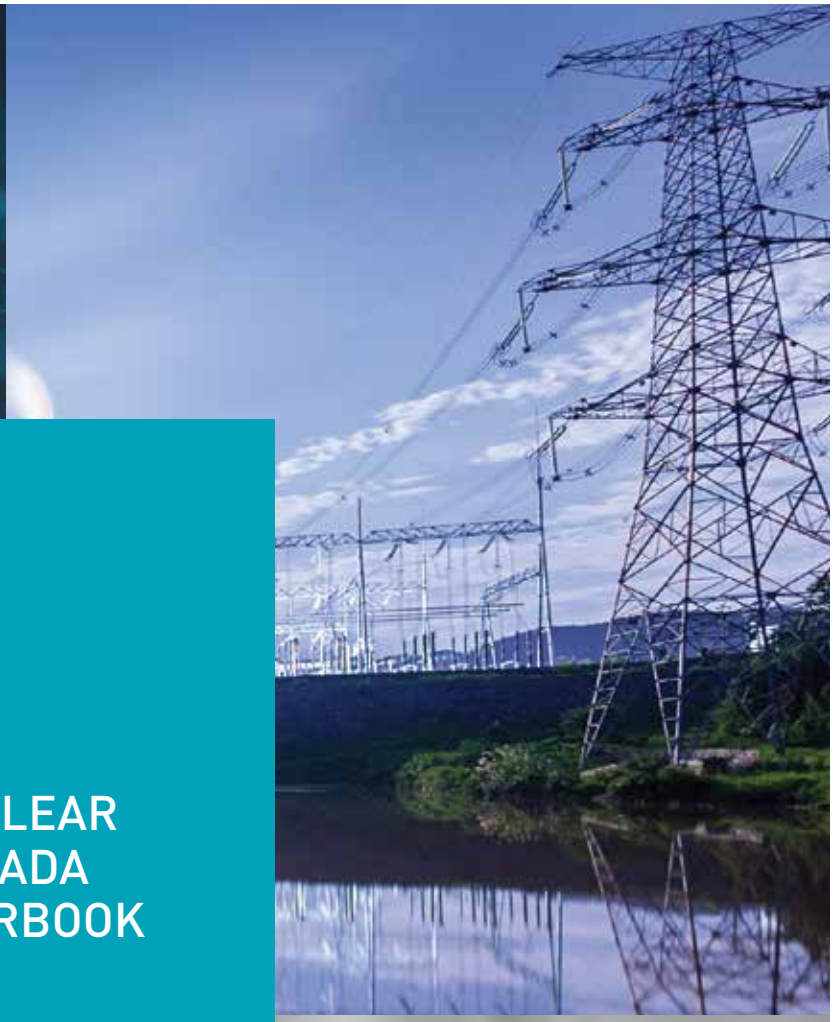

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ANNUAL INDUSTRY REVIEW & BUYER'S GUIDE

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CNS President's Report

By John Luxat

John Luxat

2018 was yet another outstanding year for the Canadian Nuclear Society (CNS) and the Canadian nuclear community. The Canadian nuclear industry demonstrated strength with positive accomplishments in their ongoing refurbishment activities. Ontario Power Generation (OPG) completed installation of calandria tubes in Darlington Unit 2, and installation of fuel channel components was underway at the end of 2018. The refurbishment of Darlington Unit 2 remains on schedule for completion in early 2020 with costs currently under-budget. This performance was positively commented on by the Ontario Auditor General and contributed to OPG receiving the go-ahead for Darlington Unit 3 refurbishment from the Ontario government. Together with Bruce Power's Major Component Replacement Program for the refurbishment of six of their reactors nuclear power will remain the dominant source of electricity in Canada's industrial heartland past the mid-point of this century.

The prospects of new nuclear power development are continuing along a positive trajectory, driven primarily by the opportunities offered by small modular reactors. Applications for consideration of new small modular reactor designs under the Canadian Nuclear Safety Commission (CNSC) Vendor Design Review process were received by Canada's regulator. Interest remains high in partnerships with Canadian Nuclear Laboratories (CNL) for new reactor development.

Notably, the Canadian Small Modular Reactor Steering Committee released the report *"A Call to Action: A Canadian Roadmap for Small Modular Reactors"* at the 1st International Conference on Generation IV and Small Reactors, held in Ottawa, Ontario in early November, 2018

Much of this new development was reflected in CNS activities. The continued growth of our conferences and courses continued in 2018 with our 38th Annual CNS Conference and 42nd CNS/CNA Annual Student Conference held in Saskatoon. This very successful conference was accompanied by a large number of other events during the year:

- 8th International Conference on Simulation Methods in Nuclear Science and Engineering
- 1st International Conference on Generation IV and Small Reactors
- 2018 information Exchange Meeting on Supercritical Water-Cooled Reactors
- 2nd Student Job Fair for the Nuclear Industry;
- CANDU Reactor Technology and Safety Course;
- CANDU Thermalhydraulics Course;
- CANDU Fuel Technology Course;
- Nuclear 101 Course;

I would like to thank personally all of the volunteers who helped organize all of the events here, and also all of our sponsors who make these events possible.

The CNS Branches have also had new activity this year. Under the leadership of Ron Thomas, the CNS organized a speaker exchange program with the United Kingdom Nuclear Institute (UNKI). In 2018, the CNS reciprocated with, Colin Hunt the CNS Secretary, visited the UKNI chapters in the United Kingdom.

2018 also had a strong awards program, with the ceremonies taking place at the Annual Conference. Further details can be found in this Yearbook. I would like to thank the CNA for its generous support of this program which has continued successfully since the 1970s.

In 2018 an initiative to upgrade the CNS financial management and reporting system was announced at the Annual General Meeting by the incoming President. Leadership of the initiative was assigned to Daniel Gammage and Keith Stratton and significant progress has been achieved. The new system will be in place by the end of June. Daniel and Keith are to be congratulated on their efforts

In conclusion, I would like to thank the CNS Council and all of our volunteers for making the CNS a strong and growing success during the year. I also commend highly Canada's nuclear employers who make possible all of the volunteer's time to contribute to the success of our programs.

I also would like to thank Daniel Gammage for his successful leadership during the 2017-2018 year. I congratulate Keith Stratton for assuming the role of President starting in June 2019. I wish him all the best during his tenure, and offer him my support throughout the year.

Hundreds of students turned out for the 2018 CNS Job Fair at UOIT. Photo by Colin Hunt.

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2018 Year in Review

By Colin Hunt, Publisher and Editor, Nuclear Canada Yearbook

Colin Hunt

Introduction

2018 has been an important and successful year for Canada's nuclear industry. The year included ongoing construction during the refurbishment of Darlington Unit 2, strong performance by Canada's nuclear reactor fleet, and the release of the small reactor development plan of the federal government's roadmap at the Canadian Nuclear Society's (CNS) 1st International Conference on Generation IV and Small Reactors.

Starting with reactor performance, Canada's CANDU nuclear technology performed well during 2018. As shown in the data tables in this Yearbook, strong performance was maintained Ontario's nuclear reactor fleet, ensuring that nuclear remained the principal source of electricity for Canada's largest industrial province. Nuclear also continued as the principal source of baseload electricity in New Brunswick as well.

With respect to renewal of Canada's nuclear infrastructure, Ontario Power Generation (OPG) completed the construction phase of its refurbishment project at Darlington Unit 2. In company with OPG, Bruce Power undertook key planning and preparatory steps before commencing its Major Component Replacement Project in 2020.

2018 has also been a very successful year for the Canadian Nuclear Society (CNS). Some of these highlights are noted in the reports by President of the CNS John Luxat, and by the CNS Education and Communications and CNS Program Committees.

CANDU 6 Nuclear Reactor Performance – 2018

Reactor	In Service	Capacity (MW)	Performance In 2018 (%)	Lifetime Performance (%)
Point Lepreau	1983	705	84.6	70.5
Wolsong 1	1983	679	0	70.4
Wolsong 2	1987	678	83.1	92.0
Wolsong 3	1998	698	73.3	89.1
Wolsong 4	1999	703	82.5	93.5
Embalse	1983	648	0	71.9
Cernavoda 1	1996	707	86.6	90.0
Cernavoda 2	2007	705	97.1	94.3
Qinshan 4	2002	700	96.6	89.8
Qinshan 5	2003	700	79.0	90.6

https://www.iaea.org/PRIS/CountryStatistics/CountryDetails.aspx?current=CA

Notes

1. Embalse undergoing plant refurbishment.
2. All reactor performance now based on Load Factor, not Capacity Factor

Nuclear Refurbishment in Canada

Nuclear refurbishment work constituted a large portion of industry activity in Canada in 2018. This activity was concentrated at two principal locations both in Ontario: Darlington Unit 2 and the Bruce Power complex.

With respect to Darlington Unit 2, OPG completed one of the last remaining steps in returning Unit 2 to service. The refurbishment outage of Unit 2 commenced in October 2016. By the end of 2018, more than 11 million man-hours of work had taken place safely since the start of the project. With approximately one year remaining in the project, OPG commenced the reassembly work on the reactor and related components.

A very important milestone was achieved on April 19, 2019 with the successful replacement of all 480 fuel channels in Unit 2..Each fuel channel consists of the fuel channel pressure tube holding the fuel bundles, surrounded by the calandria tube. OPG workers are now connecting all of the fuel channels to the reactor by installing 960 new feeder tubes at either end of the fuel channels to connect to the inlet and outlet ends of the reactor, and thereby to the steam generators in the primary heat transport circuit.

At this time, it is expected that all refurbishment work will be completed on schedule by February 2020. It is also expected that Darlington Unit 3 will commence its refurbishment outage, to be continued sequentially with Units 1 and 4.

In total, the refurbishment of Darlington's four nuclear reactors is a decade-long project. When complete, all four reactors will have had all fuel channels and feeder tubes replaced, along with replacement of major reactor components including steam generators, and plant electrical and control systems.

The importance of the Darlington refurbishment project cannot be understated. The four power reactors at Darlington represent about 20 per cent of electrical generation in Ontario. The refurbishment project will ensure that the Darlington station will remain a principal power source in Ontario past 2050. As nuclear is Ontario's principal low-cost source of carbon dioxide-free electricity, this will be essential for Canada maintaining very low gaseous emissions from its electricity sector. It is reasonable to state at

 continued from page 5

this time that the Darlington refurbishment project constitutes Canada's largest energy related project. As such it also constitutes one of the largest clean energy projects in North America.

Darlington is not the only large nuclear refurbishment project in Canada however. In 2020, Bruce Power will be starting its Major Component Replacement (MCR) Project commencing with Unit 6. Bruce Power started preliminary work some years prior in upgrading and replacing reactor systems. It has also undertaken extensive contract work with a number of suppliers both within and outside Ontario for MCR Project work. One of the largest of such agreements was the signing in June 2018 of the principal retubing contract with the Shoreline Group.

Like the Darlington refurbishment project, Bruce Power's refurbishment project will ensure the continued safe operation of the Bruce Power nuclear complex past the mid-century mark. The importance of Bruce Power to Ontario and to Canada's electrical future is enormous. At this time, Bruce Power is the largest operating nuclear complex in the world, with eight operating large power reactors, as detailed in the data tables later in this yearbook. The complex provides at least one third of Ontario's total electrical generation from all sources. Like Darlington, the refurbishment of Bruce will constitute Canada's largest clean energy project during the 13 years of the project's scope.

It should be noted here that Bruce Power is a consortium owned by private industry, and that all of the capital investment being done by Bruce Power is private capital.. Investment in the Bruce Power complex provides convincing evidence that nuclear power can indeed be an effective economic vehicle for power sector investment when coupled with efficient, evidence-based government policies regarding power generation. It is also highly relevant in this context that Bruce Power remains one of the lowest cost sources of electricity in Ontario.

Given the size and scale of the Bruce Power project, like Darlington its importance affects heavily Canada's national program to limit carbon dioxide emissions. Producing at least 40 TWh consistently each year, Bruce Power constitutes one of Canada's largest sources of energy free of gaseous emissions. As such, the federal government and its future environment policies have a large stake in the future success of refurbishment at Bruce Power and Darlington. Without nuclear power, Ontario's carbon dioxide emissions would be immensely larger, which could not be offset by renewable power, which requires carbon dioxide-emitting natural gas generation as a backstop.

Nuclear Operations in Canada

Nuclear plant operations in Canada were very strong throughout 2018. A record 11 Canadian reactors performed at 90 per cent load factor during the year as noted in the data tables further on in this Yearbook. These included Pickering 1, 5, 7, Bruce Units 2, 3, 4, 5, 6, 7, and Darlington Units 1 and 4.

Several observations should be noted here. First, the outstanding performance of the Bruce A reactors shows that reactors which were built and started operations in the 1970s can perform very well even while meeting or exceeding current regulatory standards for safety. There has been a consistent trend for the past decade of older units consistently exceeding their lifetime performance as shown in the data tables. What this in turn shows is that modern maintenance and operating methods can and have improved reactor performance over time.

It reinforces substantially that modern operating methods can: 1. extend operations of nuclear facilities considerably longer than original lifetime projections; 2. greatly improve upon historical operating performance; and 3. reduce considerably the per unit cost of electricity generated by extending the period of lifetime operation well past the amortization period of the original capital cost.

This trend holds true for Pickering as well. During 2018 just as it did in 2017, three of Pickering's six operating reactors ran at better than 80 per cent load factor. In all cases, this exceeds greatly the lifetime performance of these units. Like the Bruce A reactors, Pickering's performance has been strong for a number of previous years. This significantly improved performance of Pickering over the last number of years constitutes the principal reason why the Ontario government wishes to extend operation of the station to 2024.

This continuing improved performance had direct impact on Ontario's electricity supply. During 2018, more than 63 per cent of Ontario's electricity was supplied by its 18 nuclear reactors. Total electricity production from nuclear in Ontario was 90.1 TWh, more than 65 per cent of total electricity consumption of 137.8 TWh. It should be noted that this is a higher proportion of electricity in Ontario from nuclear power than at any time since the early 1990s, and was achieved despite one of Ontario's largest nuclear power reactors, Darlington 2, being out of service for the entire year for its complete refurbishment program, and that two reactors, Pickering Units 2 and 3, were removed from service in 1998.

It should also be observed that four of the eleven outstanding units, Pickering 1, Bruce 2, Bruce 3 and Bruce 4, were all built and commissioned in the 1970s. This has also lent confidence to the idea that refurbishment programs can result in safer better nuclear reactors that prior to refurbishment.

In summary, the completion of nuclear refurbishment in Ontario means that nuclear power will continue to reliably and cleanly generate the bulk of the province's electricity supply well past the mid-point of this century. It is equally noteworthy that Ontario's nuclear renaissance is being achieved by both public and private corporations.

New Global Prospects for CANDU

Turning to CANDU reactors outside Canada, the fleet performed well with two reactors, Cernavoda 2 and Qinshan 5, operating at a load factor of 90 per cent or

better. Details are shown in the accompanying table of CANDU 6 reactors.

However, there are also extensive prospects for Canadian nuclear construction work overseas. Embalse returned to service on January 6, 2019. With new fuel channels, Embalse can operate for another 30 years. Argentina is not the only nation outside Canada looking at life extension of its CANDU reactors. Nuclearelectrica of Romania intends to shut down Cernavoda 1 for refurbishment in 2026. The first CANDU built in Europe has performed extremely well over its lifetime, with a lifetime performance of just over 90 per cent. However, high performance also means a strong focus on maintenance. The utility has committed to a long term management program for both its nuclear power reactors at Cernavoda, which will commence with Unit 1 in 2026.

Canadian Government Nuclear Policy

Federal and provincial policy on commercial nuclear power developed during 2018 as well. For the first time in decades, the federal government of Canada committed to a positive economic policy for nuclear power generation. The statement came with the release of the federal government's Roadmap for Small Modular Reactors at the Canadian Nuclear Society's G4SR-1 Conference in Ottawa on November 7, 2018. The announcement was made by Canada's Natural Resources Minister Amarjeet Sohi.

In making the announcement, Minister Sohi noted a number of Canadian advantages in small reactor development. These included: strong existing nuclear operations and practice; a strong and effective nuclear regulatory agency, the Canadian Nuclear Safety Commission (CNSC); an extensive research and supplier chain and infrastructure; and, Canada's development and implementation of full radioactive waste disposal through the Nuclear Waste Management Organization (NWMO). The Minister also noted that 10 potential SMR designs were undergoing review by the CNSC.

Natural Resources Canada Minister Amarjeet Sohi introduces the SMR Roadmap at the CNS G4SR-1 Conference in November 2018. Photo by Colin Hunt.

It should be noted that the 2018 G4SR Conference was one of the most recent occasions in which the federal government has chosen a CNS conference venue to announce a major policy initiative.

The federal plan, called *"A Call to Action: a Canadian Roadmap for Small Modular Reactors"*, was developed by NRCan's Nuclear Energy Division under Director Diane Cameron in consultation with a host of Canadian nuclear organizations and government agencies. The plan calls for a series of steps to be taken in developing new nuclear power technology in Canada.

Through a six-month Generation Energy dialogue in 2017, Natural Resources Canada heard that Canadian partners would need to work together to realize the potential for SMRs. In response, NRCan initiated the SMR Roadmap Project with interested provinces, territories and power utilities. The Project is a ten-month program of engagement with the nuclear industry, as well as potential end-users such as Northern and Indigenous communities and heavy industry stakeholders, to explore the potential scope for a national path forward for SMRs. However, the plan does not envisage, at least at the moment, federal funding of a demonstration SMR design,

Wilson Lam (left) Chair of the G4SR Division of the CNS was the principal organizer of the CNS's first international conference specializing in small reactors. Photo by Colin Hunt.

although Canadian Nuclear Laboratories has indicated that it is willing to host such a project should a private company wish to do so. Indeed, on March 20, 2019 the CNSC received its first application for a licence to prepare site for an SMR from Global First Power and is currently applying its licensing process.

Future steps in the plan were outlined by a number of plenary speakers at the G4SR-1 conference, including: Mark Lesinski, President & CEO of Canadian Nuclear Laboratories (CNL); Peter Elder, Canadian Nuclear Safety Commission (CNSC); Fred Dermarkar, President of CANDU Owners Group (COG); and Jeff Lehmann, Vice President of New Nuclear Development, Ontario Power Generation (OPG).

Changes at the CNSC

The Canadian Nuclear Safety Commission (CNSC) also went through extensive changes in 2018. Its President Dr. Michael Binder completed the second of two five year terms. Dr. Binder was first appointed as President of the CNSC in January 2008.

Dr. Binder's term in office was marked by a number of momentous events for the nuclear industry in Canada. He presided over the public hearings for Darlington and Bruce Power. In the case of Darlington, the CNSC reviewed OPG's plan for full refurbishment of the station to enable it to continue operations for another 25 to 30 years. A similar review took place for Bruce Power and its plans for refurbishment of the Bruce Power reactors as well.

Of outstanding importance, Canada's nuclear industry completed its assessment of safety system upgrades following the 2011 Fukushima accident in cooperation with the CNSC. The assessment was followed by their implementation at all Canadian nuclear power reactors. Through Dr. Binder's leadership, Canada took a global regulatory lead in how to prevent possible beyond-design events.

Also during Dr. Binder's term in office, the CNSC and Canada's nuclear licencees completed a large number of reviews and upgrades of nuclear standards requirements. This allowed both more predictability and more accountability in nuclear plant licencing procedures.

Dr. Binder was succeeded in August 2018 by Rumina Velshi as President of the CNSC.

Michael Binder of the CNSC retired in 2018 after completing two very successful terms as its President. Photo by Colin Hunt.

The CNS in 2018

The Canadian Nuclear Society (CNS) has also had a very successful year in 2018. Of particular note is the strong and growing program of courses and conferences offered by the CNS. Two conferences in particular were outstandingly successful: the 1st International Conference on Generation 4 and Small Reactors and the 8th International Conference on Simulation Methods. Details of these conferences can be found later in this Yearbook in the report by the Program Chair.

The CNS held again its successful Student Job Fair for the Nuclear Industry in October 2018. This event was held at Durham College in Oshawa. More than 400 registrants attended, the most students one of the largest number of students ever attracted to any CNS event.

Finally in 2018, the CNS carried out its reciprocal speakers exchange with the UKNI (United Kingdom Nuclear Institute). The CNS and UNKI agreed to exchange speakers in 2016, and Dr. Alys Gardner visited a number of CNS branches during 2017.

In 2018, it was the turn of the CNS to reciprocate. It chose CNS Secretary Colin Hunt to represent it. In a weeklong trip, Mr. Hunt gave presentations at half a dozen locations scattered across England. The speaking tour included new Canadian nuclear veutures in the United Kingdom, including AECON and SNC-Lavalin.

In Closing

Governments in Canada made important policy decisions for nuclear power generation technology both for Canada and around the world. It endorsed the draft Roadmap for Small Modular Reactors covering development and installation of this new nuclear power technology.

SMRs offer the prospect of nuclear power generation in smaller reactors offering potentially greater flexibility in reactor size, fuels and with enhanced safety parameters.

The smaller sizes of SMRs in particular may be of particular use in Canada and many other countries for remote locations or small communities in countries where the national grid is underdeveloped.

The SMR Roadmap initiative comes as the Canadian government seeks to leverage Canada's strong research infrastructure in nuclear science and technology to develop new nuclear technology to meet Canada's energy needs.

In terms of power generation, 2018 ended on a note of strong performance by Canada's nuclear power sector, as noted in the data tables in this Yearbook. A record 11 power reactors in Canada had annual capacity factors of 90 per cent or greater. In Ontario alone, nuclear power represented almost two thirds of all the electricity produced in the province. In fact, the increase in nuclear power generation over the past 15 years has represented a huge reduction in Canada's total national atmospheric greenhouse gas emissions.

Colin Hunt, Dr. Alys Gardner, and Sarah Beacock, UKNI CEO along with the Calder Hall Station Chief in the control room of Calder Hall Unit 1. Calder Hall was the first multi-unit nuclear power station in the world capable of producing electricity. It was known as the Queen Elizabeth power station, and it entered service in 1956.

However, equally noteworthy was the strong progress made in the refurbishment of the Darlington Unit 2 power reactor. To the end of 2018, the project remained on budget and on or ahead of schedule, and when completed at the end of 2019, Darlington 2 will be followed by the refurbishment of Darlington 3 and Bruce Unit 6 in 2020; thus ensuring that Ontario's nuclear generation infrastructure will continue to generate clean, reliable baseload electricity past the midpoint of the 21st century.

More that 300 students were in attendance at the 2018 Student Job Fair held in UOIT. Photo by Colin Hunt.

Sadly, the CNS family was struck by two events in early 2019. The first was the death of CNS Council member Nick Sion. Nick was a longtime member of the CNS Council, and his contributions to the Council and his contributions to radiation health physics will be missed. Nick passed away on March 12, 2019.

Also in 2019 was the death of James Weller. Jim was the former General Manager of the Canadian Nuclear Association (CNA) from the early 1970s to 1990. He was instrumental in the founding of the Canadian Nuclear Society in 1978, and in 1975 created the publication you are reading now, Nuclear Canada Yearbook.

Jim died on March 13, 2019. Perhaps his most lasting memorials will be his role in the creation of the CNS and the founding of Nuclear Canada Yearbook.

Education and Communications Committee Report for 2018

By John Roberts and Ruxandra Dranga, Co-Chairs Education and Communications Committee

In 2018 the Education and Communications Committee (ECC) continued to be a key contributor towards the CNS's core objectives, through a number of activities and programs that encourage education in, and knowledge about nuclear science and technology, increase members' involvement in public educational programs, and facilitate the exchange of information between CNS members and the general public.

Courses

An important facet to delivery of courses is being able to attract speakers – having speakers who are engaging and have a pleasant delivery style is a big bonus.

The availability of mentors and training is crucial.

Mentors are individuals who are familiar with the course and whose presence at the course provides confidence to the recent recruit.

Training takes a number of forms but Train the Trainer is an approach that has been used to build confidence in recent recruits specifically in dealing with a difficult audience.

Resistance to both mentoring and Train the Trainer is unacceptable and has been apparent during the past year. Whilst both these activities do cost money the return is beneficial in being able to increase the number and frequency of courses and have a more confident cadre of presenters.

Young people relate well to young people thus it is crucial to encourage young persons to participate and perhaps those older individuals to step aside.

During the 2018/2019 we held X Nuclear 101s, Y Nuclear for Everyones and established a new relationship and courses with the Organisation of Canadian Nuclear Industries (OCNI). Z courses were conducted with OCNI.

Increasing interest from various quarters is going to result in many more interfaces with First Nations and Aboriginal peoples. CNS must facilitate sensitivity training to ensure our members observe the necessary courtesies and cultures of these peoples.

For the 2019/2020 year we are anticipating building on this success and look forward to more positive mentoring and Train the Trainer courses to increase CNS' delivery capability. In addition, training for interfacing with Aboriginal and First Nations peoples is essential.

Outreach

We are lucky have individuals within ECC who are considered valuable assets to assist with outreach of other organisations. As such several visits to communities considering hosting high activity nuclear material burial sites have either directly or indirectly requested input from one or more of these individuals.

Geiger Program

Geiger Kits delivered

In the spring of 2018 15 Geiger Kits sponsored by the CNSC were completed and delivered to Canadian high school teachers.

Geiger instrument supply problem

The CNS ECC planned to complete a second lot and supply these to teachers in the fall. We had identified another 20 teachers including a number who wished to return their kits for replacement with Apple-compatible interfaces. To our surprise our two vendors of Geigers and interfaces failed to respond to our requests.

STAO Booth/Venier Technologies

The CNS ECC had a booth at the Science Teachers Association of Ontario Annual Conference in Toronto, November 8-10, 2018. Prior to the Conference we learned that Vernier Software & Technology had developed Geiger instruments. Bryan White met with the Canadian representative for Vernier, Merlan Scientific. These instruments Geiger tubes include a much smaller window ("0.5 inch diameter) than the CNS has been using in Geiger Kits (2" diameter).

Following the Conference the CNS purchased a "GDX-RAD" instrument that interfaces via Bluetooth® to a wide variety of computers and tablets using a free "App". Testing showed that the (English variant of the) software is acceptable. Attempts to convince Vernier to produce a product version with the larger diameter tube continued into 2019.

To assure compatibility Bryan White assembled a homely adapted version of the instrument to demonstrate successfully that the electronics functioned with the larger tube. (Testing at high count rates demonstrated a curious software anomaly that does not impact the intended use.) Ultimately Vernier declined to supply a diverse instrument, but encouraged the CNS to modify their standard product to meet our needs. A preliminary estimate has been prepared for 20 instruments based on volunteer labour.

Of the Geiger Kits returned for substitution, one Geiger tube is damaged, and the second demonstrates unreliable counting at high rates. Two Geiger tubes were purchased for these devices, one of which has been used with the Vernier instrument testing.

The urgency of the supply of detectors is greater now that the CNSC is generously offering CNS funding over three years. However, these funds are granted on a performance basis and unused funds must be returned at the end of the year. Appropriately detailed documentation is essential.

We are planning for and expect to receive delivery of X detectors during 2019, Y detectors in 2020 and Z detectors in 2021.

Receipt of this publicly funded cash has additional requirements including specific reporting frequencies.

Bryan White continues to perform an excellent service for CNS. However, having only one individual is a programmatic weakness that continues and needs to be addressed. It is essential that other individuals are trained to build, repair and train recipients of the CNS Geiger kits. An attempt to address this programmatic weakness failed during 2018-2019. The funds are available and hopefully the volunteers continue to be available. This

training just needs to happen and must start during the 2019-2020 year with a view to continuing.

Nuclear Safety Culture Foundation Course

The Nuclear Safety Culture Foundation course is broadly accessible to the vendor community to support the fundamental education of their existing or newly-hired contractors and employees. This introductory course material presents an integrated nuclear safety culture framework that includes elements of defence in depth, technical conscience and human error reduction techniques, all of which are useful to mitigate the vendor risk of error in their work product.

The CNS is grateful to the input and advice from utilities (including Bruce Power and OPG) and service providers (including COG, BWXT, Hatch, Kinectrics and SNC-Lavalin), which helps the course content to remain relevant to the industry current activities.

Two courses were delivered in 2018. This course is a standalone introductory course on Nuclear Safety Culture.

Since that time the Nuclear Suppliers' Working Group of the CANDU Owners Group (COG) has approached CNS with respect to collaborating to develop and deliver a course on Nuclear Safety Culture and Human Performance for First Line Managers. CNS and COG have agreed to collaborate.

Course material is being finalised and the pilot course is scheduled for delivery during late April. Three additional courses are scheduled for 2019 with four planned to be delivered during 2020.

The introductory course will benefit from this revamped material. It is anticipated that following the return of FLMs to their companies that those companies will be requesting an introductory course for their employees. Thus demand for such a course during the 2019-2020 and following years is anticipated.

As with other courses CNS delivers, having presenters who are engaging and have a pleasant delivery style is important but essential for this course.

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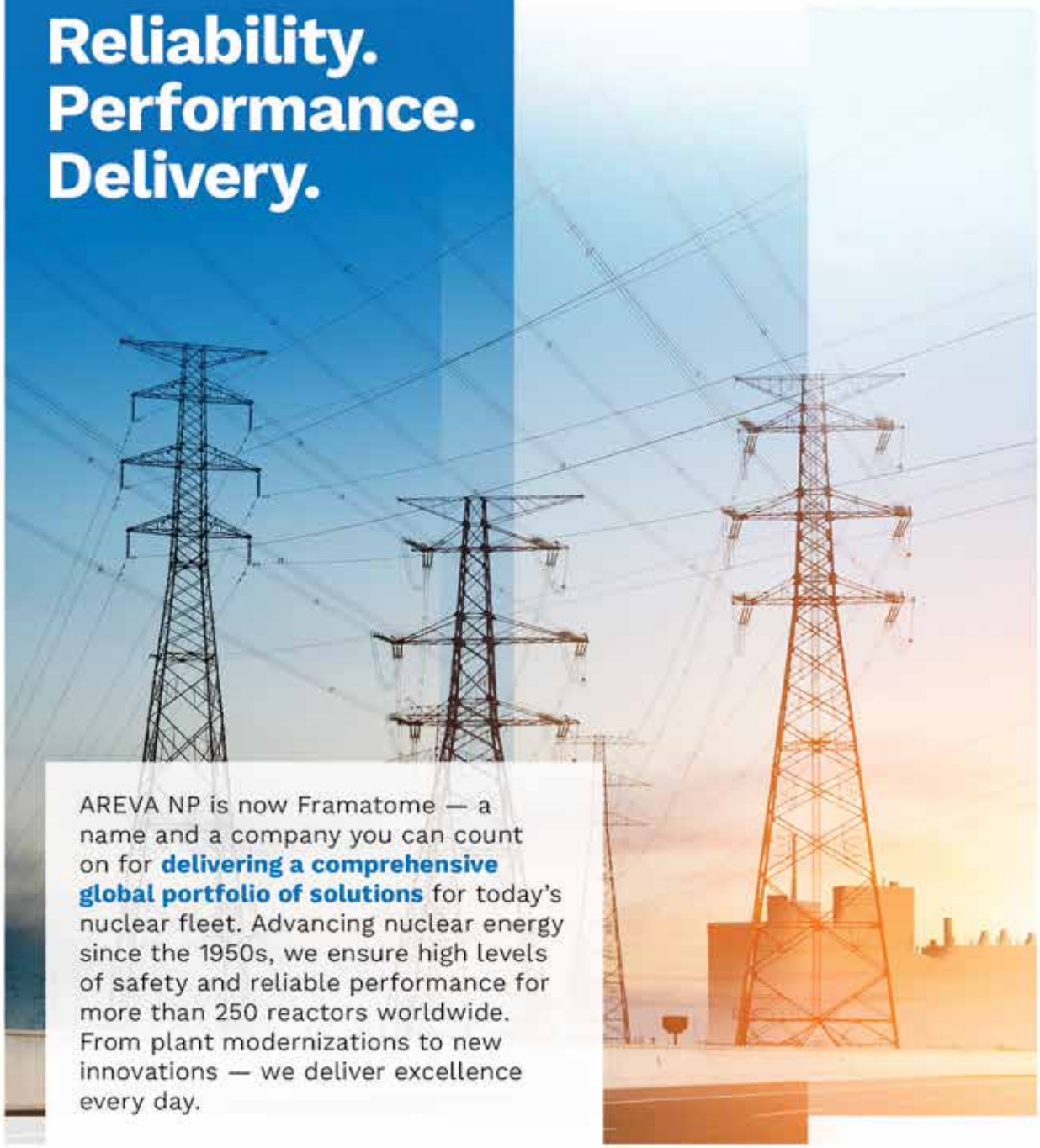

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Program Committee Chair Report for 2018

By Ruth Burany, Chair Program Committee

Organizing conferences and presenting courses is a primary way the CNS fulfills its objectives. Please review the 2019 – 2021 Event Calendar elsewhere in this Yearbook and at **https://www.cns-snc.ca/media/printable-calendar.pdf** to see the planned conferences and courses. The printable calendar on the CNS website is updated regularly. Upcoming CNS Conferences of particular note are the 39th Annual CNS Conference & 43rd Annual CNS/CNA Student Conference in Ottawa in June, the 14th International Conference on CANDU Fuel in July, the 4th Nuclear Waste Management, Decommissioning and Environmental Restoration (NWMDER) Conference in September, and the FSEP International Meeting on Fire Safety and Emergency Preparedness for the Nuclear Industry (both in Ottawa). Earlier this year, as this publication is going to print, the CNS held the 1st International Conference of Materials, Chemistry and Fitness-for-Service Solutions for Nuclear Systems in Toronto. Watch the CNS web site for courses and local chapter events organized as the year progresses.

The following highlights the events held during 2018:

CNS CANDU Reactor Technology & Safety Course

March 19-20, Courtyard by Marriott Downtown Toronto

The CANDU Reactor Technology and Safety Course is intended to enhance the professional and technical capabilities of its members (and non-members) working in, or interested in, the nuclear industry. It provides an introduction to the basic design, technology, and operation of nuclear reactors. The course presents the major systems in a nuclear plant, as well as the important CANDU reactor safety principles and systems. Preparation and execution of safety analysis to meet licensing demands is also covered.

The course is ideally suited for beginning professionals, but also beneficial to experienced professionals. It continues to be one of the most popular courses organized by the CNS and has been offered since 1996.

This year there were 45 registrants and 12 speakers. The banquet speaker was Yuksel Parlatan (of OPG) who spoke on the topic of "A CANDU Success Story: HTS Ageing Management at OPG".

Nuclear 101 Oct 10-11

Courtyard by Marriott Downtown Toronto

The two-day Nuclear-101 course is specifically designed for individuals (including students) within the nuclear community (with or without a technical background) who may interact with the public. The course enables a good understanding of nuclear and energy fundamentals, along with the tools to explain to others in simple, factual terms how the technology works, some of the interesting twists and turns of its exciting history, and the important contribution nuclear science and technology makes to our society. It consists of three modules, and includes demonstrations, Q&A, and a discussion of each module's relevance to public outreach. This year there were 43 registrants with 3 speakers.

38th CNS Annual Conference and 42nd CNS/CNA Student Conference

June 4-7, 2017, Saskatoon, Saskatewan

The peaceful application of nuclear science and technology has contributed clean, safe and resilient energy to mitigate climate change challenges; diagnostic and therapy tools that improve individual health; and means that enhance security of the global community. It is anticipated that enhancement of these benefits through research and development will continue well into the 21st century, accompanied by an increase in public confidence and acceptance of nuclear science and technology. John Luxate was the Executive Chair and succeeded Daniel Gammage as CNS President at the Annual General Meeting held in conjunction with the conference. The CNS 38th Annual Conference featured plenary and technical sessions with subject-matter experts from utilities, suppliers, the regulator, academia, federal laboratories and agencies to present the latest advancements in nuclear science and technology. In addition, this conference held an embedded topical meeting on Small Modular Reactors (SMR) with focused plenary and technical sessions dealing with the potential of and challenges to licensing and deployment of SMR in Canada. Including Sponsors and Exhibitors, there were over 300 registrants.

The CNS and CNA jointly recognized 8 recipients for their outstanding contributions within the Canadian Nuclear industry and the Canadian nuclear research and academic communities. Go to **https://cns-snc.ca/cns/awards/** to see the complete list of recipients. There was also a very successful Student Program, with students at the Bachelor's, Master's and Ph.D. levels presenting their research at a Student Poster Session.

8th International Conference on Numerical Methods in Nuclear Science and Engineering

October 9-11, 2018

The objective of the Conference was to provide an international forum for discussion and exchange of information, results and views amongst scientists and engineers working in the various fields of nuclear science and engineering. Adriaan Buijs was the Conference General Chair. The conference was very successful with 10 plenary speakers, a panel session on "Current Knowledge and Areas for Improvement in CANDU Reactor Thermalhydraulics Simulations", and 4 workshops on a range of topics. This year there were approximately 100 registrants, almost 40% of whom were from outside Canada.

1st International Conference on Generation IV and Small Reactors

November 6-8, 2018

The first conference of this nature for the CNS, this event was a huge success. Through the six-month Generation Energy dialogue in 2017, Natural Resources Canada (NRCan) heard that Canadian partners would need to work together to realize the potential for SMRs. In response, NRCan convened the SMR Roadmap Project with interested provinces, territories and power utilities. The Project is a ten-month program of engagement with the nuclear industry, as well as potential end-users such as Northern and Indigenous communities and heavy industry stakeholders, to explore the potential scope for a national path forward for SMRs. The Canadian Small Modular Reactor (SMR) Roadmap with the final report was officially launched at the Conference on Nov 7. The 3-day core program was comprised of 4 plenary sessions and a panel discussion as well as 8 technical sessions.

Wilson Lam was the chair CNL's CEO & President, Mark Lesinski fulfilling the role of Host Sponsor for the conference. The total number of paid registrants was 300.

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- Quinshan China (2 Units)
- Wolsong South Korea (4 Units)
- Embalse Argentina (1 Unit)

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Quality Systems

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Loop liner tube bellows assemblies

Pressure balanced crossover expansion joints

Containment passage rectangular expansion joints

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Canadian Nuclear Association (CNA) President's Report Looking Ahead to New Nuclear

By John Barrett, President & Chief Executive Officer, Canadian Nuclear Association

2018 was a very active year for the Canadian nuclear industry and the Canadian Nuclear Association (CNA). Refurbishments are now well under way and the industry turning its attention to nuclear new build.

Government Outreach

Our CNA advocacy, communications and outreach, at both federal and provincial levels, continues to position nuclear as one of the important low-carbon sources of energy to combat climate change and as a supplier of medical isotopes, innovation and jobs.

More and more international bodies are acknowledging how important nuclear power is in reducing greenhouse gas (GHG) emissions. We now need Canada's federal government to do the same through appropriate policies, financial instruments, and regulations to support the nuclear industry and its future.

To this end, in 2018, the CNA wrote letters to federal Cabinet Ministers urging them to exercise leadership along these lines, particularly with respect to nuclear new build, including SMRs.

SMR Roadmap

This year saw the launch of the Canadian "Call to Action" Roadmap for Small Modular Reactors. This was the result of a pan-Canadian, multi-stakeholder study launched in early 2018 that the CNA helped to develop and for which it served as the secretariat.

The Roadmap lays the groundwork for Canada to lead in the development of innovative, low-carbon nuclear technologies of the future. SMRs are a powerful way to reduce GHG emissions and adverse environmental impacts from energy production, while providing much-needed reliable sources of clean energy to small communities; to utilities and electricity grid-operators; and to the natural resources sector.

Government Legislation

We have worked hard in defending and promoting our industry's interests in two important federal legislative bills (Bills C-68 and C-69) which have moved from the House to the Senate.

Throughout 2018, CNA engaged with the Canadian Environmental Assessment Agency (CEAA), the key departments of Environment & Climate Change Canada (ECCC) and Fisheries & Oceans (DFO) to propose amendments on the bills and on C-69's Designated Project list. Our advocacy included testimony before the House Standing Committee on the Environment and Senate committees.

Finance Committee

Our industry's advocacy and outreach efforts are making a difference. The House of Commons Finance Committee released its pre-budget 2019 consultation report that specifically mentioned the importance of nuclear energy in a low-carbon National Energy Strategy. CNA's letters to Minister Morneau requesting recognition of this role and support of the industry in the budget were made available to the Committee in its deliberations.

Lobby Days

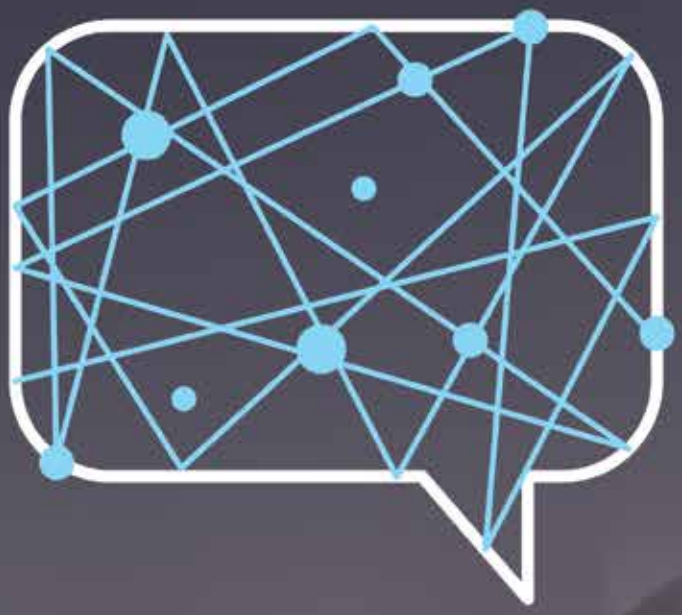
The CNA also hosted two lobbying days: at Queen's Park in Toronto and on Parliament Hill in Ottawa. These days allowed our members to meet face to face with MPs, MPPs and key departmental and ministerial staff and carry our industry messages to this key policy-making audience.

CNL's Lou Riccoboni and Mark Lesinski, Liberal MP Kim Rudd and CNA President John Barrett in Copenhagen at the Clean Energy Ministerial.

International Initiatives

On the international front, the CNA took part in the World Nuclear Association Symposium, COP24, the Pacific Basin Nuclear Conference, and the International Atomic Energy Agency (IAEA) General Conference.

Members of a Chinese delegation with CNA and CNL staff at Chalk River.



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Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

Canada

Canadian Nuclear Association (CNA) President's Report
Looking Ahead to New Nuclear *continued from page 15*

Notable initiatives included the CNA's participation in the Clean Energy Ministerial (CEM) in Copenhagen, Denmark. The event saw the launch of the Nuclear Innovation: Clean Energy (NICE) Future initiative, whose aim is to make sure nuclear has a seat at the table during discussions about innovation and advanced clean energy systems of the future. The CNA also had a speaking role at the NICE Future Conference in Tokyo, Japan.

The CNA and some member companies also hosted a large delegation from China as part of the federal government-sponsored Canada-China Track II Dialogue on Energy. During their week in Canada, the delegation visited many Canadian nuclear organizations, including Kinectrics, SNC-Lavalin, Laker, BWXT, McMaster University, Stern Laboratories and Canadian Nuclear Laboratories. The goal of the dialogue is to provide the Canadian and Chinese governments with recommendations on how and where Canada-China cooperation and collaboration can further develop.

Communications and Public Outreach

CNA advocacy during 2018 was backed up by a steady stream of communications products created specially to advance the industry's key messages and to provide broader public and policy-maker understanding of the benefits of nuclear technology and clean energy to Canadians. For example, we set up a new "Nuclear + You" microsite; produced "myth-debunking" videos; built the "Our Nuclear Advantage" section of the CNA website; produced the 2019 Nuclear Factbook; used social media to broadcast news and views; created targeted brochures on the economic impact of nuclear, its innovative future, and its medical and public health contributions; and wrote op-eds and rapid responses to "fake" news about nuclear.

I believe that 2019 will be a defining year for Canada's nuclear industry. It will be defined by "new nuclear" and, increasingly, the phrase: "new nuclear build." I can ssure you that, for our part, CNA will be advocating for new build in 2019.

CNSC President Rumina Velshi, CNA President John Barrett and Canadian Ambassador to Austria Heidi Hulan at the IAEA General Conference.

Environment and Climate Change Minister Catherine McKenna with CNA Communications Director Erin Polka at COP24.

CNA President John Barrett, OPG VP Jennifer Rowe and Liberal MP Kim Rudd at the CNA Hill Day.

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Canadian Nuclear Workers Council (CNWC)

The collective voice of organized labour in Canada's nuclear industries

By David Shier, President and CEO

The Canadian Nuclear Workers Council (CNWC) is an umbrella organization of Unions representing workers in all sectors of the Canadian nuclear industry. **The CNWC is the collective voice of the Unions in Canada's Nuclear Industry**. Founded in 1993, it represents workers in the electric power utilities, uranium mining and processing, radioisotope production for medical and industrial purposes, nuclear research, construction and trades in Ontario and labour councils in host communities. CNWC membership includes 24 local unions and four labour councils.

CNWC activities are focused on the following objectives:

To support and promote the benefits of Canada's Nuclear Industry to Canadian Workers and the public by providing fact-based information.

Specifically, this industry's:

1. Strong safety record;
2. Strong regulatory oversight
3. Contribution to cleaner air, economic growth and medical treatments
4. High-skill, high quality jobs
5. Support for the enhancement of Canadian scientific, engineering, technological innovation and skilled trades' expertise.

During 2018, CNWC representatives engaged federal, provincial and municipal elected officials, regulators and government agencies. CNWC representatives met with MPPs, candidates and staff from all three parties in the lead up to Ontario's 2018 provincial election. In October, representatives from CNWC member unions (IBEW, SPEA, PWU & SUP) participated in the CNA's Hill Day in Ottawa. In late November, CNWC member unions participated in the CNA's Queen's Park event.

With the support of our employers, the CWNC hosted several facility tours (Darlington & Pickering) for elected municipal, provincial and federal officals, candidates standing for office and labour councils.

In 2018, CNWC education and outreach activities focused on: the expansion of the membership from nuclear supply chain companies, construction union, and local labour councils; Bruce Power's and OPG's refurbishment projects; the extended operation of Pickering NGS; Bruce Power licence renewal; OPG's DGR facility; Nuclear Waste Management Organization; CNL waste facility and SMR demonstration(s); and, Fitness for Duty Regulation. The CNWC hosted online petitions in support of the Bruce Power License Renewal and Pickering "NPP Life Extension (received over 10 thousand signatures).

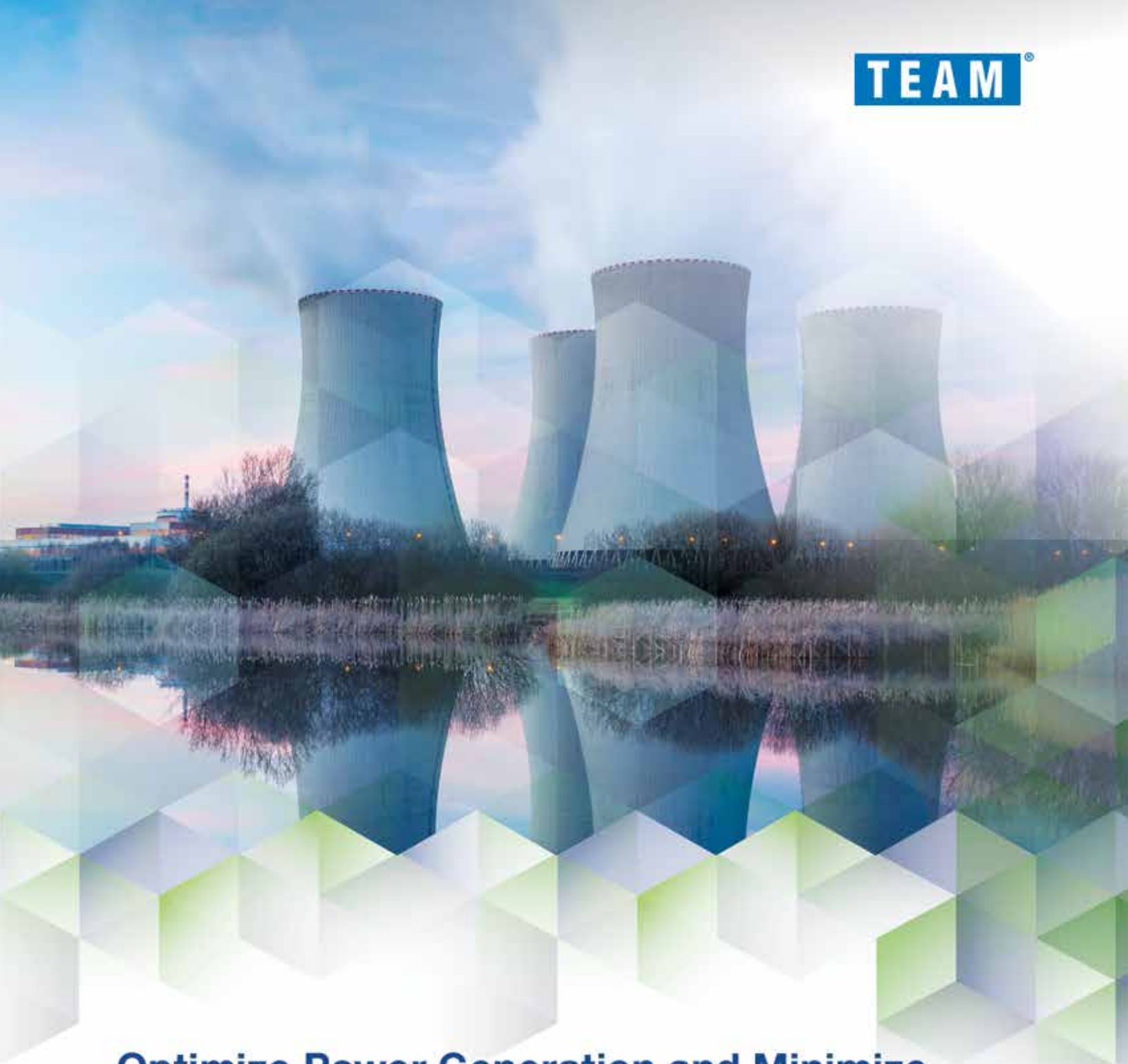
During the year, several presentations and briefs were made on behalf of the membership. These included: the hearings associated with the licence extension for Canadian Nuclear Laboratories; Bruce Power Licence Hearing: Pickering NPP Licence Hearing; NPP Regulatory Oversite Report Hearing; Uranium Mines & Mills Facilities Regulatory Oversight Report; and, the Uranium and Nuclear Substance Processing Facilities Regulatory Oversight Report.

In 2018, the CNWC undertook several communication and outreach initiatives. The council issued a quarterly newsletter in both official languages to provide our membership and others with information about significant happenings in Canada's nuclear sector and elsewhere. The council's website was updated and support continued for a website profiling the Ontario's nuclear energy advantage.

The CNWC's Annual 2019 Conference will be held in Saint John, NB from October 19-22nd. CNWC also attended the CNA's Annual Conference in Ottawa in February 2019 and will be attending the CUPE Convention in Montreal, OFL Conference in Toronto and the IBEW Nuclear Conference in December. The CNWC plans to continue the communication and outreach initiatives undertaken last year in 2019. A new brochure is being developed to promote new nuclear build and related material for the CNWC website.

CNWC Member Unions:

- District Labour Councils (Grey/Bruce, Durham, Northumberland, Lindsay)
- International Association of Firefighters (160)
- Federation of Professional & Technical Engineers Union (160 & 164)
- International Brotherhood of Electrical Workers (37, 353, & 804)
- Provincial Building and Construction Trades Council of Ontario
- Professional Institute of the Public Service of Canada (PIPSC)
- Union of Professional Engineers & Associates Union (SPEA)
- Society of United Professionals Union
- UNIFOR (S-48, O-599, O-252, 524)
- United Steelworkers (14193, 13173, 4096, 8562, 8914, 7806, 1568)



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Organization of Canadian Nuclear Industries (OCNI) President's Report

By Ron Oberth, President and CEO Organization of Canadian Nuclear Industries (OCNI)

OCNI membership continues to grow reaching 242 by the end of September 2018. Small and medium sized enterprises (SME's) recognize OCNI's value proposition in supporting a vertically integrated and collaborative supplier network through "supplier days" at customer sites, technical workshops on important and emerging supplier topics and general knowledge sharing and networking events. OCNI's financial health enables us to undertake major events, promote the nuclear industry, invest in skills development, and support local charities.

OCNI intervened at CNSC Public Licensing Hearings for CNL's Chalk River Laboratory, the Bruce Power Site and OPG Pickering. OCNI continued its public and political outreach through its "Local Supplier Engagement Program" which celebrated Refurbishment and MCR Milestones, job creation and innovations at supplier sites in Clarington, Newmarket, Burlington, Niagara Falls, Hamilton, Welland, Mississauga and Peterborough attended by local media, MPP's, mayors and MP's who can observe how Ontario's nuclear industry is creating great jobs in local communities. OCNI also works closely with the Ontario Nuclear Advocacy Committee in ensuring that industry outreach is align and coordinated.

In March OCNI and its partner organization were awarded a grant of nearly $500,000 by the Ontario Ministry of Training, Colleges and Universities (MTCU) over one year to attract youth, young women and Indigenous people into skilled trades positions in the nuclear industry. The OCNI-led 'Skilled Trades Employment Pathway to the Clean Energy Sector" (STEP) program placed 35 young men, young women and Indigenous people across the nuclear supply chain by March 31, 2019. The OCNI STEP program is helping to address a projected skilled trades gap when the OPG and Bruce Power life extension projects reach highest demand for skilled workers in the 2022/2024 – time frame.

OCNI officially opened its office in Port Elgin on March 24, 2018. The office shared with the Bruce Power Indigenous Relations Suppliers Network (IRSN) helps smaller suppliers engage with Bruce Power and supports Bruce County economic development.

Over the year OCNI led trade missions to China, the USA, and to the ITER Business Forum in France in March 2019 where the Canadian delegation received a warm welcome as Canada seeks to reengage on the $24B ITER Project at Cadarache in southern France.

Finally, OCNI signed an MOU with Bruce Power and Bruce County on May 2, 2019 to expand the Bruce Nuclear Economic Development and Innovation Initiative with OCNI as an equal partner in moving the initiative forward. The initiative will be led by a jointly funded Manager Nuclear Economic Development and Innovation working out of OCNI's Port Elgin office.

Canadian delegation (representing OCNI, ATS Automation, OPG, Rolls Royce, MDA, Canadian Nuclear Laboratories, Tyne Engineering, Laker Energy Products, SNC-Lavalin, Promation Nuclear and UNENE) with Trade Commissioner Denis Trottier (fifth from the left), greeted by ITER Director General Dr. Bernard Bigot (back row, third from the right).

Mark Nutson, Mayor Adrian Foster and Steve Gregoris.

Ron Oberth, President & CEO OCNI, Jeff Lyash President & CEO OPG and Mike Rencheck, President & CEO Bruce Power.

OCNI President Ron Oberth [second from right] and Chippewas of Nawash Unceded First Nation Chief Greg Nadjiwon [centre], cut the ribbon to open the OCNI office in Port Elgin, with Bruce Power President and CEO Mike Rencheck [far left] and Saugeen Shores Mayor Mike Smith [far right].

Group Photo (from left to right): Ron Oberth OCNI, MPP Effie Triantafilopoulos, Peter Gowthorpe Laveer, Minister Karina Gould, Ian Rowley Bruce Power, Chris Fralick OPG, Councillor Paul Sharman, MPP Jane McKenna.

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Women in Nuclear (WiN) Canada President's Report

By Heather Kleb, President WiN-Canada

As Canada enters a new phase of recognizing the significant role women play within political life and across Canada, the mission of Women in Nuclear Canada (WiN-Canada) is becoming more relevant to the greater public discourse than ever before. WiN-Canada increased its public outreach in 2018 in an effort to elevate member voices, communicate the role nuclear plays in society, and address the impact women's perceptions have on the nuclear industry.

In 2018, WiN-Canada was proud to continue to grow its website **https://canada.womeninnuclear.org**, which features a clean and modern design and allows our 2,600+ members, in six Chapters across the country, to connect with each other, and the public through their online profiles.

WiN-Canada was very active on social media in 2018 through its promotion of International Women's Day and the United Nations Day for Women and Girls in Science, which featured several WiN-Canada leaders. An increasing number of indigenous engagement opportunities were also featured on our social media channels, such as the Niagara Peninsula Aboriginal Area Management Boards' Career Fair for Aboriginal Youth and the OCNI First Nations, Métis and Inuit Engagement Workshop.

As the premier association for women working in all things nuclear, we continue to receive support from the industry, including Bruce Power, Ontario Power Generation, SNC-Lavalin, the Nuclear Waste Management Organization. E.S. Fox, the Canadian Nuclear Association, New Brunswick Power and Kinectrics, who support our annual programming, such as the scholarship and awards program and the Speakers Clearinghouse. We are looking for continued support from the industry and are hoping to bring in new sponsors in the coming year.

To strengthen WiN-Canada's connections with WiNners across the world, WiN-Canada's Chapter Chairs, members, advocates and staff met with Adriènne Kelbie, Chief Executive of the Office of the Nuclear Regulator in the UK during the trade show at the Canadian Nuclear Association Annual Conference. Executive and Board members are also active with WiN-Global, participating on the WiN-Global Board, Executive and Mentorship committee and attended the 2018 WiN-Global Conference in Argentina.

Fostering Professional Development for Women in Nuclear-Related Occupations

WiN-Canada had strong representation at a number of industry events. In addition to the Canadian Nuclear Association Conference, members participated in the Canadian Nuclear Society Conference, and Science Teachers Association of Ontario Conference.

The 15th Annual WiN-Canada Conference took place in Saskatchewan from September 26-28, 2018. Some 200 delegates from across the country gathered together to learn, network, and be inspired by over 20 different speakers. Our keynote speakers and breakout sessions were exceptional, and the technical tours were informative. At the conference, the "Unsung Hero" WiN-Canada Award was awarded to **Kim Doyle-Maloney** of OPG and a member of the Durham Chapter.

We look forward to the 2019 WiN-Canada Conference, which will be taking place **September 22 – 24, 2019**. The theme of the 2019 conference is I ♥ Nuclear, highlighting the impact women have on the nuclear industry while exploring how we can add "heart" to the public discourse.

WiN-Canada is also honoured to host the 28th Annual WiN Global conference, which will be held in **Niagara Falls from October 4-8, 2020** with the theme *Positively Charged for Success*. This will be the first time in nearly 15 years since the conference was last held in Canada!
At a local level, WiN-Canada's Chapters are doing incredible work across the country to advance our mission and connect with our local members through engaging programming. WiN-Canada volunteers are dedicated to advocating for nuclear energy and radiation technologies and forging meaningful relationships within their communities.

Each Chapter has hosted or participated in a variety of events this past year to encourage membership growth and professional development, including leadership development seminars, mentorship programs, personal branding events, participation in career fairs and events for youth, and community outreach with organizations such as Skills Canada and Habitat for Humanity.

Advancing the Public Profile of the Nuclear Industry in Canada

WiN-Canada strengthened its relationship with local, provincial and federal governments in 2018 by continuing to meet with elected officials for Parliament Hill and Queen's Park days. Board members shared their expertise and opinions on the importance of nuclear technologies to the Canadian quality of life during meetings in Ottawa and Toronto.

WiN-Canada also intervened in support of **OPG's application to renew the operating license for the Pickering Nuclear Generating Station (PNGS)** as well as Bruce Power's application for Licence Renewal for Bruce A and Bruce B Nuclear Generating Stations with the Canadian Nuclear Safety Commission. WiN-Canada members also presented at the public hearings for these license renewals.

Promoting a Variety of Career Opportunities for Women and Students

In 2018, WiN-Canada expanded its scholarship program from 1 to 3 awards, thanks to the support of our sponsors. The scholarships were awarded to women pursuing studies in the field of nuclear science and related industries.

The Speakers Clearinghouse also continued to expand its outreach at conferences and events across the country. WiN-Canada speakers also engaged students, teachers and educational institutions to inspire youth to pursue studies and careers in STEM. Some education-focused initiatives from 2018 include:

- Collaborations with Skills Ontario
- Take Our Kids to Work Day
- Several International Womens' Day events across Canada

For more information about our Speakers Clearinghouse or to learn more about our goals and objectives you can visit us online at:
www.canada.womeninnuclear.org
www.facebook.com/womeninnuclear.canada
twitter.com/win_canada
NEW LinkedIn Page: **https://www.linkedin.com/company/women-in-nuclear-canada/**

2018 Canadian Nuclear Achievement Awards

Ian McRae Award

Presented to: **Joanne M. Ball**
for leadership and contributions in the areas of nuclear reactor safety, nuclear fuels, and environmental protection

Education and Communication Awards

Presented to: **Jo-Ann Facella**
for accomplishments in the field of social engagement and acceptance of long-term management of used nuclear fuel

Presented to: **Neil Alexander**
for passion and commitment to public education and outreach related to various aspects of nuclear science, medicine and technology

Presented to: **Matthew T.J. Dalzell**
for passion and commitment to public education and outreach related to various aspects of nuclear science, medicine and technology

Fellow of the Canadian Nuclear Society

Presented to: **Blair P. Bromley**
for extensive contributions to the Canadian Nuclear Society, as Chair of the Fusion Science and Technology Division, and as organizer of conferences, technical meetings, and courses

Presented to: **Mohamed Younis**
for long-term extensive contributions to the Canadian Nuclear Society as Treasurer, Chair of Various CNS Committees, and member of numerous conference organizing committees

Harold A. Smith Outstanding Contribution Awards

Presented to: **Engin Özberk**
for outstanding contributions to nuclear research, development, and education in Western Canada and the mining sector

Presented to: **Jovica R. Riznic**
for outstanding contributions to nuclear-engineering research and education in the fields of heat transfer and reactor thermalhydraulics, reliability, safety and fitness-for-service

Presented to: **Richard Didsbury**
for outstanding contributions to CANDU build-project engineering-tool development and for preparing CNL's R&D organization for the transition to the GoCo model

Presented to: **Aamir Husain**
for outstanding contributions to nuclear industry in the fields of radiation protection, radioactive waste management and decommissioning

Presented to: **NRU Operations and Support Staff (Current & Past)**
for outstanding contributions to Canadian and international nuclear science & technology research, development, education, and health, and to the economic and environmental fields

John S. Hewitt Team Achievement Awards

Presented to: **Bruce B Cobalt Harvest Team**
in recognition of its achievements in safely and efficiently implementing a new radionuclide harvesting process using High Specific Activity Cobalt Rods at Bruce Power
Left to Right: Tim Dalpee, Chris Masse, Tyrell Moore, Paul Nuget, Dave McMahon

Presented to: **CNL Physics & Economics of Thorium-Based Fuel Research Team**
in recognition of its scientific and technical achievements in closing gaps related to reactor physics behaviour and modelling of the fuel-cycle and economic characteristics of thorium-based fuels
Left to Right (Top Row): Daniel Wojtaszek, Clifford Dugal, Blair Bromley, Sourena Golesorkhi, Nicholas Chornoboy, Jeremy Pencer, Huiping Yan. Left to Right (Bottom Row): Geoffrey Edwards, Alberto Medoza, Ashlea Colton. Missing: Mark Floyd.

2019 Conference Schedule

This programme lists events which are organized or co-sponsored by the Canadian Nuclear Society or considered to be of interest to its members.

The current listing of events is posted on the CNS website at **www.cns-snc.ca**

June 23-26, 2019
39th Annual CNS Conference & 43rd Annual CNS/CNA Student Conference
Westin Hotel, Ottawa, ON
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-annual-conference.org

July 21-24, 2019
International Conference on CANDU Fuel
Hilton Meadowvale Hotel, Mississauga, ON
Organized by: CNS FT Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc.ca/events/fuel2019

August 15, 2019
SPANS 2019 (Symposium on Plasma and Nuclear Systems)
University of Ontario Institute of Technology
Contact: Professor Hossam Gabbar
Email: Hossam.Gaber@uoit.ca
www.sege-conference.com/SPANS18CFP.pdf
www.sege-conference.com/SPANS.html

September 8-11, 2019
Waste Management, Decommissioning and Environment Restoration for Canada's Nuclear Activities
Ottawa Marriott Hotel, Ottawa, ON
Organized by: CNS E&WM Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc.ca/events/nwmder2019

September 22-24, 2019
15th Annual WiN-Canada Conference
Unifor Family Education Centre, Port Elgin
https://canada.womeninnuclear.org/calendar

September 22-27, 2019
Global and Top Fuel 2019
Seattle, Washington USA | The Westin Seattle
http://globaltopfuel.ans.org

September 29-October 4 2019
International Association for the Properties of Water and Steam (IAPWS 2019)
Banff, Alberta
http://www.iapws2019.org

October 3-4, 2019
CANDU Fuel Technology Course
Hilton Garden Inn Toronto/Ajax, Ajax, ON
Organized by CNS FT Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
e-mail: cns_office@cns-snc.ca
www.cns-snc.ca

October 27-30, 2019
3rd CNS Conference Fire Safety and Emergency Preparedness for the Nuclear Industry
Westin Hotel, Ottawa, ON
Organized by: CNS
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
https://cns-snc.ca/media/fsep-2019

November 17-21 2019
2019 ANS Winter Meeting
Washington, D.C., USA
http://www.ans.org/meetings

February, 2020
CNA Nuclear Industry Conference and Tradeshow
Ottawa, ON
Organized by: CNA
https://cna.ca

March 2020 *(Tentative)*
CANDU Technology & Safety Course
Toronto, ON
Organized by: CNS NSE Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc.ca

Spring 2020
Nuclear 101
Toronto area
Organized by: CNS ECC Committee
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc.ca

May 31-June 3, 2020
40th Annual CNS Conference & 44th Annual CNS/CNA Student Conference
Saint John, NB
Organized by: CNS
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc-ca

June 7-11, 2020
ANS Annual Meeting
Phoenix, AZ, USA
http://www.ans.org/meetings

June 8-12, 2020 *(Tentative)*
International Seminar on Thermalhydraulic Knowledge Transfer (THICKET-5)
Toronto, ON
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc-ca

October, 2020 *(Tentative)*
International Conference on Simulation Methods in Nuclear Engineering
Organized by: CNS NSE Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc.ca

November 15-19, 2020
2020 ANS Winter Meeting
Chicago, IL, USA
Organized by: ANS
http://www.ans.org/meetings/

Fall 2020
PBNC 2020
http://www.pacificnuclear.net/pnc/pbnc.html

Generation IV and Small Reactors (G4SR-2) International Conference
Ottawa, ON
Organized by: CNS G4SRT Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc.ca

CANDU Maintenance & Nuclear Components Conference (CMNCC)
Organized by: CNS NOM Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
Email: cns_office@cns-snc.ca
www.cns-snc.ca

16th Annual WiN-Canada Conference
Organized by: WiN Canada
https://canada.womeninnuclear.org/calendar

CANDU Nuclear Reactor Performance and World Uranium Production

CANDU Nuclear Reactor Performance – 2018

Reactor	In Service	Capacity (MW)	Performance In 2018 (%)	Lifetime Performance (%)
Point Lepreau	1983	705	84.6	70.5
Wolsong 1	1983	679	0	70.4
Wolsong 2	1987	678	83.1	92.0
Wolsong 3	1998	698	73.3	89.1
Wolsong 4	1999	703	82.5	93.5
Embalse	1983	648	0	71.9
Cernavoda 1	1996	707	86.6	90.0
Cernavoda 2	2007	705	97.1	94.3
Qinshan 4	2002	700	96.6	89.8
Qinshan 5	2003	700	79.0	90.6
Pickering 1	1971	542	93.2	63.0
Pickering 4	1973	542	61.9	66.8
Pickering 5	1983	540	94.1	74.2
Pickering 6	1984	540	58.7	77.9
Pickering 7	1985	540	96.8	77.9
Pickering 8	1986	540	58.1	75.0
Bruce 1	1977	825	81.5	69.3
Bruce 2	1978	825	90.0	66.3
Bruce 3	1978	825	95.4	74.1
Bruce 4	1979	825	94.2	73.3
Bruce 5	1985	872	98.9	85.0
Bruce 6	1984	872	98.6	82.4
Bruce 7	1986	872	99.4	85.0
Bruce 8	1987	872	67.3	82.7
Darlington 1	1992	934	97.2	84.1
Darlington 2	1990	934	0	73.4
Darlington 3	1993	934	75.2	85.8
Darlington 4	1993	934	90.9	86.0

Notes
1. Darlington 2 entered plant refurbishment, October 2016.
2. Embalse undergoing plant refurbishment.
3. All reactor performance now based on Load Factor, not Capacity Factor

World Uranium Production – 2017

Country or area	Production (tU) 2013	2014	2015	2016	2017	Known Resources
Australia	6350	5001	5654	6315	5882	1 664 100
Brazil	198	231	40	44	0	276 800
Canada	9332	9134	13 325	14 039	13 116	509 800
China*	1450	1500	1616	1616	1885	272 500
Czech Rep	225	193	155	138	-	-
France	0	3	2	0	-	-
Germany	27	33	0	0	-	-
India*	400	385	385	385		421
Kazakhstan	22 567	23 127	23 800	24 575	23 321	743 300
Malawi	1132	369	0	0	-	-
Namibia	4315	3255	2993	3654	4224	267 000
Niger*	4528	4057	4116	3497	3449	291 500
Pakistan*	45	45	45	45	45	-
Romania*	90	77	77	77	50	-
Russia	3135	2990	3055	3004	2917	507 800
South Africa	540	573	393	490	308	322 400
Ukraine*	1075	962	1200	1005	550	115 800
USA	1835	1919	1256	1125	940	62 900
Uzbekistan*	2400	2400	2385	2404	2404	130 100
Other	-	-	-	-	-	232 400
Total	**59 673**	**56 252**	**60 946**	**62 336**	**59 091**	**5,718,400**

*WNA estimate
All figures taken from the World Nuclear Association
WNA most recent update was March 2019

World Reactor Capacity

World Reactor Capacity – 2018

Country	Operating		Planned or Under Construction 03/01/16		Electricity Generation 2018	
	No	MW	No	MW	%	TWh
Argentina	3	1627	5	3277	4.7	6.5
Armenia	1	376	1	1060	25.6	1.9
Bangladesh			4	4800		
Belarus			4	4788		
Belgium	7	5943			39	27.3
Brazil	2	1896	5	5405	2.7	14.8
Bulgaria	2	1926	1	950	35	15.8
Canada	19	13553			14.9	94.5
China	45	42976	200	228786	4.2	277.1
Czech Rep.	6	3904	4	4800	34.5	28.3
Egypt			4	4800		
Finland	4	2764	2	2970	32.5	21.9
France	58	63130	1	1750	71.7	395.9
Germany	7	9444			11.7	71.9
Hungary	4	1889	2	2400	50.6	14.9
India	22	6219	49	47900	3.1	35.4
Iran	1	915	7	4874	2.1	6.3
Japan	37	36147	11	15703	6.2	49.3
Jordan			1	1000		
Kazakhstan			2	600		
Korea (S)	24	23231	6	8400	23.7	127.7
Lithuania			2	2700		
Mexico	2	1600	3	3000	5.3	13.2
Netherlands	1	485			3.1	3.3
Pakistan	5	1355	3	3492	6.8	9.3
Poland			6	6000		
Romania	2	1310	3	2160	17.2	10.5
Russia	35	28025	53	53024	17.9	191.3
Saudi Arabia			16	17000		
Slovakia	4	1816	3	2142	55	13.8
Slovenia	1	696	1	1000	35.9	5.5
South Africa	2	1830	8	9600	4.7	10.6
Spain	7	7121			20.4	53.4
Sweden	8	8376			40.3	65.9
Switzerland	5	3333			37.7	24.5
Taiwan	4	3719			11.4	26.7
Thailand			2	2000		
Turkey			12	14400		
Ukraine	15	13107	4	4300	53	79.5
UAE			4	5600		
UK	15	8883	10	14600	17.7	59.1
USA	98	99376	25	15550	19.3	808.0
World	**446**	**397040**	**496**	**500831**		**2563.0**

Notes
http://www.world-nuclear.org/information-library/facts-and-figures/world-nuclear-power-reactors-and-uranium-requireme.aspx

CNS Council and Staff

CNS Executive

John Luxat
President

Keith Stratton
1st Vice-President

Aman Usmani
2nd Vice-President

Dan Gammage
Past President

Mohamed Younis
Treasurer

Colin Hunt
Secretary

Benjamin Rouben
Executive Director

Ken Smith
Financial Administrator

Peter Easton
Communications Director

The Canadian Nuclear Society

The Canadian Nuclear Society (CNS) was established in 1979 as an organization of individual members, paying membership dues. It was established as an independent section of the Canadian Nuclear Association (CNA) to benefit from the office support structure of the CNA. In 1997, after twenty years of operation in this mode, and after building its own asset base, the CNS obtained a federal charter as an independent not-for-profit organization. The CNS, through its base of individual members, promotes the exchange of information on all aspects of nuclear science and technology – including uranium mining and refining, electricity generation by nuclear power, medical and industrial uses of radionuclides, management of radioactive wastes, and various associated research and development activities.

The activities of the CNS are managed by a Council that is elected by the CNS members at the Annual General Meeting, normally held in June. The Council term of office is one year. The elected Council consists of six Officers plus up to 30 Members-at-Large – all volunteers. Various members of Council are appointed to Chair Committees that look after specific issues. The Council is supported by a full time Office Manager, and by other part-time specialists.

Elected Executive for June 2018 to June 2019:

John Luxat President	**Keith Stratton** 1st V-P	**Aman Usmani** 2nd V-P	**Colin Hunt** Secretary	**Mohamed Younis** Treasurer	**Dan Gammage** Past President

Part-time Specialists and Office Staff:

Ben Rouben Executive Director	**Ken Smith** Financial Administrator	**Brian Blosser** Accountant	**Amanda Blosser** Bookkeeper	**Bob O'Sullivan** Office Manager	**Peter Easton** Communications Director

The CNS is organized into Branches and Technical Divisions, both directed towards involvement of the individual member. Branches are established on a geographical basis, and hold local meetings on issues of interest. Technical Divisions are established for specific technical areas of interest – and are responsible for organizing topical conferences, courses, and seminars.

Members of the CNS Council and staff are listed on the next page.

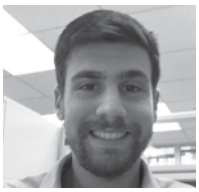
An outline of the activities of the CNS, including a list of upcoming conferences and courses, is provided elsewhere in this Yearbook.

CNS Council Members at Large

Parva Alavi

John Barrett
President and CEO, CNA

Ruth Burany



Chris Ciaravino

Xinjian Duan

Romney Duffey

Mohinder Grover

Jerry Hopwood

Ross Horgan

Doddy Kastanya

Wilson Lam

E.M (Dorin) Nichita

Peter Ottensmeyer

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Chary Rangacharyulu

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Bob O'Sullivan
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Colin Hunt
Publisher
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Ric Fluke
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Upton, NY 11973-5000
Tel: (631) 344-8000

CNSC-USNRC Office of Public Affairs (OPA)
Washington, D.C. 20555
Tel: 301-415 0317
Fax: 301-415 2395

Edison Electric Institute (EEI)
701 Pennsylvania Ave. NW
Washington, D.C.
20004-2696
Tel: (202) 508-5000

Electric Power Research Institute (EPRI)
3412 Hillview Ave.
P.O. Box 10412
Palo Alto, California 94303
Tel: (415) 855-2000

Environmental Protection Agency (EPA)
1200 Pennsylvania Ave., NW
Washington, D.C. 20460
Tel: (202) 260-2090

Lawrence Livermore National Laboratory
P.O. Box 808
Livermore, CA 94551-0808
Tel: (925) 422-1100

Los Alamos National Laboratory (LANL)
P.O. Box 1663
Los Alamos, N.M. 87545
Tel: (505) 667-7000

National Council on Radiation Protection and Measurements (NCRP)
7910 Woodmont Ave.
Suite 800
Bethesda, Maryland
20814-3095
Tel: (301) 657-2652

Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, D.C.
20006-3708
Tel: 202.739.8000
Fax: 202.785.4019

Nuclear Regulatory Commission (NRC)
Mail Stop TA-13
Washington, D.C. 20555
Tel: (301) 415-8200

Oak Ridge National Laboratory (ORNL)
P.O. Box 2008
Oak Ridge, Tennessee 37831
Tel: (615) 574-4160

Sandia National Laboratories
Albuquerque, N.M
87185-5800
Tel: (505) 844-5678

U.S. Department of Energy (DOE)
1000 Independence Ave., S.W.
Washington, D.C. 20585
Tel: (202) 586-5000

YUGOSLAVIA

Yugoslavia Federal Secretariat for Energy and Industry
Bulevar AVNOJ-A 104 11070
Novi Beograd
Tel: (38-11) 195 244

Guide to Nuclear-Related Organizations

FEDERAL GOVERNMENT

Atomic Energy of Canada Limited (AECL)
Place de Ville, Tower B112
Kent St., Suite 501
Ottawa ON K1P 5P2
Tel: (613) 589-2085

CNL Chalk River Laboratories
Chalk River ON K0J 1J0
Tel: 1-866-513-2325

CNL Low-level Radioactive Waste Management
National Office
Suite 200
1900 City Park Drive
Ottawa ON K1J 1A3
Tel: 1-866-513-2325

CNL Whiteshell Laboratories
P.O. Box 550
Pinawa MB R0E 1L0
Tel: 1-866-513-2325

Canadian Nuclear Safety Commission
P.O. Box 1046
280 Slater Street
Ottawa ON K1P 5S9
Tel: (613) 995-5894

Department of Foreign Affairs and International Trade (DFAIT)
Lester B Pearson Bldg.
125 Sussex Dr.
Ottawa ON K1A 0G2
Tel: (613) 996-9134

Environment Canada
351 Joseph Blvd.
Hull QC K1A 0H3
Tel: (613) 997-2800

Health and Welfare Canada
A.L. 0900C2
Ottawa ON K1A 0K9
Tel: (613) 957-2991

National Energy Board
444 Seventh Ave. S.W.
Calgary AB T2P 0X8
Tel: (403) 292 4800

National Research Council Canada Institute for Scientific and Technical Information (CISTI)
Bldg. M55, Room 148
Montreal Rd. Campus
Ottawa ON K1A 0S2
Tel: (613) 993-1600

Natural Resources Canada (Uranium, Nuclear Energy & Waste Management)
580 Booth Street
Ottawa ON K1A 0E4
Tel: (613) 995-0947

Natural Sciences and Engineering Research Council of Canada (NSERC)
350 Albert St., Tower 2
Ottawa ON K1A 1H5
Tel: (613) 995-5992

Nuclear Waste Management Organization (NWMO)
22 St. Clair Avenue East
Sixth Floor
Toronto ON M4T 2S3
Tel: 416-934-9814
Fax: 416.934.9526

PROVINCIAL ORGANIZATIONS

Hydro-Québec
75 René-Lévesque Blvd., West
Montréal QC H2Z 1A4
Tel: 514 289-2211

New Brunswick Power
515 King Street
P.O. Box 2000
Fredericton NB E3B 4X1
Tel: 1-800-663-6272

New Brunswick Point Lepreau Generating Station
P.O. Box 600
Lepreau NB E5J 2S6
Tel: (506) 659-2220

Ontario Power Generation (OPG)
700 University Ave.
Toronto ON M5G 1X6
Tel: (416) 592-2555

Ontario Power Generation Darlington Generation Station Information Centre
P.O. Box 4000
Bowmanville ON L1C 3Z8
Tel: (905) 623-7122

Ontario Power Generation Pickering Generating Station Information Centre
1675 Montgomery Park Rd.
Pickering ON L1V 2R5
Tel: (905) 839-0465

ASSOCIATIONS

Association of Consulting Engineers of Canada
130 Albert St., Suite 420
Ottawa ON K1P 5G4
Tel: (613) 236-0569

Association of Major Power Consumers of Ontario (AMPCO)
65 Queen Street West
Suite 1510
Toronto ON M5H 2M5
Tel: (416) 260-0280
Fax: (416) 260-0442

Canadian Association of Medical Radiation Technologists
85 Albert St., Suite 1501
Ottawa ON K1P 6A4
Tel: (613) 234-0012

Canadian Association of Radiologists
600 – 294 Albert Street
Ottawa ON K1P 6E6
Tel.: 613 860-3111
Fax: 613 860-3112

Canadian Electricity Association
275 Slater Street, Suite 1500
Ottawa ON K1P 5H9
Tel: (613) 230-9263
Fax: (613) 230-9326

Canadian Standards Association (CSA)
178 Rexdale Blvd.
Rexdale ON M9W 1R3
Tel: (416) 747-4000

Engineering Institute of Canada
1295 Hwy 2 East
Kingston ON K7L 4V1
Tel: (613) 547-5989

Electricity Distributors Association
3700 Steeles Ave. W.
Woodbridge ON L4L 8K8
Tel: (905) 265-5300

Institute de Recherche
d'Hydro-Québec (IREQ)
1800, boul. Lionel-Boulet
Varennes QC J3X 1S1
Tel: (450) 652-8011

Radiation Safety Institute of Canada
1120 Finch Avenue W.
Suite 607
Toronto ON M3J 3H7
Tel: (416) 650 9090

Guide to Nuclear-Related Organizations *continued from page 33*

UNIVERSITY/ EDUCATION

Association of Universities and Colleges of Canada
350 Albert St., Suite 600
Ottawa ON K1R 1B1
Tel: (613) 563-1236

Carleton University
1125 Colonel By Drive
Ottawa ON K1S 5B6
Tel: (613) 788-7400

Dalhousie University
1459 Oxford St.
Halifax NS B3H 4R2
Tel: (902) 494-2211

École Polytechnique
C.P. 6079 Centre-Ville
Montréal QC H3C 3A7
Tel: (514) 340-4711

Institut Armand-Frappier
531, boulevard des Prairies
C.P. 100
Laval QC H7V 1B7

Institut National de la Recherche Scientifique (INRS)
2600, boulevard Laurier
C.P. 7500
Ste-Foy QC G1V 4C7
Tel: (418) 654-2500

McGill University
845 Sherbrooke St. W.
Montréal QC H3A 2T5
Tel: (514) 398-4455

McMaster University
1280 Main St. W.
Hamilton ON L8S 4L8
Tel: (905) 525-9140

Queen's University
99 University Ave.
Kingston ON K7L 3N6
(613) 533-2000

Royal Military College of Canada
Station "Forces"
P.O. Box 17000
Kingston ON K7K 7B4
Tel: (613) 541-6000

Trent University
1600 West Bank Dr.
Peterborough ON K9J 7B8
Tel: (705) 748-1011

University of Alberta
114 Street – 89 Ave.
Edmonton AB T6G 2M7
Tel: (708) 492-3111

University of British Columbia
2329 West Mall
Vancouver BC V6T 1Z4
Tel: (604) 822-2211

University of Manitoba Department of Physics and Astronomy
Winnipeg MB R3T 2N2
Tel: (204) 474-8880

Université de Montréal
C.P. 6128, Succursale A
Montreal QC H3C 3J7
Tel: (514) 343-6111

University of New Brunswick
3 Bailey Dr.
P.O. Box 4400
Fredericton NB E3B 5A3
Tel: (506) 453-4864

University of Ontario Institute of Technology
2000 Simcoe Street North
Oshawa ON L1H 7L7
Tel: (905) 721-3190

University of Ottawa
550 Cumberland
P.O. Box, 450 Stn. A
Ottawa ON K1N 6N5
Tel: (613) 562-5700

University of Saskatchewan Physics Department
116 Science Place
Saskatoon SK S7N 5E2
Tel: (306) 966-4343

University of Toronto – Centre for Nuclear Engineering
Contact: Brian C.
Wallberg Bldg.
184 College Street
Toronto ON M5S 3E5
Tel: (416) 978-2127

University of Victoria Faculty of Engineering
PO Box 3055, EOW 248
Victoria BC V8W 3P6
Tel: (250) 721-8677

University of Western Ontario
1151 Richmond Street
Suite 2
London ON N6A 5B8

University Network of Excellence in Nuclear Engineering (UNENE)
For more information
please contact your local
UNENE representative

World Nuclear University (WNU) Atoms for Sustainable Development
For more information
please visit their website
at www.world-nuclear-university.org

Nuclear Power Plant Operators Bruce Power Inc.
P.O. Box 1540, B32
Tiverton ON N0G 2T0
Tel: (519) 361-7777

Hydro-Québec Gentilly 2 Nuclear Power Station
4900 Becancour Blvd.
Gentilly QC G0X 1G0
Tel: (819) 298-2943

New Brunswick Point Lepreau Generating Station
P.O. Box 600
Lepreau NB E5J 2S6
Tel: (506) 659-2220

Ontario Power Generation Darlington Generation Station Information Centre
P.O. Box 4000
Bowmanville ON L1C 3Z8
Tel: (905) 623-7122

Ontario Power Generation Pickering Generating Station Information Centre
1675 Montgomery Park Rd.
Pickering ON L1V 2R5
Tel: (905) 839-0465

National Organizations Canadian Nuclear Association
130 Albert Street
Suite 1610
Ottawa ON K1P 5G4
Tel: (613) 237-4262

Canadian Nuclear Society (CNS)
700 University Avenue
4th floor
Toronto ON M5G 1X6
Tel: (416) 977-7620

Canadian Nuclear Workers Council
244 Eglinton Ave. E.
Toronto ON M4P 1K2
Tel: (416) 484-4491

CANDU Owners Group
480 University Ave.
Suite 200
Toronto ON M5G 1V2
Tel: (416) 595-1888

The Canadian Centre for Energy Information
201, 322 – 11 Avenue, S.W.
Calgary AB T2R 0C5
Tel: (403) 263-7722

Organization of Canadian Nuclear Industries (OCI)
1730 McPherson Court Unit 2
P:ickering ON L1W 3E6
Tel: (905) 839-0073

INTERNATIONAL ORGANIZATIONS

Commission of the European Communities Nuclear Safety Research Directorate
200, rue de la Loi
B-1049 Brussels, Belgium
Tel: +32 2 2299 11 11

European Nuclear Society
Rue Belliard, 15-17
1040 Brussels, Belgium
Tel: +32 2 505 30 50
Fax: +32 2 502 3902

FORATOM – European
Atomic Forum
Rue Belliard, 15-17
1040 Brussels, Belgium
Tel: +32 2 502 4595
Fax: +32 2 502 3902

International Atomic Energy Agency (IAEA)
Wagramerstrasse 5
P.O. Box 100
A-1400 Vienna, Austria
Tel: +43 12600-0

International Energy Agency (IEA)
9, rue de la Fédération
75739 Paris, Cedex 15 France
Tel: +33 140 5765
Fax: +33 140 57 6559

International Radiation Protection Association (IRPA)
Route du Panorama
BP48-F92263
Fontenay-aux-Roses Cedex
France
Tel: +33 1 46 547 476
Fax: +33 1 40 849 034

(OECD) Organisation for Economic Cooperation and Development Nuclear Energy Agency (NEA)
Le Seine Saint-Germain
12, boulevard des les
F-92130 Issy-les-Moulineaux,
France
Tel: +33 (1) 45 24 82 00
Fax: +33 (1) 45 24 11 10

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)
P.O. Box 500
A-1400 Vienna, Austria
Tel: +43 1 211 31, ext. 4330

World Association of Nuclear Operators (WANO)
Tower House
10 Southampton Street
London, United Kingdom
WC2E 7HA
Tel: +44 (0)20 7451 1520

World Council of Nuclear Workers
49 rue Lauriston
75116 Paris, France
Tel: +33 (0)1 53 70 88 99
Fax: +33 (0)1 53 70 01 08

World Energy Council (WEC)
5th Floor, Regency House
1-4 Warwick St.
London, United Kingdom
SW1B 5LT
Tel: +44 20 7734 5996
Fax: +44 20 7734 5926

World Nuclear Association
12 Floor, Bowater House W.
114 Knightsbridge, London
SW1X 7LJ, UK
Tel: +44 20 7225 0303
Fax: +44 20 7225 0308

World Nuclear Transport Institute
Remo House
310-312 Regent Street
London, W1B 3AX
Tel: +44 (0) 207 580 1144
Fax: +44 (0) 207 580 5365
www.wnti.co.uk

Colin Hunt and Alys Gardner speaking at the seminar held at Aecom. Aecom was one of two Canadian companies in Britain sponsoring the speaker exchange tour. Dr. Garder was the UKNI speaker to Canada in 2017.

Canada's Nuclear Facilities

This list contains, by licence type, power reactors, uranium mine/mill facilities, uranium refineries and fuel fabrication facilities, radioisotope management facilities, research reactors, particle accelerators and radioisotope uses licensed by the Canadian Nuclear Safety Commission in Canada.

Information is based upon Canadian Nuclear Safety Commission licensing information in 2013.

Power Reactor Licences

Facility and Location	Type and Number of Units/Capacity	Startup	Status
Pickering Nuclear Generating Station A Pickering, Ontario (Ontario Power Generation)	CANDU-PHW 2 x 500 MW(e)	1971	Operating
Pickering Nuclear Generating Station A Pickering, Ontario (Ontario Power Generation)	CANDU-PHW 2 x 500 MW(e)	1971	Shutdown To be decommissioned
Pickering Nuclear Generating Station B Pickering, Ontario (Ontario Power Generation)	CANDU-PHW 4 x 500 MW(e)	1983	Operating
Darlington Nuclear Generating Station Bowmanville, Ontario (Ontario Power Generation)	CANDU-PHW 4 x 850 MW(e)	1989	Operating
Bruce Nuclear Generating Station A Tiverton, Ontario (Bruce Power)	CANDU-PHW 4 x 750 MW(e)	1976	Operating
Bruce Nuclear Generating Station B Tiverton, Ontario (Bruce Power)	CANDU-PHW 4 x 840 MW(e)	1984	Operating
Gentilly-2 Nuclear Generating Station Gentilly, Québec (Hydro-Québec)	CANDU-PHW 1 x 600 MW(e)	1983	Shutdown To be decommissioned
Point Lepreau Generating Station Lepreau, New Brunswick (New Brunswick Power Corp.)	CANDU-PHW 1 x 600 MW(e)	1982	Operating

Non-Power Reactor Licences

Unit	Type	In Service	Status
University of Toronto, Toronto, Ontario	Subcritical Assembly	1958	Decommissioned
McMaster University, Hamilton, Ontario	Pool-Type 5 MW(T)	1959	Operating
École polytechnique, Montréal, Québec	Subcritical Assembly	1974	Operating
University of Toronto, Toronto, Ontario	SLOWPOKE-2 20 kW(t)	1976	Decommissioned
École polytechnique, Montréal, Québec	SLOWPOKE-2 20 kW(t)	1976	Operating
Dalhousie University, Halifax, Nova Scotia	SLOWPOKE-2 20 kW(t)	1976	Decommissioned
University of Alberta, Edmonton, Alberta	SLOWPOKE-2 20 kW(t)	1977	Operating
Saskatchewan Research Council, Saskatoon, Saskatchewan	SLOWPOKE-2 20 kW(t)	1981	Operating
Royal Military College, Kingston, Ontario	SLOWPOKE-2 20 kW(t)	1985	Operating
Atomic Energy of Canada Ltd., Chalk River, Ontario	Maple 1 & 2 Reactors 10 MW(t)		Shutdown pending decommissioning

Nuclear Research and Test Establishment Licences

Unit	Type	Status
Chalk River Laboratories (AECL)		
NRX Reactor	42 MW(t)	Decommissioning
NRU Reactor	135 MW(t)	Shutdown March 2018
Recycle Fuel Fabrication Laboratories	Manufacture of small quantities of mixed oxide fuel for research and demonstration	Operating
PTR Reactor	100 W(t)	Decommissioned and released
ZED-2 Reactor	200 W(t)	Operating

Nuclear Research and Test Establishment Licences *(continued)*

Unit	Type	Status
Universal Cells	3 isolation cells for examining radioactive material	Operating
Molybdenum-99 Production Facility	Production of Mo-99 and Xe-133	Operating
Health Physics Neutron Generator	Electrostatic accelerator 150 KeV	Operating
Gamma Beam Irradiator GC60	Irradiation Facility	Operating
Gamma Beam 150 C Irradiation Facility	Irradiation Facility	Operating
Waste Treatment Centre and Associated Facilities	Treatment of solid and liquid waste	Operating
Fuels and Materials Cells	12 isolation cells for examining radioactive material	Operating
Waste Management Areas	Storage and handling of waste	Operating/Shutdown
Nuclear Fuel Fabrication Facility	Production of low enriched uranium fuel for research reactors	Operating
Nuclear Fuel Fabrication Facility	Production of low and high enriched uranium fuel targets for research reactors	Operating
Heavy Water Upgrading Facility	Upgrading of heavy water	Decommissioning
CECEUD Test Facility	Upgrade and detritiate heavy water	Shutdown pending decommissioning
Tritium Laboratory	Processing of tritium	Operating
Whiteshell Laboratories (AECL)		
WR-1 Reactor	Organically cooled experimental reactor	Decommissioning
WL Concrete Canister Storage Facilities	Storage of irradiated fuel	Operating
Van de Graaf Accelerator	Proton accelerator, >30 microamps	Decommissioned
14 MeV Neutron Generator		Decommissioned
Active Liquid Waste Treatment Centre	Treatment of liquid waste	Operating
WL Shielded Facilities	Post irradiated examination of fuels, reactor core components and other	Decommissioning
WL Waste Management Area	Storage and handing of waste	Operating
SLOWPOKE Demonstration Reactor	2 MW pool-type reactor	Decommissioned

Uranium Mine and Mill Facility Licences

Facility	Activity	Status
Beaverlodge, Saskatchewan (Cameco Corporation)	Long-term monitoring	Decommissioned
Cigar Lake Project, Saskatchewan (Cameco Corporation)	Mining	Operating
Cluff Lake, Saskatchewan (AREVA Resources Canada Inc.)	Long-term monitoring	Decommissioned
Key Lake Operation Saskatchewan (Cameco Corporation)	Milling	Operating
McArthur River Project, Saskatchewan (Cameco Corporation)	Mining	Operating
McClean Lake Project, Saskatchewan (AREVA Resources Canada Inc.)	Milling	Operating
Rabbit Lake Saskatchewan (Cameco Corporation)	Mining and milling	Decommissioning
Denison Mines, Elliot Lake, Ontario (Denison Mines Ltd.)	Above-ground tailings	Decommissioned
Stanrock, Elliot Lake, Ontario (Denison Mines)	Above-ground tailings	Decommissioned
Madawaska Bancroft, Ontario (Madawaska Mines Ltd.)	Long-term monitoring	Decommissioned

Canada's Nuclear Facilities *continued from page 37*

Refinery and Fuel Fabrication Facility Licences

Facility	Annual Licensed Production Limit	Status
GE Hitachi Nuclear Energy Canada Inc., Toronto, Ontario	1,800 tonnes of uranium	Operating
GE Hitachi Nuclear Energy Canada Inc., Peterborough, Ontario	1,800 tonnes of uranium	Operating
Port Hope Fuel Manufacturing Facility, Port Hope, Ontario (Cameco)	125 tonnes of UO2	Operating
Blind River Uranium Refinery, Blind River, Ontario (Cameco)	24,000 tonnes of uranium as UO3	Operating
Port Hope Uranium Converstion Facility, Port Hope, Onatario (Cameco)	12,500 tonnes of uranium as uranium hexaflouride 3,800 tonnes of uranium as UO2 1,000 tonnes of uranium as ammonium diuranate 2,000 tonnes of uranium metals	Operating

Waste Management Licences

Facility	Activity	Status
Radioactive Waste Operations Site 1 Tiverton, Ontario (OPG)	Storage of intermediate level radioactive waste from the Douglas Point nuclear reactor in in-ground concrete trenches and tile holes. The licence was amended in July 2006 to include the Spent Solvent Treatment Facility as minor amounts of nuclear substances remain in the facility from the past processing of spent solvents Contaminated with nuclear substances. No new radioactive waste is accepted at the facility.	Storage with surveillance
Western Waste Management Facility, Tiverton, Ontario (OPG)	Processing and/or storage of low level radioactive waste and storage of intermediate level radioactive waste, and processing and storage of spent nuclear fuel from the Bruce NGS	Operating
Pickering Waste Management Facility Pickering, Ontario (OPG)	Processing and storage of spent nuclear fuel from the Pickering NGS and storage of retube components from the Pickering NGS	Operating
Bruce Heavy Water Plant Tiverton, Ontario (OPG)	Decommissioning of the heavy water plant and remediation of the site	Decommissioning
Douglas Point Radioactive Waste Storage Facility Tiverton, Ontario (AECL)	Storage of solid waste from Douglas Point Generating Station, spent fuel storage, no new waste accepted	Storage with surveillance
Gentilly-1 Radioactive Waste Storage Facility Gentilly, Quebec (AECL)	Storage of solid waste from Gentilly-1 NGS, spent fuel storage. No new radioactive waste is accepted.	Storage with surveillance
Gentilly-2 Radioactive Waste Storage Facility Gentilly, Quebec (Hydro-Quebec)	Storage of solid waste and spent fuel storage from Gentilly-2 NGS	Operating
Point Lepreau Solid Radioactive WMF Point Lepreau, New Brunswick (NB Power Nuclear Corporation)	Storage of solid waste and spent fuel storage from Point Lepreau NGS	Operating
Darlington Waste Management Facility Bowmanville, Ontario (OPG)	Processing and storage of spent nuclear fuel from the Darlington NGS	Operating
University of Toronto WMF Toronto, Ontario (University of Toronto)	Storage, handling and compaction of waste from university	Operating
Central Maintenance and Laundry Facility Tiverton, Ontario (Bruce Power)	Managing waste (slightly radioactive clothing materials) from decontamination activities	Operating
Energy Solutions WMF Brampton, Ontario (Energy Solutions Canada)	Storage, handling and compaction of waste from Ontario and Quebec	Operating
Nuclear Power Demonstration WMF Rolphton, Ontario (AECL)	Storage of solid waste from the partial decommissioning of NPD NGS. No new waste accepted.	Storage with surveillance
Port Granby Long-term (LT) WMF Clarington, Ontario (AECL)	Storage of historic waste and chemical treatment of drainage and run-off. No new waste is accepted. Currently undergoing construction.	Storage with surveillance and remediation
Port Hope Long-term (LT) WMF Port Hope, Ontario (AECL)	Storage of historic waste and treatment of drainage and run-off. No new waste is accepted. Currently undergoing construction.	Storage with surveillance and remediation

Waste Management Licences *(continued)*

Facility	Activity	Status
Elliot Lake WMF Elliot Lake, Ontario (Rio Algom Ltd.)	Multiple tailings management site, chemical treatment of effluent. No new waste accepted.	Decommissioned
Port Hope PSE TSS Port Hope, Ontario (Low-Level Radioactive Waste Management Office)	Storage of historic waste	Operating
Port Hope WMF Port Hope, Ontario (Low-Level Radioactive Waste Management Office, Pine St. Extension Temporary Storage Site)	Storage of historic waste no new waste accepted	Storage with surveillance
Roving Locations (Low-Level Radioactive Waste Management Office, decontamination projects)	Possession of historic waste on an as requested basis	Operating
Agnew Lake Idle Mine Site Nairn Centre, Ontario (Ontario Ministry of Northern Development and Mines)	Above-ground tailings	Decommissioned
Dyno Idle Mine Site Bancroft, Ontario (EWL Management Ltd)	Above-ground tailings	Decommissioned
Rayrock Idle Mine Site Northwest Territories (Department of Indian Affairs and Northern Development)	Above-ground tailings	Decommissioned
Port Radium Idle Mine Site Northwest Territories (Department of Indian Affairs and Northern Development)	Above-ground tailings	Decommissioned
Madawaska Bancroft, Ontario (EWL Management Ltd.)	Above-ground tailings	Decommissioned
Bicroft Tailings Storage Facility Bancroft, Ontario (Barrick Gold Corporation)	Above-ground tailings	Decommissioned

Particle Accelerator Licences

Facility	Type	Status
Health PEI Charlottetown, Prince Edward Island	2 linacs	Operating
Region Health Authority B Saint John, New Brunswick	3 linacs	Operating
Centre de santé et de services sociaux de Chicoutimi Chicoutimi, Québec	3 linacs	Operating
Centre universitaire de santé McGill Montréal, Québec	3 linacs	Operating
Hospital Maisonneuve-Rosemont Montréal, Québec	6 linacs	Operating
The Board of Governors of the Kingston General Hospital, Kingston, Ontario	4 linacs	Operating
Thunder Bay Regional Health Sciences Centre Thunder Bay, Ontario	3 linacs	Operating
Windsor Regional Hospital Windsor, Ontario	3 linacs	Operating
Cancer Care Manitoba Winnipeg, Manitoba	7 linacs	Operating
Saskatchewan Cancer Agency Regina, Saskatchewan	3 linacs	Operating
Saskatchewan Cancer Agency Saskatoon, Saskatchewan	3 linacs	Operating
Alberta Health Services Calgary, Alberta	6 linacs	Operating
Alberta Health Services Edmonton, Alberta	5 linacs	Operating
Alerta Health Services Lethbridge, Alberta	2 linacs	Operating
Hôpital Général Juif Montréal, Québec	3 linacs	Operating

Canada's Nuclear Facilities *continued from page 39*

Particle Accelerator Licences *(continued)*

Facility	Type	Status
Cape Breton District Health Authority Sydney, Nova Scotia	2 linacs	Operating
Régie régionale de la santé (Beauséjour) Moncton, New Brunswick	3 linacs	Operating
British Columbia Cancer Agency Kelowna, British Columbia	3 linacs	Operating
British Columbia Cancer Agency Victoria, British Columbia	3 linacs	Operating
British Columbia Cancer Agency Prince George, British Columbia	2 linacs	Operating
British Columbia Cancer Agency Abbotsford, British Columbia	4 linacs	Operating
Cancer Care Ontario St. Catherines, Ontario	3 linacs	Operating
British Columbia Cancer Agency Vancouver, British Columbia	9 linacs	Operating
Eastern Regional Integrated Health Authority (Eastern Health) St. John's, Newfoundland	4 linacs	Operating
Centre hospitalier universitaire de Sherbrooke Sherbrooke, Québec	1 linac	Operating
Centre hospitalier universitaire de Sherbrooke Fleurimont, Québec	3 linacs	Operating
Centre hospitalier universitaire de Québec Québec, Québec	4 linacs	Operating
Capital District Health Authority Halifax, Nova Scotia	3 linacs	Operating
Hamilton Health Sciences Corporation Hamilton, Ontario	10 linacs	Operating
Centre hospitalier de l'Université de Montréal Montréal, Québec	7 linacs	Operating
Centre de sante et services sociaux Champlain-Charles-Le-Moyne Greenfield Park, Québec	4 linacs	Operating
Hôpital régional de Sudbury Sudbury, Ontario	6 linacs	Operating
The Ottawa Hospital Ottawa, Ontario	9 linacs	Operating
Sunnybrook Health Sciences Centre Toronto, Ontario	10 Cyclotron	Operating
Sunnybrook Health Sciences Centre Barrie, Ontario	3 linacs	Operating
Ciment Québec Inc. Saint-Basile, Québec	2 Neutron Generator	Operating
General Fusion Inc. Burnaby, British Columbia	1 Plasma Injector	Operating
Hilliburton Group Canada Inc. Nisku, Alberta	1 Neutron Generator	Operating
Hunter Well Science Ltd. Calgary, Alberta	1 Neutron Generator	Operating
Centre de sante et de services sociaux de Gatineau Gatineau, Québec	3 linacs	Operating
University Health Network Toronto, Ontario	20 linacs	Operating
Grand River Hospital Corporation Kitchener, Ontario	4 linacs	Operating
London Health Sciences Centre London, Ontario	8 linacs	Operating
McMaster University Hamilton, Ontario	1 tandetron accelerator	Operating

Particle Accelerator Licences *(continued)*

Facility	Type	Status
McMaster University Hamilton, Ontario	1 cyclotron	Operating
McMaster University Hamilton, Ontario	1 Van de Graaff	Operating
University of Guelph Guelph, Ontario	1 linac	Operating
University of Western Ontario London, Ontario	1 tandetron accelerator	Operating
Queen's University at Kingston Kingston, Ontario	2 Neutron Generator	Operating
Université de Montréal Montréal, Québec	1 Van de Graaff tandem accelerator 1 tandetron accelerator	Operating Operating
Centre de santé et services sociaux de Laval Laval, Québec	2 linacs	Operating
National Research Council Canada Ottawa, Ontario	2 linacs	Operating
Schlumberger Canada Limited Calgary, Alberta	1 Neutron Generator	Operating
Scientific Drilling International (Canada) Calgary, Alberta	1 Neutron Generator	Operating
Hotwell Canada Ltd. Calgary, Alberta	1 Neutron Generator	Operating
Montreal Neurological Institute and Hospital Montreal, Quebec	1 Cyclotron	Operating
Centre for Addiction and Mental Health Toronto, Ontario	1 Cyclotron	Operating
Centre hospitalier universitaire de Sherbrooke Sherbrooke, Québec	1 Cyclotron	Operating
Hamilton Health Sciences Corporation Hamilton, Ontario	1 Cyclotron	Operating
University of Ottawa Heart Institute Ottawa, Ontario	1 Cyclotron	Operating
Mervex Corporation Stittsville, Ontario	1 linac	Operating
Lakeridge Health Oshawa, Ontario	6 linacs	Operating
PharamaLogic P.E.T. Services of Montreal Company Lachine, Québec	1 Cyclotron	Operating
Southlake Regional Health Centre Newmarket, Ontario	3 linacs	Operating
St. Joseph's Health Care London, Ontario	1 linac	Operating
Vancouver Cancer Centre Vancouver, British Columbia	1 Cyclotron	Operating
Weatherford Canada Ltd. Edmonton, Alberta	1 Neutron Generator	Operating
Winnipeg Regional Health Authority Winnipeg, Manitoba	1 Cyclotron	Operating

Nuclear Substance Processing Facility Licences

Facility	Type	Status
New Processing Facility Chalk River Laboratories Chalk River, Ontario	Production and processing	Operating
Nordion (Canada) Inc., Ottawa, Ontario	Production and processing	Operating
SRB Technologies, Pembroke, Ontario	Processing	Operating
Shield Source Inc., Peterborough, Ontario	Processing	Shutdown

TETRA TECH

Nuclear Energy Services

Tetra Tech is a leading provider of consulting, engineering, and technical services, with more than 50 years of experience in the nuclear industry.

Technical expertise and practical experience

Tetra Tech is an experienced, full-service consulting and engineering firm providing support to the energy industry worldwide. Nuclear power is a vital component to the world's energy future. Tetra Tech's nuclear power practice provides multidisciplinary engineering and consulting services, including engineer-procure-construct (EPC) services, asset management, project management, and technical expertise in nuclear security, condition assessments, and nuclear plant programs.

Tetra Tech supports the entire nuclear project life cycle, from mining through waste management.

Engineering Studies and Design

- Conceptual studies and design requirements
- Preliminary and detailed design
- Radioactive waste management

Project and Construction Management

- Project management
- Work planning
- Procurement
- Field engineering and commissioning

Asset Management and Equipment Reliability

- Plant programs (security, fire protection, and environmental qualification)
- Preventative maintenance optimization
- Condition assessments and aging management

Nuclear Products, Materials and Services

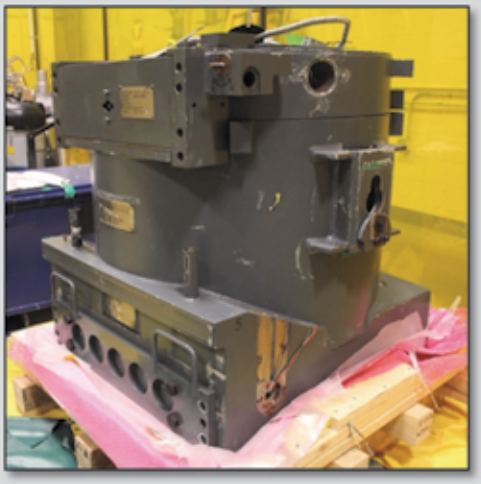
Spend Less...Save More

Reduce • Reuse • Recycle

ISOQAR REGISTERED 0026 UKAS MANAGEMENT SYSTEMS
Certificate Number 968
ISO 9001, ISO 14001

UniTech can reduce your costs!

OFF-SITE TOOL & METAL DECONTAMINATION SERVICES	• REDUCE costs using UniTech's decontamination services. **About ½ the cost of metal melt** • RE-USE tools/equipment rather than re-purchasing. UniTech's decon processes deliver results. • RECYCLE obsolete equipment and metals rather than disposing as radwaste using our high tech monitoring solutions. • Services scalable from 1 package/year to 1 truckload/day. • With our CNSC WNSL we take responsibility for the materials at your site and manage the transport and export. If required, we obtain a non-proliferation license to manage activity or controlled tools.
OFF-SITE LAUNDERABLE PPE AND RESPIRATORY PROTECTION PROGRAMS	• **Don't toss it, WASH IT! Launderable PPE is ½ the price of single-use disposable PPE and creates North American jobs – people who buy electricity.** • Implement without significant costs to capital budgets with a lease program & eliminate all PPE radwaste. • Over 2M uses of our standard ProTech Anti-C dressout used in Canada saving millions of $'s in direct cost.
MOBILE SUPPLY STORE (MSS)	• An MSS added to the laundry program puts consumables through security allowing storage/issue from within the Unzoned Area. • Gets needed items into the worker's hands quickly – no down time waiting for materials coming from the warehouse. • Stocking list is customized to meet customer requirements. • No inventory overhead – only pay for what you use. • Restocked from laundry truck – no security issues. • Secondary packaging dispositioned as value added service.
PROJECT SITE SUPPORT	• Turnkey support for a full range of projects (big and small), project work, combined services, short-term/long-term. • UniTech provides RP, PPE, respiratory protection, TMD, radiological instrumentation, and dosimetry services.
PROJECT PARTNERING	• UniTech provides the expertise, resources and support structure in the areas of RP/PPE/TMD allowing the customer to bid on a wider range of projects.
DECON / CHANGE-OUT TRAILER RENTAL	• Designed to order – clean and hot side, monitoring equipment, calibration, etc. all turnkey on a rental basis. • No decommissioning cost for trailers at the end of the project.
CONTAMINATION MONITOR RENTAL	• When you need to supply instruments for your project, a UniTech rental program can save both time and money. • Can accommodate short/long term (months/years). • Personnel exit monitors, small article monitors, hand held instrumentation, and dosimetry services.
WASTE SORTING	• Trash sorting reclaims usable materials; allows decon / release of metals for recycling; ensures optimum waste efficiency for final processing. All services reduce waste volume and overall cost.



15,000 lb. waste transfer flask (1 of 8) decontaminated and released from a Candu 6 mid-cycle rebuild tool set. 697 crates, 2.4M lbs. exported on 69 trucks.

Verified the absence of radioactivity (including Alpha) on 34 truckloads, 1.1M lbs., of post project scaffolding.

Decontaminated and released a $30M Containerized Winch System (CWS) that was contaminated during a Steam Generator replacement project. Included 1,600 ft of 1¼" cable.

8 U.S. regional decontamination facilities licensed since 1957. 3 facilities servicing Canada since 2001.
Contact us: (800) 344-3824 · info@unitechcdn.com

Nuclear Products, Materials and Services

Nuclear Products, Materials and Services *continued from page 45*

Consultants, Engineering
ANRIC Enterprises Inc. 22
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12
Hatch Ltd.
Niagara Energy Products 62
Nuvia Canada
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Consultants, Environmental
EcoMetrix Incorporated
Hatch Ltd.
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Consultants, Geotechnical
Hatch Ltd.
SNC-Lavalin Inc. 18

Consultants, Management
ANRIC Enterprises Inc. 22
DB2 Consulting Inc..... 45
Hatch Ltd.
RCM Technologies Canada Corp..... 55
Tetra Tech Canada Inc. 42

Consultants, Materials
MarShield Radiation Protection Products..... 52
RCM Technologies Canada Corp..... 55

Consultants, Procurement
BWXT Canada Ltd..... IFC
DB2 Consulting Inc..... 45
Hatch Ltd.
Niagara Energy Products 62
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Consultants, Radiation and Health
EcoMetrix Incorporated
MarShield Radiation Protection Products..... 52
Nuvia Canada
Tetra Tech Canada Inc. 42

Consultants, Seismic
BWXT Canada Ltd..... IFC
Hatch Ltd.
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Consultants, Stress, Thermal, Vibration
ANRIC Enterprises Inc. 22
BWXT Canada Ltd..... IFC
Hatch Ltd.
Kinectrics Inc.
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Containers, Radiation Shielding
Container Products Corporation
E.S. Fox Limited 11
EnergySolutions Canada
MarShield Radiation Protection Products..... 52
Niagara Energy Products 62
Nuvia Canada
SNC-Lavalin Inc. 18

Containers, Shipping
Container Products Corporation
E.S. Fox Limited 11

Containment Structures, Reactor
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42
Thorburn Flex Inc. 14, 60

Control and Absorber Rods
Cameco Fuel Manufacturing

Control Rod Drive Mechanisms
Cameco Fuel Manufacturing

Control Rods
Cameco Fuel Manufacturing

Control Systems, Computerized
RPC Radiy
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Controllers, Programmable
RPC Radiy
Tetra Tech Canada Inc. 42

Controls Modernization
Hatch Ltd.
RPC Radiy

Creative Services
Excentric Agency 47

Kim Rudd, Parliamentary Secretary to the Minister of Natural Resources. Photo by Colin Hunt.

Custom Control Panels
AZZ Industrial
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

D

Data Acquisition & Handling Systems
BWXT Canada Ltd..... IFC

Decommissioning Services
EcoMetrix Incorporated
EnergySolutions Canada
Hatch Ltd.
Nuvia Canada
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42
UniTech Services Group, Inc. 44

Decontamination Services: PCB, Fire/Smoke
UniTech Services Group, Inc. 44

Decontamination, Chemicals, Equipment and Processe
EnergySolutions Canada
Kinectrics Inc.
Nuvia Canada
SNC-Lavalin Inc. 18

Doors, Radiation Shielding
E.S. Fox Limited 11
MarShield Radiation Protection Products 52
Niagara Energy Products 62

Dryers, Vapour Recovery
Tetra Tech Canada Inc. 42

E

Educational Services, Industry
Kinectrics Inc.

Electrical Distribution Equipment
AZZ Industrial
RPC Radiy

Electrical Engineering
Hatch Ltd.
Tetra Tech Canada Inc. 42

Electrical Motors
AZZ Industrial

Electronic Repair and Refurbishment
AZZ Industrial

End Fittings
Laker Energy Products Ltd.
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Engineering Construction
Framatome Canada Ltd.... 12
Hatch Ltd.
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18

Engineering Tools (Design & Operation Support)
SNC-Lavalin Inc. 18

Environmental Qualification
Kinectrics Inc.
Tetra Tech Canada Inc. 42

Nuclear Products, Materials and Services *continued from page 47*

F

Fabrication, Pipe, Nuclear
E.S. Fox Limited 11
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Fabrication, Pipe, Nuclear
Normac Adhesive Products Inc.
Thorburn Flex Inc. 14, 60

Fasteners, Nuclear Quality
Howard Marten Group of Companies
Laker Energy Products Ltd.
Niagara Energy Products 62

Feeder Services
BWXT Canada Ltd..... IFC

Filters, Water, Nuclear
Howard Marten Group of Companies

Fire Protection
Hatch Ltd.
Nuvia Canada
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Flasks, Shielding
MarShield Radiation Protection Products..... 52
Niagara Energy Products 62
SNC-Lavalin Inc. 18

Flasks, Shielding
Cameco Fuel Manufacturing
E.S. Fox Limited 11

Flow Meters
AZZ Industrial
Howard Marten Group of Companies

Flux Monitor Components
Cameco Fuel Manufacturing
RPC Radiy
SNC-Lavalin Inc. 18

Colin Hunt, Alys Gardner, Sarah Beacock in the Box Store of the decommissioned "Golf Ball". This was the prototype reactor for Britain's Advanced Gas-cooled Reactors. The Box Store was where decommissioned parts of the Windscale Advanced Gas-Cooled Reactor were stored temporarily until they could be recycled.

Fuel Channel Components
BWXT Canada Ltd..... IFC
Cameco Fuel Manufacturing
Laker Energy Products Ltd.
Niagara Energy Products 62
SNC-Lavalin Inc. 18

Fuel Element Cladding
Cameco Fuel Manufacturing

Fuel Fabrication
BWXT Canada Ltd..... IFC
Cameco Fuel Manufacturing

Fuel Handling Equipment
BWXT Canada Ltd..... IFC
Laker Energy Products Ltd.
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42
Thorburn Flex Inc. 14, 60

Fuel Manufacture
BWXT Canada Ltd..... IFC
Cameco Fuel Manufacturing

Fuel Support Assemblies
BWXT Canada Ltd..... IFC

Fuel, Power Reactors
Cameco Fuel Manufacturing

Fuel, Research Reactors
Cameco Fuel Manufacturing

Fuelling Machine Carriages
BWXT Canada Ltd..... IFC

Fuelling Machine Heads
BWXT Canada Ltd..... IFC
Laker Energy Products Ltd.
SNC-Lavalin Inc. 18
Thorburn Flex Inc. 14, 60

Fusion Research & Development Services
Hatch Ltd.
SNC-Lavalin Inc. 18

Fusion Studies
Hatch Ltd.

Fusion System Design Services
SNC-Lavalin Inc. 18

G

Gamma Detectors
LND Inc. 50
Mirion Technologies (IST Canada) Inc. .....OBC

Gamma Flux Mapping Systems
Mirion Technologies (IST Canada) Inc. .....OBC

Gamma Spectroscopy
Nuvia Canada

Gaskets, Nuclear
Niagara Energy Products 62

Gauges, Density, Nuclear
LND Inc. 50

Gauges, Level, Nuclear
AZZ Industrial

Glass, Radiation Shielding
MarShield Radiation Protection Products..... 52

Glove Box Supplies
UniTech Services Group, Inc. 44

Glove Boxes
E.S. Fox Limited 11

Graphic Design Services
Excentric Agency 47

H

Harsh Environment Qualification Testing
AZZ Industrial
Kinectrics Inc.

Headers, Reactor
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Health Physics
Nuvia Canada
SNC-Lavalin Inc. 18
UniTech Services Group, Inc. 44

Heat Exchanger Tubes
DB2 Consulting Inc..... 45

Heat Exchangers
BWXT Canada Ltd..... IFC

Heat Exchangers, Nuclear
AZZ Industrial
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12

Heat Flux Measurement
RdF Corporation

Heat Treatment
Cameco Fuel Manufacturing

Heater Controls SCR Power
Henry Controls Inc.

Heating, Ventilating, Air Conditioning Systems
AZZ Industrial
E.S. Fox Limited 11

Heavy Tungsten Alloy
MarShield Radiation Protection Products 52

Heavy Water Plants
SNC-Lavalin Inc. 18

Hot Cells and Hot Labs, Equipment & Services
Nuvia Canada

Human Factors
DB2 Consulting Inc..... 45
SNC-Lavalin Inc. 18

Hydraulic Nuts & Bolts
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

I

Inspection Devices, Remote
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12
Kinectrics Inc.
SNC-Lavalin Inc. 18

Inspection Services
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12
Kinectrics Inc.
SNC-Lavalin Inc. 18
Team Industrial Services 20

Instrumentation Seismic
AZZ Industrial
RPC Radiy
SNC-Lavalin Inc. 18

Instrumentation, Specialized
Hoskin Scientific Ltd. 53

Insulation, Radiation
Niagara Energy Products 62

Ion Exchangers
BWXT Canada Ltd..... IFC

Irradiation Services
McMaster Nuclear Operations & Facilities
SNC-Lavalin Inc. 18

J

Journalists, Nuclear
CGH Publications Inc.

L

Laboratories, Analytical
Kinectrics Inc.

Laboratories, Chemical
McMaster Nuclear Operations & Facilities

Laboratories, Testing
Kinectrics Inc.

Laundry, Contaminated Clothing
UniTech Services Group, Inc. 44

Leak Testing, Sealed Sources
Stuart Hunt and Associates Ltd.

Licensing Support
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Liquid Zone Controls
Cameco Fuel Manufacturing

Loss of Coolant Accident Testing
Kinectrics Inc.

Lubrication Systems
Howard Marten Group of Companies

Nuclear Products, Materials and Services *continued from page 49*

M

Machining, Nuclear Quality
E.S. Fox Limited 11
Kinectrics Inc.
Laker Energy Products Ltd.
MarShield Radiation Protection Products 52
Niagara Energy Products 62
Team Industrial Services 20
Thorburn Flex Inc. 14, 60

Main Seam Line Break Testing
Kinectrics Inc.

Maintenance Equipment
Howard Marten Group of Companies
SNC-Lavalin Inc. 18

Maintenance Management
BWXT Canada Ltd..... IFC
Tetra Tech Canada Inc. 42

Maintenance Services
BWXT Canada Ltd..... IFC
E.S. Fox Limited 11
SNC-Lavalin Inc. 18

Marketing Services
Excentric Agency 47

Materials Handling Equipment
Hatch Ltd.
Howard Marten Group of Companies

Metal Fabrications, Nuclear
Cameco Fuel Manufacturing
Container Products Corporation
E.S. Fox Limited 11
MarShield Radiation Protection Products 52
Thorburn Flex Inc. 14, 60

Metal Hose Assemblies
Thorburn Flex Inc. 14, 60

Metrology Calibration Test & Measurement
Kinectrics Inc.
SNC-Lavalin Inc. 18

Modification Installation Services
E.S. Fox Limited 11

Monitoring Systems, On-Line
RPC Radiy
SNC-Lavalin Inc. 18

Monitors, Area, Gamma
LND Inc. 50

Monitors, Containment
SNC-Lavalin Inc. 18

Monitors, Radiation, General
LND Inc. 50
Nuvia Canada
Stuart Hunt and Associates Ltd.

Monitors, Radiation, Portal
LND Inc. 50

Monitors, Vibration
Tetra Tech Canada Inc. 42

Motor Control Centres
AZZ Industrial

N

Neutron Absorption
MarShield Radiation Protection Products 52

Neutron Activation Analysis Services
McMaster Nuclear Operations & Facilities

Neutron Detectors
LND Inc. 50
Mirion Technologies (IST Canada) Inc. .....OBC
SNC-Lavalin Inc. 18

Neutron Flux Mapping Systems
Mirion Technologies (IST Canada) Inc. .....OBC
SNC-Lavalin Inc. 18

Neutron Radiography
McMaster Nuclear Operations & Facilities

Non-Destructive Examination
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12
MarShield Radiation Protection Products 52
Niagara Energy Products 62

Non-Destructive Testing
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12
Hatch Ltd.
Kinectrics Inc.
LND Inc. 50
Niagara Energy Products 62
SNC-Lavalin Inc. 18
Team Industrial Services 20

Non-Destructive Testing Equipment
Team Industrial Services 20

Non-Lead-Alternative
MarShield Radiation Protection Products 52

Nuclear Instrumentation Systems
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Nuclear Medicine Equipment
MarShield Radiation Protection Products 52

Nuclear Qualified Heat Shrink Sleeving
Kanata Electronic Services Limited

O

Operators, Nuclear Valves
AZZ Industrial
Normac Adhesive Products Inc.

Other
Normac Adhesive Products Inc.

Outage Support
E.S. Fox Limited 11
Framatome Canada Ltd.... 12
Kinectrics Inc.
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

P

Packings, Mechanical, Nuclear Grade
AZZ Industrial

Penetrations, Containment, Electrical
Mirion Technologies (IST Canada) Inc. .....OBC
SNC-Lavalin Inc. 18

Penetrations, Containment, Mechanical
Thorburn Flex Inc. 14, 60

Pipe Fittings, Nuclear Grade
Laker Energy Products Ltd.
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Piping Analysis
ANRIC Enterprises Inc. 22
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12
Hatch Ltd.
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42
Thorburn Flex Inc. 14, 60

Piping Supports
Laker Energy Products Ltd.
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Piping, Nuclear Grade
ANRIC Enterprises Inc. 22
Laker Energy Products Ltd.
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Plant Life Management Services
Kinectrics Inc.
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Plant Upgrades and Uprates
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18

Eleodor Nichita was a keynote speaker at the 8th International Conference On Simulation Methods In Nuclear Science And Engineering in October 2018. Photo by Colin Hunt.

Nuclear Products, Materials and Services *continued from page 51*

S

Nuclear Products, Materials and Services *continued from page 53*

A handful of antinuclear demonstrators outside the 1st International Conference on Generation IV and Small Reactors held November 6-8, 2018 in Ottawa. Photo by Colin Hunt.

T

Nuclear Products, Materials and Services *continued from page 55*

Tritium Processing
Kinectrics Inc.
Laker Energy Products Ltd.
SNC-Lavalin Inc. 18

Tube Expanders
Thorburn Flex Inc. 14, 60

Tube Fittings
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Tube Supports
Howard Marten Group of Companies

Tubes, Calandria
BWXT Canada Ltd..... IFC
Cameco Fuel Manufacturing
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Tubes, Pressure
BWXT Canada Ltd..... IFC
Niagara Energy Products 62
Thorburn Flex Inc. 14, 60

Tubes, Testing
BWXT Canada Ltd..... IFC

Tubing, Nuclear Instrumentation
Laker Energy Products Ltd.

Tubing, Steam Generators
Thorburn Flex Inc. 14, 60

Tubing, Zircaloy, Reactor Grade
Cameco Fuel Manufacturing

Tungsten Machined Parts
MarShield Radiation Protection Products..... 52

Turbine/Generators
Thorburn Flex Inc. 14, 60

Turbines
Thorburn Flex Inc. 14, 60

Type A" Containers"
Container Products Corporation

U

Underground Engineering Services
Tetra Tech Canada Inc. 42

Uninterruptible Power Supply Systems
AZZ Industrial
Henry Controls Inc.

Uranium Mining & Milling
EcoMetrix Incorporated
Tetra Tech Canada Inc. 42

Uranium, Conversion Services
Tetra Tech Canada Inc. 42

Urinalysis
Kinectrics Inc.

V

Valve Operators
AZZ Industrial

Valve Stations
Normac Adhesive Products Inc.

Valve, Engineering and Testing
BWXT Canada Ltd..... IFC
Hatch Ltd.
RCM Technologies Canada Corp..... 55
SNC-Lavalin Inc. 18
Tetra Tech Canada Inc. 42

Valves (Nuclear Quality) & Valve Repair
AZZ Industrial
BWXT Canada Ltd..... IFC
Framatome Canada Ltd.... 12
Henry Controls Inc.
Laker Energy Products Ltd.
Niagara Energy Products 62
Normac Adhesive Products Inc.
SNC-Lavalin Inc. 18
Team Industrial Services 20

Valves, Non-Nuclear
BWXT Canada Ltd..... IFC
Niagara Energy Products 62
Team Industrial Services 20

Vanadium
SNC-Lavalin Inc. 18

Vanadium FNX Detectors
SNC-Lavalin Inc. 18

Vessels, Pressure
BWXT Canada Ltd..... IFC
E.S. Fox Limited 11
Niagara Energy Products 62
RCM Technologies Canada Corp..... 55
Thorburn Flex Inc. 14, 60

Vibration
Hatch Ltd.
Thorburn Flex Inc. 14, 60

Hundreds were in attendance af G4SR-1 conference for the unveiling of the SMR Roadmap by the Government of Canada. It was the first new policy announcement by the federal government on new nuclear power technology in decades. Photo by Colin Hunt.

W

Z

Technical Chair Paul Spekkens briefs the technical session chairs during the 2018 CNS Annual Conference in Saskatoon. Photo by Colin Hunt.

UNENE · REUGN

University Network of Excellence in Nuclear Engineering
Réseau d'Excellence Universitaire en Génie Nucléaire

What the UNENE Universities offer...

- Cutting-edge nuclear research giving real-world post-graduate training.
- Education: A Master of Engineering Degree from one of the member universities.
  - Courses tailored to individuals already working in the nuclear industry, and delivered on weekends in Whitby and via distance learning for all courses, so as not to conflict with core working hours.
  - For the degree 10 courses, or 8 courses and an Engineering Project, must be successfully completed over a period of 5 years.
  - A nuclear engineering diploma. The diploma is a four-course subset of the M.Eng.
  - A student can take just one or a few courses rather than the full program.
  - Students must be registered as graduate students in one of the participating universities.
  - Possibilities also exist to offer courses at a location close to an organization enrolling more than 6 students.
  - Training courses are under development. These can be offered at the site of an organization registering at least 10 students.

The courses comprise:

- ☐ Nuclear Plant Systems and Operations
- ☐ Reactor Physics
- ☐ Heat Transport System Design
- ☐ Nuclear Reactor Safety Design
- ☐ Nuclear Materials
- ☐ Control, Instrumentation and Electrical Systems in CANDU Power Plants
- ☐ Engineering Risk and Reliability
- ☐ Fuel Engineering
- ☐ Fuel Management
- ☐ Operational Health Physics
- ☐ Reactor Chemistry and Corrosion
- ☐ Project Management
- ☐ Waste Management
- ☐ Power Plant Thermodynamics

PLUS: Refresher mini-courses prior to the core subjects.

[1]Prospective students are advised that offers of admission to a new program may be made only after the university's own quality assurance processes have been completed and the Ontario Universities Council on Quality Assurance has approved the program.

Who we are...

The University Network of Excellence in Nuclear Engineering (UNENE) is an alliance of universities, nuclear power utilities, research and regulatory agencies for the support & development of nuclear education, research and development capability in Canadian universities.

UNENE's mission is to assure a sustainable supply of qualified nuclear engineers and scientists, and to build and apply university experience to meet the current and future needs of the Canadian nuclear industry.

For more information, please:

- contact UNENE directly at unene@mcmaster.ca
- visit our website **www.unene.ca**
- email our President, Jerry Hopwood jerry.hopwood1@gmail.com
- email our Programme Director, Nik Popov nik.popov@rogers.com

UNENE · REUGN
University Network of Excellence in Nuclear Engineering
Réseau d'Excellence Universitaire en Génie Nucléaire

Suppliers' Addresses and Contacts

Serving CANDU Reactors Worldwide

Thorburn Flex Inc

Flexible Piping Specialist

Since its conception over 50 years ago, Thorburn has become a world leader in the design and manufacture of precision machined hose assemblies, quick couplings, adapters & swivel joints. Operating under a strategy of global presence in the CANDU Nuclear Industry, Thorburn is structured to consistently meet and exceed customers expectations in quality, value and service.

NGS Installations:
- OPG Pickering (8 Units)
- OPG Darlington (4 Units)
- OPG/BP Bruce (8 Units)
- HQ Gentilly (1 Unit)
- NB Power Point Lepreau (1 Unit)
- Cernavoda Romania (2 Units)
- Quinshan China (2 Units)
- Wolsong South Korea (4 Units)
- Embalse Argentina (1 Unit)

Designers and OEM's:
- AECL
- GE Canada
- SNC-Nuclear
- CANDU Energy
- AREVA

Products:
- D_2O primary & auxiliary hose assemblies
- D_2O drum adapter assemblies
- Metallic & rubber hose assemblies for F/M catenary systems
- F/M head fluid quick couplings
- Flexible piping assemblies for ion exchangers
- Water treatment flexible piping assemblies
- Metallic braided hose assemblies for steam service
- Flexible piping & quick couplings for cryogenic systems

Registered Quality Systems:
- CSA N285.0, B51, CAN3 Z299.3
- ASME B31.1, B31.3
- ASME U Stamp
- ASME NCA4000 NQA-1 NPT Stamp (In Progress)
- ISO 9001:2008
- CRN for all Canadian Provinces

Quality Systems

Thorburn Flex Inc
173 Oneida, Pointe-Claire, Quebec
Canada, H9R 1A9

Tel: +1-514-695-8710
Fax: +1-514-695-1321
sales@thorburnflex.com

Thorburn hose assemblies on a CANDU catenary system

Custom Metallic & Non-Metallic Hose Assemblies

For catenary, fueling machine, D_2O primary & auxiliary service. Registered & designed to ASME/N285.0 Classes 2, 3 & 6.

Thorburn quick couplings on a CANDU fueling machine

NT92 Valved Dry Break Quick Couplings

Designed to address the challenges associated with dry break disconnect for D_2O & resin transfer.

Fueling machine with Thorburn quick couplings & hose assemblies

NT71 Dry Break Fueling Machine Quick Couplings

Designed to provide dry break disconnect for F/M service. Registered & designed to ASME/N285.0 Classes 2, 3 & 6.

2500 psi steam piping system with Thorloc 316SS 4 inch connector

THORLOC Pipe Clamp Connector

Sizes up to 4" (DIN 100). Withstands bending, tension & compression loads. Registered and designed to ASME/N285.0 Classes 1, 2, 3 & 6.

Suppliers' Addresses and Contacts

ANRIC Enterprises Inc. 22

701 Evans Ave., Ste. 202
Toronto, Ontario
M9C 1A3
Canada

Richard Barnes
President
Tel: 416-253-9459
Email: rwbarnes@anric.com

AZZ Industrial

560 Horizon Drive, Suite 100
Suwanee, Georgia
30024
USA

Douglas Shuda
Director of Marketing
Tel: 678-728-9304
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