadian work experience requirements on prospective licence holders, with the goal of striking an appropriate balance between fairness and accessibility to applicants with public health and safety considerations. In recent years, the regulator has worked with the Office of the Fairness Commissioner (OFC), which was created under FARPCTA, to address similar concerns expressed by former fairness commissioner Grant Jameson, and PEO will continue to work with the OFC, the Ministry of Labour, Training and Skills



Development and the Ministry of the Attorney General as new regulations in FARPCTA are developed and promulgated.

Bellini also reminded Downey about PEO's modernization efforts, specifically the action plan to incorporate the recommendations of the 2019 external regulatory review. The attorney general was also advised that PEO is moving towards the conclusion of its multi-year Governance Roadmap, and that it soon plans to implement a mandatory continuing professional development (CPD) program for its licence holders (see p. 8). Downey showed interest in PEO's progress in moving towards mandatory CPD as well as other ongoing initiatives, and he expressed his continued confidence in PEO's regulatory work.

BC ENGINEERING AND GEOSCIENCE REGULATOR REJECTS CREATION OF SEPARATE ADVOCACY BODY

By Adam Sidsworth

British Columbia's engineering and geoscience regulator, Engineers and Geoscientists BC (EGBC), decided in late 2021 not to create a separate advocacy body for the province's engineering and geoscience professions.

The ability of EGBC to act as both a regulator and advocator of its duo professions initially became uncertain with the passage of BC's *Professional Governance Act* (PGA), which came into full effect in February 2021. The PGA allows the province to oversee the regulatory practices of EGBC and four other regulatory bodies through its Office of the Superintendent of Professional Governance (OSPG) (see "British Columbia engineering regulator responds to BC government's intentions paper," *Engineering Dimensions*, May/June 2019, p. 14). Section 22(3) of the PGA specifically states that "a regulatory body may only act in an advocacy role in accordance with this act and in accordance with rules, conditions or limits prescribed by the lieutenant governor in council." However, EGBC noted in a newsletter to members that the aim of this restriction is to assure that regulators, including EGBC, focus their advocacy activities to support its regulatory mandate rather than the interests of its licence holders.

EGBC INVESTIGATES ITS ADVOCACY ROLE

EGBC was spurred to investigate its ability to undertake advocacy activities following a motion at its 2019 Annual General Meeting asking EGBC to review the possibility of devolving its advocacy activities to a separate independent body, akin to PEO's separation of its advocacy responsibilities to the Ontario Society of Professional Engineers (OSPE) in 2000. Using a framework supplied by the OSPG, EGBC worked to determine which of its advocacy activities would need to cease or be modified. "The regulatory body is an expert in the legislative, bylaw and standards of practice frameworks that its professions work in and in the governance of its professionals," the OSPG advised. "It may speak in its role as a regulator but should limit speaking for the profession."

Importantly, however, the OSPG framework provided EGBC with much-needed direction to evaluate its programs to ensure they are in the public interest or benefit licensed professionals. The framework provided specific activities that regulatory bodies—including EGBC—can consider continuing if they fit into their regulatory

parameters, including proposals to government, job fairs, advocating for members during election cycles, school outreach programs and affinity programs.

"The review determined that Engineers and Geoscientists BC's core operations and most other programs can continue, while some require modest changes to come into compliance with the PGA," EGBC stated. "Three programs were identified to be outside of our mandate under the PGA: Two online directories that allowed registrants to advertise their services or availability for employment have been closed; and the Benevolent Fund Society, which provided financial grants to registrants in need, will be dissolved."

Meanwhile, the organization's promotion of engineering and geoscience can continue if they are adjusted to support equity, diversity and inclusion and promote the professions to girls and other underrepresented groups. And EGBC's mentoring program could continue if re-oriented to support the registration of applicants and interns. EGBC ultimately decided that devolving advocacy activities to a separate entity would not be a benefit at this time, particularly since it is still adjusting to its mandate under the new PGA. It also cited a potential loss of volunteers and overtaxed EGBC staff. However, EGBC will review the decision later this year.

A SIMILAR PROCESS IS ONGOING AT PEO

EGBC's examination of its advocacy activities may seem familiar to PEO, which, although it devolved its advocacy role to OSPE over two decades ago, never entirely excused itself of advocacy-related activities. In 2019, PEO underwent an external review of its performance as an engineering regulator, which recommended that PEO examine its committees, task forces, working groups and chapters to determine if they fit PEO's regulatory mandate.

At its November 2019 meeting, PEO Council approved an activity filter tool to assess and determine which PEO committees, chapters, and working groups are related to governance, regulatory or neither. Of the 93 activities examined, 40 were deemed regulatory, 18 were deemed governance and 35 were neither regulatory nor governance activities (see "The activity filter explained," *Engineering Dimensions*, March/April 2020, p. 7). However, the fate of those 35 remains largely undetermined until PEO completes its governance renewal project, which is scheduled to wrap up later this year.

ALBERTA MOVES TO QUICKEN PROCESS FOR INTERPROVINCIAL LICENSING

By Adam Sidsworth

The province of Alberta enacted a bill that will set fixed deadlines for the province's professional regulators to make decisions on licensing professionals already licensed in other Canadian jurisdictions.

Bill 49, the *Labour Mobility Act*, received royal assent on December 2, 2021. With its passage, Bill 49 requires regulators of over 100 professions, including the Association of Professional Engineers and Geoscientists of Alberta (APEGA), to make registration decisions within 20 days of receiving a complete application of a candidate already licensed by another provincial or territorial regulator in that profession.

"This will make Alberta the first jurisdiction in Canada to legislate decision timelines," the government of Alberta states.

"Ensuring decisions are made quickly will support Alberta employers by reducing barriers to hiring out-of-province when necessary. Regulatory authorities [will] need to establish an internal review or appeal process for registration decisions within a reasonable timeframe. They would also need to maintain a record of any decisions made through these processes for three years."

Under the Canadian Free Trade Agreement (CFTA), if an applicant for licensure with one provincial or territorial engineering regulator is already registered with another provincial or territorial engineering regulator, the engineering regulator being applied to will typically contact the regulator of origin to confirm that the applicant is in good standing. However, some regulators may require additional information. APEGA typically requires proof of registration in good standing with another Canadian engineering regulator, completion of an undergraduate engineering degree, no restrictions on practice and confirmation that all appropriate exams have been passed.

APEGA WELCOMES INCREASED INTERPROVINCIAL MOBILITY

As far back as July 2019, APEGA stated that it was in full support of the easing of interprovincial licensing of professional engineers and geoscientists, noting that it "has a long history of recognizing out-of-province professional credentials in Alberta quickly and efficiently to get new Albertans working as soon as possible." APEGA points out that it makes decisions on interprovincial mobility applications within five to seven business days.

In July 2019, Kenney announced that the government of Alberta would eliminate exceptions to the otherwise free trade of goods and labour as listed under the CFTA, including local food under the *Supporting Alberta's Local Food Sector Act*, wastewater treatment facilities, the Alberta Utilities Commission, Alberta Innovates and the Alberta Energy Regulator. The CFTA, which replaced the 1995 Agreement on Internal Trade, was designed to relax the flow of the trade of goods and labour between provincial and territorial provinces. Interprovincial trade accounts for 40 per cent of provincial and territorial exports.

"As part of our government's job-creation strategy, we are taking the bold step to drop all provincial exceptions to the 2017 Canada Free Trade Agreement related to procurement," Kenney said. "Alberta is proud to take a leadership role on an ambitious free



enterprise agenda to benefit our province and promote national economic growth."

Because Bill 49 is new, APEGA's reaction could change as the bill is implemented. "Once [the] details have been finalized, APEGA will review and might need to make modifications to its licensing process to meet the intent of Bill 49," Diane Johnstone, P.Eng. (Alberta), APEGA's director, legislative review and government relations, says.

INTERPROVINCIAL LABOUR MOBILITY AND PEO

Since 2009, Ontario has had its own *Ontario Labour Mobility Act* (OLMA), which is designed to either eliminate or reduce measures of Ontario's professional regulators that would otherwise restrict or impair the ability of individuals already registered with a regulator in the same field in another Canadian province or territory. The act was subsequently updated to ensure Ontario fulfills its obligations under the CFTA.

Under the OLMA, Ontario regulators are not allowed to have professionals already licensed in another Canadian jurisdiction undergo additional training or exams. However, Ontario regulators are permitted to impose some requirements, such as a police check, be of good character or pay a membership fee. Yet there are no time limits for Ontario regulators to make a decision. Currently, PEO typically takes about five weeks to approve an application from an engineering regulator licensed in another Canadian jurisdiction.

OPEA CALL FOR NOMINATIONS

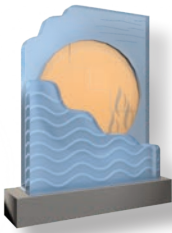
NOMINATIONS ARE BEING ACCEPTED FOR THE 2022 ONTARIO PROFESSIONAL ENGINEERS AWARDS (OPEAs).

Now in their 75th year, the OPEAs showcase Ontario professional engineers who have made outstanding contributions to their profession and community. Nominate an exceptional engineer or team of engineers who have led a successful engineering project. OPEA recipients are honoured annually in November at a black-tie gala hosted by the Ontario Society of Professional Engineers.

Only one nominator and two referees are now required for individual OPEA categories.

For the OPEA Citizenship Award, the Awards Committee recognizes noteworthy support and advancement of equity, diversity and inclusion in the profession and promoting or supporting equity, diversity and inclusion within society.

• THE AWARDS •



GOLD MEDAL

The premier award, the Gold Medal recognizes commitment to public service, technical excellence and outstanding professional leadership.



AWARD FOR ENGINEERING PROJECT OR ACHIEVEMENT

This award recognizes a team of engineers who have conceived of, designed and executed an outstanding project or achievement that has had a significant, positive impact on society, industry or engineering. *See page 25 for more information.



CITIZENSHIP AWARD

Those who earn this award have given freely of their time, professional experience and engineering expertise—to the benefit of humanity.



THE DEADLINE

Nominations are due by 4 p.m. EST on **Wednesday, February 23, 2022.**

ELIGIBILITY

More information about the awards, including selection criteria and nomination forms, is available at www.opeawards.ca or by email at awards@ospe.on.ca



ENGINEERING MEDAL

The Engineering Medal recognizes professional engineers who have improved our quality of life through the ingenious application of their engineering skills and whose achievements rise significantly above the normally high standards of the profession. It can be awarded in the categories of:

Engineering Excellence

Recognizes overall excellence in the practice of engineering, where the innovative application of engineering knowledge and principles has solved a unique problem, led to advanced products or produced exceptional results

Management

Awarded for managing and directing engineering projects or enterprises where innovative management practice has contributed significantly to the overall excellence of the engineering achievement

Research and Development

Awarded for using new knowledge in developing useful, novel applications, advancing engineering knowledge or applied science or discovering or extending any of the engineering or natural sciences

Entrepreneurship

Awarded for applying new technologies or innovative approaches that have enabled new companies to get started and/or assisted established companies to grow in new directions

Young Engineer

Awarded to outstanding young Ontario engineers who have made exceptional achievements in their chosen fields. Candidates must be no older than 35 as of December 31 in the year the nomination is submitted and have demonstrated excellence in their careers as well as in community and professional participation

SUSTAINABLE ENGINEERING DESIGN AND PRACTITIONERS' PROFESSIONAL OBLIGATIONS

By Sherin Khalil, P.Eng., PMP, and José Vera, P.Eng., MEPP

Practitioners have professional obligations to incorporate sustainable engineering design principles in their practice, while understanding their roles in managing environmental aspects.

WHAT IS SUSTAINABILITY AND HOW CAN IT BE INCORPORATED INTO ENGINEERING DESIGN?

Sustainability is a term that has several definitions. It can be defined as a "problem statement that integrates the environment and the economy in a way that both sides can live with it," according to international environmental consultant Albert F. Appleton; and/or "the possibility that human and other forms of life will flourish on the planet forever," according to environmental researcher John R. Ehrenfeld.

There is a global commitment to achieve sustainable development in three pillars: economic, social and environmental. The challenge is how the integration of these pillars can be achieved in a balanced manner. How do we ensure social acceptance of environmental protection? How do we protect the environment at a reasonable cost? Practitioners could face many challenges when trying to integrate these three pillars of sustainability in practice.

Practitioners should consider the following when developing sustainable engineering design projects:

- Adopt life-cycle assessments (LCAs) in their engineering practice;
- Design for targeted durability;
- Prevent waste at the design stage rather than treating it at the end-of-life cycle;
- Design for recycling and reuse;
- Minimize toxic reagents;
- Minimize energy consumption and/or consider renewable energy sources;
- Minimize material diversity;
- Reduce demand for resources;
- Reduce waste production; and
- Carry out a comprehensive risk assessment prior to commencing projects to evaluate the potential environmental, economic and societal impacts.

The *Professional Engineers Act* (PEA) defines the practice of professional engineering as "any act of planning, designing, composing, evaluating, advising, reporting, directing or supervising that requires the application of engineering principles and concerns the safeguarding of life, health,

property, economic interests, the public welfare or the environment or the managing of any such act."

The above-mentioned definition covers the safeguarding of the environment. Therefore, practitioners could refer to the global Sustainability Development Goals (SDGs) (<https://sdgs.un.org/goals>) as a framework to aspire to. The 17 SDGs were adopted by the United Nations in 2015 to address some of the world's urgent challenges. The specific SDG goals that require engineering skills and technical knowledge include:

- Goal 6—clean water and sanitation to ensure availability and sustainable management of water and sanitation for all;
- Goal 7—affordable and clean energy to ensure access to affordable, reliable, sustainable and modern energy for all;
- Goal 9—industry, innovation and infrastructure to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation;
- Goal 11—sustainable cities and communities to make cities and human settlements inclusive, safe, resilient and sustainable; and
- Goal 12—responsible consumption and production to ensure sustainable consumption and production patterns.

Sustainable design in infrastructure is one of the most critical areas because it affects everyone. Consequently, practitioners should consider utilizing green technologies and adopting the concept of sustainability, particularly if they work in construction design. Practitioners also need to be careful while designing any structure, paying attention to limited resources and energy and on procedures that reduce the impact on the environment. They should read the targets and indicators of each of the above-mentioned SDG goals to understand their mandate and how sustainable engineering design principles can be applied to achieve them.

DO PRACTITIONERS HAVE A PROFESSIONAL OBLIGATION TO CONSIDER SUSTAINABILITY PRINCIPLES IN THEIR WORK?

The short answer is yes. Furthermore, if a practitioner's client does not want to consider sustainability principles in their project, practitioners have an obligation to present the consequences to be expected when their judgment is overruled. In section 72(1)(2)(f) of Regulation 941 of the PEA, "professional misconduct" means "failure of a practitioner to present clearly to the practitioner's employer the consequences to be expected from a deviation proposed in work, if the professional engineering judgment of the practitioner is overruled by non-technical authority in cases where the practitioner is responsible for the technical adequacy of professional engineering work." Practitioners are responsible for incorporating sustainability considerations into the industrial design process and considering environmental implications of a product during its development and at its later stages of life.

Furthermore, in section 72(1)(2)(b) of Regulation 941 of the PEA, "professional misconduct" means "failure to make reasonable provision for the safeguarding of life, health or property of a person who

may be affected by the work for which the practitioner is responsible.” Because practitioners play a significant role in safeguarding life, health and welfare—and air, water and land are essential for human life—it could be reasonably argued that engineers must make reasonable provisions for air, water and land to be clean and safe. Consider that:

1. In the case of air pollution, engineers should design their projects with the consideration of fewer emissions and potentially zero waste. For more information, refer to PEO’s *Guideline for Providing Engineering Services Under O. Reg. 1/17 and Part II.2 of the EPA* (www.peo.on.ca/sites/default/files/2021-06/ProvidingEngServicesGdline2021.pdf);
2. When it comes to water, engineers should resolve water quality and quantity issues and address wastewater issues in their work. For more information, refer to the PEO guideline *Engineering Evaluation Reports For Drinking Water Systems* (www.peo.on.ca/sites/default/files/2019-07/Engineering%20Evaluation%20Reports%20For%20Drinking%20Water%20Systems.pdf); and
3. For land, engineers should efficiently promote pollution prevention in their designs and promote early detection and response to land quality issues through legislated requirements for mandatory reporting of site contamination. Refer to the PEO’s *Solid Waste Management Guideline* (www.peo.on.ca/sites/default/files/2019-11/Solidwastemanagementguideline.pdf) and *Environmental Site Assessment Remediation and Management Guideline* (www.peo.on.ca/sites/default/files/2020-07/ESAGuideline2020.pdf).

Section 72(1)(2)(d) of Regulation 941 of the PEA further defines “professional misconduct” as a “failure to make responsible provision for complying with applicable statutes, regulations, standards, codes, bylaws and rules in connection with work being undertaken by or under the responsibility of the practitioner.” According to the American Society of Civil Engineers, the following are essential steps to achieve a sustainable development project:

1. Perform LCAs from planning to reuse—Practitioners should use rigorous life-cycle methodologies that quantify the economic, environmental and social effects of the project;
2. Use resources wisely—Minimize use of non-renewable resources. Sustainable development should include progressive reductions in resource use for a given level of service and resiliency. The feasibility of restoration, or return of depleted resources, should be evaluated by the practitioner;
3. Plan for resiliency—Sustainability requires planning for the impact that natural and man-made disasters and changing conditions can have on economic, environmental and social resources; and
4. Validate the application of principles—Engineers must guide project development and validate the application of these principles by using metrics and rating tools such as the Envision™ Rating System for sustainable infrastructure.

WHY ARE LIFE-CYCLE ASSESSMENTS IMPORTANT?

An LCA is an essential tool to evaluate the environmental impact of a chemical, product, project, development or operation. LCAs consider energy production, material extraction, manufacturing, packaging and transportation and use and end-of-life stages. Each stage has raw

material input and output flows such as waste, air or water emissions.

LCAs can be used by practitioners to achieve the goal of designing for the environment by considering different material options at the early design stage and selecting one action over another. For example, an LCA could be used to help determine which option is greener: an aluminum frame or a steel frame. On one hand, aluminum is more energy intensive to produce than steel. On the other hand, aluminum has a higher strength density ratio than steel. So, an aluminum frame can be lighter but still as strong as a steel frame. Consequently, the most optimal material would depend on the application; for example, if weight is a key factor, aluminum might be the best choice for a frame. For more information on an LCA of different materials in buildings, visit www.mdpi.com/2075-5309/9/1/20.

In summary, practitioners should design for sustainability, adopt LCAs in their engineering practice and propose sustainable solutions to their clients and employers and indicate any consequences expected from a deviation proposed in the work. **e**

FURTHER READING

Engineers Canada’s *National Guideline on Sustainable Development and Environmental Stewardship for Professional Engineers*, engineerscanada.ca/national-guideline-on-sustainable-development-and-environmental-stewardship-for-professional-engineers

Sherin Khalil, P.Eng., PMP, is PEO’s standards and guidelines development coordinator; and José Vera, P.Eng., MEPP, is PEO’s manager of standards and practice.

Attend

The following events may have an in-person and/or online component. See individual websites for details.

January 2022



JANUARY 30

International Conference on Artificial Intelligence, Robots and Mechanical Engineering, Montreal, QC
academicsconference.com/Conference/19500/ICAIRME

JANUARY 30

International Conference on Control System, Power and Electrical Engineering, Montreal, QC
academicsconference.com/Conference/19510/ICCSPEE



JANUARY 30

International Conference on Environment, Agriculture and Biotechnology, Montreal, QC
academicsconference.com/Conference/19512/ICEABT

February 2022

FEBRUARY 22–23

International Academic Conference on Engineering, Technology and Innovations, Vancouver, BC
academicworld.org/Conference/2022/Canada/1/IACETI

FEBRUARY 25–26

International Conference on Civil and Environmental Engineering, Montreal, QC
academicsera.com/Conference2022/Canada/2/ICCEE



March 2022

MARCH 2

International Conference on Software Engineering and Computer Science, Montreal, QC
academicsconference.com/Conference/19645/ICSECS

MARCH 2

International Conference on Recent Advances in Science, Technology and Engineering, Montreal, QC
academicsconference.com/Conference/19643/ICRASTE

Read



Clean Meat: How Growing Meat Without Animals Will Revolutionize Dinner and the World, by Paul Shapiro, 2018: A look at the race to create and commercialize cleaner, safer, sustainable meat—real meat—without the animals and the debate that surrounds it

The Hydrogen Revolution: A Blueprint for the Future of Clean Energy, by Marco Alverà, 2021: Why hydrogen can become the fuel of the future, from transportation to electricity, and how it could eliminate fossil fuels, boost economic growth and encourage global action on climate change

Listen



Threshold

A podcast that uses the power of story to examine how humans are changing, and being changed by, the planet and make sense of this moment we're in
thresholdpodcast.org

A Sustainable Mind Podcast

Conversations with the minds behind today's most impactful environmental campaigns, organizations and startups
asustainablemind.com

How to Save a Planet

A show about climate change filled with possibility and smart, inspiring stories about the mess we're in and how we can get ourselves out of it
gimletmedia.com/shows/howtosaveplanet

Watch



Everybody Can Be a Sustainability Leader

A TEDx talk that explores how everyone can put some sustainability effort into their current job and way of life
youtube.com/watch?v=yJKXQ0JHlvc

Triple Bottom Line (3 Pillars): Sustainability in Business

The concept of the triple bottom line—providing businesses with a new perspective on the rationale for integrating sustainability into who and how they are in the world
youtube.com/watch?v=2f5m-jBf81Q

How We Can Make the World a Better Place by 2030

Can we end hunger and poverty, halt climate change and achieve gender equality by 2030? The governments of the world think we can.
youtube.com/watch?v=o08ykAqLOxk

HOW PRACTITIONERS CAN MANAGE LIABILITY RISKS

By Aun Japanwala and Tasmeea Islam

Engineering projects can be complex, challenging and difficult to manage. Whether professional engineers are designing a small storefront, a new transportation hub or parts for a washing machine, the pressure—and the potential for errors—is high. Regardless of who's at fault when an error does occur, society is quick to point the finger. How can practitioners protect themselves?

Under section 74(1) of Regulation 941 under the *Professional Engineers Act*, holders of a certificate of authorization (C of A) are required, with few exceptions, to have professional liability insurance to cover claims related to the delivery of professional services. Typically, employee engineers working for C of A holders that have professional liability insurance are covered under their employer's policy. However, engineers working for these firms—especially if they are named on the C of A as responsible for the engineering services—should review their exposure to liability with the firm's insurer. Additionally, employee engineers should check with their employer's insurance company to see if they are covered for professional negligence or errors and omissions.

WHAT ARE THE BIGGEST RISKS?

Some of the liability risks faced by practitioners can involve clients claiming the engineer made a mistake, accusing the engineer of negligence or naming the engineer in a lawsuit. According to claims data from Victor Insurance, 52 per cent of claims against engineers and architects are due to design error allegations. Additionally, if disruptions in performance, scheduling or pricing of an engineering project are unaccounted for under the existing terms of the contract, and if the client isn't aware of delays or cost overruns well in advance, the practitioner might be accused of negligence or breach of professional duty. Whether or not the practitioner is at fault, clients may look to pass the financial responsibility onto the practitioner if an error or omission costs them money. And even if a claim is frivolous, the practitioner will still have to defend themselves to clear their name.

HOW CAN PRACTITIONERS MANAGE THESE RISKS?

Here are 10 important tips to help practitioners avoid a claim:

1. **Practice good contract management.** Set clear expectations regarding the project, including the terms and conditions; the timing, delivery and termination of services; and pricing and payment schedules. Seek legal counsel if necessary.

The practitioner should ensure their legal obligations are understood and amend contracts as needed for adequate protection;

2. **Ensure the contractual ability to stop working if not being paid.** This is key in case a project gets held up. Additionally, all invoices should state that they are subject to the terms of the master agreement;
3. **Implement quality control processes.** The practitioner should review their work regularly and keep a list of active clients to avoid taking on more work than can be handled at one time;
4. **Document everything.** The practitioner should maintain a complete record of provided services and interactions, taking note of the date and time, all discussed topics, any issues and any recommendations made and why, along with the client's refusal if applicable;
5. **Be thorough.** The practitioner should take photos and/or videos of any problems or errors encountered, and always follow up discussions with a summary email, particularly for verbal agreements or instructions given to other parties;
6. **Be cautious.** The practitioner should not put their stamp of approval or sign-off on anything they're not 100 per cent comfortable with. Remember that the practitioner must explain their reasoning to a judge if it's called into question. Similarly, the practitioner shouldn't agree to switch materials or brands unless they have tested them and can certify the change will have no major impact. And the rationale for switching and/or not switching materials should always be documented;
7. **Don't certify what can't be seen,** even if a contractor states that they've done something before with no issues. Instead, the practitioner should conduct their own research and ask for third-party reports on efficacy and safety before making any changes;
8. **Communicate.** The practitioner should keep all relevant parties informed of updates to such things as design plans and layouts, pricing and deadlines, bylaws and government and safety protocols, and they should be particularly mindful of budget and scheduling changes or anything else that could drive up the total cost;
9. **Strengthen insurance coverage.** The right coverage will ensure legal action doesn't jeopardize the practitioner's business by covering damages—legal expenses, administrative costs and court settlements—even if the claims made are groundless; and
10. **Consult with a risk advisor** who specializes in the engineering sector to help identify exposures, navigate industry trends and adopt a proactive approach to risk management.

For more information on professional liability insurance requirements under the C of A, refer to PEO's guideline *Certificate of Authorization Requirements: An Information Guide* (www.peo.on.ca/sites/default/files/2019-09/CofA_Infoguide.pdf). [e](#)

Aun Japanwala is a risk advisor for engineering firms and Tasmeea Islam is a marketing and communications associate with PROLINK Insurance Inc., based in Toronto, ON.

The electric vehicle's biggest drawback: **ITS BATTERY**

By Adam Sidsworth

The age of the electric vehicle is here. The federal government is mandating sales by 2035, yet there is concern about the sustainability and feasibility of producing the vehicles' lithium-ion batteries. Developing an effective recycling ecosystem might be key to the industry's long-term success.



Ontario is embracing electric vehicles. At a November 2021 press conference in Guelph, ON, Premier Doug Ford and Vic Fedeli, minister of economic development, job creation and trade, announced the second stage of the province's "Driving Prosperity: The Future of the Automotive Sector" plan, which aims to have at least 400,000 hybrid vehicles and electric vehicles (EVs) manufactured in Ontario by 2030.

Under Driving Prosperity, the provincial government hopes to attract a new battery assembly plant, increase exports of Ontario-made auto parts and establish an electric battery supply chain network that connects northern Ontario's mineral-rich mining sector with the manufacturing industry of southern Ontario. Fedeli cited investments such as \$56.4 million over the next four

years through the Autonomous Vehicle Innovation Network, a provincial agency fostering Ontario-made automotive technologies.

"Our government has a plan to unleash Ontario's economic potential as we build up home-grown supply chains for electric vehicles and battery manufacturing," Ford asserted at the press conference. "Ontario is a world-leading partner in creating the best vehicles with the best labour force and clean energy."

CANADA COMMITS TO LOWERING EMISSIONS

Road transport is one of the largest contributors of global greenhouse gas (GHG) emissions, so in 2018, the province committed itself to lowering GHG emissions by 30 per cent by 2030, based on 2005 levels, aligning itself with similar commitments made by the federal government. In that vein, the province partnered with the federal government in October 2020 to help Ford Motor Company transform its Oakville, ON, plant to manufacture EVs, with both levels

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of government contributing \$295 million each to help the company make the Oakville plant its top producer of EVs. And, along with many other countries, Canada is accelerating this massive industrial shift by mandating that all new light-duty car and passenger truck sales be zero-emission by 2035.

This means millions of EVs could be hitting the road in the coming decade, and although EVs may reduce GHG emissions, the massive batteries required to run them pose a unique sustainability challenge. EV batteries differ by model, but they each contain approximately 80 kilograms of combined lithium, nickel, manganese and cobalt—all mined materials. “It is impossible to remove minerals from the earth and process them without impacting in varying degrees the air, land, water, as well as plant and animal life,” the Ontario Mining Association points out.

Mining carries both environmental and social costs, and the question remains if the supply of key minerals for EV batteries can meet the impending demand. According to the *Electric Vehicle Outlook 2021* report by strategic research provider BloombergNEF, there are enough deposits of lithium to keep EV batteries in production until the middle of this century, but that projection is heavily dependent on battery recycling. “Without it, by 2050 cumulative lithium demand exceeds currently known reserves,” the report warns. “In order to keep demand in balance for lithium, nickel and cobalt, a range of approaches will be needed that will require governments, automakers, cell manufacturers, miners and recyclers to work together.”

Currently, 30 per cent of copper and lithium production occurs in Chile, which has over half of the world’s lithium supply, recovered from mineral deposits and brines in salt lakes. (Lithium is also found in other countries, notably Australia and Canada, in the form of hard rock.) Chilean brines are largely extracted from the Atacama Desert, where water is scarce; brine is pumped into evaporation ponds, resulting in lithium-rich concentrate. The water- and energy-intensive process is taxing on the desert environment—about 2 million litres of water are imported to extract just over a tonne of lithium. Likewise, two thirds of the world’s supply of cobalt—another key mined ingredient in EV batteries—is sourced from the Democratic Republic of Congo, where eight of its 14 largest cobalt mines are owned by China, which in turn monopolizes 80 per cent of the cobalt refining industry. Child labour at these mines is widespread, and the cobalt is extracted largely by hand, according to the Institute for Energy Research.

In November 2021, Premier Ford announced that he would like to ease restrictions for development around Ontario’s Ring of Fire to allow for EV battery production. Notably, the province would like to ease the requirements to protect an area of land equivalent to twice the size of New Brunswick and Nova Scotia combined. The Ontario Chamber of Commerce (OCC) has noted that the province has known



An image of black mass, containing nickel, cobalt and lithium in its pure form. Unlike earlier processes, Li-Cycle is able to retrieve them without using any thermal or treatment processes.

Photo: Li-Cycle

deposits of four of the five critical minerals required to make lithium-ion batteries (lithium, cobalt, graphite and nickel). Yet the OCC also notes that heavy industry—including mining—is the third-largest source of GHG emissions, as it can require high temperatures and energy sources that potentially come from fossil fuels.

A LITHIUM FUTURE

The science behind the EV battery is similar to that of a cell-phone: Each battery cell has a metal cathode made of lithium and a plethora of other metals—typically cobalt, manganese, nickel and iron—a graphite anode, a separator and a liquid electrolyte typically consisting of lithium salt. An electrical current is created as lithium ions flow from the anode to the cathode. And although a single cell has typically enough to power a cellphone, thousands of cells must be bundled together in modules into battery packs and then housed in a metal casing to power an EV. Altogether, an EV battery can weigh hundreds of kilograms. The Mercedes-Benz EQC EV battery, which came out in 2018, weighs 650 kilograms.

With the impending demand for lithium-ion batteries for EVs, Ontario researchers are already looking at alternatives, including researchers at the universities of Toronto and Waterloo. But as one of those researchers, Gisele Azimi, PhD, P.Eng., associate professor in the departments of chemical engineering and applied chemistry and materials science and engineering at the University of Toronto and Canada research chair in urban mining innovations, told TVO: “Even if they become viable and commercially available, they will not replace lithium-ion batteries. Lithium-ion batteries are so intertwined with our life that we cannot eliminate them and put them aside.... We will use them in parallel, so you will always have a stream of lithium-ion batteries.”

Indeed, despite the fact that lithium-ion battery technology has improved exponentially in the last three decades, the price of lithium-ion battery cells has declined by 97 per cent since they were first introduced. In the same time period, the one-kilowatt-hour has become 41 times cheaper.

EV batteries will continue to drop in cost through to the mid-2020s, so the cost of EV production is expected to reach parity with gas-powered vehicles by the middle of this decade. Lithium-ion-powered EVs are likely here to stay.

DEVELOPING A CIRCULAR ECONOMY FOR EV BATTERIES

In an effort to reduce the need to mine new material, a handful of Canadian companies are exploring EV battery recycling, including Quebec-based Lithion Recycling, which notes that it recovers 95 per cent of the materials from spent lithium-ion batteries. And in Ontario, Li-Cycle has a similar mission. Li-Cycle and Lithion have both received funding from Sustainable Development Technology Canada to improve their recycling processes for this use.

“Li-Cycle was founded in 2016, and in that short time, we’ve worked to commercialize and focus on extracting a high value of material from batteries of all types,” says Kunal Phalpher, P.Eng., chief strategy officer of Li-Cycle. The company has developed a closed-loop resource recovery of lithium-ion batteries, claiming that it is able to recover 95 per cent of a battery’s material. “We have a two-stage process: our spokes and hubs,” Phalpher explains. “The spoke takes end-of-life lithium-ion batteries and battery scrap—waste generated in battery manufacturing—and breaks them down into three production streams. One is plastics from the battery; one is a mix of aluminum and copper. And then we have the black mass, a powder substance that contains a variety of metals, which is where the most valuable materials are—the cobalt, the nickel and the lithium.”

In the hub stage, the black mass will be processed into battery-grade end products for reuse in lithium-ion battery production or other applications. “It’s a hydrometallurgical process that takes the metal from the lithium-ion battery and refines it into advanced material for batteries,” Phalpher explains. “What’s innovative about the hub is that it focuses not only on nickel and cobalt recovery but also recovering lithium with high purity and quality. And we’re moving away from the thermal processes and treatment of the battery. That means you’re not throwing away things like graphite or losing aluminum. You’re recovering a lot of those individual components and returning them to the economy in some form.”

Li-Cycle notes that its recycling processes produce no landfill waste. It is different than the traditional lithium-ion battery recycling processes, which typically recover only 40 per cent of the materials. Li-Cycle claims that its recycling processes are cost effective, safe and automated, reuse all water in its facilities, are relatively low in energy use and produces almost zero GHG emissions.

Phalpher notes that Li-Cycle’s Kingston, ON, and Rochester, NY, spoke facilities are able to recycle 5000 tonnes of batteries per year, but their spoke facilities that will open in Arizona and Alabama will each be able to recycle 10,000 tonnes per year. And according to Phalpher, the increased production capacity will be beneficial: “We’ve done some studies to compare the impact of our material on GHG emissions compared to the same material coming straight out of the ground. There’s close to a 75 per cent savings of the GHG emissions. CO₂ emissions are higher to produce an electric vehicle. And where is the CO₂ coming from? Primarily the battery. A big portion of the impact comes from the raw



The Mercedes Benz EQC is a fully electric vehicle powered by a lithium-ion battery weighing 650 kilograms when introduced in 2018.



A Li-Cycle employee manages lithium-ion batteries on a conveyor belt at the company’s Rochester, NY, spoke. Photo: Li-Cycle

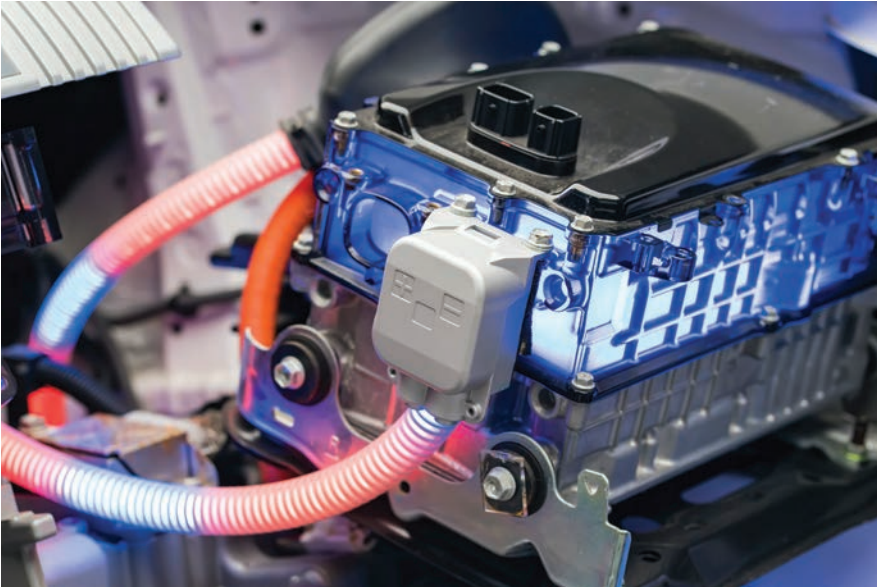
materials and supply chain. By reducing the CO₂ impact of the raw material supply chain, you're reducing the overall impact."

THE ABILITY OF RECYCLING TO MAKE A DENT

"Recycling [instead of] refining and processing from virgin materials—digging it out of the ground and smelting it—is a big benefit because a lot of the heavy lifting on the resource extraction side is already done," observes Maria Kelleher, P.Eng., an environmental engineer and principal of Kelleher Environmental, an environmental consulting company.

"The limitation is that recycling EV batteries today doesn't account for that much material compared to the current and projected demand, because the EV battery lasts a really long time. If you put an EV battery into the market in 2020, it will probably last for 10 years in the EV and another 10 years in the energy storage systems or in lower-grade second-use applications. It won't be available for recycling for 20 years after it is introduced to the market."

Kelleher has been consulting in the EV and EV battery market as far back as 2013 and has written extensively on the matter. In *Electric Vehicle (EV) Batteries: What Municipal Staff Need to Know*, cowritten with environmental consultant Samantha Millette, Kelleher notes the promising cathode-to-cathode recycling technologies ushered in by companies such as Li-Cycle: "Traditional recycling of lithium-ion batteries involves processing them to produce various side streams that are sent to smelters for nickel and cobalt recovery," Kelleher and Millette observe. "Most cathode-to-cathode recycling approaches...would recover separate materials such as lithium, manganese, aluminum, cobalt and nickel from the cathodes through hydro-metallurgical processes and avoid the



An electric car's lithium-ion battery pack contains approximately 80 kilograms of combined lithium, nickel, manganese and cobalt.

energy-intensive smelting process...these new approaches would allow the recyclers to sell recovered metals directly back to battery manufacturers, rather than selling materials to smelters for further processing."

Yet Kelleher believes that, given the long life spans of EV batteries, recycling in general, even if it's really successful at capturing EV batteries' material, will not have a significant immediate effect at denting the need to mine virgin metals for the expected upswing of demand for EV batteries in the coming years. "There's a big CO₂ benefit [in recycling]," Kelleher admits. "But the tricky part of the story is when will all these EV batteries be ready for recycling? It might be a number of years in the future, so people in the business are saying, 'Maybe these [recycled] batteries will give us 10 per cent of what we will need.' They will contribute, but the amount available for the foreseeable future will not be big enough to mitigate all the GHG impacts of EV battery production." Long term, however, Kelleher's research found that EV battery recycling has the potential to have a 56 per cent reduction in GHG emissions over the 18-year lifespan of the EV battery.

Yet Minister Fedeli recognizes the importance of a closed-loop recycling lithium-ion battery sector. "In order to have a good sales position in the electric vehicle sector, you need to have proper integrity through the whole system—and that starts with clean energy," Fedeli points out. "And it continues all the way through the reusing and recycling. It's all integrated. It's hard to have one without the other." Recycling of EV batteries, indeed, may be a solution. **e**

CALL FOR NOMINATIONS:

AWARD FOR ENGINEERING PROJECT OR ACHIEVEMENT



DO YOU KNOW AN ENGINEERING TEAM THAT HAS LED A SUCCESSFUL ENGINEERING PROJECT OR ACHIEVEMENT?

The Ontario Professional Engineers Awards (OPEAs) are now considering submissions for the 2022 Award for Engineering Project or Achievement, which pays tribute to an endeavor that has made a significant, positive impact on society, industry and/or engineering and that was conceived, designed and executed with significant input by Ontario engineers. Recipients are honoured annually in November at a black-tie gala hosted by the Ontario Society of Professional Engineers.

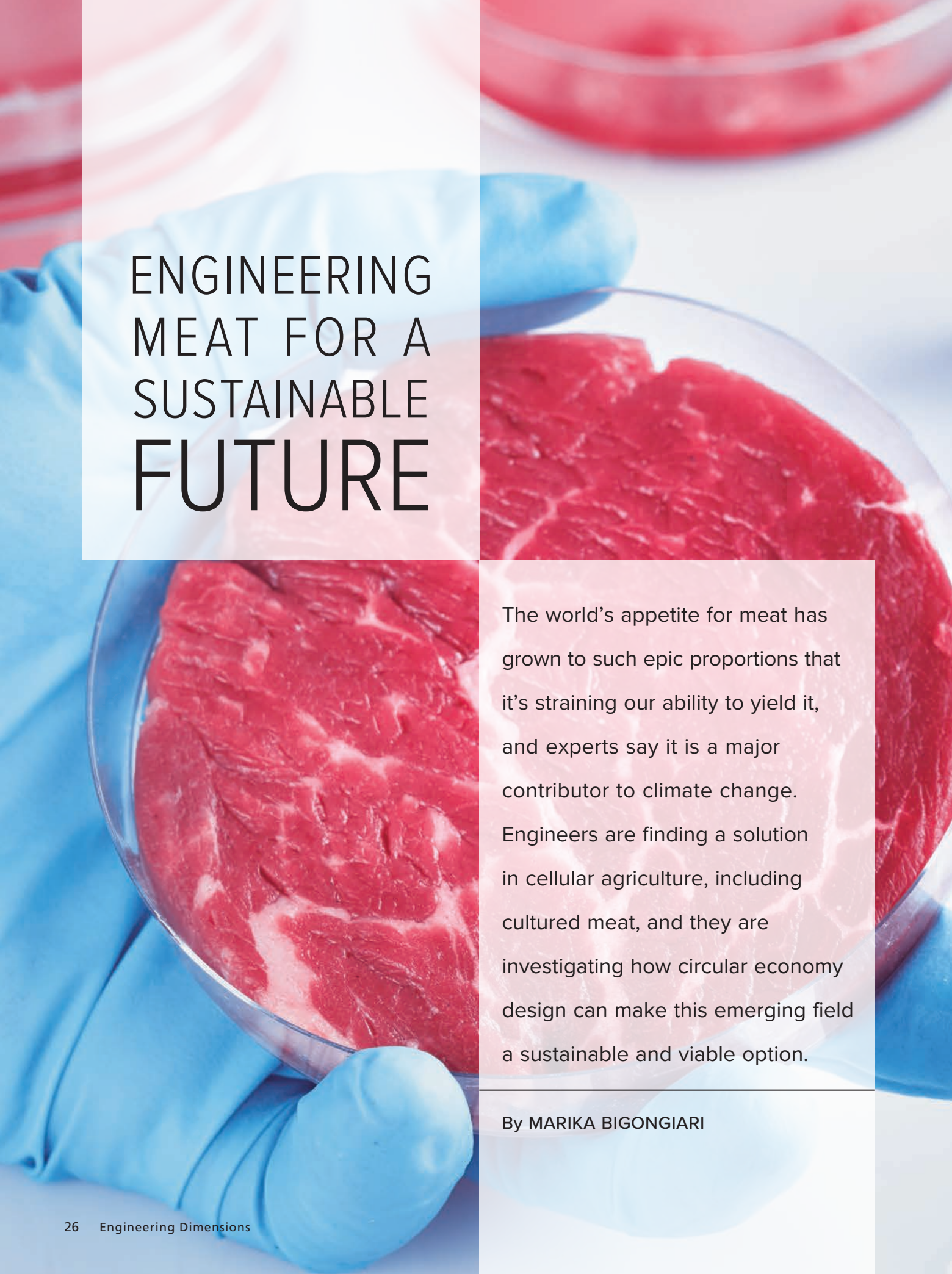
Previous recipients of the award include Hands-Free Mooring, by the St. Lawrence Seaway Management Corporation; the Dual Education Program, by Siemens Canada; the 2nd Concession Project, by The Regional Municipality of York; and the Bombardier Global 7500 Business Jet.

WINNER OF THE 2020 OPEA FOR ENGINEERING PROJECT OR ACHIEVEMENT NATIONAL ARTS CENTRE REJUVENATION



Originally designed as a “fortress for culture,” the once monolithic and windowless National Arts Centre now shines as an iconic beacon for the performing arts for more than 1.2 million visitors every year. An embrace of both beauty and function inspired a hybrid wood-steel solution and use of pre-fabricated panels with an integrated systems approach.

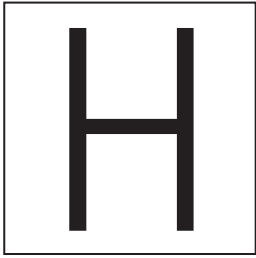
The coffered ceiling, which covers a 60,000-square-foot glass-clad extension, is a defining feature of the project, building on the centre’s original hexagonal language. The transformation of the arts centre also features three newly connected wings, cultural programming enclosed by a custom glass curtain wall, a grand staircase and a hexagonal tower overlooking the Rideau Canal. The rejuvenated National Arts Centre opened on July 1, 2017 in celebration of Canada’s 150th year anniversary and continues to carry symbolic value to this day.



ENGINEERING MEAT FOR A SUSTAINABLE FUTURE

The world's appetite for meat has grown to such epic proportions that it's straining our ability to yield it, and experts say it is a major contributor to climate change. Engineers are finding a solution in cellular agriculture, including cultured meat, and they are investigating how circular economy design can make this emerging field a sustainable and viable option.

By **MARIKA BIGONGIARI**



Humans have an insatiable taste for meat—production has more than tripled over the last 50 years—but the current way of producing it is unsustainable. According to the United Nations (UN) Food and Agriculture Organization, animal agriculture uses an estimated 80 per cent of arable land yet only accounts for 20 per cent of the calories we ingest. Nearly one third of the total

water footprint of agriculture in the world is related to the production of animal products, according to non-profit organization Water Footprint Network. And, although statistics vary widely, the 2009 World Watch Institute report *Livestock and Climate Change* asserted that livestock and their by-products are responsible for as much as 51 per cent of greenhouse gas emissions.

Because of its detrimental effects on the environment, the UN's Intergovernmental Panel on Climate Change (IPCC) recommended a reduction in meat consumption in its 2019 special report on climate change and land, and it suggests that demand-side management of the food system could be one of the solutions, which includes avoiding food waste during consumption, reducing over-consumption and changing dietary preferences.

But what if dietary preferences didn't have to change all that much? Cellular agriculture (CellAg) is an emerging technology that cultivates real meat in a lab—without the need to raise and slaughter animals, resulting in less impact on the planet. CellAg products are already in development around the globe and have even been commercialized. Eat Just's lab-grown chicken nuggets hit the market in 2020 in Singapore, where it became the world's first cultured meat product approved for sale. But, as with all emerging technologies, CellAg is not without its challenges, and engineers are exploring ways to make it a sustainable option, such as applying circular economy interventions to the design.

CANADIAN ENGINEERS AT THE FOREFRONT OF CULTURED MEAT

McMaster University mechanical and biomedical engineering professor and School of Biomedical Engineering co-director Ravi Selvaganapathy, PhD, P.Eng., and his research team developed a new biofabrication technique that layers cell sheets to create a three-dimensional, meat-like structure composed of fat and muscle cells—without the use of any exogenous materials—that promises a flavour and texture consumers are used to. With this innovation, Selvaganapathy and former McMaster post-graduate fellow Alireza Shahin-Shamsabadi, PhD, co-founded cultured meat company CaroMeats with plans to commercialize the technology.

Selvaganapathy originally set out to develop new tissue engineering methods, primarily for artificial organs or for use as a test vehicle for new drugs, but he soon considered lab meat—an alluring alternate application with very different design requirements compared to biomedical applications. “For biomedical applications, we need the tissue to be living, while meat is essentially a dead tissue,” he explains. “In the case of meat, texture and taste are important, whereas for biomedical applications, the physiological response is important.”

His process for creating cultured meat begins with cell lines from mice or rabbits that are differentiated into skeletal muscle and fat cells, but the technology is similar regardless of species. “It would be like a platform technology that you can apply to many different kinds

of animals or animal cells,” explains Selvaganapathy, who received a 2021 Government of Canada New Frontier Research Fund Exploration Award for his project.

The cells are currently being grown in a lab in petri dishes but eventually will be cultured in bioreactors—large vats with stirrers that keep the liquid nutrient media moving. The process to feed and nurture the cells so they multiply to create tissue will take anywhere from 14 to 28 days. Producing meat in this way provides the potential for it to be customized, including fortifying it with essential vitamins and minerals and fine-tuning the fat content as desired. “Meat consumption will transform when you have these capabilities to structure, engineer and modify,” Selvaganapathy notes.

THE CHALLENGES OF AN EMERGING TECHNOLOGY

Scaling up is one of several hurdles to commercial success for cultivated meat and other CellAg products; another is achieving cost parity. And although costs have fallen dramatically since its genesis, cultivated meat has a reputation for being expensive. Netherlands stem cell researcher and Mosa Meats founder Mark Post, PhD, famously cultivated the first beef patty in a lab for a whopping €250,000 (equivalent to C\$360,000 today) in 2013. However, by 2017, the cost of making that patty had fallen to €10 (C\$14). “Any new technology is going to be expensive,” Selvaganapathy observes. He compares cultured meat to the evolution of solar technology: “Twenty to 25 years ago, solar was quite expensive. But over a period, once the technology was demonstrated and proven, engineers found a way to reduce cost, increase scale and optimize processes. This technology will be very similar.”

The initial high cost associated with producing cultured meat is unsurprising, since its origins come from tissue engineering. Tissue engineering has historically been focused on biomedical applications, which have a higher price point but aren't typically aimed at the consumer market. But as the field becomes an area of interest to more companies, vendors will soon manufacture these accessories to scale, eventually reducing costs. “Once those costs are reduced, then you'd see the cost of the final product, the meat, also come down and eventually reach parity,” Selvaganapathy explains.

Energy usage is another area of concern when considering the long-term sustainability of cultivating meat, something Selvaganapathy says will change over time with the evolution of the technology. Currently, the cells must be maintained at a certain temperature to grow and continually stirred over a period, which uses energy. “The source of those energies could be solar; in which



Twenty layers of assembled cell sheets made of co-cultured fat and muscle cells were created using an innovative new technique developed by Ravi Selvaganapathy, PhD, P.Eng., and his research team. Such an assembly can be made to varying thickness to make slab-type cultivated meat possible. Photo: Ravi Selvaganapathy

case they are going to be quite green. But currently, the infrastructure may not necessarily support that," Selvaganapathy explains.

And consider that, in the production of cultivated meat, energy and other resources are focused on producing muscle tissue specifically. Traditional animal agriculture is comparably inefficient, since energy is used to raise, feed and slaughter entire animals and not just the meat. "With this process, you circumvent the whole big chain and reduce a lot of wastage, because you're directing resources, mainly in the form of energy, into only developing the particular product you want," Selvaganapathy says.

INTEGRATING CIRCULAR ECONOMY DESIGN

Ensuring the CellAg industry's success may hinge on its long-term sustainability; and applying circular economy interventions to its methodologies may be the answer. In fact, the potential for cellular agriculture processes and products to reduce adverse social and environmental outcomes associated with traditional animal agriculture has been one of the main arguments used by proponents to garner support for research and development in this field. Applying circular economy principles and closed-loop supply chains to this burgeoning industry may be one way to achieve this value proposition while reducing overall production costs. "CellAg companies will need to be intentional when they design their processes and supply chains," says Dawne Skinner, P.Eng. (Nova Scotia), founder of Net Positive Solutions Consulting. "Modelling and optimizing production processes and supply chains to maximize the socio-economic and environmental benefits of this industry, prior to investing in the development of production facilities, is critical."

Skinner is an environmental engineer with significant experience leading circular economy scopes of work for government and business clients across Canada and internationally. "When choosing a circular economy intervention, it is important that decision making be supported with data that shows that the socio-economic and environmental benefits of that choice are superior to other choices," Skinner adds.

The circular economy has a distinct but important role to play in the sustainability of industry. According to the Ellen MacArthur Foundation, a circular economy is a systems solution framework that tackles global challenges like climate change and is based on three principles—eliminating waste and pollution, circulating products and materials and regenerating nature—with an aim to improve

social, environmental and economic outcomes. "The circular economy differs from other sustainability paradigms in that the potential economic and financial benefits of transitioning to a circular economy, through improved design, business model innovation and the reduction and revalorization of waste products/by-products, has been well researched," Skinner observes. "Prior to the circular economy, sustainability has generally been viewed as a cost rather than an opportunity, so companies were less likely to see sustainability as a profitable strategy."

Skinner is currently pursuing her doctorate degree in industrial engineering as a New Harvest fellow under the supervision of Professor M. Ali Ülkü, PhD, at the Centre for Research in Sustainable Supply Chain Analytics at Dalhousie University in Halifax, NS, and is researching opportunities to implement and optimize circular economy interventions and closed-loop supply chains to the CellAg industry. Since the industry has not achieved cost parity with traditional animal agriculture products and cost is a major barrier to its wide-scale production, Skinner's work on designing, modelling and optimizing circular and closed-loop supply chains for the emerging field is critical.

The goal of CellAg, like the circular economy, Skinner explains, is to provide consumers with better choices by designing production processes so they require fewer inputs, are more ethical and improve social and environmental outcomes. Skinner foresees circular economy opportunities, such as those available through engaging in industrial symbiosis networks, including the exchange of resources like side-stream by-products and energy, for conventionally disconnected companies that are located near each other. Two of the main by-products of cultured meat production are ammonia and lactic acid, for example, both of which have industrial uses. "Cell culture media requires water, heat

CIRCULAR ECONOMY



LINEAR ECONOMY



A circular economy is a systems solutions framework that tackles global challenges like climate change and aims to improve social, environmental and economic outcomes. It aims to eliminate waste and pollution, circulate products and materials and regenerate nature. Conversely, a linear economy continually uses new resources and produces a high volume of waste.

(energy), a food source (glucose, amino acids, vitamins, etc.) and growth factors," Skinner explains. "Opportunities to use agricultural residues, food processing side streams and waste heat to contribute to reducing the overall environmental, social and cost impacts of these products will be evaluated."

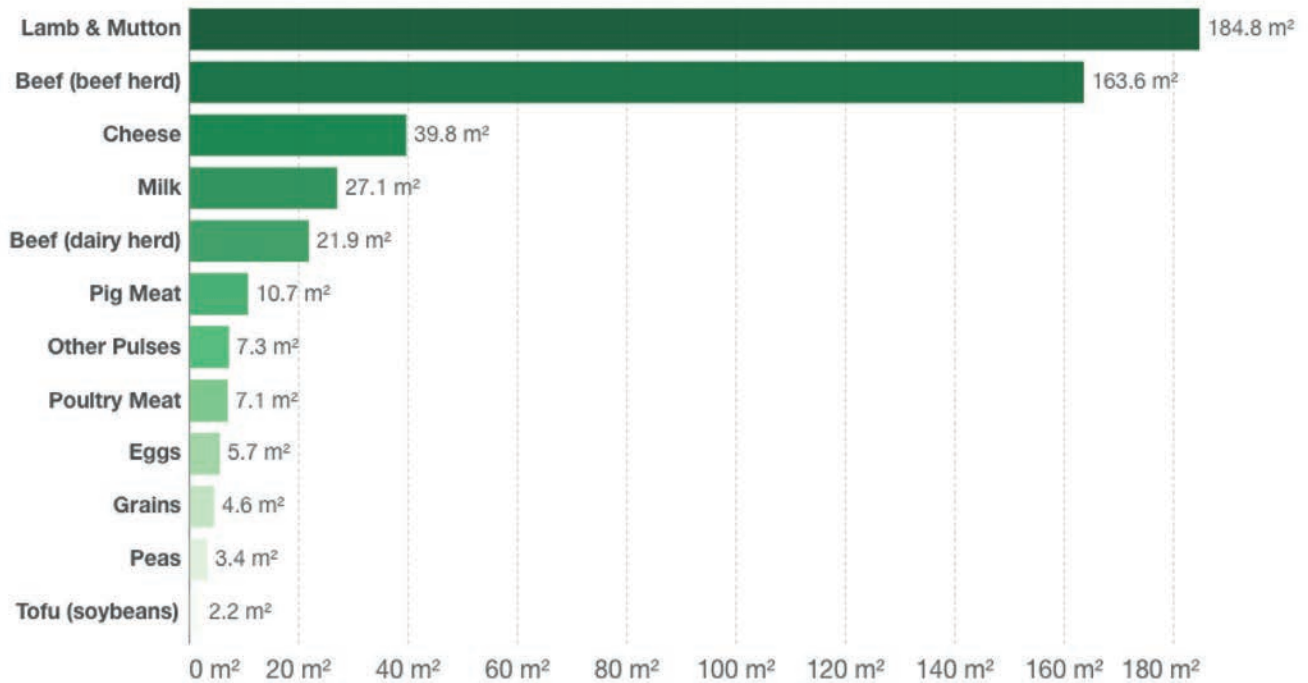
There is also a need to model and optimize such a system to improve social benefits compared with traditional animal agriculture. Looking forward, Skinner suggests this emerging industry might include elements such as helping workers and farmers transition from traditional animal agriculture to alternative protein supply chains and supporting groups who have been marginalized in the current system, such as Indigenous, Black and other racialized communities affected by environmental racism, to be included in a meaningful way. "The value proposition of this type of production is that it will be more sustainable and ethical, so companies and researchers are working towards this outcome," Skinner says. "However, further research, and funding, is needed to continue to improve the viability of this industry."

GETTING CONSUMERS ONBOARD

Consumers have a big role to play in CellAg's success—and when it comes to sustainability and encouraging people to make different choices, the stick isn't always the best method. Instead, the circular economy and CellAg focus on improving the overall sustainability of production and business models rather than trying to make consumers feel bad. "Berating consumers for their choices when they have little input into production decisions and even less information on the environmental footprint of products on the market, doesn't necessarily

Land use per 100 grams of protein

Land use is measured in meters squared (m²) per 100 grams of protein across various food products.



Data shows the global average land use based on a large meta-analysis of food production, illustrating the significantly higher land usage to produce animal products compared to alternative proteins.

Photo: J. Poore and T. Nemecek, with additional calculations by Our World in Data

work," says Skinner, who explains that changing consumer behavior is complex and providing them with more sustainable and ethical choices without a premium price is critical. "As we learn more about the negative environmental and social impacts of animal agriculture, it is widely recognized that transitioning to a plant-based diet can significantly improve the outcomes of our food system; however, a majority of consumers still wish to eat animal products."

In a world grappling with climate change, Skinner believes that transitioning to a more sustainable, ethical, kinder and more inclusive means of producing our food should be important to everyone. "Cellular agriculture can offer consumers the products they want with less harm to animals and the environment, and I believe that circular economy interventions can play a big role in making

this industry viable, sooner," she says. "Animal agriculture has a large environmental footprint compared with alternative proteins and can have significant negative social impacts, too." For Selvaganapathy, moving to the sustainable alternative is inevitable: "We don't have enough land to [continue raising animals for food], and that's where the inevitability of this technology comes in. You must have a complementary additional technology that doesn't depend on the proportionality of land use—and that is what this technology is about." [e](#)

Disclaimer: The views expressed by Ravi Selvaganapathy are his own and don't necessarily reflect those of McMaster University or CaroMeats.

PEO UPDATES ELECTION PROCESS TO HELP LICENCE HOLDERS RUNNING FOR COUNCIL

By Adam Sidsworth

PEO is currently undergoing a governance renewal project and, once it is fully implemented, Council composition—and its accompanying elections—could be noticeably different. The regulator's newly formed Governance and Nominating Committee (GNC) is working hard to prepare Council and licence holders for the changes that could be ushered in, including introducing new publications and processes to help licensed engineers running for Council as well as those who are newly elected.

One of the first things the GNC did for PEO's 2022 Council elections, which is currently underway, is add a list of helpful attributes for Council candidates in PEO's *2022 Elections Guide* (peo.on.ca/sites/default/files/2021-11/2022ElectionsGuide_EDITED_Nov2.pdf). Among the attributes the GNC is looking for in candidates are accountability, respect, leadership qualities, board and governance experience, knowledge of PEO's regulatory role and sensitivity to inclusivity.

"The key is educating the current and future councillors on their role," notes GNC Chair Arjan Arenja, P.Eng., who also sits on Council as a lieutenant governor appointee. "The councillor attributes are about educating and helping [licence holders make] informed decisions on the role of governance."

Arenja notes that these attributes are critical now that councillors are required to serve on at least one of PEO's four governance committees, which includes the GNC. "The role of a councillor on the GNC is to work with staff on policy, review it, make sure it's strategically aligned with PEO and then recommend it be adopted. If you have somebody who does not understand this, it could be problematic."

A NEW ONBOARDING PROCESS FOR COUNCILLORS

The GNC has also redesigned the onboarding process of new councillors, which will occur for the first time at PEO's 2022 Annual General Meeting this spring. "For the first time, we will explain the new governance committees, the role that councillors can play and the skills that are needed," explains Liz Maier, PEO's vice president, organizational effectiveness. Maier, who is the staff adviser to the GNC, adds that the GNC is also developing a new governance manual for councillors. "It will be the bible for the new Council," Maier says.

To this end, Arenja points out that Council members should recognize their team-playing role. "Collectively as a board, we are responsible," Arenja explains. "If you voted for something differently, your liability as a director does not diminish. If Council voted with a majority, that's what Council stands behind."

THE IMPETUS FOR GOVERNANCE RENEWAL

In March 2020, Council began a two-year, four-stage Governance Roadmap aimed at defining Council's role as PEO's governing body while delegating day-to-day operations to staff (see "PEO reveals two-year Governance Roadmap workplan," *Engineering Dimensions*, November/December 2020, p. 10). The first and second phases, which were completed last June, focused on the regulatory mandate of Council and PEO committee structures and mandates. And it was during the second stage that the four governance committees were born (see "Council approves establishment of new governance committees," *Engineering Dimensions*, May/June 2021, p. 20).

"The Governance Roadmap should end at the end of April," Maier predicts. "We are in the middle of finalizing what was identified in the activity filter as Group 3—[activities] that are not considered governance, and they are not considered regulatory. The GNC has been working on a framework and criteria." The activity filter Maier is referring to grew out of the 2019 external review of PEO's performance as the provincial engineering regulator, which recommended that PEO examine all of its committees, sub-committees and working groups to determine if they fit into PEO's regulatory mandate. Of the 93 activities examined in the filter, 35 were deemed unrelated to Council governance or PEO's regulatory mandate.

Maier notes that many of the more contentious issues that fell into this category—notably PEO's chapters and Regional Councillors Committee—had a direct impact on the schedule of the Governance Roadmap. The roadmap was scheduled to examine optimal Council composition and other related matters in its third stage, but these were deferred until this April, with the GNC beginning to make recommendations at its strategic planning session this month. This means that, although this year's Council elections process is largely the same, bigger changes are likely to be implemented next year. [e](#)

ARE YOU INVOLVED IN YOUR LOCAL PEO CHAPTER?

PLEASE MAKE NOTE OF THE UPCOMING CHAPTER ANNUAL GENERAL MEETINGS.

PEO Etobicoke Chapter 2022 Annual General Meeting
Wednesday, January 26, 2022, from 7 p.m. to 9 p.m. EST
www.eventbrite.ca/o/peo-etobicoke-chapter-28909639753

PEO East Toronto Chapter 2022 Annual General Meeting
Wednesday, February 2, 2022, at 6:30 p.m. EST, Arts & Letters Club,
14 Elm Street, Toronto, ON
www.eventbrite.ca/o/peo-east-toronto-chapter-28802019649

PEO Oakville Chapter 2022 Annual General Meeting
Thursday, February 3, 2022, from 6 p.m. to 8:30 p.m. EST
www.eventbrite.ca/o/peo-oakville-chapter-28909659893

PEO Grand River Chapter 2022 Annual General Meeting
Monday, February 7, 2022, from 7 p.m. to 9 p.m. EST,
Bingemans Conference Centre, 425 Bingemans Centre Drive, Kitchener, ON
www.eventbrite.ca/o/peo-grand-river-chapter-28899318003

PEO Niagara Chapter 2022 Annual General Meeting
Wednesday, February 16, 2022, from 6 p.m. to 8:30 p.m. EST
www.eventbrite.ca/o/peo-niagara-chapter-28909655865

PEO Kingston Chapter 2022 Annual General Meeting
Wednesday, February 23, 2022, at 6:45 p.m. EST
www.eventbrite.ca/e/peo-kingston-chapter-agm-2022-tickets-214645750217

PEO York Chapter 2022 Annual General Meeting
Saturday, February 26, 2022, from 6 p.m. to 8:30 p.m. EST,
Sheraton Parkway Toronto North Hotel, 600 Hwy 7, Richmond Hill, ON
www.eventbrite.ca/e/peo-york-chapter-agm-tickets-184999467387

PEO London Chapter 2022 Annual General Meeting
Thursday, March 3, 2022, at 4 p.m. EST,
Highland Country Club, 1922 Highland Heights, London, ON
www.eventbrite.ca/e/peo-london-chapter-agm-tickets-208741901647

PEO Simcoe-Muskoka Chapter 2022 Annual General Meeting
Thursday, March 10, 2022, at 7 p.m. EST
www.eventbrite.ca/e/peo-simcoe-muskoka-chapter-annual-general-meeting-tickets-214726933037

COUNCIL AFFIRMS TRANSFORMATIONAL DIRECTION OF PEO'S 2020–2022 STRATEGIC PLAN

By Nicole Axxworthy

544TH MEETING, NOVEMBER 19, 2021

At its November meeting, Council affirmed the direction of PEO's 2020–2022 *Strategic Plan: Roadmap to Transformation (Clarity of Purpose)*, which summarizes the critical elements of the regulator's ongoing transformation process and includes a schedule for its priority work. PEO's last strategic plan expired in 2020, and although there is a one-year overlap, the new plan represents a significant change in direction with the regulator's modernization and governance improvements—rooted in PEO's action plan, Governance Roadmap and related decisions—and captures the work PEO has been focusing on since 2020. The new strategic plan is an official document to clearly communicate critical elements of PEO's enterprise-wide transformation to stakeholders.

The strategic plan was drafted by PEO management to reflect the immediate strategic priorities previously determined by Council, including:

- Council's 2018 decision to voluntarily commission an external review of its regulatory performance;
- Council's 2019 formal acceptance of the external review's final report;
- Council's 2019 approval of a three-year, high-level action plan to address the report's recommendations, and an activity filter to help define PEO's clarity of purpose;
- The CEO/registrar's 2019 initiative to undergo an independent organizational review to address PEO's operational structure to ensure it has the appropriate capacity and agility to achieve the regulatory and governance objectives;
- Council's 2020 approval of the two-year Governance Roadmap and 11 accompanying tenets;
- Council's 2021 approval of seven governance directions and four new governance committees;
- Council's 2021 removal of any barriers to implementing mandatory continuing professional development; and
- Council's 2021 formation of an anti-racism and anti-discrimination exploratory working group.

The plan also details the foundational steps required to transition to the next-generation strategic plan for 2023–2025. This work will begin in early 2022, with Council to define its longer-term vision and goals. The new strategic plan will be distributed to PEO stakeholders, promoted through PEO's communication channels and reviewed by Council's four governance committees to ensure it aligns with their annual workplans.

2022 OPERATING AND CAPITAL BUDGETS APPROVED

Council approved the draft 2022 operating and capital budgets, as recommended by the Audit and Finance Committee. Total revenues for 2022 are budgeted at \$34.8 million and

total expenses for sustaining regular day-to-day operations are budgeted at \$30.5 million, resulting in an excess of revenues over expenses of \$4.3 million. An additional spend of \$3.6 million is budgeted for various projects and Council initiatives, resulting in a surplus of \$700,00.

The 2022 budgeted revenue is planned to be \$34.8 million, representing an increase of \$1.3 million, or 4 per cent, over the 2021 forecasted revenue of \$33.5 million. The main factors contributing to the increase are:

- An increase in the volume of applications, registrations, exams and other fees aggregating to an increase of \$733,000, or 7.5 per cent;
- An increase in P.Eng. revenues of \$466,000, or 2.3 per cent, due to the expected increase in throughput for issuing licences in 2022;
- An increase in 40 Sheppard revenues of \$103,000, or 4 per cent, due to the recovery of higher operating costs and slightly higher parking revenue; and
- A marginal increase of \$25,000, or 3 per cent, in investment revenue due to the expected performance of the investment portfolio.

The 2022 budgeted expenses for regular operations are planned to be \$30.5 million, which represents an increase of \$4.4 million, or 17 per cent, over 2021 forecasted expenses of \$26.1 million. Some of the reasons contributing to this increase are:

- An increase in employee salaries and benefits and retiree and future benefits of \$2.8 million, or 19 per cent, over the 2021 forecast due to an increase in employees (the full-time employee headcount in 2022 will be 134 in comparison to the forecasted headcount of 118 in 2021) and a 2.5 per cent increase in staff salaries for merit increases and pension top-up contributions;
- An increase of \$1.3 million, or 470 per cent, for chapters due to higher allocations for operations in 2022, reinstatement of chapter scholarships and expenses for various events such as the Chapter Leaders Conference;
- An increase of \$319,000, or 291 per cent, in volunteer business expenses due to higher costs for meals, mileage, accommodation and travel-related expenses for attending various events, committee meetings and conferences;
- An increase of \$231,000, or 20 per cent, in the spend for computers and telephone due to higher costs for various service maintenance contracts, software support contracts and IT initiatives to sustain operations; and
- An increase of \$170,000, or 172 per cent, in the spend for professional development due to higher spend on courses and training for staff and volunteers.

The above are partially offset by:

- A reduction of \$270,000, or 15 per cent, in purchased services primarily due to lower costs for the Professional Practice Exam because of remote writing of exams, which are less expensive than in-person. These costs are primarily offset by higher costs for P.Eng. seals and for meals/catering for various events such as the Chapter Leaders Conference, Council workshop and regional congresses;
- A reduction of \$211,000, or 45 per cent, in spend on various IT consultants;
- A reduction of \$206,000, or 27 per cent, in amortization largely due to fewer capital projects in 2022 and the full amortization of some old equipment; and
- A reduction of \$121,000, or 6 per cent, in 40 Sheppard Avenue West expenses largely due to a decrease in depreciation, amortization of leasing costs and mortgage interest expenses.

The 2022 capital budget is \$562,000 and is comprised of various maintenance and improvement projects at 40 Sheppard. These are part of common area maintenance costs that are recoverable from the tenants and are recommended by PEO's property manager, BGIS. The planned improvements for 2022 include \$350,000 for garage repairs, \$80,000 for common area wall painting, \$67,000 for replacing exterior windows, \$40,000 for heat pumps and \$25,000 to revamp the planters.

BORROWING RESOLUTION POLICY

Council approved a motion to renew PEO's existing operating line of credit with Scotiabank until January 31, 2023. This includes an overdraft up to \$250,000 and use of corporate credit cards with an aggregate limit of up to \$120,000.

AUDIT FIRM SELECTION

At its November meeting, Council approved a motion to retain Deloitte & Touche LLP as PEO's auditor for the period of 2022 to 2026. The current five-year audit agreement with Deloitte expired in 2021, so an RFP was issued to reputable accounting firms in August 2021, which is consistent with PEO's practice to go through a tendering process for audit services every five years. Though PEO has been using Deloitte for approximately 18 years, the Audit and Finance Committee made the recommendation to reappoint the firm because it is the best choice compared to the seven proposals submitted by other firms.

Councillors discussed if there is a risk to using the same firm for so many years, and PEO Director of Finance Chetan Mehta pointed out that many large firms, such as Manulife, use the same firm for decades. Additionally, although the term of the agreement with Deloitte is for five years, the auditor will have to be reappointed each year by PEO licence holders at the annual general meeting, in accordance with section 52 of By-Law No. 1.

APPROACH TO COUNCIL MEETING AGENDAS AND MINUTES

At its November meeting, Council passed a motion to adopt a new approach to agendas and minutes for both public and in-camera meetings of Council and governance committees. In the past, there has been a perceived lack of clarity about what Council and committee minutes should include, particularly with in-camera discussions and how to note in-camera items on the public agenda without revealing confidential information.

Council received expert advice from external advisors and staff regarding best practices, and the document *Agendas and Minutes Approach (Including In Camera Items)* was developed to reflect the advice received.

The new approach will apply to Council and its four governance committees. As part of the motion, Council directed staff to prepare a bylaw amendment so the new approach could be extended to cover all meetings of PEO committees.

30 BY 30 TASK FORCE STOOD DOWN

Council heard a presentation from 30 by 30 Task Force Chair Helen Wojcinski, P.Eng., FEC. It included the annual report and metrics for the 30 by 30 initiative to have 30 per cent of newly licensed engineers be women by 2030 (see "30 by 30 reveals newly licensed women engineers in Canada now represent 20 per cent," *Engineering Dimensions*, November/December 2021, p. 14). Although the metrics reported at the task force's annual check-in in September only included 2018 and 2019, the presentation to Council included year-end results for 2020 as well, which showed some categories that met or exceeded the 30 per cent goal: 33 per cent of engineering interns who participated in PEO's Licensure Assistance Program and obtained a licence are women, 33 per cent of chapter chairs are women and 36 per cent of P.Engs on Council are women.

Following the presentation, Council approved a motion to stand down the 30 by 30 Task Force, effective

December 31, 2021, as per the task force's terms of reference. Ownership of the 30 by 30 work will be transferred to the appropriate PEO staff and will be sustained until 2030 with the pre-approved budget of \$5,000 per year. The annual check-ins will also continue, where metrics are presented to Council at its November meetings. In addition, as part of PEO's 30 by 30 action plan, the 30 by 30 Task Force requested that PEO move forward with participating in a gender audit research study of its existing licensing process and internal operations, as approved by Council at its June 25, 2021, meeting (see In Council, *Engineering Dimensions*, July/August 2021, p. 23). Additionally, Wojcinski will continue as PEO's 30 by 30 champion until a successor is approved by Council.

ANTI-RACISM AND ANTI-DISCRIMINATION WORKING GROUP TO CONTINUE

At its November meeting, Council approved a six-part motion to continue the Anti-Racism and Anti-Discrimination Exploratory Working Group (AREWG) in fulfilling its duties

related to racism and other equity and human rights issues. The approved motion includes allowing the AREWG to develop recommendations relevant to PEO's function as a regulator, employer and organization, as a next step following its report to Council in June 2021. Council also approved a new mandate, which accommodates an expanded scope regarding equity affairs and allows the AREWG to proceed to Phase 3 of its work, involving establishing an anti-racism and equity code for Council's approval that articulates policy principles and PEO's commitment and expectations for the profession and the organization regarding anti-racism and equity.

Council tasked the AREWG to recommend to Council, before the 2022 Annual General Meeting, any appropriate changes to coincide with PEO's governance transformation and journey to becoming a modern, inclusive regulator. The motion also included the approval that new AREWG members and chairs be appointed. [e](#)

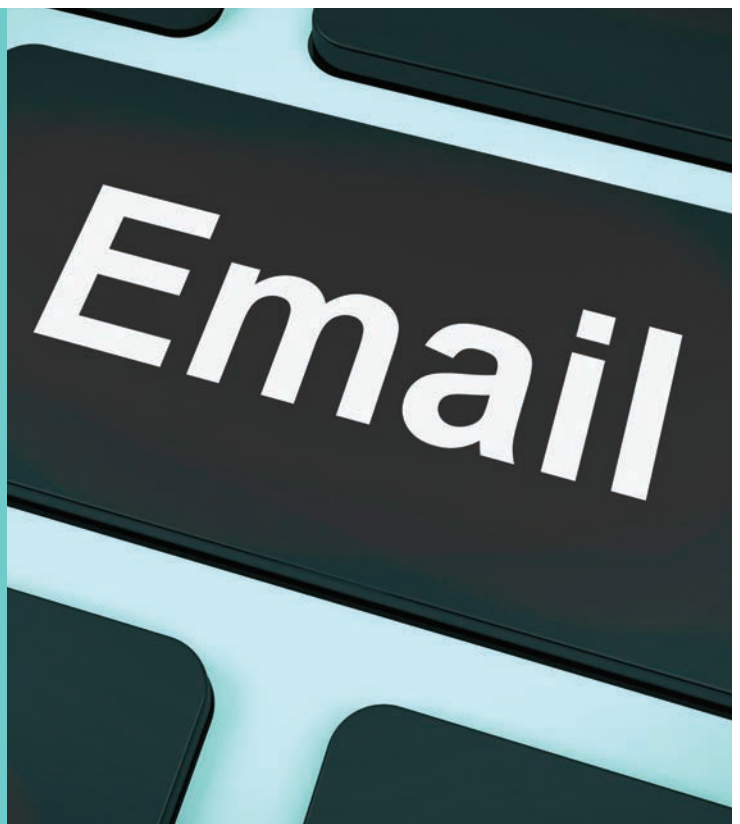
VALID EMAIL ADDRESS REQUIRED TO RECEIVE PEO COMMUNICATIONS

As part of our commitment to modernizing our operations, we will soon be implementing a change in how we deliver information to you.

Effective April 30, 2022, all applicants and licence and certificate holders will be required to provide PEO with a valid and unique (i.e. not shared) email address to receive regulatory communications from us. This includes renewal notices, Council elections materials, annual general meeting details, updates on our Practice Evaluation and Knowledge program and changes to provincial legislation, regulations and PEO bylaws. After this date, we will no longer be using regular mail to communicate with applicants and licence and certificate holders.

To provide us with your email address, simply log in to the PEO portal at secure.peo.on.ca and update your contact information under the Profile tab. Then, make sure to add PEO to your approved senders list (@peo.on.ca) so our email messages don't end up in your spam filter.

Thank you for your co-operation as we continue to improve and streamline our operations to serve you more efficiently.



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Deadline for March/April 2022 is February 3, 2022. Deadline for May/June 2022 is April 7, 2022.

Digital magazine gets lost in email shuffle

Steven Clarke, P.Eng., Ottawa, ON

On the inside back cover of the November/December 2021 edition of *Engineering Dimensions*, I see a notification that “We’re saying goodbye to print!” (p. 63). I have to say that I’m very disappointed by this news and strongly ask that PEO reconsider.

Ever since the digital version of *Engineering Dimensions* became available, I continued to elect to receive the print version. This is for a very simple reason: I will actually read the print version. The print version sits on my kitchen table, and I read an article or two while having my morning coffee before heading to the office. Over a span of a couple weeks, I generally read most of the content.

If *Engineering Dimensions* flips to a digital version for me, I can say with confidence that it won’t get read. It isn’t because I’m averse to reading online articles; quite the contrary. It’s because the digital version of *Engineering Dimensions*, received via email or similar means, will get lumped into the 100+ emails I receive daily. It’ll get lost in the mix and quickly forgotten about. If eliminating cost is a reason for saying goodbye to the print edition, then I’d like the option of paying a bit extra for the print edition, versus losing it.

Despite many publications moving online, I think doing so with *Engineering Dimensions* is a big step backward. The print version lands in people’s hands, and people notice it when it lands in their physical mailbox. It doesn’t get lost in the shuffle of email overload that many people experience, and it stays relevant.

If PEO can reconsider this move to eliminate the print edition, I think many members would be appreciative and open to a modest increase in fees to cover the cost.

Print edition keeps licence holders connected

Donald Ferguson, P.Eng., Pickering, ON

I just received my copy of the November/December 2021 issue of *Engineering Dimensions* and

was very disappointed to learn that the print edition will be discontinued early next year (“We’re saying goodbye to print!” p. 63). I have been a P.Eng. since 1975 and have always enjoyed receiving and reading my copy of PEO’s magazine. I realize I am probably in a significant minority of PEO members who still receive a hard copy, but I believe it has always been a way to keep connected to PEO and to keep informed about happenings involving the engineering profession. I would suggest that, of all the members who currently receive the digital version, very few people take the time to read it in any level of detail. If my assertion is true, then creating the magazine for a digital-only audience could be a waste of your time. I urge you, and others who control PEO’s finances, to reconsider your decision to eliminate the paper version of *Engineering Dimensions*. No longer having a hard copy version may seem like progress in an increasingly computerized and digital world, but I believe it is a mistake to abandon such a useful communication device, especially for those of us who grew up reading and understanding actual hard copy books and magazines and who have difficulty appreciating publications that are presented only in a digital format.

Diversity produces better outcomes

Richard B. Jones, LLB, LLM, P.Eng.,
Milford, ON

The cover of the March/April 2020 edition of *Engineering Dimensions* teases the reader with the title, "Why Diversity Matters." Your Editor's Note on page 5 tiptoes towards answering "Why?" and suggests that the lack of diversity "...could result in engineering solutions not produced or designs not thought of." But then there is nothing more on the beneficial possibilities but only a dialogue of representation, of equity as numeric outcomes. That's it? That is all there is? You don't have an answer for the question on the cover?

Inclusion and diversity are not just about equity, fairness, proportional representation, legal compliance with numbers and population-based quotas and feeling good because you are doing the "right" thing. There are tangible benefits that follow from diversity in our workplaces and in other groups.

Teams, workplaces and groups with diverse memberships produce better outcomes. Inclusion and diversity result in better performance. Diverse workplaces and diverse teams of professionals (including engineers) simply produce better results. And the more novel and challenging the tasks facing a group, the better the outcomes will be if the group is diverse. This is a place where there are rewards for doing the "right" thing.

Studies of groups of marooned survivors of shipwrecks or plane crashes have found that groups with diverse members fare better. The diverse members complement and support each other, and this produces materially better outcomes for the group. Extended studies of teams in multinational business enterprises have demonstrated that groups with diversity of gender, race, ethnicity and age perform better and generate better outcomes. It has been my experience that those outcomes are enhanced under the added pressures of crisis conditions.

BlackRock is one of the largest investment managers in the world. Years ago, BlackRock studied the composition of boards of directors and of the management teams of enterprises in which they invested for their clients. BlackRock also studied its own structures and investment decision-making and found that diverse and inclusive teams produced better outcomes. Such teams handled unexpected challenges and changes better and produced better results and better investment decisions.

BlackRock now applies the following principles to their operations worldwide and in their assessments of the enterprises in which they invest:

"We work collaboratively, without silos and without turf, to create the best outcomes for our clients, our firm and the communities where we operate.

- A diverse workforce is indispensable to our creativity and success. It's how we answer the biggest questions and solve the toughest problems.
- An inclusive, equitable environment makes us thrive. It enables us to draw on expertise and unique experiences from across the firm and bring out the best in each other."

Clearly, BlackRock determined that there is a very good reason why diversity and inclusion matter: applying them simply produces better results and is better for them, for their employees and for their clients. Professional engineers and PEO could do worse than putting BlackRock's words up on the wall in their workplaces.

...

Diversity matters because caring about it works. Diverse and inclusive teams and workplaces produce better outcomes. That is a compelling reason why we should do the right and fair things about diversity and that is the answer to the question raised on your cover.

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LETTERS TO THE EDITOR are welcomed, but must be kept to no more than 500 words, and are subject to editing for length, clarity and style. Publication is at the editor's discretion; unsigned letters will not be published. The ideas expressed do not necessarily reflect the opinions and policies of PEO, nor does PEO assume responsibility for the opinions expressed. Emailed letters should be sent with "Letter to the editor" in the subject line. All letters pertaining to a current PEO issue are also forwarded to the appropriate committee for information. Address letters to editor@peo.on.ca.

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Find the 2022 Council Elections candidate statements in this issue's insert.
Go to peovote.ca for all election-related resources,
including video recordings of this month's All Candidates Meetings.

Voting closes February 18. Count yours in.

WE'RE SAYING GOODBYE TO PRINT!

PEO is currently undergoing a significant transformation to become a more modern and effective regulator, and with that, *Engineering Dimensions* is changing, too.



WE'LL BE MOVING TO A FULLY DIGITAL PLATFORM

starting with the March/April 2022 issue. This means you will no longer have the option to receive a hard copy of the magazine in the mail—an option we've been offering readers since we created the *Engineering Dimensions* digital edition in 2008. We'll be sending you the digital edition to the email address we have on file. If you're already receiving it, nothing will change. But if you're currently receiving a printed copy, please ensure PEO has your email address.

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