



ENGEOActions

THE NEW BRUNSWICK SOURCE FOR ENGINEERING AND GEOSCIENCE NEWS

TACKLING CLIMATE CHANGE IN NEW BRUNSWICK...AND BEYOND

What is being done and how can the Engineering and Geoscience professions contribute?

> MEET YOUR NEW VICE-PRESIDENT Get to know Raphaël and his thoughts on being a part of the APEGNB team

PLUS:

A recap of our 2021 AGM and professional development sessions

ENGINEERS HAVE SPOKEN.

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WE CAN HELP YOU FEEL MORE CONFIDENT TOO. TELL US ABOUT YOUR FINANCIAL GOALS.

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*Survey conducted by us in June 2019 with participants of the Engineers Canada-sponsored Financial Security Program.



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OUR MISSION

To protect the public interest by regulating practice and to maintain public confidence in the professions.

OUR VISION

The Association of Professional Engineers and Geoscientists New Brunswick leads the professions as a trusted, integral resource in regulatory matters.

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APEGNB ANNOUNCES NEW AT-LARGE COUNCIL REPRESENTATIVE

Message from the President

I feel very grateful to be the 103rd APEGNB President and the 10th female APEGNB President. I'd like to thank everyone who worked on our 2022 Annual Meeting and to our registrants who took time out of their schedules to attend, learn, vote and move our professions forward. It is my pleasure to work with the APEGNB staff and our current council for this year.

As your President, my goals are to continue to strengthen our presence with our province through advocacy, communication and relationship building. It is important that we continue to build our relationship with the Government of New Brunswick to ensure they understand our mandate and how our professions are critical to the future of New Brunswick. We will continue to maintain transparency as we do this work.

As well, we had a successful public awareness campaign that was launched last year, which was well received.

We have seen a lot of change these past few years in dealing with all the challenges that the COVID-19 pandemic has caused our work and workplaces. We have dealt with a great deal of disruption due to COVID-19 but our professions have proven ourselves as valuable members as we move through these challenges. As well as workplace changes, we are now using the *myAPEGNB* platform to handle our fees, report our professional development and update contact information among other important data management. We continue to move forward to enhance the experience of registrants interaction with APEGNB.

I am proud of the diversity in our professions. We work to support the Engineer's Canada 30 by 30 initiative. The goal of the initiative is to raise the percentage of newly licensed female engineers 30 per cent by the year 2030. However, this is only one part of our association's diversity story.





Michelle Paul-Elias, P.Eng. FEC

We continue to welcome foreign trained registrants as our province continues to grow. As well, we have many industries represented in our registrants and that presents diversity in thoughts and experience.

We have a lot of work ahead as we look to the future of our professions. I'm asking you as registrants to consider how you may be able to support the initiatives of your association. Your time and talents are valuable, and we would welcome hearing from you if you have any interest in volunteering for future committee or task force work.

Michelle Paul-Flins

MICHELLE PAUL-ELIAS, P.ENG., FEC

President, APEGNB 2022 president@apegnb.com

Michelle follows in the footsteps of Marlo Rose, P.Eng., FEC and Maggie Stothart, P.Eng., FEC as the 103rd President of APEGNB, and the historical 3rd female in a row to lead the Association.

VIRTUAL AGM AND PROFESSIONAL DEVELOPMENT SESSIONS February 15 - 18, 2022

Whether you watched from the comfort of your home or a quiet office, from your desktop or your tablet, the 2021 APEGNB Annual Meeting and professional development sessions built off the success of last years event. We offered nine professional development sessions which drew over 250 participants on average for each event and 254 registrants plus 11 guests participated in the annual meeting itself.



Results of the 2022 election:

- President Vice-President Fredericton Moncton Northwest
- Michelle Paul-Elias, P.Eng., FEC Raphaël Roy, P.Eng. Tammy Lamey, P.Eng. Jérémie Aubé, P.Eng. Karine Savoie, P.Eng.

3400 ballots sent out **20%**

participation rate

Congratulations to the 2022 Award Recipients!

Clayton Barclay P.Eng. C.C. Kirby Award



Amy Winchester P.Eng. Women in Engineering Award



Iris Auclair-Bernard

President's Award

P.Eng., FEC

P.Geo., FGC Outstanding Educator Award



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VIRTUAL AGM AND PROFESSIONAL DEVELOPMENT SESSIONS February 15 - 18, 2022



Have you ever wondered what happens behind the scenes of a virtual event? Thanks to our friends at Encore for sharing a picture of their control centre.

Introducing the 2022 APEGNB Life Members

Laurent Maltais Rino Beaulieu Bernie Hudgins François Haché Nick Papadopoulos Paul Orser Bruce Delicaet John White Bill Gates Richard Keirstead Rhéal Maillet Marc Voisine Brent Anderson Tony Smith Clifford Stratton Walter Allison Robert Dunnett Phillip Gilks Kenneth Shaffer John Bartlett Bob Butler David Lewis Conrad Allain Brent Hatchard Len LeBlanc Randall Blakely Scott MacDonald Murdock MacAllister David Agnew Réjean Barriault Eldo Hildebrand Majid Debly Dale Case Scott Hatcher Charles Maillet Donald Nesbit Rob Wilcox Calvin Pelkey Ken Amos Kevin MacLean Gary Ogden Gérard Poitras Bruce Baird

A Revised Physical Geography 110 Course: Increasing Earth Science Literacy for New Brunswick High School Learners

Submitted by: Ann C. Timmermans Quartermain Earth Science Centre quartermain@unb.ca

"Science Literacy is the artery through which the solutions of tomorrow's problems flow" NEIL DEGRASSE TYSON

The quote presented by Neil deGrasse Tyson could not be truer for the Earth, Environmental and Space Science (EESS). With global issues of sustainability, climate change, threats to biodiversity, and dwindling energy and mineral resources, it is important that young people are scientifically literate with respect to the complex multidisciplies underpinning these issues. Yet, the EESSs struggle to gain the recognition and value in New Brunswick high schools.

Individuals' attitudes towards science are mainly formed within the school environment. With little opportunity to gain EESS literacy in high school, a high number of incoming college and university students have never experienced an Earth Science course, especially compared to the number entering having taken biology, chemistry or physics. Enrolment into programs related to geoscience and geological engineering therefore continues to struggle with an annual static or a declining influx of students, even with a growing need for qualified professionals to address the environmental challenges and natural resource limitations of the twenty-first century.

The Education and Early Childhood Development (EECD) and Geoscience educators at the Quartermain Earth Science Centre (QESC) at the University of New Brunswick (UNB) have recognized this concerning gap between the importance of EESS education and its low status in New Brunswick high schools. In response, new courses are being built that offer students more selection in their EES education. In this article, we discuss the status of Earth Science literacy for 16-year-olds in NB and our progress in revising the Physical Geography 110 course.

Status of Earth Science Literacy for 16-year-olds in New Brunswick

Earth Science literacy is crucial for all high school students to encourage their appreciation for global climate change, sustainability, and the fate of humankind. The EECD and UNB



curriculum writing team reviewed the Third International Geoscience Education Survey (King, 2013) to evaluate the status of Earth Science literacy for NB students compared to other schools around the world. The 2013 survey concluded that in Canada, geoscience as an independent discipline at the high school level (ages 16 to 18-yearolds) does not exist in many high schools. Each Canadian province and territory has jurisdiction over its own curricula; many, however, are consistent with the Pan-Canadian Assessment Program (PCAP), that has published a common framework for K-12 science learning outcomes. In New Brunswick, Earth Science forms part of the compulsory curriculum until grade 9 (age 14). Specifically, the approach to Earth Science education in high school involves a small compulsory part of the grade 9 Social Studies course, as well as a part of the optional Physical Geography 110 course. Neither of these satisfy college or university science entrance requirements. Teaching materials at high school level are often outdated, though some NB Physical Geography 110 educators use the Earth Science literacy principles as supported by Big Ideas in Earth Science (Ladue et al., 2008; Wysession et al., 2012; King, 2013), however, recruitment of educators with a background in Earth Sciences is low. This is because, according to a survey, Earth Science is not a teachable subject, so few teachers specialize or focus on Earth Science (King, 2013).

In response to the survey results, the curriculum writing committee decided to use the International Geoscience Syllabus to help build the framework for a modernized Earth Systems Science component within the new Physical Geography 110 course. The International Syllabus is designed for students aged 16 and is accompanied by free open textbooks (IGEO's "Exploring Geoscience Across the Globe") with hands-on laboratory activity components (IGEO's "Exploring Geoscience – Activities and Questions"), which are editable to

QUARTERMAIN EARTH SCIENCE CENTRE

include local content. The result is a blended course that celebrates both Physical Geography and Earth Systems Science, designed so students can strengthen their knowledge, skills, attitude, and appreciation for the fields.

Structure and Framework for the Revised Physical Geography 110 Course

The New Brunswick Curriculum is structured in terms of general curriculum outcomes, specific curriculum outcomes, and achievement indicators. General Curriculum Outcomes (GCO) are overarching statements about what all students are expected to learn in each strand or sub-strand. Specific Curriculum Outcomes (SCO) are statements that identify specific concepts and related skills underpinned by the understanding and knowledge attained by students as required for a given grade. I Can – Exemplars (Achievement Indicators) are lists of the depth, breadth and expectations for the learning outcomes.

The three main GCOs for the revised Physical Geography 110 include: (1) Students will explore perspectives on position and place, (2) Students will examine patterns and systems in the human and natural worlds, and (3) Students will participate in a land-based field project. These GCOs within the revised Physical Geography 110 course compliments the competencies and attitudes that NB learners should develop through their educational and life experiences at the high school level. New Brunswick published its Global Competencies for NB students (2019) and has provided a consistent vision for the development of a coherent and relevant Physical Geography 110 curriculum. Earth Science education is a proven science that develops high order thinking skills (systems thinking) by providing learners with the ability to overcome cognitive barriers for spatial (geographic) and temporal thinking, retrospection, and understanding natural phenomena across scales of many orders of magnitude (View, 1957; Batzri et al., 2015). These are the cognitive skills needed to increase EESS awareness, thus empowering students with knowledge and abilities to make better decisions on the effective and sustainable use of our water, energy and natural resources, mitigation for natural disasters, and awareness of the implications of climate change.

Science, Technology, and Innovation (STI) in NB are recognized as the key drivers behind economic growth and prosperity. To create a more sustainable world, Physical Geography 110 teachers can create relevant, real-world context for students by intentionally connecting classroom learning to the United Nation's 17 Sustainability Development Goals (UN SDGs, Figure 1). Various inquiry-based hands-on laboratory exercises engage students with sustainability issues, and learners are tasked to become "sustainability change-makers". In the revised Physical Geography 110 course, students may explore and investigate topics related to UN SDG 6 – Clean Water and Sanitation, 11 – Sustainable Cities and Communities, 12 – Responsible Consumption and Production, 14 – Life Below Water and 15 – Life on Land. For the final summative assessment, Physical Geography 110 teachers will be encouraged to build a culminating field project instead of paper-based exams. A field project plays a fundamental role in facilitating understanding of geographical and geological concepts. The efficacy of a field project for high school students in their local districts is dependent on accessible resources and careful planning for travel, safety, instruction, and evaluation. As local and school communities vary, a safe geographic traverse could mean a locale on school property or another suitable New Brunswick location.

Where Do We Go from Here?

The initiative to revise the Physical Geography 110 course is part of a larger project to provide high school students with greater access to grade 11 and 12 EESS courses with the same prestige as the traditional chemistry, biology, and physics courses. The Advanced Environmental Science 120 course was launched in 2018, and an Advanced Earth and Space Science course will be built in the near future. These courses should be suitable as prerequisites that satisfy college or university science entrance requirements. However, the successful introduction of new EESS courses depends on several factors.

- Support for High School Science Teachers: A teacher's perception of . the EESSs exerts a major influence on students' attitudes. In general, relatively few teachers have a degree or background knowledge in the EESSs. Most high school science teachers have a biology background and may not be interested in Earth Science; as a result, they are not comfortable with teaching the material. This lack of interest and enthusiasm compounded with the attitude of its low educational value can be passed on to their students, giving rise to poor attitudes towards the subject in school. Teacher background is therefore crucial for the success in delivering the Physical Geography 110 and other related courses. Professional development is a cornerstone of the introduction of any course, especially for the EESSs. The challenge is to empower teachers with opportunities and resources so they can enthusiastically engage their students in inquiry-based, hands-on, relevant, and student-centred Earth science learning. Teacher professional development should therefore focus on building knowledge in both physical geography and physical geology with respect to pedagogical strategies to achieve the NB Competency Goals.
- Community Resources: Available resources for teachers are extensive. These include the Quartermain Earth Science Centre, Science East, Stonehammer UNESCO Global Geopark, APEGNB, the University of New Brunswick, the New Brunswick Museum, and various provincial government organizations. New Brunswick also has a large network of geo-professionals and geo-educators to help teachers acquire resources, tour interesting geological sites, and build their field projects units.

QUARTERMAIN EARTH SCIENCE CENTRE

Final Thoughts

The revised Physical Geography 110 course blends the fields of Physical Geography with Earth Systems Science, which contributes to elevating Earth Science literacy for high school students in New Brunswick. The Physical Geography 110 course, along with the Advanced Environmental Science 120 (2018) and Advanced Earth and Space Science (date TBA) courses, reduces the gap between the potential of Earth Sciences and its current low status as presented by the IGEO International Geoscience Education Survey (King, 2013). The revised Physical Geography 110 course is consistent with supporting learners in building their NB Global Competencies while increasing awareness in global Earth and Environmental issues and the sustainable development goals. Professional geoscientists and geoscience educators can help support high school science teachers in their delivery of EESS courses by providing geological expertise and resources. These, along with other efforts for Earth Science education reforms, encourage early awareness of the EESSs as important fields of study, provide field and laboratory experiences, build a more informed community, and can enhance the diversity of students entering as geoscience majors.

Thank you to all the individuals involved in this important initiative to revise the Physical Geography 110 course. A high school environment that provides opportunities for students to improve their Earth Science literacy helps them to think critically about the natural world, ask questions, find and understand the facts, and explore answers to tomorrow's questions.

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SUSTAINABLE GOALS



Figure 1: United Nations 17 Sustainable Development Goals. Highlighted for the revised Physical Geography 110 course are: goals 6 - Clean Water and Sanitation, 11 - Sustainable Cities and Communities, 12 - Responsible Consumption and Production, 14 - Life Below Water and 15 - Life on Land. https://sdgs.un.org/goals

MEET YOUR NEW VP

RAPHAËL ROY, P.ENG. 2022-2023 APEGNB VICE-PRESIDENT ENGEOActions sat down virtually and got to know the

new elected APEGNB VP, Raphaël Roy, a bit better.

What inspired you to put your name forward for Council?

My main inspiration on everything I do is to solve problems that are sustainable and will improve our way of life for future generations. I really dislike short gain decisions that will only benefit few. I strongly believe that the only way to make a difference is to engage, to educate and to act as role models. Our association is one of the best mediums to do so, as Engineers and Geoscientists are always at the front line of key public decision-making. This is what motivated me to put my name forward to be part of Council.

What do you wish to accomplish in this role?

The association has a mission to protect the public interest by regulating practice and to maintain public confidence in the professions. But what about its vision in doing so? I strongly believe that Engineers and Geoscientists are one of the pillars of today's society. We have a major role to educate, to be a role model for our peers and to support our community in a sustainable way. I wish to bring this sentiment forward to our members as an opportunity to reflect on what "I/we" can do for my/our community as Engineers and Geoscientists and for future generations.

What do you see as the biggest challenges for the engineering and geoscience professions in New Brunswick?

The ongoing proposed *Engineering Technology Act* amendments is one of the most important matters that have strong consequences on the roles of Engineers, Geoscientists, Architects and Technologists, to name a few professions. I believe we need to review the historical foundations of each of these professions impacted by these changes and pinpoint how we want to work together to best protect the public's interest. We need to set clear requirements on legislation, liability and minimum standards on education, skills and experience required to represent these roles in order to protect New Brunswicker's. I believe finding a clear uniform agreement between the parties impacted which clearly defines the roles and responsibility will help to table this matter once and for all.

Secondly, not to be too much of an ideologist and repeating myself, I believe that our professional association has a duty to educate and mandate the professional development of our members in sustainable development that will provide the information, skills, and techniques to appropriately adapt to future challenges posed by climate change. Let's not forget that the APEGNB's mission is to protect the public interest and to maintain public confidence in the professions. Can we say that we have achieved this mission if we, as an association, have not acted as leaders in the climate transition that has to occur for our future generations?



NAME: RAPHAËL ROY, P.ENG. CURRENT OCCUPATION: DIRECTOR OF ELECTRICAL ENGINEERING, CORBO

A little bit about you: I have many years of experience in the industrial and renewable sectors. As well, I have experience in R&D specializing in advanced manufacturing, welding, and robotics to name a few. One of the projects I am most proud of, is when I was able to help start up an industrial cluster in welding and metallurgy and establish a new technology access center specializing in automation and robotics in northern NB.

I am an active member in my community and the association. I have mentored over 20+ young engineers during my career, I have been a longserving representative on the Northeastern Branch Executive Council, I am an elected municipal councillor and a minor league baseball coach.

What opportunities do you see for the future of APEGNB?

I do believe that our challenges, our obstacles, bring forward who we truly are. It is under pressure that we perform, that we grow. I have a saying, the only way to move forward, is to apply force. So, with that, I see an opportunity to have a stronger relationship with our fellow regulated associations and have a clear and defined practice guidelines that will move us, and our New Brunswick, forward. Finally, as an Association, we need to be a strong supporter of STEM as a foundation to help learn about climate crisis and create action plans with key stakeholders in order to make change.

What motivates you?

I really love debating and brainstorming on issues with my co-workers in hopes of finding sustainable solutions to problems we face as a society. I base everything I do on creating a better future for my children where they can grow and contribute to society safely.

What makes our mission meaningful to you?

I believe that our mission of protecting the public interest by regulating our practices and to maintain public confidence in the professions is more than just ensuring that we pay our annual dues, or completed and submitted our professional development hours. For me, these actions are just a prerequisite to achieving our mission. A mission needs to be driven by a vision. It has to go beyond our basic duties as professionals in order to be meaningful. Engineers and Geoscientists are the front line of our modern society's infrastructure. Our professions played and will play a key role in where the future will take us. We thus have a moral responsibility under this mission to act as the "pillar" in ensuring operations are continuously adapted to the impacts of climate change, for example and to work in the best interest of public safety. We need engineers and geoscientists to develop solutions, strategies, policies and develop new professional practices that improve resilience. We need to work alongside key stakeholders in bringing forward solutions toward sustainable development. Transition to a green economy is not an idea or concept, it's now a reality that we all need to take concrete actions for the sake of our future generations and preserving the advancements we have made in the last centuries.

What is leadership and how will you apply it to your work with APEGNB?

Leadership assembles, inspires and brings forward a vision. Leadership creates an environment where people can grow and can give their best to our society so it can flourish. To create that vision, we first need to listen, bring forward ideas, and think outside the box. This is what I hope to be able to accomplish during my time on Council.

Our professions play a key role in what we are and where we are today. We have a moral responsibility to act as the "pillar" in ensuring operations are continuously adapted to the impacts of climate change and public safety.



In the Matter of a Complaint Pursuant to the Engineering and Geoscience Professions Act

Summary of Decision and Reasons

January 21, 2022

On November 17, 2021, the Complaints Committee of the Association of Professional Engineers and Geoscientists of New Brunswick met to investigate and consider a Complaint against a member. The Complaint alleged professional misconduct.

Having reviewed the Complaint and Reply, and having reviewed the relevant sections of the *Act*, the Complaints Committee determined that the matter was within its jurisdiction. The Committee further determined that the matter warranted referral to the Discipline Committee.

Prior to taking this action, however, the Committee proposed a "Voluntary Agreement" to resolve the issue. This agreement was acceptable to the Complainant and included the following terms:

- The Association publishing, without names, without geographic reference, a summary of the matter to the membership consistent with the following for the purpose of education:
 - APEGNB received a Complaint against a Member who erroneously failed to engage an Architect with respect to the construction of a commercial building contrary to the "Guidelines for Development and Maintenance of the Professional Relationship Between Architects and Engineers" (the "Guidelines")
 - Specifically, the Member failed to engage the services of an Architect as provided for in the Guidelines.

- The Member undertook to remedy the situation at his own expense and to abide by the Guidelines.
- In the course of addressing the Complaint by way of Voluntary Submission to the Complaints Committee of APEGNB, the Member acknowledged that the violation of the Guidelines had caused conflict with other regulatory bodies and officials.
- Based on the diligence of regulators and various officials the matter was identified prior to the conclusion of the construction of the commercial construction project and there are no ongoing issues of public safety.

With the acceptance of the voluntary resolution, the Complaints Committee concluded its investigation and consideration of the Complaint, and considers the matter resolved.

- Roland Richard, P.Eng. Acting Chair, APEGNB Complaints Committee

To protect the public, APEGNB investigates all complaints about unlicensed individuals or companies and unprofessional, inadequate or incompetent engineers or geoscientists. If you have concerns about the work of a professional engineer or geoscientist, fill out a complaint form found on our website.



What is good standing?

CAROL MACQUARRIE, P.ENG. DIRECTOR OF PROFESSIONAL AFFAIRS AND REGISTRAR

Good standing is defined in the APEGNB By-Laws as "a Member, Licencee, or Certificate of Authorization holder who is not in arrears of any fees or other amount owing to the Association; who is in compliance with the *Act*, by-laws, and rules; and who is absent of any restrictions or conditions on practice."

Maintaining good standing with APEGNB is a core component of self-regulation and compliance with the *Engineering and Geoscience Professions Act.* Registrants (members, licencees, and holders of certificates of authorization) in good standing are entitled to use professional title and to practice the professions in New Brunswick.

As a self-regulatory body, members in good standing are also entitled to certain privileges – those being: eligibility to sit on Council and committees, to attend and vote at the Annual Meeting, and to transfer membership to another jurisdiction. Additionally, certain affinity programs are dependent upon good standing status.

It is incumbent upon a registrant who is not in good standing to resolve outstanding regulatory obligations as expeditiously as possible. Failure to remedy a non-compliance within an allotted time, can result in a strike off (removal) from the Register. Once struck from the Register, a former registrant is no longer entitled to title and practice rights.

There are currently three provisions in the By-Laws for that can result in a registrant not being in good standing and that that can end in strike off:

- failure to pay dues
- failure to comply with the reporting requirements of the continuing professional development program, and
- failure to maintain professional liability insurance unless exempted.

In each case, if struck, a former registrant is entitled to reinstatement to the Register upon satisfactory completion of any outstanding requirements including payment of fees for reinstatement.



Failure to comply with other elements of the Act, By-Laws, and Council Rules, may be considered professional misconduct and subject to the disciplinary procedures of the Act. A registrant is in good standing while any disciplinary investigation is underway. Should the process result in disciplinary actions, the registrant is not in good standing until the order has been fully served and discharged by APEGNB.

Carol MacQuarrie CAROL MACQUARRIE, P.ENG MACQUARRIE@APEGNB.COM



DID YOU KNOW?

To use the analogy of a traffic light, being in good standing would be considered a green light, not being in good standing would be considered a yellow light and being struck from the Register would be a red light.

Becoming a leader in climate adaptation: Dream or reality?

Submitted by: Serge Dupuis, P.Eng., FEC, MBA, M.Sc. Assistant Professor, Department of Civil Engineering, Université de Moncton

In New Brunswick, we have it all: inland and coastal flooding, ice storms, heat waves, extreme winds and more. More importantly, our engineers are experts at designing, building and protecting critical infrastructure in the face of these tangible effects of a changing climate. With the impending release of the National Adaptation Strategy by the federal government, these adaptation skills, which sometimes seem inherent to New Brunswick engineers, will be in greater demand nationally and internationally.

Through the development of adaptation education and resources, New Brunswick engineers will be better equipped to advance climate adaptation within the province and be leaders in this field across Canada. "New Brunswick Engineers... Leaders in Climate Adaptation": future headline or just a dream?

Major adaptation projects have been completed across the province with many more initiatives to come. One example is the Building Adaptive Capacity to Climate Change for New Brunswick Engineers project led by the Université de Moncton and ending in March 2022. This three-year project was designed under Natural Resources Canada's Building Regional Adaptation Capacity and Expertise (BRACE) initiative and is also supported by the Government of New Brunswick, APEGNB and UNB.

The goal of the project was to better equip the province's engineers to advance adaptation in our communities by offering seminars, workshops and other educational resources. With initiatives such as the creation of a partnership with CSA Group priority access to emerging trends in climate change adaptation. Our project team has also been asked to create national adaptation guides including a best practices guide for engineering adaptation education and an adaptation resource guide for engineers that will be published soon.

During this project, we were moved by the willingness to learn and collaborate with engineers from all regions of the province. We thank them for being forthright in sharing adaptation successes and challenges during training. Our engineers recognize the importance of resilience and informed decision making in adaptation. In addition, they welcomed the interdisciplinary work that is essential to advance community adaptation.

The future of climate adaptation is exciting and promising in New Brunswick. With the recent opening of CLIMAtlantic, a regional climate services center sponsored by the Canadian Climate Services Centre (CCCS), New Brunswick and the Atlantic Provinces are in the spotlight.

Recently, the federal government announced that contracts have been awarded to expand the Atlantic Science Enterprise Centre (ASEC) in Moncton. This \$325 million project will house the science departments of Fisheries and Oceans Canada, Environment and Climate Change Canada, the Canadian Food Inspection Agency, the National Research Council and the Canadian Space Agency (virtual partner). Although New Brunswick will probably not start training astronauts, the collective scientific capacity in New Brunswick will expand and have significant benefits for engineers.

In New Brunswick, engineers have the perfect recipe to be leaders in adaptation. The experience and expertise of our engineers is essential to the advancement of adaptation in our province. The need for adaptation expertise will continue to grow in the coming years and the job market is already looking for engineers specializing in (Canadian Standards Association), New Brunswick engineers have climate change adaptation. Our team at the Université de Moncton wants to continue to support the province's engineers in their adaptation projects.

> Thanks to APEGNB for supporting this project and for more information, please contact serge.dupuis@umoncton.ca.



INTERNATIONAL GEODIVERSITY DAY

The UNESCO General Conference recently approved the establishment of International Geodiversity Day. This annual, worldwide celebration raises awareness across society about the importance and value of "non-living" nature for the well-being and prosperity of all creatures on the planet. International Geodiversity Day is held on October 6th, and 2022 is the first year it will officially be observed.

Re-shared with permission from the Canadian Federation of Earth Sciences Written by Carolyn Hill-Svehla

Geodiversity is not a term we hear of often, unlike biodiversity, which most people are likely familiar with. In reality, these concepts go hand in hand.

Geodiversity refers to the abiotic or inorganic components of nature, including rocks, minerals, fossils, and landforms and topography such as mountains, lakes and rivers. This part of nature underpins biodiversity and provides the foundation for life to thrive. I hesitate to use the term "non-living" to describe geodiversity as many cultures hold great spiritual connection and significance to these natural elements. To many outside the realm of western science, the "non-living" natural world is alive and imbued with spirits; for example, in Anishinaabe culture, rocks are considered animate objects.

In general, people are largely unaware of the extent to which we depend on geological diversity, so devoting a day to celebrating its importance and impact is a great step to raising awareness. Historically, geodiversity has driven and guided human migration and settlement patterns and played a vital role in defining cultural identities and spiritual heritage. For example, many large ancient cities were founded near rivers or along coasts to access food and water, trade, transportation, and defence. It influenced our earliest beliefs and spirituality, showcased in the prevalence of deities based around natural phenomena and nature generally.

Geodiversity has also influenced international politics and trade, such as in the race to access coffee and tea, or the development of employment opportunities, as seen in the growth and decline of mining towns. Differences in bedrock and soil composition also support agricultural systems and productivity. The success of our energy reserves from oil and gas or hydroelectric power, for example, are dependent on production facilitated by local geodiversity. Another example is the sourcing of building materials such as aggregate and masonry stone.

Not immune to geodiversity is our procurement of minerals and metals. These are key resources that we depend on every day, from the vehicles we drive to cellphones, kitchen appliances, makeup, and toothpaste. Critical and strategic minerals are also helping to drive green and renewable technologies for a sustainable future.

This boils down to the need to showcase and promote the vital role that geodiversity has played in linking all life forms and raise awareness of the solutions that the geological sciences can provide to address urgent global concerns and inform policy choices moving forward.

Besides the tangible value of geodiversity, there is also an intrinsic value worthy of protection. Diverse landscapes and features that exist in nature have inspired artists for millennia through colour and shape.

The Group of Seven artists are a personal favourite of mine! These elements have inspired countless myths and folklore. For example, ammonite fossils have evoked tales from around the world. It is also well-established that spending time in nature is essential for boosting mental health and maintaining an overall healthy lifestyle (I think most geoscientists would agree!). The human connection to the Earth lays the foundation for our species, and we should not forget to reflect on our relationship with the planet, its past and future. We can take notes from traditional Indigenous teachings to look at Earth, our home, less objectively and re-establish our connection with the world because we are all united as part of nature.

The International Geodiversity Day initiative has been in the works since 2020. Thanks are due to the International Union of Geological Sciences (IUGS) and 108 other scientific organizations including the CFES and Canadian Geoparks Network, for their hard work making this global celebration of geodiversity happen.

This year on October 6th, keep an eye out for local geodiversity events happening near you, take advantage of natural spaces, or plan a trip to one of Canada's stunning UNESCO Global Geoparks.





Canadian Federation | Fédération canadienne of Earth Sciences

des sciences de la Terre







SOARing to new heights

ENGEOActions spoke with Ryan Dunbar, P.Eng., President of SOAR Professional Services

By Lauren Nicholson, Director of Communications, APEGNB

SOAR Professional Services is an innovative, employee-owned planning, engineering, environmental science, and management consulting firm dedicated to supporting First Nations, Inuit and Métis communities and organizations across Canada. In addition to their Indigenous client base, they also work with Canadian corporations that share their progressive view on advancing reconciliation with Indigenous Peoples.

Growing up off reserve, the son of an Indigenous mother and a non-Indigenous father, Ryan Dunbar saw first hand the social issues and hardships that the Maliseet (W ∂ last ∂ kwiyik) First Nation peoples at Kingsclear faced. He knew from a young age that he wanted to create change and for him, his inspiration started at home.

"Growing up, my mother influenced me the most. She was my best friend and the kindest soul you would ever meet," explains Dunbar.

"I am proud to say that she was the first off reserve woman elected to Council in the history of the Kingsclear First Nation. I'm even prouder to say that once she joined Council, she became a force to be reckoned with."

It was the influence of strong leaders like his mother and grandmother that ignited a spark that drove him to have a deep connection, understanding and sense of awareness of the Kingsclear community and Indigenous communities in general.

"It wasn't because my mother was on Council that I wanted to give back to my people. It was my understanding of the social issues and seeing the work she did and the people inspired by her that motivated me to do what I do now."

Dunbar explains that the vision behind SOAR Professional Services is giving passionate, Indigenous people like himself the supporting resources to make a difference in Indigenous communities and create positive change.

"Although I did not grow up living in Kingsclear First Nation, a result of my grandmother's expulsion from the community when she married a non-Indigenous man, my family has always retained

close ties with our community," he explained. "This connection allowed me to gain an understanding of community politics, services, barriers, and the regulatory environment. This gave me a unique opportunity to support progressive relationship-building as well as find opportunities to advance Indigenous economic diversification and employment opportunities."

A Professional Engineer, Dunbar has worked at Dillon Consulting for the past 16 years. In the last nine years, he has worked exclusively on large scale Indigenous projects in many First Nations communities across Canada.

Throughout his time at Dillon, his passion for helping Indigenous communities continued to grow. He has helped lead the progression within Dillon on how they navigate and shift the traditional dynamics of what an organization can do to support Indigenous employees and clients. Using his Indigenous knowledge and awareness combined with his education and experience, Dunbar was empowered and supported to create further positive change within First Nations communities.

"In 2020, with the approval of senior leadership within Dillon and the Dillon Board of Directors, I was asked to start building SOAR Professional Services in an effort to significantly increase the Indigenous staff representation supporting our clients across Canada," he said. "SOAR aspires to provide Indigenous people opportunities to help their communities the way I was empowered by Dillon early in my career."

SOAR's unique partnership with Dillon provides access to the necessary technical resources and expertise for SOAR to thrive until the company is able to become self-sufficient. It also provides opportunities to build capacity through collaboration on projects that positively impact the lives of Indigenous peoples.

His other hope is that creating an Indigenous led, staffed and owned company like SOAR, will help to change the way organizations approach and work with First Nations communities in New Brunswick and beyond.

His past work on large scale infrastructure, planning and design projects with First Nations, provided the space to have a broader view of the gaps and obstacles that First Nations communities face.

COMPANY PROFILE

"I've worked with a lot of Indigenous communities throughout the country and the issues I see in New Brunswick are not that different than what I've seen in other parts of the country."

"While all Indigenous communities are unique, once you start to figure out the issues and challenges faced, it becomes clear on how to create a design or plan to best help these communities thrive."

Dunbar references the ancient Haudenosaunee (hoe-dee-no-SHOW-nee) 7th generation concept: that we are all connected to a community both seven generations back that came before us and and seven generations into the future that will come after us. Each decision we make, matters deeply to those who were part of our past, present and future.

For Dunbar his greatest influence personally and on his career, were those who lived before him and his desire to create a better way of life for his family, his daughter, friends, colleagues, clients and employees.

"When you talk about projects that helps a community and its people feel safer, have access to clean water, create a new understanding of economic development, and add new employment, it's a beautiful idea. With companies like SOAR, we are helping to support a better future for Indigenous communities. By doing things differently, we are doing things better." He credits his family, as well as those around him at Dillon and in the many communities he has worked with, for his ability to create positive change. Without the teamwork and the people that have the passion needed to create sustainable change for these communities, Dunbar would not be able to do his job effectively.

"With the right resources, passion and commitment, you can move mountains."

FIND OUT MORE ABOUT SOAR : WWW.SOARPS.CA LINKEDIN: @SOAR PROFESSIONAL SERVICES TWITTER: @SERVICES_SOAR INSTAGRAM: @SOARPROFESSIONALSERVICES

Did you know?

According to past versions of the Indian Act, if you received a professional accreditation (e.g. - Professional Engineer, Doctor, Lawyer, etc.), the accredited individual was considered "fully assimilated" and lost their Indigenous Status under the Act.

> Find out more about the Indian Act: https://en.wikipedia.org/wiki/Indian_Act



Ryan Dunbar, P.Eng. Photo submitted



COMPETENCY ASSESSMENT



Engineering and Geoscience Competency Assessment

This system is for professional registration or licensure applicants to record their progress in meeting the competency requirements for engineering or geoscience experience and have it validated and assessed.



A screenshot of the CBA website: https://competencyassessment.ca/

WHAT IS A COMPETENCY-BASED ASSESSMENT (CBA)?

APEGNB, along with many other Canadian regulators, is transitioning to an alternate method for MITs and new applicants applying for professional status to record and submit their work experience. This is known as a Competency Based Assessment, or CBA for short.

As the name implies, CBA focusses on competencies rather than time like the older Logbook program. Competencies are observable and measurable skills, knowledge, abilities, motivations or traits required for professional registration and are demonstrated through the actions and behaviours of you, the individual. That said, we are still looking for the same type of information about your work experience, just in a different format.

By focusing on competencies, the CBA system permits a more quantitative assessment of applicants using a more precise measuring system to assess readiness for licensure. The applicant will have a better understanding of the types of work examples that are required, and accepted. This ensures your references and the assessors are on the same page by understanding what types of examples are relevant to the assessment process. It makes the assessment of the experience more objective, transparent and consistent. As a bonus, where this is an online system, you can record your experience on the go.

The applicant still needs to demonstrate 48 months of work experience and it must be attested by a P.Eng./P.Geo. However, instead of describing the work experience in monthly blocks, applicants will provide specific work experience examples that meet the competencies. Experience in a 'Canadian environment' is still a requirement and these competencies are denoted with a Canadian flag symbol. These competencies demonstrate one's knowledge and experience of Canadian regulations, codes, standards, quality control, safety awareness, professional accountability and communications. It is important to highlight that Canadian environment experience is not limited to work done within the physical bounds of Canada, but rather work done in an environment similar to that of Canada.

For each competency, the applicant will select one example from their work experience which best highlights the appropriate exposure to that competency by providing a brief overview of the specific situation or problem followed by a description of one's response to the situation, including any judgments made or solutions found. This section is typically the longest portion of the example and should include details about the specific actions taken that demonstrate completion of the competency at the appropriate level. It is important to be specific about your individual work and contributions. For example, the use of the word "I" is encouraged and writing in point form is permitted. Finally, in the outcome section, you will relate the impact of the actions, solutions or judgments generated.

For each competency, this submission along with a self assessment ranking will be sent to the applicants references for comments and feedback. Once all competencies are completed, the submission (including feedback and comments from references) will be presented to the APEGNB Board of Admissions.

For additional guidance, there are helpful indicators listed for each competency. These are examples of actions, skills or behaviours that an applicant could use to demonstrate the achievement of a competency. This is not a check list, but rather a list of potential examples which can be used for guidance. There are many ways to demonstrate that you have met a competency. Because the Board of Admissions should be viewing a collection of the applicants best work experience examples, applicants are allowed to overwrite a previous submissions by submitting a new and better example reflecting their competency experience. The competencies have been written so that all disciplines within engineering and geoscience can make use of them.

Naturally, there are different competencies for engineering and for geoscience, which have all been developed with subject matter divided into seven (7) main areas:

- Technical Competence
- Communication
- Project and Financial Management
- Team Effectiveness
- **Professional Accountability**
- Social, Economic, Environmental and Sustainability
- Personal Continuing Professional Development.

These seven areas cover the same qualities/experience we are looking for in the Logbook program. Likewise for Geoscience

applicants, there are 29 competencies spread over four (4) categories.

Active applicants and MITs can sign up for access to the CBA system here: https://competencyassessment.ca.

experts across Canada. For Engineering there are 34 competencies The new CBA process applies to any new MIT applicant after January 1, 2022, and any MIT who has not yet submitted any work logs. MITs who have submitted work logs as part of the MIT program, may continue to do the Logbook program, OR can switch to the CBA process. French versions of these portals are coming soon, so applicants can submit their experience in French or they can choose to continue in the logbook program until their language of choice is available.

> If you have any questions about the CBA process, please contact APEGNB at registration@apegnb.com.

APEGNB EMPLOYEE SPOTLIGHT

Congratulations Stamatia!



MAGGIE STOTHART, P.ENG., FEC PRESENTS STAMATIA WITH HER CERTIFICATE FROM ENGINEERS CANADA.

Congratulations to Stamatia Baker, APEGNB's Acting Director of Registration on the most recent letters added after her name: FEC (Hon.) and FGC (Hon.).

The fellowships honour individuals who have given noteworthy service to the professions through their work with either Engineers Canada / Geoscientists Canada or its provincial and territorial regulators.

Source

Geoscience: Climate Change, Patrick Potter, Earth Science Resources, Lands and Minerals Sector, Natural Resources Canada, 2021. Reproduced with the permission of the Department of Natural Resources, 2022.



GEOSCIENCE AND CLIMATE CHANGE

Federal, provincial, territorial and Indigenous decision makers need to make evidence-based decisions about how we adapt to climate change. Our scientists at the Geological Survey of Canada (GSC) support them with the geoscience they need to protect Canada's economy, its people and its environment. In particular, we study how our changing climate affects permafrost, coastlines, glaciers and the occurrence of extreme events such as flooding and landslides.

Why it matters

As a northern country, Canada is experiencing climate change at twice the rate of the world's average. In the Canadian Arctic, the rate is three times the world average. Increasing temperatures mean that glaciers are melting and permafrost is warming and thawing. The effects are dire in Canada, which has the third largest area of glacier ice in the world (~200,000 km2). Moreover, a full 50% of Canada contains permafrost. Canada's northern coastlines are among the fastest changing areas in the world.

Melting glaciers and permafrost thaw impact freshwater availability and quality, groundwater dynamics, ground stability and marine fish habitat. Permafrost thaw and coastal erosion threaten existing infrastructure and development projects, and accompanying sea-level rise floods land and enlarges rivers and lakes. In short, melting ice and sea-level rise can wreak havoc on coastal regions.

Almost all Indigenous communities in Canada's North are located on the coast, so they're most at risk of experiencing climate change impacts. These include risks to infrastructure, water supply, livelihoods, housing, food sources and ultimately the health and safety of the citizens.

What we're doing

We have several programs that serve our research on climate change geoscience:

- 1. Climate Change Geoscience Program (CCGP)
- 2. Marine Geoscience for Marine Spatial Planning (MGMSP)
- 3. Groundwater Geoscience Program (GGP)
- 4.GEM-GeoNorth (GEM)
- 5. Public Safety Geoscience Program (PSGP)



Assessing changes in permafrost, glaciers, coastlines, sea level and extreme events

- Mapping and monitoring the ground ice conditions in Canada's permafrost
- Understanding how permafrost, climate and infrastructure interconnect
- Assessing the rate and cause of glacier changes in Canada's arctic and alpine environments, including ice dynamics and thickness change
- Creating sea-level projections under different future climate scenarios
- Assessing future flooding hazards (e.g. flood forecasting of the Hudson Bay Lowland)
- Determining the sensitivity of Canadian coastal regions to climate change and the impacts on coastal Indigenous communities
- Clarifying the causes and consequences of rapidly changing northern environments, including coastal areas experiencing erosion due to sea-level rise, permafrost degradation, reduced sea ice and more storm surges
- Gathering data and knowledge about Canada's aquifers (stores of groundwater), which are susceptible to climate change (their recharge rates as well as an increase in their use in drier areas)
- Providing geoscientific advice and expertise on major resource development projects and their potential environmental effects, as required for federally mandated environmental impact assessments

Supporting adaptation strategies

- Informing adaptation strategies for existing and proposed infrastructure, coastal communities and major transportation routes in the North
- Providing decision makers with information about climate change hazards
- Ensuring the availability of data to support land-use planning and government regulations that help at-risk communities adapt to climate change
- Providing advance warning to Indigenous communities that are vulnerable to the effects of climate change
- Offering long-term hydro-climatic records to help improve hydroelectric water management

Indigenous engagement

Our climate change research often takes place with and near Indigenous communities, particularly in the North, but also in other areas of Canada. We work with Indigenous communities to increase our shared understanding of the land. For example, the Climate Change Geoscience Program is working with the Hamlet of Tuktoyaktuk, Northwest Territories, to learn from the people, share our coastal science and work together to adapt to the impact of climate change in the area.

For more information visit: www.nrcan.gc.ca/earthsciences/earth-sciences-resources/geoscience-climatechange/10900

As a northern country, Canada is experiencing climate change at twice the rate of the world's average. In the Canadian Arctic, the rate is three times the world average.





Tackling Climate Change on the Rideau Canal Skateway

BLOG POST BY JOËLLE TOURANGEAU COMMUNICATIONS ASSISTANT, STRATEGIC COMMUNICATIONS, NCC

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Ottawa is one of the coldest capitals in the world, and we really try to make the best of our long winters. Every year, hundreds of thousands of people make their way onto the world's largest skating rink: the Rideau Canal Skateway.

Over the years, the NCC's knowledge of the science of ice has grown. Innovation has kept our experts at the leading edge of ice maintenance. But, as winters get warmer and wetter, skating seasons shorten and ice quality decreases. In 2022, the NCC partnered with Carleton University to address the impacts of climate change on the Skateway. This collaboration aims to keep this decadeslong tradition alive.

Shawn Kenny, a civil engineering

professor from Carleton University, is one of the leads on this four-year collaboration. He's working with our Skateway team to address the impacts of climate change. I met with him to talk about the science behind our climate change study.

From slush cannons to ice probes, there are many solutions on the table.

Q: What are the main steps in this four-year project?

A: The first two years will be about gathering data to improve our knowledge base. Using temperature sensors, drones and remote-sensing tools, we will look at local weather, ice thickness and snow cover along the Skateway.



In the second and third years, as we collect more data, we will develop models to project or predict what will happen next. We will also explore solutions to lessen the impacts of climate change on the Skateway, and build the resilience of the ice.

In the fourth year and going forward, we will evaluate solutions from years two and three, and recommend solutions that the NCC should pursue over time. The long-term goal is to help the NCC make informed decisions on adapting its operations.

Q: What challenges are unique to the Skateway?

A: From an engineering perspective, the Skateway and ice roads are very similar. The main difference is the location. The Skateway is situated within an urban area, whereas most ice roads are in remote locations.

The Skateway faces urban pressures: surface water runoff, salt intrusion and heat from underground pipes, etc. The variation in depth is another challenge. It influences the heat and energy balance from the mudline to the ice cover.

Q: Which sections of the Skateway are more problematic?

A: The NCC has identified sections that can be problematic due to the urban stressors just mentioned. This includes the sections from Laurier Avenue to the National Arts Centre and from Concord Street to the University of Ottawa.

We also have a challenge with wider sections of the canal, such as at Concord Street and near Holmwood Avenue, as these are larger areas which support a lot of snow. This causes deflection of the ice, and may allow water to infiltrate upward through cracks. This can decrease the overall strength of the ice cover.

Q: Do you already have solutions in mind?

A: The ideas are still in development, but we are hopeful about three solutions: slush cannons, thermosyphons and enhanced snow management.

Early season enablers

Slush cannons would be useful to promote ice growth in the early part of the season. The idea is to spew slush onto the ice to make it thicker, faster. Pumps that use liquids and solids already exist in other industries, but the challenge will be to make a pump that works at a temperature of around zero degrees. Once it's safe for crews to go onto the ice, standard flooding operations should resume, as they are more efficient.

Thermosyphons

Another technology that might have a high chance of success is one used in the Arctic, called thermosyphons. Simply put, a thermosyphon is a passive heat exchange system. This technology allows cold air to get beneath the foundation of a structure (like a building or a road embankment) and redistributes heat into the air, above the surface. If applied to the Skateway, this technology would promote ice growth by cooling the water beneath the ice.

Better snow management

We also need to find an efficient way to remove the snow when vehicles can't go onto the Skateway. When snow accumulates, it forms an insulating blanket over the ice, and eats away at the surface. To freeze, ice needs to be exposed to as much air as possible. Snow needs to be moved, compacted, melted and flooded with water.

Snow removal is an energy-intensive process. For every centimetre of snowfall, the NCC crew moves almost 125,000 kilograms of snow off the Skateway. That's approximately equivalent to the weight of

- 740,000 hockey pucks
- 25,000 shovelfuls of snow
- 280 polar bears
- 21 "Frosters" (giant ice resurfacers used to maintain the Skateway)

Are you interested in learning more about what the NCC is doing to adapt to climate change? Check out the other initiatives under the NCC's climate change adaptation project. Engineers of Tomorrow

Evolving the engineering profession by talking about it differently

Submitted by Rebecca White Chief Executive Officer, Engineers of Tomorrow

Photo submitted

Despite the focus on STEM subjects in K-12 classrooms, engineering remains largely left out of the conversation. Students have entire periods dedicated to science, math and tech. Educators are expected to simply integrate engineering into the appropriate cross-curricular places.

Here's the kicker....many educators ARE teaching their students about engineering, they just don't call it engineering! They lack the language or may be intimidated by the complexity of engineering.

It's complicated, to be sure, but the connection to the future of humanity could not be more clear. The complex issues that engineers are designing solutions for these days require diverse thinkers. From engineering better medicines to making solar energy economical (source: NAE Grand Challenges for Engineering) there is work to be done to evolve the engineering profession to be able to come up with real solutions.

At Engineers of Tomorrow we're starting conversations early, with kids as young as four. Using a grass-roots model, combined with research-based methods, engineers are taking a humanfirst approach to help students see that there's a place for them in engineering.

Now, more than ever students and educators need support to help connect them to a bright future.

Engineer's of Tomorrow's flagship engineering outreach program - Engineer-in-Residence - teaches world-class, research-based STEM communication methodologies to local engineering professionals. Engineer volunteers learn how to design classroom experiences using social science and connect with students in rich and meaningful ways. They're matched with a class for a full school year and they apply those skills to create positive engineering experiences for their students.

Beyond the value that the Engineer-in-Residence experience adds to a young person's education, the EIR experience connects the engineers to a passionate community of like-minded people. EIR volunteers are transported to their younger days doing fun, hands-on activities like designing newspaper towers, building balloon powered cars, or making volcanoes erupt with baking soda and vinegar!

We're looking for engineers to join our volunteer team to support the 2022/2023 EIR program!

For more information visit EIR.ca.

ARC FLASH HAZARDS: HOW ENGINEERING AND STANDARDS CAN MAKE FOR SAFER ELECTRICITY USE



Electric energy plays a massive role in our lives. It powers manufacturing, transportation, water treatment, computing, healthcare, entertainment, and more. It is almost more challenging to think of activities in our daily lives that do not need electricity.

Some of the biggest users and producers of electricity include the industrial, commercial, and utility sectors. These users harness and distribute electric energy with a combination of high- and low-voltage power distribution equipment. Of course, power distribution equipment can present risks to its users. One of the key risks? The development of arc flash incident energy.

Exposure to arc flash incident energy is potentially lethal. It can be disastrous to equipment. So, it's vital that organizations introduce safeguards and awareness around arc flash hazards in any electrical safety program for industrial, commercial, and utility power systems.

You can integrate an electrical safety program through engineering analysis and design, the understanding and interpretation of standards, worker education, and engineered arc flash hazard analysis. Let's further explore some key aspects of arc flash hazards to make sure you're doing everything you can to stay safe.

This piece originally appeared on Stantec's Ideas hub. www.stantec.com/ideas

Arc flash hazards 101

What is an electric arc flash? Electrical arcs are the product of substantial electrical current flow through hot and ionized air. And while air is not as good of a conductor, compared to metallic wires, it can still conduct electricity under certain conditions.

Electrical arcs can be intentional—like those formed by sparkplugs-or unintentional. An arc flash event is the unintentional formation of an electrical arc between two terminals. You can attribute the causes of arc flashes to a few hazards: interrupting and closing actions on circuits (e.g., actuating a disconnect switch), short-circuits, and human error (e.g., accidently contacting energized parts with tools).

What happens when an arc is formed?

Large and uncontrolled amounts of kinetic, electrical, sound, and thermal energies are released.

An arc flash energy release can create a catastrophic failure of equipment. These failures can cause significant property damage, extended outages, fire, and financial losses. When people are exposed to an arc flash event, serious or fatal injuries can occur.

In the context of arc flash hazards, thermal injuries—caused by the extreme heat released by the electrical arc—are the most concerning injury due to their severity and least curability. Engineering standards help mitigate and reduce the likelihood of thermal injuries. In North America, the CSA Z462 and NFPA 70E provide guidance for signage, work methods, and analysis to manage exposure to arc flash incident energy.

In addition, the IEEE Std. 1584 has been the benchmark in the engineering analysis for calculating the severity of arc flash thermal energy release within a power system.

Keeping up with standards

It is vital to keep up with standards. As of 2021, the NFPA 70E and CSA Z462 have been revised. It is important to note that although these standards are produced by two organizations, their content and purpose are closely matched through active collaboration by both the CSA Group (formerly the Canadian Standards Association) and the National Fire Protection Association (NFPA).

Both standards have a common goal: provide personnel with safe work practices to reduce exposure to major electrical hazards.

The use of IEEE Std. 1584-2018 revision represents one of the key changes in both standards. It offers greatly improved empirical models of arc flash hazard calculation. This has helped pave the way for more accurate arc flash labels and better-informed personal protective equipment (PPE) options.

The CSA has also introduced the new arc flash PPE Category 5, which provides thermal energy protection up to 75 calories/cm2. Traditionally, PPE has been limited to Category 4 at 40 calories/cm2. Although higher levels of PPE are now available, it's important to still perform arc flash hazard analysis and mitigation. And you should still follow safe work practices.

Arc flash hazard mitigation

Arc flash hazards will always exist. Their only method of elimination is through de-energization. So, it is necessary to establish work practices and perform engineering to help counteract the effects of arc flash energy release.

As part of a comprehensive electrical safety program, electrical equipment should be labelled with arc flash energy and PPE information to allow informed decisions in the field.

The information on the labels should be updated every five years, and/or when a major upgrade to the power system occurs. The arc flash analysis and labels should be developed by qualified persons and sealed by a professional engineer. Field level risk assessment —as well as knowledge of PPE use, maintenance, and procedures—should be taught to all personnel.

It is equally important to keep diagrams and models of a power system up to date to proactively monitor arc flash levels. You can



Electrical arcs are a product of substantial electrical current flow through hot and ionized air.

also deploy limits on arc flash energy and use engineered mitigation strategies. Recently, electrical protective devices have introduced better early detection technologies that can extinguish an arc flash nearly instantaneously. Being proactive, combined with engineering analysis and design, can limit arc flash energy— and drastically reduce the risks.

A culture of safe electrical work

It's been rewarding to help several of our clients quantify and mitigate their power system's arc flash energy through engineering analysis and design. We are committed to providing education to our client's teams on arc flash hazards to foster a culture of safe electrical work.

Thankfully, when people follow work procedures and teams receive the right engineering support, arc flashes are a rare occurrence. But since the consequences of an arc flash can be substantial, it is better to be safe than sorry.

ABOUT THE AUTHOR

Electrical Designer Xavier St-Onge, P.Eng., is based out of Stantec's Fredericton office. He focuses on protection and control, substation grounding analysis and design, and power quality. He applies these skills to the heavy industrial, utility, and renewable energy sectors, primarily on power system design and analysis projects.

Kevin Kilfoil, P.Eng.

Kevin Kilfoil works at Edmundston Energy as the electrical utility coordinator and was recently appointed to the position of APEGNB At-Large Representative.



GET TO KNOW KEVIN

Kevin has been working with Edmundston Energy since 2018. His role at Edmundston Energy consist of network planning and analysis for the electrical generation and distribution. Kevin is also involved in all projects related to new technologies and renewable energy to lower the carbon footprint of Edmundston. He is also leading the mapping effort for the generation and distribution network with GIS and ESRI which is used to optimize the distribution network.

Prior to join Edmundston Energy, Kevin spent close to 10 years with Kiewit Corporation, an industrial construction company based out of Omaha Nebraska. Kevin was involved in different large-scale construction projects. Working throughout North America on various projects from oil and gas industry, to mining, to energy generation and large-scale solar farm projects, Kevin always had an interest in the energy sector.

His time spent at Kiewit gave him the opportunity to work on the various construction projects such as: a large-scale oxygen plant, a new 2 x 100 MW gas turbine, a new nickel process plant, a natural gas pipeline, a 40 MW solar farm and various other projects related to the energy sector.

Kevin completed is bachelor's in mechanical engineering at the University of Moncton in 2006. He also completed a Bachelor's in Social Science with a major in Economics in 2001 at the University de Moncton.

Kevin is also active in his Northwest branch and currently serves as the treasurer.



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HAVE SOMETHING TO SHARE?

If you have a project update, story or idea of what you would like us to feature in a future issue of *ENGEOActions*, write to us @

LAUREN@APEGNB.COM

New Brunswick Flood Hazard Maps

The New Brunswick Flood Hazard Maps allow users to explore areas that may experience potential flooding on the coast and near rivers in New Brunswick. These new updated and expanded maps incorporate the influence of climate change on flooding to the year 2100.

WHERE TO ACCESS THEM

The mapping can be accessed through **GeoNB** or **HERE**

HOW THEY WERE CREATED

The maps were created by the Department of Environment and Local Government using projections from:

- Updated Sea-Level Rise and Flooding Estimates for New Brunswick Coastal Sections 2020 by R.J. Daigle Enviro;
- Hydrotechnical Report: Inland Flood Mapping in New Brunswick by l'Université de Moncton.

The maps were produced with support from the Government of New Brunswick and the Government of Canada.

HOW THEY CAN BE USED

Flood maps show where and how often potential flooding can occur.



Governments and communities can use these maps to help make decisions about the location of buildings, roads, and other infrastructure. Mapping will identify areas at risk of flooding and areas expected to flood in the future.



Communities can also use the maps to help plan for the changing climate and the increasing risk of flooding. More than half of New Brunswick's municipalities have already embarked on adaptation planning and will have completed Climate Change Adaptation Plans by April 2022.



Individuals can use the maps to see if their homes or properties might be impacted by flooding.

This can inform decisions about protecting a home with various <u>flood proofing</u> <u>measures</u>. The mapping can also help government, communities and individuals plan an evacuation route in the event of a flood, inform first responders of flood-prone locations, and serve to inform the production of municipal and community vulnerability assessments.

The New Brunswick Flood Hazard Mapping shows five different levels of flooding.

THE NEW BRUNSWICK FLOOD HAZARD MAPS' FIVE FLOOD LEVELS

1. Present Day2. PresFlood, 1 in 20 yearFlood,(5% Annual ExceedanceFlood,Probability)This is aThis is aflooding event thathas a 5% chance ofbeingbeing reached peryear. This is alsoknown as a 1 in100-year20-year flood event.event.

2. Present Day Flood, 1 in 100 year (1% Annual Exceedance Probability) This is a present-day flooding event that has a 1% chance of being reached per year. This is also known as a 1 in 100-year flood 3. 2100 Flood with Climate Change, 1 in 20 year (5% Annual Exceedance Probability) This is a flooding event that will have a 5% chance of being reached per year,

when adjusting for climate change impacts to the year 2100. This is also known as a 1 in 20-year flood event, adjusted for climate change. 4. 2100 Flood with Climate Change, 1 in 100 year (1% Annual Exceedance Probability) This is a flooding event that will have a 1% chance of being reached per year, when adjusting for climate change impacts to the year 2100. This is also known as a 1 in 100-year flood event, adjusted for climate change.

5. 2100 Higher High Water Large Tide (HHWLT)

This is the projected extent of the high tide in the year 2100. With sea levels continuing to rise due to climate change, this serves as a good reference to understand what sea levels will look like in the future.

*Annual Exceedance Probability (AEP): AEP is the probability or chance that a given event (in this case flooding) will occur annually and is usually indicated by a percentage. For example, a flood hazard map showing a 1% AEP indicates the flooding has a 1% chance of happening in any given year.



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