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CNS President’s Report
By Peter Ozemoyah

2017 was an outstanding year for the Canadian Nuclear Society (CNS) and the Canadian nuclear community. In the larger Canadian sphere, our industry had strong, positive experience with the ongoing refurbishment of Darlington Unit 2, accompanied by the go-ahead for Darlington Unit 3 by the Ontario government. Taken together with Bruce Power’s program for the refurbishment of six of their reactors, maintaining eight unit operation, nuclear power will remain the dominant source of electricity in Canada’s industrial heartland past the mid-point of this century.

For the first time in more than 50 years, we have the prospect before of new nuclear power development. By the end of this past summer, there were at least seven applications before the Canadian Nuclear Safety Commission (CNSC) seeking approval for new small modular reactor designs. Canadian Nuclear Laboratories (CNL) had also received nearly one hundred expressions of interest in partnerships for new reactor development.

Much of this new development was reflected in the CNS as well. The continued growth of our conferences and courses continued in 2017 with our 37th Annual CNS Conference and 41st CNS/CNA Annual Student Conference held in Niagara Falls. This very successful conference was accompanied by a large number of other events during the year:

- 2nd International CNS Conference on Fire Safety and Emergency Preparedness in the Nuclear Industry;
- 1st Student Job Fair for the Nuclear Industry;
- CANDU Reactor Technology and Safety Course;
- CANDU Thermalhydraulics Course;
- CANDU Fuel Technology Course;
- Nuclear 101 Course;

Particular attention should be given to our first ever student job fair. Superbly organized by Jacques Plourde, this was held at UOIT/Durham College in Oshawa. With more than 600 students registered, it attracted the largest number of students who have ever participated in any CNS event.

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 2017, the UKNI speaker Dr. Alys Gardner visited a large number of the CNS branches this past fall. The CNS will be reciprocating in 2018 with a CNS speaker visiting the UKNI chapters in the United Kingdom.

With respect to public activity, the CNS gave a strong presentation at the operating license renewal hearing of the Point Lepreau station. In fact, for the first time ever, the CNS presentation made strongly positive public news in New Brunswick for its support of former Premier Frank McKenna’s call for new nuclear power at Point Lepreau. Past President Peter Ozemoyah, and Colin Hunt and Peter Easton are to be thanked for their contributions to the CNS regulatory activity during the year.

2017 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 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 which make possible all of the volunteer’s time to make our programs happen.

I also would like to thank Dr. Peter Ozemoyah for his successful leadership in 2016-2017. I congratulate Dr. John Luxat for taking on the role of President starting in 2018, to wish him all the best during his tenure, and to offer him my support throughout the year.

Dan Gammage

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FROM THE MEN AND WOMEN WHO HELP KEEP THE LIGHTS ON.
2017 Year in Review
By Colin Hunt, Publisher and Editor, Nuclear Canada Yearbook

Introduction
2017 has been a highly successful year for Canada’s nuclear industry. The year included ongoing construction on the refurbishment of Darlington Unit 2, strong performance by Canada’s nuclear reactor fleet, and the release and acceptance of Canadian Nuclear Laboratories’ (CNL) long term development plan for Chalk River Laboratories.

Consistent with its science and technology mandate, CNL unveiled its plan for redevelopment of the Chalk River site. The plan envisions decommissioning and removal of most of the more than 100 small, old research buildings, many dating back to the 1940s, from the site. They will be replaced by a large new campus of five buildings better suited to CNL’s new research and development activities.

Nuclear operations in Canada also had a year of strong performance as shown in the data tables later in this Yearbook. Nine 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 Point Lepreau, Pickering 6, Bruce Units 1, 2, 4, 7, 8, and Darlington Units 3 and 4.

Several observations should be noted here. First, the outstanding performance of the Bruce A reactors shows that reactors that 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.

This trend holds true for Pickering as well. During 2017, four 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

Nuclear Research in Canada
For the first time in decades, CNL solicited expressions of interest in other organizations interested in the development of new nuclear reactor technology. Issued in the spring of 2017, the request generated strong interest both in Canada and around the world. What CNL offered was research and development assistance and a site in which to host prototypes of new, advanced reactor technology.

CNL received more than 80 responses to its request. These included 19 requests to site demonstration or prototype reactors at Chalk River. Responses came from a broad range of stakeholders, including SMR technology developers, potential end users, host communities, supply chain companies and academic institutions. The new designs featured enhanced safety systems and greater levels of efficiency, while at the same time reducing capital costs. Many also proposed novel fuel types and engineered systems; these aspects will require intensive study and investigation prior to licensing and ultimately deployment. Responses to the report also explored the possibilities of the potential of SMR technology beyond the generation of electricity.

The request resulted in seven applications to Canadian Nuclear Safety Commission (CNSC) for approval in principle of their designs, and one design had received affirmation from the CNSC by the end of 2017.

Nuclear Operations in Canada
Nuclear plant operations in Canada were strong throughout 2017. Nine 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 Point Lepreau, Pickering 6, Bruce Units 1, 2, 4, 7, 8, and Darlington Units 3 and 4.

2017 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 Dan Gammage, and by the CNS Education and Communications and CNS Program Committees.

Colin Hunt

CANDU 6 Nuclear Reactor Performance – 2017

<table>
<thead>
<tr>
<th>Reactor</th>
<th>In Service</th>
<th>Capacity (MW)</th>
<th>Performance in 2017 (%)</th>
<th>Lifetime Performance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point Lepreau</td>
<td>1983</td>
<td>705</td>
<td>89.1</td>
<td>70.5</td>
</tr>
<tr>
<td>Wolsong 1*</td>
<td>1983</td>
<td>679</td>
<td>40.4</td>
<td>72.6</td>
</tr>
<tr>
<td>Wolsong 2</td>
<td>1987</td>
<td>678</td>
<td>90.0</td>
<td>92.4</td>
</tr>
<tr>
<td>Wolsong 3</td>
<td>1998</td>
<td>698</td>
<td>32.7</td>
<td>89.9</td>
</tr>
<tr>
<td>Wolsong 4</td>
<td>1999</td>
<td>703</td>
<td>99.2</td>
<td>94.0</td>
</tr>
<tr>
<td>Embalse</td>
<td>1983</td>
<td>648</td>
<td>0</td>
<td>74.0</td>
</tr>
<tr>
<td>Cernavoda 1</td>
<td>1996</td>
<td>707</td>
<td>96.3</td>
<td>90.1</td>
</tr>
<tr>
<td>Cernavoda 2</td>
<td>2007</td>
<td>705</td>
<td>89.5</td>
<td>94.0</td>
</tr>
<tr>
<td>Qinshan 4</td>
<td>2002</td>
<td>700</td>
<td>76.6</td>
<td>89.8</td>
</tr>
<tr>
<td>Qinshan 5</td>
<td>2003</td>
<td>700</td>
<td>94.4</td>
<td>91.5</td>
</tr>
</tbody>
</table>


Notes
units. Like the Bruce A reactors, Pickering's performance has been strong for a number of previous years. This greatly improved performance of Pickering 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 2017, more than 63 per cent of Ontario's electricity was supplied by its 18 operating nuclear reactors. It is noteworthy that this is a higher proportion of nuclear-generated electricity in Ontario than at any time since the early 1990s. This performance was achieved even though two reactors, Pickering Units 2 and 3, were removed from service in 1998.

It is also noteworthy that two of the nine outstanding units, Bruce 1 and 2, had been fully refurbished. This has also lent confidence to the idea that refurbishment programs result in safer, better nuclear reactor performance than prior to refurbishment and justifies both OPGs and Bruce Power's investments in such work.

The refurbishment program at Ontario Power Generation's (OPG) Darlington 2 continued throughout 2017. At one point during the year, the project was 30 days ahead of schedule and on budget. By December 19, 2017, the project for Unit 2 was 40 per cent complete. As OPG President Jeffrey Lyash noted at the time, "Projects which begin well tend to end well."

During the year, Bruce Power also revealed the schedule for its Major Component Replacement Program. The work will begin in 2020 with Unit 6, to be followed by Unit 7. Over the course of the next decade all Bruce Units 3-8 will be refurbished sequentially. Bruce Power has been and will be continuing to conduct refurbishment work on its units in a manner that does not require long term outages for replacement of large components. Bruce Power President Mike Renchek has indicated that when completed the program will enable Bruce Power reactors to continue in service until the mid-2060s.

In summary, the completion of nuclear refurbishment in Ontario means that nuclear power will continue to generate the bulk of the province's non-emitting, reliable and dispatchable electricity production well past the mid-point of this century.

New Global Prospects for CANDU

Turning to CANDU reactors outside Canada, the fleet performed well with five reactors, Wolsong 2 and 4, Cernavoda 1 and 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. At this time, the refurbishment of Embalse in Argentina is ongoing, with return to service expected in 2018. SNC Lavalin Nuclear also has strong prospects for new nuclear work in Argentina, having completed a pre-project assessment for what may be Argentina's fourth nuclear reactor, Atucha 3, in 2016. Work on this project continued in 2017; if launched, it will be the first new CANDU reactor since the completion of Cernavoda 2 in Romania in 2007.

Canadian Government Nuclear Policy

Federal and provincial policy on commercial nuclear power developed during 2017 as well. The year commenced with a series of hearings in 2016 by the House of Commons Natural Resources Committee on the current state and future development of nuclear power in Canada. The Canadian Nuclear Society was summoned on the first day of hearings to testify on its views about the current and future state of the industry.

By the middle of 2017, the Committee had produced a detailed report. It noted that nuclear power was one of Canada's strategic economic strengths. It recommended strongly the support of small modular
reactors (SMRs) as a means of providing reliable electricity to remote locations within Canada, particularly remote mining and other industrial sites, as well as Northern off-grid communities.

The support for nuclear power on an economic basis was supported by two reports during the year, one from the Financial Accountability Officer (FAO) of Ontario, and the other from the Fraser Institute. The FAO report, concluded that refurbishing Ontario’s four reactors at Darlington and six at Bruce is the best supply option for new electricity generation in the province. It also noted that the cost of refurbishment would be $80.70/MWh to 2064, substantially lower than cost of natural gas, wind, solar or bioenergy, as well as the province’s average power cost of $115/MWh from all sources.

Ontario Energy Minister Glenn Thibeault indicated that there was no alternative to nuclear power in Ontario that could be installed with comparable cost; as well, the Ontario Energy Board observed that options for importing electricity from Quebec were also limited and noted that Hydro-Quebec expects lower surplus electricity to be available in the future.

For its part, the Fraser Institute also weighed in during the year on Ontario electricity costs, which it could be expected to rise over the next two decades. It found that the revenues paid for power generation were: Hydro $58/MWh, Nuclear $66/MWh, Wind $140/MWh, and Solar $480/MWh.

However, the Fraser Institute also found that provincial generating capacity also rose despite an overall decline in electricity consumption. It attributed this increased generating capacity to the need for additional gas-fired generation to backstop wind and solar generation which, being intermittent, require such backup power capability. Together, wind and solar account for less than 9 per cent of Ontario’s electricity supply and thus, according to the Fraser Institute, have a disproportionate impact on electricity prices and future increases, principally because of the need for backup generation, principally from gas plants.

Taken together, these two reports supported strongly the Ontario government’s decision to proceed with the refurbishment of Darlington, as well as Bruce Power’s decision to proceed at Bruce; a particularly significant decision as the refurbishment program is funded by private capital.

The activity and strong performance of Canada’s nuclear technology led to initiatives at the federal government level as well. The most notable event was the leadership of Kim Rudd, Parliamentary Secretary to the Minister of Natural Resources, with responsibility is for all things nuclear. During 2017 she led the Canadian delegation to the Clean Energy Ministerial (CEM), an international meeting of energy ministers. Canada was an initiating member of this meeting, and she urged international co-operation in raising the profile of nuclear energy as a clean, safe, reliable and economic energy source. At this time, she had agreement with the United States and Japan to raise the profile of nuclear power.

Canada will be the host of the CEM meeting in 2019.

New Sources for Radioisotopes

With the impending shutdown of NRU (Nuclear Research Universal) research reactor at Chalk River in 2018, there were a number of new arrangements made for new radioisotope supply in 2017. One of the most prominent of these was the agreement among Bruce Power, Nordion and Cameco Corporation.

At this time, most of the world’s supply of Cobalt-60 is produced in Ontario. Nearly all of this was produced at the NRU reactor. During 2017, the three companies agreed that new Cobalt-60 would be produced in the power reactors at Bruce. Cameco Fuel Manufacturing Inc. would fabricate the new fuel bundles with cobalt, to be shipped to Bruce for irradiation. The irradiated cobalt will then be sent to Nordion in Kanata for manufacture into new Cobalt-60 sources.

One of the most interesting developments during the year was the announcement by OPG of its agreement with NASA (National Aeronautics and Space Administration) to provide new sources of Plutonium-238. By 2017 NASA had less than 35 kg of Pu-238 remaining in its inventory for use in its deep space probes, of which only 1 kg was usable.

Pu-238 is essential for deep space probes as a power supply. Typically a probe needs 4.5 kg of Pu-238 for its thermoelectric generator. It is also needed to keep scientific instruments warm enough in space to function. As the strategic facilities to produce Pu-238 in the United States no longer existed, it cannot produce the isotope domestically. In short, the United States was out of space fuel, prohibiting any future manned or unmanned space exploration.

In 2017, OPG President Jeffrey Lyash announced that OPG will be providing new supplies of Pu-238 starting in 2020.

New Developments in Waste Management

Canada’s plan for the long term management of used nuclear fuel took a large step forward in 2017. The Nuclear Waste Management Organization (NWMO) began borehole drilling at Ignace Ontario, to obtain geologic core samples to help determine site suitability.

At this time, approximately half a dozen Ontario communities remain as potential active sites, for selection. Acceptance of locating a permanent deep geologic waste site for long-term storage of Canada’s high level radioactive wastes, is, and will be entirely voluntary on the part of any community participating in the selection process.

Also during 2017, CNL revealed its plans for management of low level wastes at the Chalk River site. The renovation of the laboratories will produce large amounts of very low level radioactive wastes, including concrete, flooring, siding and similar rubble from the removal of old buildings.
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CNL has produced its plan to manage these volumes of irradiated material, the Near Surface Disposal Facility (NSDF), with the environmental assessment of the plan expected to begin in 2019.

The CNS in 2017
The Canadian Nuclear Society (CNS) has also had a very successful year in 2017. Of particular note is the strong and growing program of courses and conferences offered by the CNS. Two conferences specifically were outstandingly successful: the 2nd CNS International Conference on Fire Safety and Emergency Preparedness in the Nuclear Industry; and, the 11th International Conference on CANDU Maintenance and Nuclear Components. Details of these conferences can be found later in this Yearbook in the report by the Program Chair.

The CNS launched a new event in 2017, the Student Job Fair for the Nuclear Industry in October 2017. This event was held at Durham College in Oshawa, and it was the first such event held in Canada. More than 600 registrants attended, the most students ever attracted to any CNS event. The CNS will now hold the job fair as an annual event.

With respect to public information, as mentioned earlier, the CNS was requested to testify in November 2016 at the hearings on the current state of Canada’s nuclear industry by the House of Commons Standing Committee on Natural Resources. The Committee’s report was tabled in Parliament in June 2017, and the government’s response was tabled and released in October. The CNS was significantly quoted in the Committee report, and its views were reflected extensively in the Committee recommendations. The government response endorsed the Committee’s findings.

In Closing
Governments in Canada made a number of policy decisions about nuclear power and technology starting in 2015, including its recognition by the Federal Government as a non-emitting, reliable source of electricity. Implementation of them began in 2016 and carried through in 2017. During the past year, we have seen the success to date in the project to refurbish Darlington 2 and the Ontario government’s decision, based in part on that success, to continue with Darlington 3.

As mentioned earlier, all three nuclear operating utilities in Canada finished 2017 with strong performances of their nuclear fleets. This strong performance was mirrored by the operators of CANDU reactors outside Canada as well. For approximately the next half-century, Canadian nuclear power reactors are likely to remain as dominant sources of electricity within their respective jurisdictions.

Beyond CANDU, we have seen new developers emerge with new reactor technologies and configurations coming to Canada seeking partnerships. During 2017, the first of these was accepted in principle by the CNSC as in conformity with Canadian safety standards. With the ongoing renovation of Chalk River Laboratories, Canada is well-placed as an international partner of choice for the development and possibly demonstration of new nuclear reactor prototypes.

It’s not happening by accident. Canada is one of the few nations in the world possessing research and manufacturing facilities and personnel to carry out the full spectrum of the research and development required for the successful completion of the various new nuclear technologies. Just as in the late 1940s, Canada is emerging again as a world leader in nuclear science and development. Before many more years have passed, the future may well see Canadian nuclear fuel powering the probes that will carry out the further exploration and development of near-Earth space and the outer reaches of the solar system.
Education and Communications Committee Report for 2017
By Ruxandra Dranga and John Roberts, Co-Chairs Education and Communications Committee

In 2017 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.

Geiger Kits to High Schools across Canada
CNS thanks the Canadian Nuclear Safety Commission (CNSC) for a generous grant given specifically in support of the Geiger Program. Bryan White, who is the single point of contact between the CNS and high schools across Canada that have a Geiger kit, continued providing technical support for science teachers. The CNSC grant has allowed for 15 new Geiger kits to be purchased, assembled and distributed to science teachers across Canada. Further materials will be purchased in 2018, which will be used to facilitate training sessions for volunteers and support the expansion of the Geiger program. CNSC has been provided with quarterly updates on the Geiger program.

An additional important component of the Geiger program is the Ionising Radiation Workshop, which demonstrates the use of the detector in a classroom setting. Geiger kit demonstrations were performed during the Science Teacher’s Association of Ontario Conference, which was attended last November. A total of 16 new requests for Geiger kits were received during this Conference.

Courses
2017-2018 was once again successful year for the “Nuclear 101” course, with a course taking place in May 2017 in Ottawa. The “Nuclear 101” course is specifically design for individuals with or without a technical background who are part of the nuclear science and technology community and who find themselves interacting with the public. The course has been very popular amongst individuals in the nuclear community (both technical and non-technical) and received excellent reviews from all participants.

A three-hour seminar version of the “Nuclear 101” course has also been created, titled “Nuclear-for-Everyone” (N4E). This course is for individuals who do not directly work in the nuclear industry, but who collaborate and interact with organizations which are part of the nuclear community was again organized as an embedded seminar in the Technical Program for the 2017 CNS Annual Conference in Niagara Falls. In addition to the Nuclear-for-Everyone course, a Nuclear 101 / N4E Facilitators’ workshop was organized during the 2017 Annual Conference, to develop new facilitators for these courses. Both seminar and Facilitators’ workshop were well attended and received positive feedback. Five N4E seminars were presented at the Oshawa job fair in 2017 by alumni from the Facilitators’ workshop!

Lecturers for both courses are strongly encouraged to continue mentoring individuals to support expansion of this program. CNS continues to seek qualified volunteers to expand the frequency of delivering Nuclear 101 and Nuclear for Everyone Courses.

Nuclear Science Week
The third year of Canada’s involvement in Nuclear Science Week was a success. Events were held across Canada (Alberta, Saskatchewan and Ontario) and were universally well received. The events were fun and informative; there is wide agreement that we should do this again.

In Alberta, Jason Donev worked with a team at the University of Calgary to put on a public event at the Rothney Astrophysical Observatory. The event completely sold out with more than 500 people in attendance, filling up the facility to full capacity.

In Ontario, Jacques Plourde coordinated the first, and extremely successful, Nuclear Job Fair held in Oshawa. The fair attracted 400 students from four Provinces and 34 employers/exhibitors. Planning for the 2018 event is well advanced.

Nuclear Safety Culture Foundation Course
The first Nuclear Safety Culture foundation course was delivered, with positive feedback being received. Development of additional course material is scheduled for 2018 with the expectation that requests for delivery of further courses will be received.

Public Advocacy – Further Information
For further information on the CNS’ activities in Education and Communication, contact Ruxandra Dranga or John Roberts (Co-Chairs, CNS Education and Communication Committee) at ECC@cns-snc.ca.

Conference, the CNS Nuclear Industry Job Fair will become an annual event after being first held in 2017.
Organizing conferences and presenting courses is a primary way the CNS fulfills its objectives. Please review the 2018 – 2020 Events Calendar elsewhere in this Yearbook and at [https://www.cns-snc.ca/media/printable-calendar.pdf](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 38th Annual CNS Conference & 42nd Annual CNS/CNA Student Conference in Saskatoon in June, the 8th International Conference on Numerical Methods in Nuclear Science and Engineering in October, and the 1st International Conference on Generation IV and Small Reactors in November (both in Ottawa). Watch the CNS web site for courses and local chapter events organized as the year progresses.

The following highlights the events held during 2017:

**CNS CANDU Reactor Technology & Safety Course**
March 27-29, 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 42 registrants and 12 speakers. The banquet speaker was Richard Wiens (of Nordion) who spoke on the topic of “High-Activity Cobalt Production in Bruce Reactors”.

**Nuclear 101**
May 1-2, Fairfield Inn & Suites Toronto Airport Toronto, Ontario
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 48 registrants with 3 speakers.

**37TH CNS ANNUAL CONFERENCE AND 39TH CNS/CNA STUDENT CONFERENCE**
June 4-7, 2017, Niagara Falls, ON
The central objective of the CNS annual conference is to provide a forum for exchanging views, ideas and information relating to the application and advancement of nuclear science and technology, and for discussing energy-related issues in general. The theme for the 2017 conference was “Our Nuclear Future: Renewal and Responsibility”. Daniel Gammage was the Executive Chair and succeeded Peter Ozemoyah as CNS President at the Annual General Meeting held in conjunction with the conference. Gary Newman (Chief Engineer, Senior Vice President of Engineering, Bruce Power Nuclear Generating Station) was the Honorary Chair of the conference. The Harold A. Smith Lecture was presented by Paul Spekkens, Director of Nuclear Technologies, Kinectrics and the lecture provided reflections on the nuclear industry in Canada. There were six plenary sessions with 26 speakers and 24 technical sessions with 128 speakers. There were 29 exhibit booths by the nuclear industry. Including Sponsors and Exhibitors, there were 360 paid 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.

continued on page 13...
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Whether it’s building a new state-of-the-art operator training simulator for the Embalse site, replacing the Digital Control Computers at the Bruce site or replacing the trip computers for shutdown systems at the Darlington site, L3 MAPPS is a reliable supplier to Canadian and foreign CANDU plant owners seeking to extend the operating life of valuable nuclear power plants. For a proven Canadian solution that is innovative, reliable and on the cutting edge, you can count on L3 MAPPS to deliver robust I&C and simulator solutions to the highest standards. L3T.com/MAPPS
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.

2nd CNS Conference on Fire Safety and Emergency Preparedness for the Nuclear Industry
September 17—20, 2017 Toronto Marriott Eaton Centre
Leveraging the success of the 1st Technical Meeting on Fire Safety and Emergency Preparedness, the 2nd International Meeting on Fire Safety and Emergency Preparedness provided a forum for nuclear professionals to network and communicate changes presently impacting the industry. The 2.5-day core program was comprised of 3 plenary sessions and 6 technical sessions where the latest work and information in the important areas of fire safety and emergency preparedness and mechanisms of emergency management and response that support enhanced interoperability were shared.

Rudy Cronk and Ann Turney were co-chairs with Frank Saunders of Bruce Power fulfilling the role of Honorary Chair for the conference. Stephanie Durand, Director General, Public Safety Canada was the keynote speaker for FSEP 2017. Eleven plenary speakers filled out the morning plenary program, followed by 48 technical sessions on the Monday and Tuesday afternoon. Including Sponsors and Exhibitors, there were 258 paid registrants.

The conference had a full agenda, with 6 plenary sessions and 17 technical sessions over 3 days. Including Sponsors and Exhibitors, there were 258 paid registrants. The conference was preceded with the CANDU® Configuration Overview Course. This course complements CMNCC 2017 by providing the opportunity for participants to become familiarized with the basic layout of a nuclear station and the function of nuclear plant equipment.

The CMNCC 2017 conference was very successful with new innovative ideas added to the agenda. These included a NAYGN/Win-Canada Mix and Mingle with Alex DeLorey, 2017.

Canadian Astronaut Finalist. An evening Utility Engagement event was very effective and generated some good ideas towards solving utility identified challenges in an open forum. A “CANDU around the World” Dinner event provided opportunity to mix and mingle and build relationships with the Honorable Energy Minister of Ontario Glenn Thibeault presenting a very positive message in support of the nuclear industry and nuclear power in Ontario. He also made a round of all the exhibits (during dinner event).

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11th International Conference on CANDU Maintenance and Nuclear Components
October 1-4, 2017 Toronto Marriott Eaton Centre
CMNCC 2017 followed the same approach as previous CANDU maintenance conferences, but with broadened scope to include all major components found in nuclear power plants worldwide. The Conference Theme was “Delivering Clean Energy through CANDU® Life Extension”. Aman Usmani was the Conference General Chair and Shane Rider of OPG was the Honorary Chair.

CANDU Fuel Technology Course
October 12-13, 2017 Hilton Garden Inn, Ajax
The aim of this course is to provide an understanding of the CANDU fuel design, performance and operation, and how the fuel interacts with the interfacing systems. The course will be of great interest to the fuel designers, manufacturers, station operations, fuel channel and fuel handling system designers, safety analysts, and performance and inspection staff. This course was successful, with a total 31 participants and 18 speakers.

CANDU Thermalhydraulics Course
December 4-5, 2017 Marriott Downtown Toronto Courtyard by Marriott Downtown Toronto
This CNS course presents an extensive overview of the important disciplines in CANDU reactor technology and safety. This includes an introduction to the basic design, technology, and operation of nuclear reactors. The major systems in a nuclear plant as well as the important CANDU reactor safety principles and systems were presented and how to prepare and execute safety analysis to meet licensing demands was discussed. 42 participants registered for this course with 8 speakers presenting. The banquet speaker was David Novog on “On the Ground of Fukushima”. 🍁
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2017 was a very active year for the Canadian nuclear industry and the Canadian Nuclear Association (CNA). Strong industry engagement with the CNA coupled with the federal government’s focus on climate change has resulted in nuclear gaining favour as an essential part of Canada’s path towards deep decarbonization.

**Vision 2050**

This year the CNA released its Vision 2050 document that outlines nuclear technology’s role in leading the way to a low-carbon energy future. Developed by the CNA and multiple representatives from the nuclear industry, the document sets out the pathways, as well as the steps necessary, to lead Canada to a sustainable, clean-energy future, which includes working across a broad engagement of stakeholders, such as potential host communities, Indigenous leaders, the broader public, and all levels of government. This document not only became the basis of the CNA’s submission to Natural Resource Minister Jim Carr’s Generation Energy policy process, it will be a cornerstone of the CNA's advocacy work.

**Government Outreach**

CNA’s outreach, at both federal and provincial levels, continued to position nuclear as one of the important low-carbon sources of energy to combat climate change. This year, the CNA hosted three lobbying days at Queen’s Park and on Parliament Hill, which allowed CNA members to meet face to face with MPs, MP’s and key departmental and ministerial staff. This included the first Hill Day with Women in Nuclear.

Our industry’s outreach efforts are making a difference. On October 5, the federal government responded to the recommendations in the Standing Committee on Natural Resource’s report on Canada’s nuclear sector, by endorsing all the committee’s recommendations, including the creation of a Nuclear Innovation Council, for which the CNA specifically advocated.

In Ontario, the CNA and its members were substantial participants in the provincial government’s consultations over the 2017 Long-Term Energy Plan (LTEP). When it was released on October 26, the government had reaffirmed its commitment to nuclear refurbishments and the life extension of the Pickering Nuclear Generating Station to 2024.

**Natural Resources Canada, Global Affairs Canada and the SMR Project Roadmap**

Natural Resources Canada (NRCan) reached out to the CNA on numerous occasions in 2017, starting with Parliamentary Secretary Kim Rudd’s request to host two early-morning policy roundtable events on the margins of the CNA’s annual conference in February.

NRCan and Global Affairs Canada (GAC) continued to work with the CNA to build the Nuclear International Markets Working Group (NIMWG). The working group then organized the Canadian delegation to the International Atomic Energy Agency’s (IAEA) General Conference in Vienna in September. The CNA worked closely with federal government partners to execute a Team Canada approach to the events, present and staff the Canada booth, support Parliamentary Secretary Rudd’s political-level leadership of the delegation, and ensure a successful program of bilateral meetings and connections – leveraging a strong relationship with the federal government to build stronger global networks for the industry.

Later in the year, NRCan asked the CNA to provide the Secretariat for a national SMR Roadmap Project, which had been conceived in the NRCan-chaired Inter-Utility Working Group on small modular reactors (SMRs). The SMR Roadmap Project is not only hugely valuable in exploring the user requirements and concerns around deploying an SMR fleet in Canada; it also strengthens and institutionalizes CNA’s relationships inside the federal government, as well as with northern territorial governments, utilities and other communities of interest.

**International Prominence and Other National Initiatives**

On the international front, CNA participated in the World Nuclear Association Symposium and the US Nuclear Energy Assembly, and helped host a visit to Ottawa by the US Nuclear Infrastructure Council.

Noteworthy national initiatives in 2017 included preparing for NAFTA renegotiations through meetings convened by the Canadian Manufacturing Coalition, the Canadian Global Affairs Institute, and Global Affairs Canada; bringing the Calgary-based Canadian Energy Research Institute (CERI) around from virtually disregarding nuclear in a major study to recognizing it as an integral part of the Canadian clean energy system; and attending alongside Ontario Power Generation, Canadian Nuclear Laboratories, and others, the Arctic Energy and Emerging Technologies (AEET) conference in Inuvik – a crucial forum for introducing north-of-sixty-degrees communities to nuclear’s potential to meet their human and economic needs.

**Microsites, Public Outreach and Key Messages**

The CNA, as part of the Ontario’s Nuclear Advantage Committee, successfully managed the “Ontario’s Nuclear Advantage” campaign and associated microsite leading up to the provincial election in June 2018.
The Source of Smart Solutions

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  CSA N285.0, B51, N286-12, Z299.1, N299.1,
  10CFR50 Appendix B, 10CFR21,

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In tandem, the CNA began developing a microsite targeting the wider Canadian public, called Nuclear + You, focusing on the everyday applications of nuclear technology.

The CNA continued to develop its print and digital messaging in the form of a public newsletter, op-eds, targeted advertising, and a strong social media presence. The 2017 Factbook was published and distributed to over 20,000 individuals and institutions across Canada. The CNA also identified and shared key messages via its website and a free app to encourage industry alignment.
One team.  
Combined strength.  
Greater opportunities.

We are SNC-Lavalin and Atkins, working for you as one team. Together, we deliver exceptional safety and project execution for our clients in the nuclear, clean power, mining and metallurgy, oil and gas, and infrastructure markets. We help optimize your project costs and schedules through our enhanced combined service offering and wealth of experience.


SNC-Lavalin  
Member of the SNC-Lavalin Group

snclavalin.com
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 the Nuclear Industry. Founded in 1993, it represents sectors including 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 2017, several presentations and briefs were made on behalf of the membership. The CNWC participated in hearings associated with the licence extension for Canadian Nuclear Laboratories, McClean Lake Uranium Mill in Saskatchewan, Point Lepreau, the Nuclear Power Plant Regulatory Oversight Report, Uranium Mines & Mills Facilities Regulatory Oversight Report and the Uranium and Nuclear Substance Processing Facilities Regulatory Oversight Report. Our organization, in conjunction with 12 other trade unions, was also engaged in the CNSC’s Fitness for Duty Regulation – Hours of Work and D&A Testing and Safety Culture Regulation consultations. The CNWC also participated in our industry's Nuclear Leadership Forum and the development of a Canadian Nuclear Innovation Agenda.

During 2017, 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 including Fact Sheets on a range of nuclear-related topics that can be downloaded. CNWC support also continued for a website profiling the Ontario’s nuclear energy advantage.

The Council’s annual conference was held in Peterborough, Ontario in October. The conference titled, “The Nuclear Fuels Sector and Looking Ahead to the Future of Nuclear Power in Canada”, updated unionized workers on national and international developments in the industry. CNWC members staffed a display booth and answered questions at other conferences and conventions: Candian Nuclear Association; CUPE National; Ontario Federation of Labour; and IBEW Nuclear.

During 2017, CNWC representatives engaged federal and provincial elected officials, regulators and government agencies. As well, with the support of our employers, the CNWC hosted several facility tours (Darlington & Pickering) for elected municipal, provincial and federal officials, candidates standing for office and labour councils.

In 2018, CNWC education and outreach activities will focus on: 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);

During 2018, the CNWC plans to continue to support its current outreach initiatives.

CNWC Member Unions:
- District Labour Councils (Grey/Bruce, Durham, Northumberland, Lindsay)
- International Association of Firefighters (160)
- Federation of Professional & Technical Engineers (160 & 164)
- International Brotherhood of Electrical Workers (37, 353, & 804)
- Ontario Construction & Building Trades Council
- Power Workers’ Union
- Professional Institute of the Public Service of Canada (PIPS)
- CRPEG
- Union of Professional Engineere & Associates (SPEA)
- Society of United Professionals Union
- UNIFOR (S-48, O-599, O-252, 524)
- United Steel Workers (14193, 13173, 8562, 8914, 7806, 1568)
The year began with significant milestones achieved by Ontario Power Generation on the Darlington Unit 2 Refurbishment Project - the first stage of a $12.8B 12-year project to refurbish all four Darlington units and extend their operating lives to 2060. With OPG’s commitment to a 96% project spend in Ontario – this is great news for the Canadian nuclear supply chain.

The $13B Bruce Power Major Component Replacement (MCR) project is now well advanced in detailed planning with the first unit of this six-unit project to come off line in 2020. Bruce Power has announced plans to source more than 90% of MCR products and services from Ontario.

OCNI membership continues to grow reaching 238 at year-end. Small and medium sized enterprises (SME’s) in particular benefit from OCNI’s support for a vertically integrated and collaborative supplier network through organizing “supplier days” at customer sites, technical workshops on important and emerging supplier topics and general knowledge sharing and networking events. Signature supplier days are planned at OPG Pickering on May 31st, Canadian Nuclear Laboratories on September 14th, and OPG-Darlington September 21st. Dates for the Bruce Power and SNC Lavalin supplier days will be confirmed in late June.

The Ontario Ministry of Advanced Education and Skills Development’s (MAESD) “Skills Catalyst Fund” recently awarded a grant of nearly $495,000 to OCNI to undertake a talent development program that will promote education and training in skilled trades to underrepresented groups including youth, women, and indigenous peoples. The OCNI-led project will provide career opportunities for underrepresented groups while enhancing the pipeline of skilled trades people required to refurbish and replace major components at 10 nuclear generating units at the Darlington and Bruce sites.

OCNI lead a strong delegation of 15 Canadian nuclear suppliers to the Nuclear Industry China (NIC) Exhibition in Beijing during the week of March 26 – 30th. Trade mission delegates had high level meetings with China General Nuclear Power Corporation (CGN) on the Cernavoda 3&4 project in Romania and with China National Nuclear Corporation (CNNC) on the Atucha 3 project in Argentina. Delegates also had constructive discussions with China Nuclear Power Operations Technology Corporation (CNPO), China Nuclear Power Engineering Company (CNPEC), and Suzhou Nuclear Power Research Institute (SNPI). Delegates met with many other Chinese and international nuclear organizations at the Canadian Pavilion at NIC 2018 an event that also attracts many high-ranking Chinese government officials.

OCNI in collaboration with Bruce Power Indigenous Relations Supplier Network (IRSN) officially opened its satellite office at 625 Goderich Street in Port Elgin on March 21, 2018. Our new office will support OCNI member companies in fostering stronger working relationships with Bruce Power in support of the MCR Program and site infrastructure investments. Bruce Power and its supplier partners have created the IRSN in order to further strengthen their relationships with local Indigenous communities.

OCNI with support of OPG, the Aecon-SNC-Lavalin Joint Venture launched a “Local Supplier Engagement Program” in which Darlington Refurbishment Project milestones were celebrated in the presence of MPP’s and local politicians and media while recognizing the resulting quality jobs and local economic impacts. OCNI managed 10 events over 10 months at small and medium sized suppliers from Sarnia in the west to Arnprior in the east.
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<th>UniTech can reduce your costs!</th>
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<tr>
<td><strong>OFF-SITE TOOL &amp; METAL DECONTAMINATION SERVICES</strong></td>
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<td>• REDUCE costs using UniTech’s decontamination services. About ½ the cost of metal melt</td>
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<td>• Services scalable from 1 package/year to 1 truckload/day.</td>
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<td>• 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.</td>
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<td>• An MSS added to the laundry program puts consumables through security allowing storage/issue from within the Unzoned Area.</td>
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<td>• Gets needed items into the worker’s hands quickly — no down time waiting for materials coming from the warehouse.</td>
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<td>• Stocking list is customized to meet customer requirements.</td>
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<td>• Restocked from laundry truck — no security issues.</td>
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<td><strong>PROJECT SITE SUPPORT</strong></td>
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<td>• Turnkey support for a full range of projects (big and small), project work, combined projects, short-term/long-term.</td>
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<td>• UniTech provides RP, PPE, respiratory protection, TMD, radiological instrumentation, and dosimetry services.</td>
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<td>• 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.</td>
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<td><strong>CONTAMINATION MONITOR RENTAL</strong></td>
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<td>• When you need to supply instruments for your project, a UniTech rental program can save both time and money.</td>
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<td>• Can accommodate short/long term (months/years).</td>
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<td>• Personnel exit monitors, small article monitors, hand held instrumentation, and dosimetry services.</td>
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<td><strong>WASTE SORTING</strong></td>
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<td>• 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.</td>
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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.
Women in Nuclear (WiN) Canada
President’s Report
By Heather Kleb, President WiN-Canada

With the increased attention to women’s rights and gender parity over the past year, the mission of Women in Nuclear Canada (WiN-Canada) has become more relevant to the greater public discourse than ever before. WiN-Canada increased its public outreach in 2017 in an effort to elevate member voices and communicate the role nuclear plays in addressing the most important issue we face as a global community—climate change.

In 2017 WiN-Canada was proud to launch its new website: https://canada.womeninnuclear.org, which features a clean and modern design and allows our 1,800+ members, in six Chapters across the country, to connect with each other, and the public, through online profiles.

As the premier association for women working in all things nuclear, we received overwhelming support from the industry, including Ontario Power Generation, Bruce Power, SNC-Lavalin, and the Nuclear Waste Management Organization. E.S. Fox, the Canadian Nuclear Association and New Brunswick Power support our youngest members through scholarships and Kinectrics supports our Speakers’ Clearinghouse.

New partnerships and MOUs were also forged with the Canadian Institute for Non-Destructive Evaluation and the Women of PowerLine Technicians. As demonstrated in this report, WiN-Canada has had a very successful year of programming, advocacy and member engagement.

Fostering Professional Development in Women in Nuclear-Related Occupations

The 2017 WiN-Global Conference in Beijing, China provided another opportunity to connect with members around the world. WiN-Canada members played an active role in the conference, and presented a Country Report on behalf of the organization. Canada continued to be a leader in the WiN-Global organization, spearheading the Mentorship Committee, the Communications Committee, and filling the role of WiN-Global Vice President.

WiN-Canada had strong representation at a number of industry events. Members attended the 2017 Canadian Nuclear Association Conference, the Canadian Nuclear Society Conference, and co-hosted an event with the CANDU Owners Group and NAGYN. Representatives from WiN-Canada also participated in the EUCI Leadership Conference for Women in Energy.

Our local Chapters continued to grow with many actively recruiting for Executive Committee members over the past year. 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
- Trade and Tech Galas
- Paint Nite Fundraiser for Missing and Murdered Indigenous Women

To celebrate Canada 150, WiN-Canada held its 14th Annual Conference in the Ottawa area. Some 200 members from across the country gathered to discuss trends in the nuclear industry and professional development, under the theme “NYOUClear”. Delegates enjoyed tours of the Canadian Science and Technology Museum, the Canadian Nuclear Laboratories and the Canadian Nuclear Safety Commission.

Advancing the Public Profile of the Nuclear Industry in Canada

WiN-Canada strengthened its relationship with local, provincial and federal governments in 2017 through Hill days and meetings with elected officials. Board members shared their expertise and opinions on the importance of nuclear technologies to the Canadian quality of life during meetings in Ottawa.

WiN-Canada intervened in support of Canadian Nuclear Safety Commission licence renewal applications at public hearings. The organization supported Canadian Nuclear Laboratories’ application for Chalk River Laboratories and a WiN-Canada member presented at the public hearings.

Promoting a Variety of Career Opportunities for Women and Students

In 2017 WiN created an Awards Committee to oversee the annual WiN-Canada Award, which is presented at the Annual Conference, as well as the new scholarships offered to female students pursuing studies in the field of nuclear science and related industries. The Committee looks forward to the increased development and promotion of the awards program.

After a successful launch of the Speakers Clearinghouse in 2016, the initiative is building momentum! In 2017, the roster of speakers has grown over 30 venues, schools and conferences have been identified for future outreach. WiN-Canada also continues to engage students, teachers and educational institutions to inspire youth to pursue studies and careers in STEM. Some education-focused initiatives from 2017 include:

- Collaborations with Skills Ontario and Skills New Brunswick
- Sessions at the CNS Nuclear Job Fair at the University of Ontario Institute of Technology (UOIT)
- Promotion of the Speakers Clearinghouse at the Science Teachers Association of Ontario Conference, in partnership with CNS

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
2017 Canadian Nuclear Achievement Awards

**W. B. Lewis Medal**
Presented to
Arthur B. McDonald
for demonstrating exceptional technical achievements and strong leadership in the field of particle physics research in Canada.
Dr. McDonald was the 2015 winner of the Nobel Prize for Physics for his work at the Sudbury Neutrino Laboratory.

**Ian McRae Award**
Presented to
Joan Miller
for leadership and outstanding contributions in decommissioning and waste management, particularly for the Nuclear Legacy Liabilities Program, and the Port Hope Area Initiative.

**Harold A. Smith Outstanding Contribution Award**
Presented to
Igor Pioro
in recognition of a career of exceptional leadership and technical contributions to the nuclear industry in Canada and the world.

**George C. Laurence Award for Nuclear Safety**
Presented to
Barclay Howden
for demonstrating a strong commitment to safety and for the instrumental role he played in ensuring nuclear safety in Canada.

**John S. Hewitt Team Achievement Award**
Presented to
the CWEST Team
for the design, manufacturing, and application of a circumferential wet-scrape tool used to reduce outage duration and personnel dose during hydrogen-equivalent sampling at the Bruce Power station.

*Left to Right (Top Row): Jeff Gervacio, Ben Goodman, Michael Schmidt, Simon Bérubé.*
*Left to Right (Bottom Row): Mark Icaro, Sasha Antler, Andrew Hrycko, Farhan Zameer, Scott Da Silva.*
*Missing: Andrew Grieve, Nick Finelli, Tony Ceramic, Nigel White, Dylan Steed.*

**Education and Communication Award**
Presented to
Jason M. K. Donev
for enthusiasm and commitment to teaching and communicating with the public about nuclear science and nuclear energy.

**Education and Communication Award**
Presented to
Robert Liddle
for passion and commitment as a tireless educator and advocate for the nuclear industry.

**Fellow of the Canadian Nuclear Society**
Presented to
Wei Shen
for long-term extensive contributions to the Canadian Nuclear Society and to the nuclear industry.

**R.E. Jervis Award**
Presented to
Mojtaba Momeni
for outstanding academic accomplishments in the area of corrosion of Cr-Fe-Ni alloys in nuclear reactor environments.
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
## CANDU Nuclear Reactor Performance – 2017

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**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 – 2016

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*WNA estimate

All figures taken from the World Nuclear Association

WNA most recent update was July 2017
## World Reactor Capacity – 2017

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**World**  

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**Notes**

All figures taken from the World Nuclear Association, March 1, 2016.
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.

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.

Elected Executive for June 2017 to June 2018:

Dan Gammage  
President

John Luxat  
1st V-P

Keith Stratton  
2nd V-P

Colin Hunt  
Secretary

Mohamed Younis  
Treasurer

Peter Ozemayah  
Past President

Benjamin 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  Andrew Ali  John Barrett  Ruth Burany  Chris Ciaravino

Peter Easton  Mohinder Grover  Emma Hauch  Jerry Hopwood  Paul Jones

Raphael Kouroumdjian  Wilson Lam  Kris Mohan  E.M (Dorin) Nichita  Peter Ottensmeyer

John Roberts  Nick Sion  Wei Shen  Jerzy Szpunar  Ron Thomas

Aman Usmani  Kamal Verma  Stephen Yu

CNS Staff

Bob O’Sullivan  Colin Hunt  Ric Fluke  Brian Blosser  Amanda Blosser

CNS Office Manager  Publisher CNS Bulletin  Editor CNS Bulletin  Accountant  Bookkeeper
<table>
<thead>
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<th>Country</th>
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<th>Address</th>
<th>Phone</th>
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<tr>
<td>BELGIUM</td>
<td>Foratom – European Atomic Forum</td>
<td>Avenue des Arts 56 1000 Brussels Belgium</td>
<td>+32 2 502 4595</td>
<td>+32 2 502 3902</td>
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<tr>
<td></td>
<td>Institute for Reference Materials and Measurements (IEMM)</td>
<td>Avenue des Arts 56 1000 Bruxelles – Belgique</td>
<td>+32 2 761 94 50</td>
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<tr>
<td>CANADA</td>
<td>National North American Young Generation in Nuclear</td>
<td>c/o P.O. Box 1268</td>
<td>+877 526-2946</td>
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<td></td>
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<td>P.O. Box 840</td>
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<td>Czech Republic State Office for Nuclear Safety [SUJB]</td>
<td>Senovaze namesti 9 110 00 Prague 1</td>
<td>+420 221 624 111</td>
<td>+420 222 220 917</td>
</tr>
<tr>
<td></td>
<td>Danish Energy Agency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bangladesh Atomic Energy Commission</td>
<td>P.G.O. Box 158, 4 Kazi Nazrul Islam Avenue, Dhaka-1000</td>
<td>+880 2 502 600</td>
<td>+880 2 861 3051</td>
</tr>
<tr>
<td></td>
<td>Uranium Information Centre</td>
<td>GPO Box 1649N</td>
<td>+61 2 9717 3111</td>
<td>+61 2 9543 5097</td>
</tr>
<tr>
<td></td>
<td>Australian Nuclear Science and Technology Organization</td>
<td>Lucas Heights Res. Labs., New Illawarra Road Lucas Heights</td>
<td>+61 2 9717 3111</td>
<td>+61 2 9543 5097</td>
</tr>
<tr>
<td></td>
<td>Danish Energy Agency</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Bangladesh Atomic Energy Commission</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 0S2
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 550
Pinawa MB R0E 1L0
Tel: 1-866-513-2325

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) 240-0280
Fax: (416) 240-0442

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
Ontario ON K1P 5H9
Tel: (613) 230-9263
Fax: (613) 230-9326

Canadian Standards Association (CSA)
178 Rexdale Blvd.
Rexdale ON M9W 1R3
Tel: (416) 747-6000

Engineering Institute of Canada
1295 Hwy 2 East
Kingston ON K7L 4V1
Tel: (613) 567-5989

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

Institute of Health Physics Society
2260 Westgate Dr.
Mississauga ON L5J 1C4
Tel: (905) 629-2039

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
### 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) 733-2000

**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  
P.O. Box 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) 398-6655

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

**Queen’s University**  
99 University Ave.  
Kingston ON K7L 3N6  
Tel: (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: (780) 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

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

**University of Ottawa**  
114 Street – 89 Ave.  
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 Western Ontario**  
1151 Richmond Street  
Suite 2  
London ON N6A 5B8

**University of Victoria**  
Faculty of Engineering  
P.O. Box 3055, E0W 2Z8  
Victoria BC V8W 3P6  
Tel: (250) 721-8677

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

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

**Ontario Power Generation**  
Picking Generating Station Information Centre  
1675 Montgomery Park Rd.  
Picking 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 M6P 1K2  
Tel: (416) 484-4911

**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  
Picking ON L1V 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 30
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 1 45 24 82 00
Fax: +43 1 45 24 11 10

International Energy Agency (IEA)
9, rue de la Fédération
75739 Paris, Cedex 15 France
Tel: +33 140 57 65 59

International Radiation Protection Association (IRPA)
Route du Panorama
BP48-F92263
Fontenay-aux-Roses Cedex
France
Tel: +33 1 46 54 7 476
Fax: +33 1 40 84 9 034

(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
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

<table>
<thead>
<tr>
<th>Facility and Location</th>
<th>Type and Number of Units/Capacity</th>
<th>Startup</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pickering Nuclear Generating Station A</td>
<td>CANDU-PHW</td>
<td>1971</td>
<td>Operating</td>
</tr>
<tr>
<td>Pickering, Ontario [Ontario Power Generation]</td>
<td>2 x 500 MW(e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pickering Nuclear Generating Station A</td>
<td>CANDU-PHW</td>
<td>1971</td>
<td>Shutdown</td>
</tr>
<tr>
<td>Pickering, Ontario [Ontario Power Generation]</td>
<td>2 x 500 MW(e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pickering Nuclear Generating Station B</td>
<td>CANDU-PHW</td>
<td>1983</td>
<td>To be decommissioned</td>
</tr>
<tr>
<td>Pickering, Ontario [Ontario Power Generation]</td>
<td>4 x 500 MW(e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darlington Nuclear Generating Station</td>
<td>CANDU-PHW</td>
<td>1989</td>
<td>Operating</td>
</tr>
<tr>
<td>Bowmanville, Ontario [Ontario Power Generation]</td>
<td>4 x 850 MW(e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bruce Nuclear Generating Station A</td>
<td>CANDU-PHW</td>
<td>1976</td>
<td>Operating</td>
</tr>
<tr>
<td>Tiverton, Ontario [Bruce Power]</td>
<td>4 x 750 MW(e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bruce Nuclear Generating Station B</td>
<td>CANDU-PHW</td>
<td>1984</td>
<td>Operating</td>
</tr>
<tr>
<td>Tiverton, Ontario [Bruce Power]</td>
<td>4 x 860 MW(e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gentilly-2 Nuclear Generating Station</td>
<td>CANDU-PHW</td>
<td>1983</td>
<td>Shutdown</td>
</tr>
<tr>
<td>Gentilly, Québec [Hydro-Québec]</td>
<td>1 x 600 MW(e)</td>
<td></td>
<td>To be decommissioned</td>
</tr>
<tr>
<td>Point Lepreau Generating Station</td>
<td>CANDU-PHW</td>
<td>1982</td>
<td>Operating</td>
</tr>
<tr>
<td>Lepreau, New Brunswick [New Brunswick Power Corp.]</td>
<td>1 x 600 MW(e)</td>
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<td></td>
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### Non-Power Reactor Licences

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

### Nuclear Research and Test Establishment Licences

<table>
<thead>
<tr>
<th>Unit</th>
<th>Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalk River Laboratories (AECL)</td>
<td>NRX Reactor 42 MW(t)</td>
<td>Decommissioning</td>
</tr>
<tr>
<td></td>
<td>NRU Reactor 135 MW(t)</td>
<td>Shutdown March 2018</td>
</tr>
<tr>
<td></td>
<td>Recycle Fuel Fabrication Laboratories</td>
<td>Manufacture of small quantities of mixed oxide fuel for research and demonstration</td>
</tr>
<tr>
<td></td>
<td>PTR Reactor 100 W(t)</td>
<td>Decommissioned and released</td>
</tr>
<tr>
<td></td>
<td>ZED-2 Reactor 200 W(t)</td>
<td>Operating</td>
</tr>
</tbody>
</table>
### Nuclear Research and Test Establishment Licences (continued)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Cells</td>
<td>3 isolation cells for examining radioactive material</td>
<td>Operating</td>
</tr>
<tr>
<td>Molybdenum-99 Production Facility</td>
<td>Production of Mo-99 and Xe-133</td>
<td>Operating</td>
</tr>
<tr>
<td>Health Physics Neutron Generator</td>
<td>Electrostatic accelerator 150 KeV</td>
<td>Operating</td>
</tr>
<tr>
<td>Gamma Beam Irradiator GC60</td>
<td>Irradiation Facility</td>
<td>Operating</td>
</tr>
<tr>
<td>Gamma Beam 150 C Irradiation Facility</td>
<td>Irradiation Facility</td>
<td>Operating</td>
</tr>
<tr>
<td>Waste Treatment Centre and Associated Facilities</td>
<td>Treatment of solid and liquid waste</td>
<td>Operating</td>
</tr>
<tr>
<td>Fuels and Materials Cells</td>
<td>12 isolation cells for examining radioactive material</td>
<td>Operating</td>
</tr>
<tr>
<td>Waste Management Areas</td>
<td>Storage and handling of waste</td>
<td>Operating/Shutdown</td>
</tr>
<tr>
<td>Nuclear Fuel Fabrication Facility</td>
<td>Production of low enriched uranium fuel for research reactors</td>
<td>Operating</td>
</tr>
<tr>
<td>Nuclear Fuel Fabrication Facility</td>
<td>Production of low and high enriched uranium fuel targets for research reactors</td>
<td>Operating</td>
</tr>
<tr>
<td>Heavy Water Upgrading Facility</td>
<td>Upgrading of heavy water</td>
<td>Decommissioning</td>
</tr>
<tr>
<td>CECEUD Test Facility</td>
<td>Upgrade and detritiate heavy water</td>
<td>Shutdown pending decommissioning</td>
</tr>
<tr>
<td>Tritium Laboratory</td>
<td>Processing of tritium</td>
<td>Operating</td>
</tr>
</tbody>
</table>

### Whiteshell Laboratories (AECL)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Activity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR-1 Reactor</td>
<td>Organically cooled experimental reactor</td>
<td>Decommissioning</td>
</tr>
<tr>
<td>WL Concrete Canister Storage Facilities</td>
<td>Storage of irradiated fuel</td>
<td>Operating</td>
</tr>
<tr>
<td>Van de Graaf Accelerator</td>
<td>Proton accelerator, &gt;30 microamps</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>14 MeV Neutron Generator</td>
<td></td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Active Liquid Waste Treatment Centre</td>
<td>Treatment of liquid waste</td>
<td>Operating</td>
</tr>
<tr>
<td>WL Shielded Facilities</td>
<td>Post irradiated examination of fuels, reactor core components and other</td>
<td>Decommissioning</td>
</tr>
<tr>
<td>WL Waste Management Area</td>
<td>Storage and handing of waste</td>
<td>Operating</td>
</tr>
<tr>
<td>SLOWPOKE Demonstration Reactor</td>
<td>2 MW pool-type reactor</td>
<td>Decommissioned</td>
</tr>
</tbody>
</table>

### Uranium Mine and Mill Facility Licences

<table>
<thead>
<tr>
<th>Facility</th>
<th>Activity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaverlodge, Saskatchewan</td>
<td>Long-term monitoring</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Cigar Lake Project, Saskatchewan</td>
<td>Mining</td>
<td>Operating</td>
</tr>
<tr>
<td>Cluff Lake, Saskatchewan</td>
<td>Long-term monitoring</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Key Lake Operation Saskatchewan</td>
<td>Milling</td>
<td>Operating</td>
</tr>
<tr>
<td>McArthur River Project, Saskatchewan</td>
<td>Mining</td>
<td>Operating</td>
</tr>
<tr>
<td>McClean Lake Project, Saskatchewan</td>
<td>Milling</td>
<td>Operating</td>
</tr>
<tr>
<td>Rabbit Lake Saskatchewan</td>
<td>Mining and milling</td>
<td>Decommissioning</td>
</tr>
<tr>
<td>Denison Mines, Elliot Lake, Ontario</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Stanrock, Elliot Lake, Ontario</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Madawaska Bancroft, Ontario</td>
<td>Long-term monitoring</td>
<td>Decommissioned</td>
</tr>
</tbody>
</table>
### Refinery and Fuel Fabrication Facility Licences

<table>
<thead>
<tr>
<th>Facility</th>
<th>Annual Licensed Production Limit</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE Hitachi Nuclear Energy Canada Inc., Toronto, Ontario</td>
<td>1,800 tonnes of uranium</td>
<td>Operating</td>
</tr>
<tr>
<td>GE Hitachi Nuclear Energy Canada Inc., Peterborough, Ontario</td>
<td>1,800 tonnes of uranium</td>
<td>Operating</td>
</tr>
<tr>
<td>Port Hope Fuel Manufacturing Facility, Port Hope, Ontario (Cameco)</td>
<td>125 tonnes of UO2</td>
<td>Operating</td>
</tr>
<tr>
<td>Blind River Uranium Refinery, Blind River, Ontario (Cameco)</td>
<td>24,000 tonnes of uranium as UO3</td>
<td>Operating</td>
</tr>
<tr>
<td>Port Hope Uranium Conversion Facility, Port Hope, Ontario (Cameco)</td>
<td>12,500 tonnes of uranium as uranium hexafluoride 3,800 tonnes of uranium as UO2 1,000 tonnes of uranium as ammonium diuranate 2,000 tonnes of uranium metals</td>
<td>Operating</td>
</tr>
</tbody>
</table>

### Waste Management Licences

<table>
<thead>
<tr>
<th>Facility</th>
<th>Activity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radioactive Waste Operations Site 1, Tiverton, Ontario (OPG)</td>
<td>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.</td>
<td>Storage with surveillance</td>
</tr>
<tr>
<td>Western Waste Management Facility, Tiverton, Ontario (OPG)</td>
<td>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 NGS Storage of spent nuclear fuel from the Pickering NGS and storage of retube components from the Pickering NGS</td>
<td>Operating</td>
</tr>
<tr>
<td>Pickering Waste Management Facility, Pickering, Ontario (OPG)</td>
<td>Processing and storage of spent nuclear fuel from the Pickering NGS and storage of retube components from the Pickering NGS</td>
<td>Operating</td>
</tr>
<tr>
<td>Bruce Heavy Water Plant, Tiverton, Ontario (OPG)</td>
<td>Decommissioning of the heavy water plant and remediation of the site</td>
<td>Decommissioning</td>
</tr>
<tr>
<td>Douglas Point Radioactive Waste Storage Facility, Tiverton, Ontario (AECL)</td>
<td>Storage of solid waste from Douglas Point Generating Station, spent fuel storage, no new waste accepted</td>
<td>Storage with surveillance</td>
</tr>
<tr>
<td>Gentilly-1 Radioactive Waste Storage Facility, Gentilly, Quebec (AECL)</td>
<td>Storage of solid waste from Gentilly-1 NGS, spent fuel storage. No new radioactive waste is accepted.</td>
<td>Storage with surveillance</td>
</tr>
<tr>
<td>Gentilly-2 Radioactive Waste Storage Facility, Gentilly, Quebec (Hydro-Quebec)</td>
<td>Storage of solid waste and spent fuel storage from Gentilly-2 NGS</td>
<td>Operating</td>
</tr>
<tr>
<td>Point Lepreau Solid Radioactive WMF, Point Lepreau, New Brunswick [NB Power Nuclear Corporation]</td>
<td>Storage of solid waste and spent fuel storage from Point Lepreau NGS</td>
<td>Operating</td>
</tr>
<tr>
<td>Darlington Waste Management Facility, Bowmanville, Ontario (OPG)</td>
<td>Processing and storage of spent nuclear fuel from the Darlington NGS</td>
<td>Operating</td>
</tr>
<tr>
<td>University of Toronto WMF, Toronto, Ontario (University of Toronto)</td>
<td>Storage, handling and compaction of waste from university</td>
<td>Operating</td>
</tr>
<tr>
<td>Central Maintenance and Laundry Facility, Tiverton, Ontario (Bruce Power)</td>
<td>Managing waste (slightly radioactive clothing materials) from decontamination activities Storage, handling and compaction of waste from Ontario and Quebec</td>
<td>Operating</td>
</tr>
<tr>
<td>Energy Solutions WMF, Brampton, Ontario (Energy Solutions Canada)</td>
<td>Storage of solid waste from the partial decommissioning of NPD NGS. No new waste accepted.</td>
<td>Storage with surveillance</td>
</tr>
<tr>
<td>Nuclear Power Demonstration WMF, Rolphton, Ontario (AECL)</td>
<td>Storage of historic waste and chemical treatment of drainage and run-off. No new waste is accepted. Currently undergoing construction.</td>
<td>Storage with surveillance and remediation</td>
</tr>
<tr>
<td>Port Granby Long-term (LT) WMF, Clarington, Ontario (AECL)</td>
<td>Storage of historic waste and chemical treatment of drainage and run-off. No new waste is accepted. Currently undergoing construction.</td>
<td>Storage with surveillance and remediation</td>
</tr>
<tr>
<td>Port Hope Long-term (LT) WMF, Port Hope, Ontario (AECL)</td>
<td>Storage of historic waste and treatment of drainage and run-off. No new waste is accepted. Currently undergoing construction.</td>
<td>Storage with surveillance and remediation</td>
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</tbody>
</table>

Canada’s Nuclear Facilities continued from page 37
### Waste Management Licences (continued)

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<thead>
<tr>
<th>Facility</th>
<th>Activity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elliot Lake WMF</td>
<td>Multiple tailings management site, chemical treatment of effluent. No new waste accepted.</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Port Hope PSE TSS</td>
<td>Storage of historic waste</td>
<td>Operating</td>
</tr>
<tr>
<td>Port Hope, Ontario (Low-Level Radioactive Waste Management Office)</td>
<td>Storage of historic waste no new waste accepted</td>
<td>Storage with surveillance</td>
</tr>
<tr>
<td>Roving Locations (Low-Level Radioactive Waste Management Office, decontamination projects)</td>
<td>Possession of historic waste on an as requested basis</td>
<td>Operating</td>
</tr>
<tr>
<td>Agnew Lake Idle Mine Site</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Nairn Centre, Ontario (Ontario Ministry of Northern Development and Mines)</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Dyno Idle Mine Site</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Bancroft, Ontario (EWL Management Ltd)</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Rayrock Idle Mine Site</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Northwest Territories (Department of Indian Affairs and Northern Development)</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Madawaska</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Bancroft, Ontario (EWL Management Ltd.)</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Bancroft Tailings Storage Facility</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
</tr>
<tr>
<td>Bancroft, Ontario (Barrick Gold Corporation)</td>
<td>Above-ground tailings</td>
<td>Decommissioned</td>
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### Particle Accelerator Licences

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<tbody>
<tr>
<td>Health PEI</td>
<td>2 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Charlottetown, Prince Edward Island</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Region Health Authority B Saint John, New Brunswick</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Centre de santé et de services sociaux de Chicoutimi Chicoutimi, Québec</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Centre universitaire de santé McGill Montréal, Québec</td>
<td>6 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Hospital Maisonneuve-Rosemont Montréal, Québec</td>
<td>6 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>The Board of Governors of the Kingston General Hospital, Kingston, Ontario</td>
<td>4 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Thunder Bay Regional Health Sciences Centre Thunder Bay, Ontario</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Windsor Regional Hospital Windsor, Ontario</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Cancer Care Manitoba</td>
<td>7 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Winnipeg, Manitoba</td>
<td>7 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Saskatchewan Cancer Agency Regina, Saskatchewan</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Saskatchewan Cancer Agency Saskatoon, Saskatchewan</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Alberta Health Services Calgary, Alberta</td>
<td>6 linacs</td>
<td>Operating</td>
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<tr>
<td>Alberta Health Services Edmonton, Alberta</td>
<td>5 linacs</td>
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<tr>
<td>Alberta Health Services Lethbridge, Alberta</td>
<td>2 linacs</td>
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<tr>
<td>Hôpital Général Juif Montréal, Québec</td>
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<td>Operating</td>
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<tr>
<td>Facility</td>
<td>Type</td>
<td>Status</td>
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<td>-------------------------------------------------------</td>
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<tr>
<td>Cape Breton District Health Authority</td>
<td>2 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Sydney, Nova Scotia</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Régie régionale de la santé (Beauséjour)</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Moncton, New Brunswick</td>
<td>2 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>British Columbia Cancer Agency</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Kelowna, British Columbia</td>
<td>4 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>British Columbia Cancer Agency</td>
<td>2 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Victoria, British Columbia</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>British Columbia Cancer Agency</td>
<td>9 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Vancouver, British Columbia</td>
<td>10 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Eastern Regional Integrated Health Authority</td>
<td>4 linacs</td>
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</tr>
<tr>
<td>(Eastern Health) St. John’s, Newfoundland</td>
<td>1 linac</td>
<td>Operating</td>
</tr>
<tr>
<td>Sherbrooke, Québec</td>
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<tr>
<td>Fleurimont, Québec</td>
<td>4 linacs</td>
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<tr>
<td>Québec, Québec</td>
<td>3 linacs</td>
<td>Operating</td>
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<tr>
<td>Capital District Health Authority</td>
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<tr>
<td>Halifax, Nova Scotia</td>
<td>7 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Hamilton, Ontario</td>
<td>6 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Montréal, Québec</td>
<td>9 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Centre hospitalier de l’Université de Montréal</td>
<td>10 Cyclotron</td>
<td>Operating</td>
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<tr>
<td>Ottawa, Ontario</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Sunnybrook Health Sciences Centre</td>
<td>2 Neutron Generator</td>
<td>Operating</td>
</tr>
<tr>
<td>Toronto, Ontario</td>
<td>1 Plasma Injector</td>
<td>Operating</td>
</tr>
<tr>
<td>Sunnybrook Health Sciences Centre</td>
<td>1 Neutron Generator</td>
<td>Operating</td>
</tr>
<tr>
<td>Barrie, Ontario</td>
<td>1 Neutron Generator</td>
<td>Operating</td>
</tr>
<tr>
<td>Ciment Québec Inc.</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Saint-Basile, Québec</td>
<td>20 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>General Fusion Inc.</td>
<td>4 linacs</td>
<td>Operating</td>
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<tr>
<td>Burnaby, British Columbia</td>
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<tr>
<td>Hilliburton Group Canada Inc.</td>
<td>1 tandetron accelerator</td>
<td>Operating</td>
</tr>
<tr>
<td>Nisku, Alberta</td>
<td>3 linacs</td>
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<tr>
<td>Hunter Well Science Ltd.</td>
<td>20 linacs</td>
<td>Operating</td>
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<tr>
<td>Calgary, Alberta</td>
<td>4 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Centre de sante et services sociaux de Gatineau</td>
<td>8 linacs</td>
<td>Operating</td>
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<tr>
<td>Gatineau, Québec</td>
<td>1 Neutron Generator</td>
<td>Operating</td>
</tr>
<tr>
<td>University Health Network</td>
<td>1 Neutron Generator</td>
<td>Operating</td>
</tr>
<tr>
<td>Toronto, Ontario</td>
<td>1 Neutron Generator</td>
<td>Operating</td>
</tr>
<tr>
<td>Grand River Hospital Corporation</td>
<td>3 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>Kitchener, Ontario</td>
<td>20 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>London Health Sciences Centre</td>
<td>4 linacs</td>
<td>Operating</td>
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<tr>
<td>London, Ontario</td>
<td>8 linacs</td>
<td>Operating</td>
</tr>
<tr>
<td>McMaster University</td>
<td>1 tandetron accelerator</td>
<td>Operating</td>
</tr>
<tr>
<td>Hamilton, Ontario</td>
<td>3 linacs</td>
<td>Operating</td>
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</table>
Particle Accelerator Licences (continued)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Type</th>
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<tr>
<td>McMaster University</td>
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<tr>
<td>Hamilton, Ontario</td>
<td></td>
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<tr>
<td>McMaster University</td>
<td>1 Van de Graaff</td>
<td>Operating</td>
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<tr>
<td>University of Guelph</td>
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<tr>
<td>University of Western Ontario</td>
<td>1 tandetron accelerator</td>
<td>Operating</td>
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<tr>
<td>London, Ontario</td>
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<tr>
<td>Queen’s University at Kingston</td>
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<tr>
<td>Kingston, Ontario</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Université de Montréal</td>
<td>1 Van de Graaff tandem accelerator</td>
<td>Operating</td>
</tr>
<tr>
<td>Montréal, Québec</td>
<td>1 tandetron accelerator</td>
<td>Operating</td>
</tr>
<tr>
<td>Centre de santé et services sociaux de Laval</td>
<td>2 linacs</td>
<td>Operating</td>
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<tr>
<td>Laval, Québec</td>
<td></td>
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<tr>
<td>National Research Council Canada</td>
<td>2 linacs</td>
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<tr>
<td>Schlumberger Canada Limited</td>
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<tr>
<td>Scientific Drilling International (Canada)</td>
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<tr>
<td>Montreal Neurological Institute and Hospital</td>
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<td>Centre for Addiction and Mental Health</td>
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<td>Centre hospitalier universitaire de Sherbrooke</td>
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<td>Sherbrooke, Québec</td>
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<tr>
<td>Hamilton Health Sciences Corporation</td>
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<td>University of Ottawa Heart Institute</td>
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<td>Mervex Corporation</td>
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<td>Lakeridge Health</td>
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<td>Southlake Regional Health Centre</td>
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<td>Newmarket, Ontario</td>
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<tr>
<td>St. Joseph’s Health Care</td>
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<td>London, Ontario</td>
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</tr>
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<td>Vancouver Cancer Centre</td>
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<td>Vancouver, British Columbia</td>
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<tr>
<td>Weatherford Canada Ltd.</td>
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<tr>
<td>Edmonton, Alberta</td>
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<td>Winnipeg Regional Health Authority</td>
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<td>Winnipeg, Manitoba</td>
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Nuclear Substance Processing Facility Licences

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<tr>
<td>New Processing Facility</td>
<td>Production and processing</td>
<td>Operating</td>
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<tr>
<td>Chalk River Laboratories</td>
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</tr>
<tr>
<td>Chalk River, Ontario</td>
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</tr>
<tr>
<td>Nordion (Canada) Inc., Ottawa, Ontario</td>
<td>Production and processing</td>
<td>Operating</td>
</tr>
<tr>
<td>SRB Technologies, Pembroke, Ontario</td>
<td>Processing</td>
<td>Operating</td>
</tr>
<tr>
<td>Shield Source Inc., Peterborough, Ontario</td>
<td>Processing</td>
<td>Shutdown</td>
</tr>
<tr>
<td>Winnipeg Regional Health Authority</td>
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<td></td>
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<tr>
<td>Winnipeg, Manitoba</td>
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</tbody>
</table>
AZZ Nuclear

Headquartered in Fort Worth, Texas, with major facilities in Fort Worth and in Suwanee, Georgia, AZZ Nuclear combines the capabilities of Engineered Solutions, Specialty Welding and other AZZ business units that supply equipment to the nuclear industry. With the primary goal of keeping nuclear plants operating safely, AZZ Nuclear supplies critical equipment and performs highly technical services aimed at extending the life of plant systems.

AZZ Nuclear Engineered Solutions (formerly NUI) is the largest third-party supplier of equipment solely focused on the nuclear industry. Engineering, design, manufacturing, testing and qualification are all performed in a 200,000-square-foot state-of-the-art manufacturing and testing facility located in Fort Worth, Texas. In addition to third-party supply, AZZ Nuclear is an OEM for certain equipment types, a manufacturer of other equipment, and routinely dedicates commercially available products. AZZ Nuclear’s mission is to provide the worldwide nuclear industry with critical and safety-related equipment, equipment maintenance, equipment qualification and engineering services, in a manner that causes the least impact to nuclear plant resources, at the lowest long-term cost, and deliver expeditiously to meet demanding schedules.

AZZ Specialty Welding (formerly WSI) is a leading global provider of technologically advanced maintenance, repair and overhaul services. With a long track record of enhancing safety, reducing risk and improving plant productivity and performance, AZZ Specialty Welding has delivered planned and emergency response solutions to a wide range of nuclear facilities around the world. With repairs successfully performed in more than 130 nuclear power plants around the world, whatever the location, material and size of the asset, AZZ Specialty Welding can offer a field upgrade to your component at the time that repairs are required, ensuring nuclear plants are working at their best. Reducing outages and increasing uptime for nuclear and industrial applications globally.

Nuclear Equipment Services
With best-in-class testing to ensure operation under worst-case scenarios, AZZ Nuclear’s Qualification and Dedication programs include thermal aging, radiation testing, EMI/RFI testing, LOCA testing, seismic testing, and software V&V.

Nuclear Equipment Supply
Encompassing thousands of products ranging from Electrical, Mechanical, Instrumentation and Control, HVAC and even specialty one-of-a-kind items, AZZ Nuclear supplies the nuclear industry with everything but fuel.

Stress Corrosion Mitigation
Stress corrosion cracking affects nearly every plant and mitigation strategies are an essential component of plant life extensions. AZZ Nuclear employs several strategies, such as weld overlays and waterjet peening to mitigate the effects of stress corrosion cracking.

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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

Tetra Tech is a leading provider of consulting, engineering, and technical services, with more than 50 years of experience in the nuclear industry.
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<th>Place</th>
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<td>May 30–31, 2018</td>
<td>TownePlace Suites Marriott, 19 Millenium Way, Kincardine, ON</td>
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<td><strong>Pickering Nuclear Generating Station</strong></td>
<td>June 26–28, 2018</td>
<td>Hope Fellowship Church, 1685 Bloor Street, Courtice, ON</td>
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Find out more about the hearing process and future Commission proceedings at [nuclearsafety.gc.ca](http://nuclearsafety.gc.ca).

## Audiences publiques de la Commission à venir

La Commission canadienne de sûreté nucléaire (CCSN) tiendra des audiences publiques pour examiner des demandes de renouvellement du permis d'exploitation des installations suivantes pour une période de dix ans :

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<th>Date (Partie 2) : Les 30 et 31 mai 2018</th>
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Pour en savoir plus sur le processus d’audience et les séances de la Commission à venir, visitez [suretenucleaire.gc.ca](http://suretenucleaire.gc.ca).
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From now to 2064

BRUCE POWER’S LIFE-EXTENSION PROGRAM MEANS JOBS, CLEAN A/R, AND LOW-COST ELECTRICITY FOR DECADES.

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What the UNENE Universities offer...

- Cutting-edge nuclear research giving real-world post-graduate training.
- Education: A Master's 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 industrial research 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.

The courses are also offered using Distance Education tools for sites remote from the GTA.

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
- Operational Health Physics

PLUS: FREE refresher mini-courses prior to the core subjects.

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
Suppliers’ Addresses and Contacts
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.

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- OPG Pickering (8 Units)
- OPG Darlington (4 Units)
- OPG/BP Bruce (8 Units)
- HQ Genilicy (1 Unit)
- NB Power Point Lepreau (1 Unit)
- Cernavoda Romania (2 Units)
- Qinshang 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:
- D₂O primary & auxiliary hose assemblies
- D₂O 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 N4A900 NCA-1 NPT Stamp (In Progress)
- ISO 9001:2008
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Custom Metallic & Non-Metallic Hose Assemblies
For catenary, fueling machine, D₂O primary & auxiliary service. Registered & designed to ASME/N285.0 Classes 2, 3 & 6.

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THORLOC Pipe Clamp Connector
Sizes up to 4” (OD 100). Withstands bending, tension & compression loads. Registered and designed to ASME/N285.0 Classes 1, 2, 3 & 6.

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