Canadian Nuclear Society **Annual Industry Review and Buyer's Guide**

2011 Nuclear Canada Yearbook

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CNS President's Report

2011

Adriaan Buijs

The 2011 edition is the first Nuclear Canada Yearbook published by the Canadian Nuclear Society, which has taken the torch from the Canadian Nuclear Association in publishing this industry-wide reference book. The CNS is proud to serve the Canadian nuclear community in this manner and hopes to carry on the tradition of the Yearbook.

The undertaking of the Nuclear Canada Yearbook fits well with the stated goal of the Canadian Nuclear Society, namely to promote the exchange of information on all aspects of nuclear science and technology and its applications. As the CNS holds its annual conference later in the year than the CNA, the publication date of the Yearbook has shifted accordingly.

With the Yearbook, the CNS takes the opportunity to present itself to a wider readership in Canada. A description of the structure of the CNS and an overview of its activities for the past year are provided, and you will find that the CNS is a vibrant organisation that has again had a successful year with a large variety of activities. A more complete account of all the CNS' activities can be found in the CNS Bulletin, which is distributed free to its members four times per year.

When reflecting on the past year as reviewed by Colin Hunt in this Yearbook, we realise that the industry is going through difficult times. Any nuclear news these days is dominated by the natural disaster that struck Japan just a few weeks before my writing this message. The suffering of the Japanese people as a result of the earthquake and the subsequent tsunami is enormous, and the thoughts of all members of the CNS are with them, as always when a disaster strikes a country.

Ironically, the humanitarian situation in Japan is being overshadowed by the impact of the tsunami on the Fukushima nuclear power plant. The CNS has been called upon many times to comment on the developments at the plant, and members have stepped up to the plate, providing expert opinions on radio and television and in the written media, to help understand the events as they unfold, according to their expertise. On behalf of the CNS and of the industry as a whole, I would like to thank them for their efforts.

At home, the uncertainty surrounding AECL is impacting the Canadian nuclear industry and its people, and is threatening the development and the marketing of the indigenous CANDU reactor design. It cannot be stressed enough that CANDU is not merely another reactor type, but that it represents a world-class design in terms of safety and fuel efficiency and is unique in terms of fuel flexibility. The CNS will be hosting a conference in October to highlight this fact once again.

Fortunately, there is also good news to report. Our CANDU reactors have provided the people of Canada with another year of safe and reliable electricity with minimal impact on the environment; and in a demonstration of extraordinary technological know-how, a team of AECL and other industry experts repaired the leak in the NRU Calandria Vessel. This enabled a return-to-service of NRU in August of 2010, and restored the medical radionuclide supply to the world.

As the presidency of the CNS spans only one year, the end of my term coincides with the publication of this yearbook. It has been a pleasure and an honour to serve this society of volunteers, and I look forward to continue being an active member of the Canadian Nuclear Society. In closing, I would like to thank the members of CNS Council and the staff of the CNS for their hard work in 2010 to make all of our activities and events a success.

Remembering the past: The Chicago Team

Many of the CP-1 team stand in front of Eckhart Hall (the Metallurgical Laboratory building) at the University of Chicago pn December 2, 1946, the four-year anniversary of the world's first self-sustaining, controlled nuclear chain reaction. Front row, left to right: Enrico Fermi, Walter H. Zinn, Albert Wattenberg, and Herbert L. Anderson. Middle row: Harold Agnew, William Sturm, Harold Lichtenberger, Leona Woods Marshall, and Leo Szilard. Back row: Norman Hilberry, Samuel Allison, Thomas Brill, Robert G. Nobles, Warren Nyer, and Marvin Wilkening. (Photo courtesy of Argonne National Laboratory)

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Buyer's Guide

Steam generator packaging and shipment at the Cambridge plant of Babcock and Wilcox.

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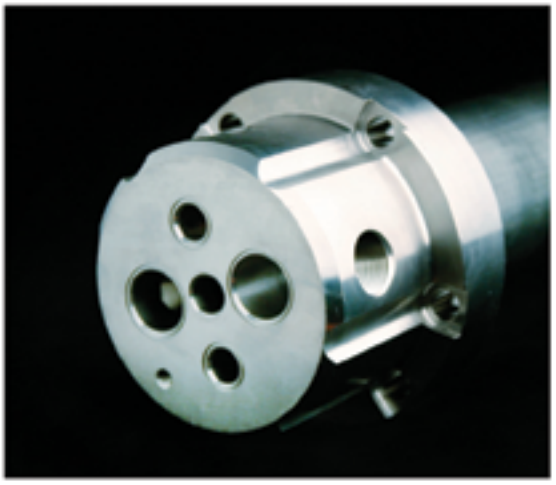

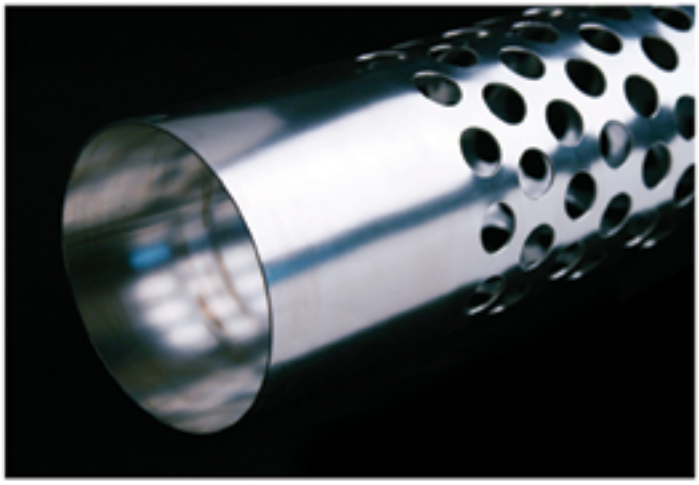

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2010 Year in Review

By Colin Hunt, Publisher and Editor
Nuclear Canada Yearbook

Colin Hunt

Overview

2010 was an important year for Canada's nuclear industry. The year was marked by strong operating performance by Canada's nuclear reactors. Particularly notable was the operation of the Bruce and Darlington reactors, as noted in the performance tables found elsewhere in this Yearbook.

Also performing very well was the domestic and overseas fleet of CANDU 6 reactors. As shown in Table A, the 11 reactors averaged over 72 per cent capacity factor despite two of them being out of service for the entire year for retubing and refurbishment.

There were also important developments in Canada's uranium industry as well. Cameco continued with its recovery of the Cigar Lake uranium mine. Canada's total uranium production rose during the year following several previous years of small declines.

There were also some important activity in government policy and international activity. Notably these included the signing of a nuclear co-operation agreement with India, bringing to an end 37 years of technical isolation between the two principal nations in the world building and operating heavy water reactors.

Finally, a summation of the past year would not be complete without acknowledging the nuclear accident at one of the worlds largest nuclear facilities, the Fukushimi Daiichi nuclear power station which occurred on March 11, 2011.

Table A: CANDU 6 Nuclear Reactor Performance – December 2010

Reactor	In Service	Capacity (MW)	Performance In 2008 (%)	Lifetime Performance (%)
Point Lepreau*	1983	680	0	74.0
Gentilly 2	1983	675	60.1	77.7
Wolsong 1*	1983	622	0	81.2
Wolsong 2	1997	730	93.7	93.6
Wolsong 3	1998	729	97.1	95.0
Wolsong 4	1999	730	94.3	95.9
Embalse	1984	648	74.6	85.0
Cernavoda 1	1996	706	95.1	89.2
Cernavoda 2	2007	705	97.2	94.9
Qinshan 4	2002	700	89.5	91.5
Qinshan 5	2003	700	93.4	89.9
Total		**7625**	**72.2**	**88.0**

COG CANDU/PHWR Performance Indicators, December 2010.
*These reactors under reconstruction.

Domestic Activity

As shown in the data tables in this Yearbook, Canada's domestic reactors had a good year of operations in 2010. Four Bruce B reactors and two Darlington reactors had capacity factors well in excess of 90 per cent. In fact the rolling average of the modern CANDU stations of Pickering B, Bruce B and Darlington all show a rising production performance on a year over year average as shown in Table B.

Refurbishment was a major part of the industry's activity in 2010. The refurbishment program of the Bruce A Units 1 and 2 continued. Of particular note, Bruce

Darlington: the proposed site for new nuclear reactors.

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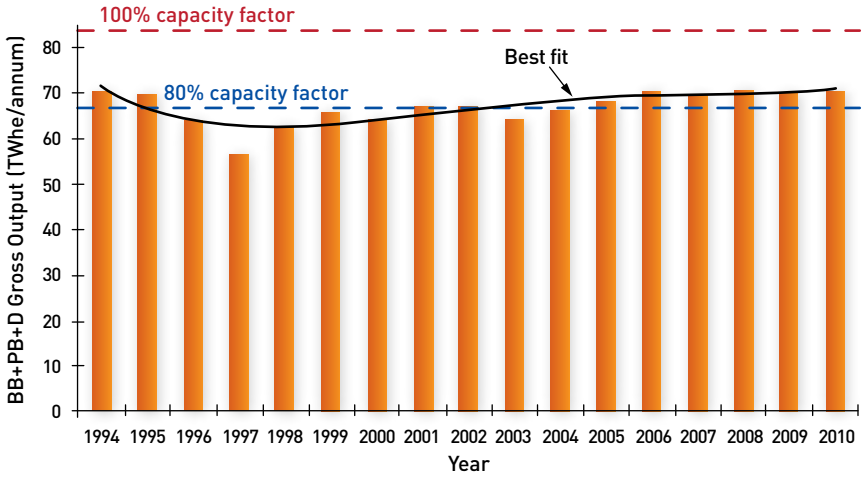
Table B:



Power and its contractors completed the installation of all calandria tubes in Unit 1 on November 10 following the completion of installation of new tubes of Unit 2 in August. The importance of the achievement cannot be understated. Bruce Power has succesfully completed the world's first complete replacement of both calandria tubes and pressure tubes in a CANDU reactor.

With the substantial completion of the retubing operation, Bruce Power expects to begin fuel loading before July 2011 in Unit 2 and start commissioning of the steam generators and steam systems during the spring of 2011. Unit 2 is expected to return to service in late 2011, with Unit 1 returning to service early in 2012.

Ontario Power Generation (OPG) announced its future nuclear strategy on February 16, 2010. With respect to the Darlington station, OPG announced that it would proceed with full refurbishment of all reactors starting approximately in 2016. At the same time, OPG announced that it would be continuing operations of the Pickering B nuclear reactors to 2020. At that time, OPG indicated that the reactors would be placed in safe storage prior to full decommissioning of the station.

With respect to new reactors in Ontario, the joint environmental review panel commenced public hearings on March 21, 2011. The proposal by OPG is for the construction of up to four new reactors at the Darlington site. It may be recalled that this site was originally proposed by Canada as the site to host ITER, the International Thermonuclear Experimental Reactor.

The importance of reliable nuclear generation increased in Ontario last year, as OPG removed from service four coal fired units. Lambton 1 and 2 and Nanticoke 3 and 4 represented approximately 2,000 MW of generating capacity that will no longer be available.

Work continued on the refurbishment of New Brunswick Power's Point Lepreau station throughout 2010. A significant difficulty was encountered with the newly installed calandria tubes. NB Power had required a guarantee of 25 to 30 years life for the new tubes, An assessment done during the summer showed that this could not be guaranteed. NB Power agreed with Atomic Energy of Canada Limited (AECL) that all of the new tubes should be replaced as announced on October 15. The revised project schedule now calls for the return to service of Point Lepreau in May 2012.

One of the most remarkable achievements of the year was the full restoration of the NRU at Chalk River Laboratories. On May 15, 2009 a small leak of heavy water was detected following the shutdown as a result of a loss of the electrical grid to parts of eastern Ontario and western Quebec

The ZED 2 research reactor at Chalk River Laboratories celebrated its 50th anniversary of operations in 2010.

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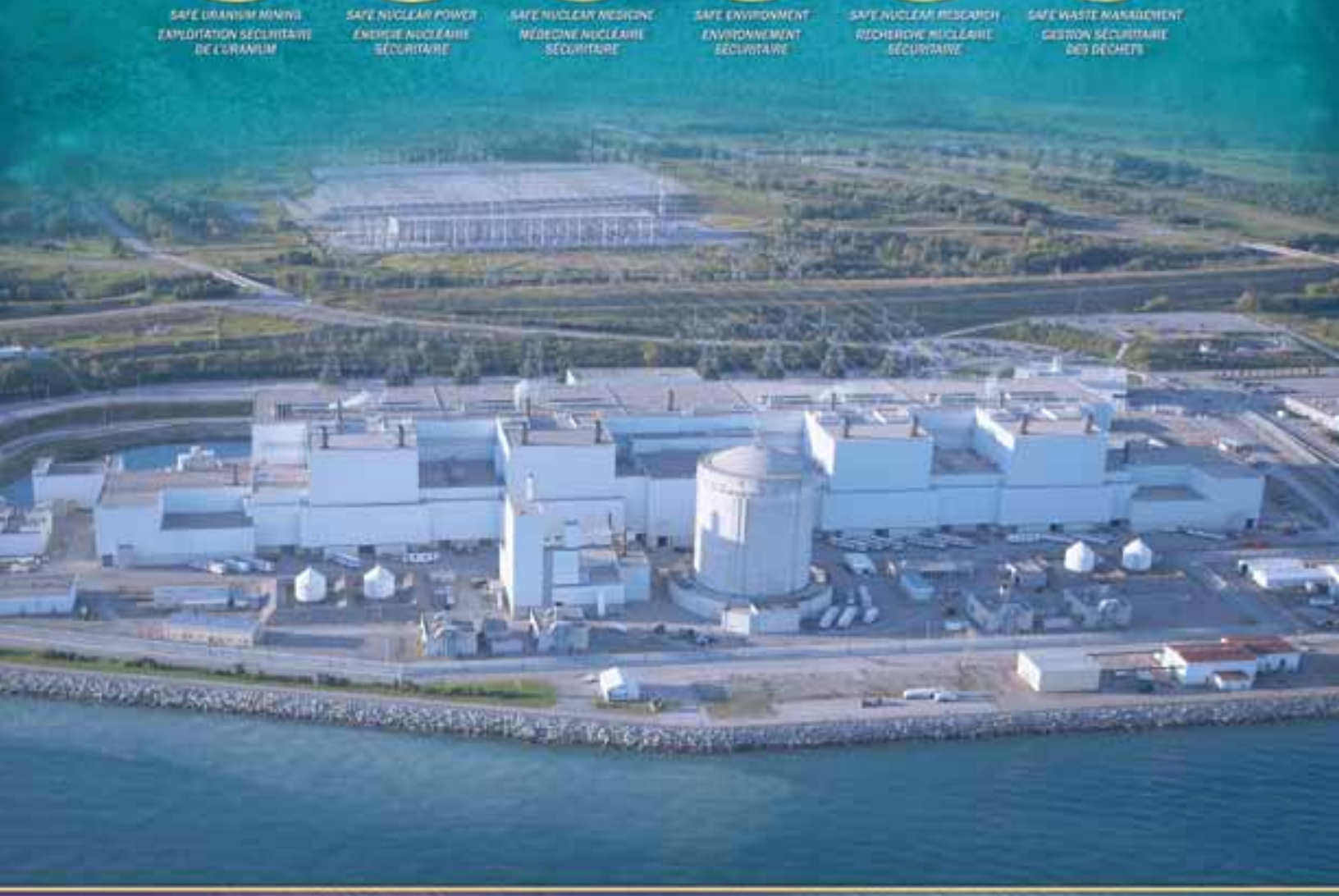

Canadian Nuclear Safety Commission
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Canada

The NRU reactor is one of the world's most important neutron research facilities.

on May 14. Subsequent investigations showed significant areas of corrosion in the interior reactor vessel. Repairs to the reactor proceeded during 2009 and 2010 under technically demanding conditions. The reactor returned to full service on August 17 with the first Molybdenum 99 production on August 18.

The importance of the NRU reactor and its return to service cannot be understated. It is the largest and one of the oldest research reactors in the world. It accounts for the largest share, about 30 per cent, of the world's production of medical radio-isotopes. It is also responsible for nearly all of the neutron-related research and development undertaken at Chalk River Laboratories including research programs by the National Research Council and by Canadian universities.

Nuclear Policy in Canada

One of the most important policy developments in nuclear science and technology took place on June 28, 2010 when Canadian Prime Minister Stephen Harper and Indian Prime Minister Manmohan Singh signed a nuclear co-operation agreement between the two countries. The two leaders had announced the completion of negotiations in November 2009 and the final signing took place in Ottawa.

The terms of the agreement permit the trade of Canadian nuclear technology to India for those facilities under IAEA safeguards. It permits the sale of Canadian uranium to India's nuclear power program. It also permits Canadian organizations to acquire nuclear technology under safeguards from India's nuclear program.

The agreement ends 37 years of India's nuclear technology isolation. It allows the two principal builders and operators of heavy water, fuel channel reactors to co-operate on all areas of the peaceful uses of nuclear technology. As part of the agreement, India closed permanently its CIRUS research reactor, which India used for the production of strategic nuclear materials. Not a CANDU reactor, CIRUS was a research reactor modeled on the design of the NRX reactor at Chalk River Laboratories. Never under safeguards, it was originally supplied to India in 1955 under the Colombo Plan.

In domestic affairs, the federal government continued with its efforts to pass its revisions to the Nuclear Liability Act. Bill C-20 succeeded in passing House of Commons committee review with only minor amendments in 2009, but it died on the order paper with the proroguing of Parliament early in 2010. The bill was reintroduced again in 2010, but has once again expired with the calling of a federal election in April 2011.

Also of concern to Canada's nuclear industry was the federal government's intentions to restructure AECL. The policy was announced on May 28, 2009 by then-Natural Resources Canada Minister Lisa Raitt. In broad scope, the plan called for the privatization of the commercial arm of AECL, principally the CANDU reactor design, construction and services business, with the research arm, principally located at Chalk River Laboratories to be retained in government ownership. The government continued through 2010 by soliciting and negotiating with potential private sector partners.

It had been expected that agreement would be reached in 2011. However, this has been delayed by the spring national elections.

Canada's Uranium Industry

Cameco Corporation completed a major re-organization of its senior executives on May 13, 2010. Tim Gitzel became President, with former President and CEO Jerry Grandey retaining the post of Chief Executive Officer. Robert Steane moved into the position of Senior Vice President and Chief Operating Officer, the post formerly held by Mr. Gitzel.

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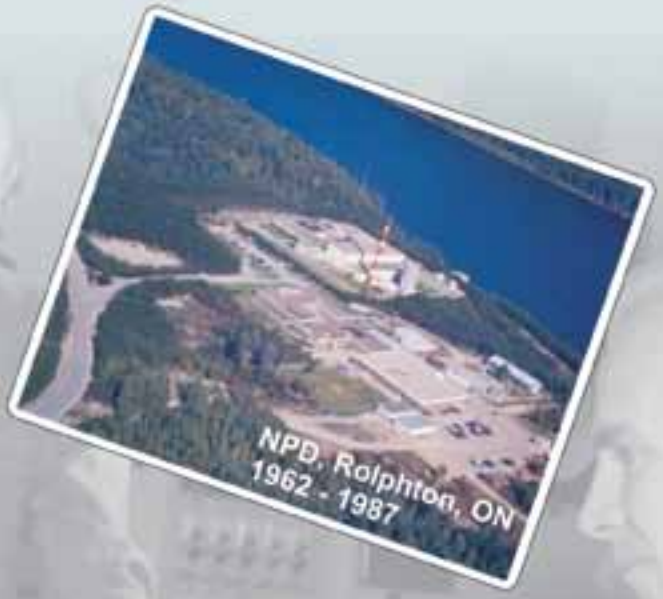

As Canada prepares for another 50 years of sustainable electricity supply from nuclear energy, the CNS looks back to the milestones of the first 50 years, and ahead to new generations of Canadians that will advance the science and technology to sustain a prosperous nation.

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Cameco expanded its sales opportunities overseas by negotiating an agreement with the Guangdong Nuclear Power Holding Co. for the sale of Canadian uranium to China. The market is an important one, as China intends to expand its nuclear generating capacity from the current 9 GW to 70 GW by 2020.

Cameco continued with its work to recover its Cigar Lake uranium mine. Dewatering of the mine was completed in February 2010. Cameco then commenced the restoration of the underground works. Commencement of a new shaft will continue after ground freezing operations have been completed in 2011.

Construction of the mine had begun in 2005, but was halted in 2008 by water inflow. Cigar Lake is very important to Canada's uranium industry. It allows access to reserves of more than 203 million pounds of U3O8 at an average ore grade of 17 per cent.

Adding to Canada's uranium production is important, both for Canada and for nations around the world using nuclear power. For the first time in nearly three decades, Canada lost its position as the world's largest supplier of uranium to Kazakhstan. That country's supply of commercial uranium nearly doubled between 2008 and 2009 to more than 14,000 tons of uranium, displacing Canada as the world leader. Canada's uranium production rose significantly in 2009 to more than 10,000 tons, reversing three previous years of production declines.

International Development

Three new heavy water reactors started commercial operation in 2010. These are RAPS Units 5 and 6 and Taiga Unit 4 in India. All are 220 MW reactors modeled after the Douglas Point full scale prototype reactor in Ontario. These are expected to be the last reactors of this size built in India. Already in operation are a number of 500 MW heavy water reactors. In 2010, the first concrete was poured for India's first 700 MW heavy water reactors, Kakrapar Units 3 and 4.

India also completed its first retubing of a heavy water reactor with the return to service of Kakrapar 1 in December after a two and a half year outage. Kakrapar 1 is the first heavy water reactor outside Canada to be refurbished and restored with fuel channel replacement.

India was not the only nation renewing its nuclear reactor fleet. An important milestone was passed with the refurbishment of Wolsong 1 with the complete replacement of all calandria and pressure tubes before the end of the year. The project has been running on schedule, and the reactor is expected to return to service before the summer of 2011.

Earthquake at Fukushima

On Friday, March 11, 2011 at 2:46 p.m. eastern Japan was struck by a powerful earthquake measuring 9.0 on the Richter Scale. The earthquake occurred in the Pacific Ocean along 200 km of a fault line approximately 130 km distant from the city of Sendai. This differs from normal earthquakes which usually have a single point source, and it served to magnify greatly both the moment of the earthquake which exceeded three minutes and the effect of the tsunami which followed. Eleven nuclear reactors at four nuclear power stations near Sendai were operating at the time. All of the reactors at Fukushima Daiini, Onagawa, and Tokai all achieved safe shutdown immediately following the earthquake, with the only incident being a hydrogen fire in the turbine hall of Onagawa 1 which was promptly extinguished. All of these reactors achieved a cold shutdown within four days.

Such was no the case with the Fukushima Daiichi nuclear power station, owned and operated by Tokyo Electric Power Company (TEPCO). At that time, three of the station's six nuclear reactors (Units 1-3) were in operation.

Despite the power of the earthquake, the plants were largely undamaged by the event, and all of the reactors shut down safely. However, all of the fossil fuel generating stations in the area, shut down as well, and the result was a collapse of the electrical grid and loss of power to the station. All of the backup diesel generators were started, powering the emergency core cooling systems. Approximately one hour later a large tsunami crossed the sea wall of the

The control room of the NRU reactor at Chalk River Laboratories.

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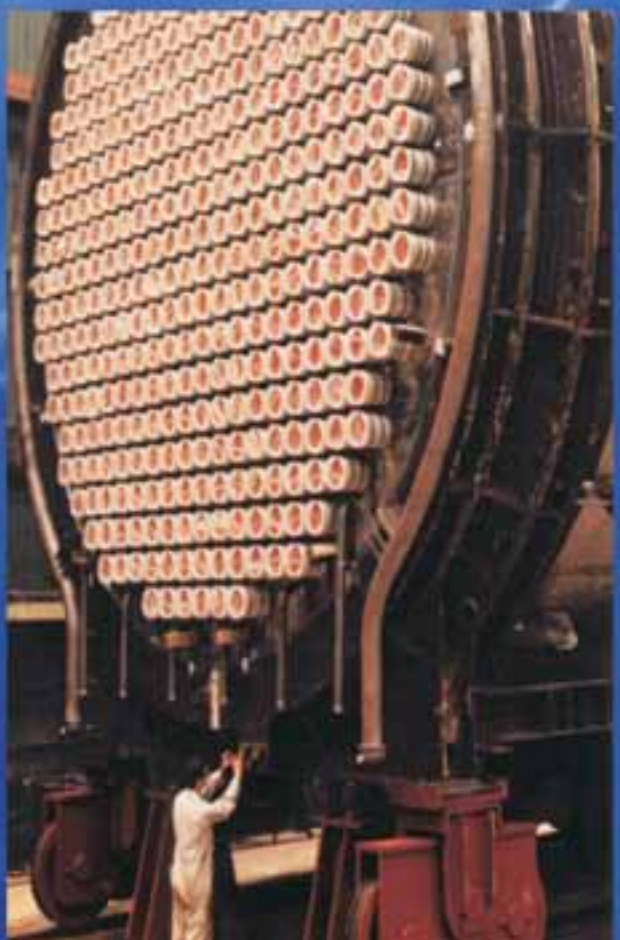

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Beyond medical isotope production, the NRU reactor is a vital research facility for the National Research Council.

plant, submerging the diesel generators and washing away the diesel fuel storage tanks. At that point all power was lost to the station.

Even though the reactors were shut down, they were still producing between 30 and 50 MW of radioactive decay heat at the moment the tsunami hit. This heat would induce boiling in the reactor coolant and eventually uncover the fuel if not checked.

Initial activity at the three affected reactors was concerned with restoring removal of heat from the reactor cores and to restore water cooling and circulation to the spent fuel storage pools. To relieve the pressure of gases building up in the primary containment around the pressure vessel, plant workers released gases to the secondary reactor building located above the primary reactor containment. This resulted in several hydrogen explosions. While these explosions ruptured the secondary building structures on top of the building, they did not affect the primary containment around the reactor vessels of Units 1 and 3. In Unit 2, damage was suspected at the time of writing to the suppression pool that forms part of the primary containment. In Unit 4, shut down and defueled for maintenance at the time, an explosion and fire in the reactor building was possibly related to heat generation in its spent fuel pool.

On April 17, TEPCO revealed details of its long term remediation plan for the three reactors. All will be flooded up to the top of the fuel with water. Spent fuel will be removed to central storage. A water treatment plant and improved water storage facilities will be built to treat water on site. Temporary containment structures would be built to prevent further radiation releases. All four reactors will then be decommissioned permanently.

It should be noted that despite the earthquake and tsunami greatly exceeding the design basis of the plant, casualties have been very light. Three TEPCO employees were killed, one crane operator at the time of the earthquake and two employees in the plant yard when the tsunami struck. Three contract employees laying cable received radiation doses of approximately 170 mSv, primarily to hands and feet. By April 13, 22 plant employees had received radiation doses of more than 100 mSv but less than 250 mSv, the maximum permissible for emergency situations. There were no cases of radiation burns reported.

There have been no radiation-related casualties to the general public outside the plant, and there have been no significant radiation doses to members of the general public.

In Closing

There is one important consideration that must be kept in mind with respect to the accident at Fukushima Daiichi. Both the earthquake and the tsunami greatly exceeded the design basis of the plant. Moreover, all reactors lost all electrical power, creating the worst of all possible circumstances for a power reactor accident. Despite all of these extreme circumstances, the passive safety systems of the reactors, notably their primary containment, succeeded in protecting both workers and the general public from harmful doses of radiation, and have prevented any radiation-related deaths or major injuries.

Given the severity of the earthquake, this serves as a strong testament to the ruggedness and reliabiltiy of the containment of even 40 year old reactors, as is the case with Fukushima I-1.

Nuclear Canada Yearbook

2010 marked a significant change for Nuclear Canada Yearbook. Started in 1976 by then General Manager of the Canadian Nuclear Association (CNA) Jim Weller, Nuclear Canada Yearbook has been published for the last 35 years as a showcase of Canada's nuclear technology and a reliable source of statistics for Canada's facilities, reactor performance and uranium production.

In 2010, the Canadian Nuclear Society (CNS) assumed responsibility for the publishing of the Yearbook. The Yearbook will differ from previous editions by highlighting activities of the CNS. However it will continue to showcase the products, services and facilities of Canada's nuclear industry.

In so doing, the CNS has affirmed the importance of the Yearbook as a key service to Canada's nuclear suppliers and service providers, a service that will continue in the years to come.

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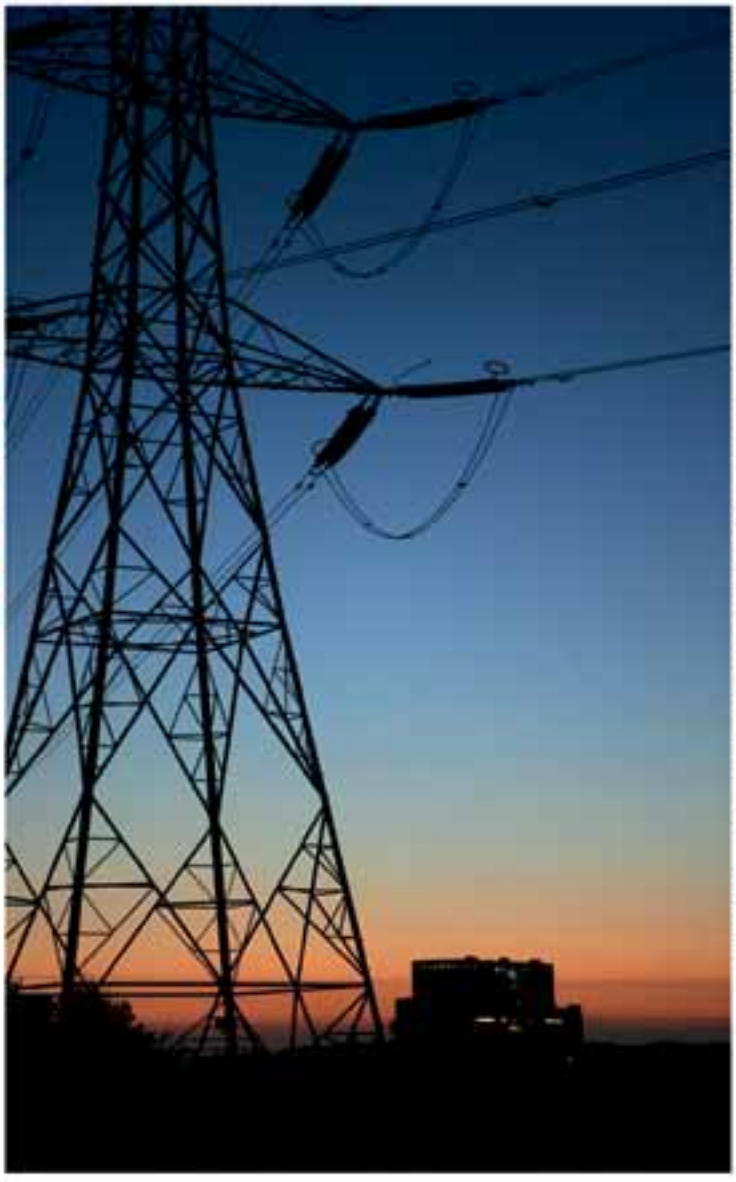

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CNS Conferences and Courses

Consistent with its mandate, the CNS has a strong track record of organizing conferences, courses and seminars on subjects related to nuclear science and technology.

The combined CNS Annual Conference and CNS/CNA Annual Student Conference gathers together scientists, engineers, technologists, senior management, government officials, and students from across Canada, and from other countries. The central objective of this conference is to exchange views on how nuclear science and technology can best serve the needs of humanity, now and in the future. The 2010 Annual Conference was held in Montréal and attracted more than 90 papers and 400 participants. The 2011 CNS Annual Conference is to be held in Niagara Falls, and in 2012 it will be held in Saskatoon.

In addition to its Annual Conference, the CNS organizes various other conferences (normally on a bi-annual basis) as well as courses. The following events were held during the past year:

The CANDU Reactor Safety Course was held in Toronto in March, 2010, and again in March 2011.

The CANDU Reactor Safety Course is one of the most popular courses organized by the CNS. It has been offered at least once a year (and sometimes twice a year) since 1996. In each of the last two offerings the attendance was over 40 and this is quite typical. The course addresses a broad set of topics on reactor safety, and attendees always find that this allows them to get a better understanding of the way in which different disciplines impact reactor safety.

The 2nd Canada-China Joint Workshop on Supercritical Water-Cooled Reactors (CCSC-2010) was held in Toronto in April, 2010.

This event was a significant gathering of participants from research organizations and institutions spanning both countries. It was created to provide a forum to discuss advances and issues, share information and promote future collaborations around SCWR technology development. All participants agreed that the event has successfully brought experts and newcomers from the industry and the academic community closer together to advance SCWR technology with a common goal. They enjoyed the opportunity to exchange information, share ideas, and build friendships across the Pacific Ocean.

The Nuclear Education and Outreach Conference was held in Calgary in June, 2010 and is described on the CNS Activities page.

The 11th International Conference on CANDU Fuel is a bi-annual event which was held in Niagara Falls in October, 2010.

Over 140 members of the global CANDU-fuel community gathered in Niagara Falls, Ontario for the CNS 11th International Conference on CANDU Fuel, October 17-20, 2010. The theme of this year's conference was "Flexible Fuel for a Greener Future." "This theme focuses on one of the unique features of the CANDU reactor design. CANDU's ability to use alternative fuels beyond conventional natural uranium holds great promise for the sustainability of this industry," said Joseph Lau, Vice-President, Engineering and Technical Delivery, in his opening remarks.

"The participants had high praise for the conference organization and content, including the technical tour and banquet. The conference also attracted 70 high quality papers from Argentina, Canada, China, Korea, India and Romania." Added Steve Palleck, Fuel Design Branch Manager and Conference Chair, "By all accounts, the CNS 11th International Conference on CANDU was a big success and exceeded all our expectations".

The International Nuclear Power Plant Chemistry (NPC 2010) Conference and the 8th International Radiolysis, Electrochemistry and Materials Performance Workshop were held in Quebec City in October, 2010.

This unusual conference, for the CNS, was the fifteenth of the series of International Conferences on Water Chemistry of Nuclear Power Reactors. The conference originated in Bournemouth England and is held every two years on a different continent. A large number of papers were attracted at this Canadian and international gathering. It was a huge success for the first visit to Canada. The total attendance (about 300) tied the previous record of this Bournemouth series of conferences. The workshop was held in conjunction with the conference and for the first time was organized integrally with the "Bournemouth" Conference. The workshop also enjoyed a record attendance. Both events encouraged the sharing of experiences between more and less experienced delegates. The feedback asked for this practice to continue.

The Technical Meeting on Low Power Critical Facilities and Small Reactors was held in Ottawa in November.

This event was held partially in commemoration of the 50th anniversary of the ZED2 Reactor at Chalk River Laboratories achieving first criticality on September 7, 1960. ZED2 has been designated as a Nuclear Historical Landmark by the American Nuclear Society. Joe Calvin, President of the ANS, presented the award at the event.

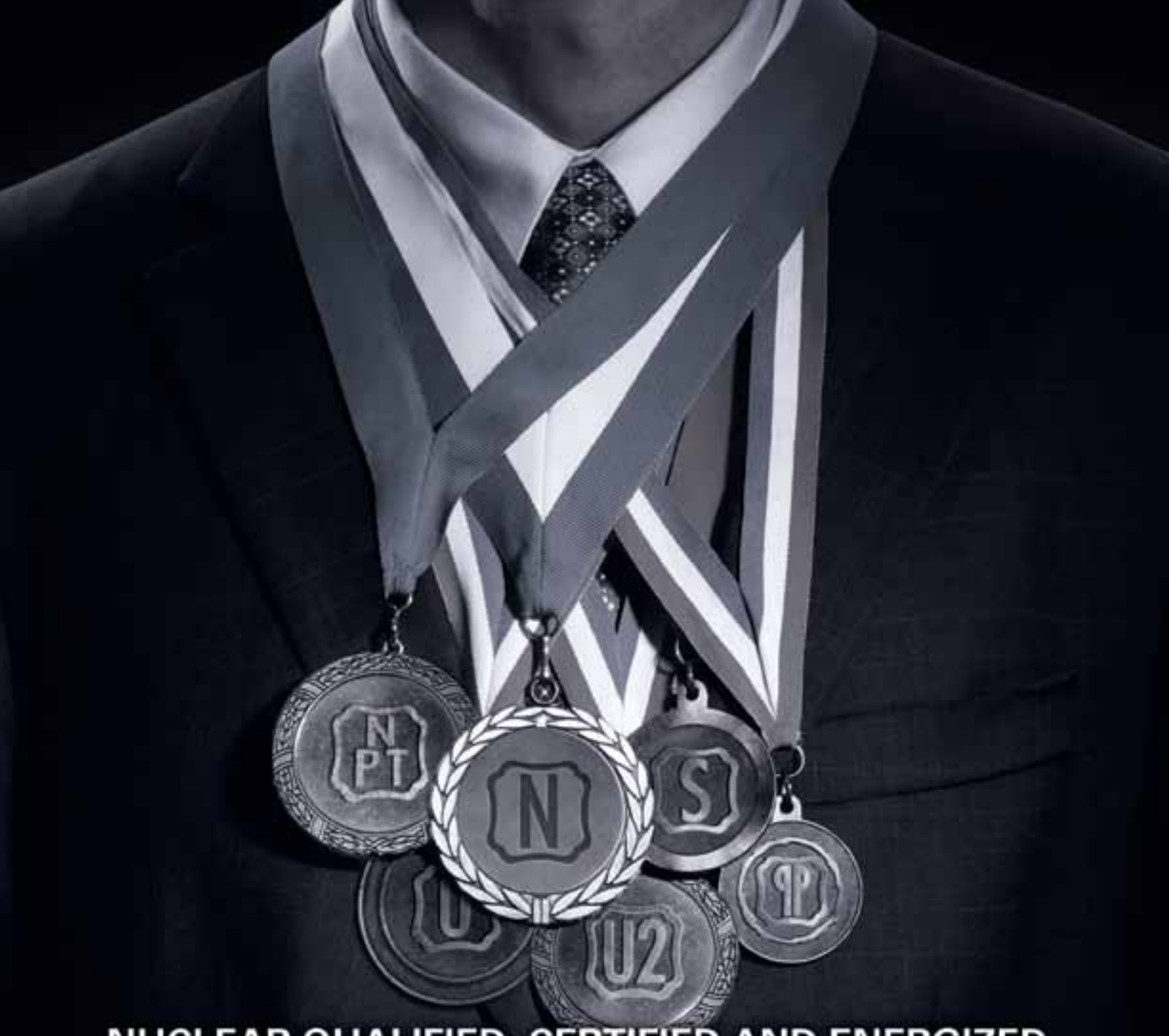
The event was well attended featuring about 30 presentations from both Canadian and international organizations on a variety of topics related to reactor experimentation and safety.

The 5th International Symposium on Supercritical-Water-Cooled Reactors (ISSCWR5) was held in Vancouver in March 2011

This biennial symposium, the premier venue for the exchange of technical information on Supercritical Water-cooled Reactors (SCWRs), was attended this year by 130 delegates from 16 countries. Canadian university participation at the symposium was high, with a large number of student presentations.

All of the technical conferences are held under the umbrella of one of the CNS Technical Divisions. The list of CNS Divisions and the current Chairs of these Divisions is provided below.

- Design & Materials Division – *John Roberts*
- Environment & Waste Management Division – *Ken Dormuth*
- Fuel Technologies Division – *Steve Palleck & Erl Køhn*
- Fusion Division – *Blair Bromley*
- Medical Applications & Radiation Protection Division – *Anthony Waker*
- Mining & Processing Division – *John Roberts*
- Nuclear Operations & Maintenance Division – *Jacques Plourde*
- Nuclear Science & Engineering Division – *Elisabeth Varin*



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CNS Committee Activities

The Canadian Nuclear Society has established a number of Committees to support its various activities and to interface with other organisations. Perhaps the largest of the CNS activities is led by the Education and Communication Committee (ECC), chaired by Jeremy Whitlock and Peter Lang. The ECC implements the CNS' mandate of public communication and educational support, and represents a significant area of financial investment on behalf of the CNS membership.

During the past year, the ECC has expanded its program of public education on nuclear science and technology matters. A second Ionising Radiation Workshop road kit (with experiments involving monitoring of naturally-occurring radioactive materials, or NORM, and consumer items) was developed, allowing one to be placed in Alberta (hosted by the University of Calgary for science teacher workshops in Western Canada), while the second kit remains available for Eastern Canada opportunities. The Ionising Radiation Workshop was presented three times in 2010. The road kits were used at several other outreach activities. The CNS has donated Geiger Kits to a total of 91 Canadian High Schools with two on order at the end of 2010, and has 40 outstanding requests for donations. The CNS appreciates the support received from Kinectrics Inc. for one Geiger Kit donation. The ECC has received encouraging response to our search for a commercial partner to provide support services for the Geiger Kit donations and workshop presentations.

The inaugural Nuclear Education and Outreach Symposium (NEO-2010) held at the University of Calgary attracted 50 participants from Canada, the United States of America and the European Union. NEO-2011 is planned for June 8-9, to follow the CNS Annual Conference in Niagara Falls.

Other important committees are:

- The Branch Affairs Committee, chaired by Syed Zaidi, coordinates the activities of the various branches of the CNS, and supports them financially and administratively. The CNS Branches organised seminars for their members and interested members of the public. Several Branches supported student science fairs, provided scholarships for high school students, and participated in science teacher conferences and outreach events held in their regions.
- The Membership Committee, chaired by Ben Rouben, manages all aspects of the membership, such as renewal notices, membership databases, membership drives, and membership communications. Recently, the membership database has been integrated with the CNS website to allow members to renew their membership online and to update their profile.
- The Finance Committee, chaired by Mohamed Younis, manages the members' equity in the Society, following a conservative investment strategy to increase the Society's capacity to finance its activities.
- The Past Presidents' Committee, chaired by the current Past President of the Society, Dorin Nichita. Its main task is to establish the slate of officers for the next term of Council.
- The Honours and Awards Committee, chaired by Krish Krishnan, manages – in cooperation with the Canadian Nuclear Association – the nomination and selection process for awards that are handed out to deserving individuals and teams in the Canadian nuclear industry and academia. The committee also nominates Fellows of the Canadian Nuclear Society, members of the Society who have distinguished themselves both within the society and in their careers, and who are rewarded with the official designation of FCNS.
- The International Liaison Committee, chaired by Kris Mohan, establishes and maintains ties with nuclear societies in other countries by means of formal agreements. Information is exchanged through the International Liaison Committee, and on occasion non-financial sponsorship is provided for events of common interest. The CNS is a member of the International Nuclear Societies Council and the Pacific Nuclear Council, and participates in the meetings of these international bodies.
- The Internet Committee, chaired by Ben Rouben, oversees the internet services provided to the Society. The CNS website was originally created and maintained on a volunteer basis by Morgan Brown, but is now contracted to a professional webmaster, Elmir Lekovic. It is the internet portal of the Society to the world. It provides information on the CNS' objectives, its organisational structure and activities. As mentioned above, it is now integrated with the membership data base. The website also provides the facility to register for CNS events such as courses and conferences, and it provides a portal for online paper submission to conferences.
- The Universities Committee, chaired by John Luxat, maintains the ties of the Society with the Canadian universities and the University Network of Excellence in Nuclear Engineering (UNENE).
- The Scholarships Committee, chaired by Mohamed Younis, manages the process of soliciting and judging proposals for summer and doctoral scholarships, and of administering the awarded scholarships.
- The Intersociety Committee, chaired by Eric Williams, maintains the ties with other learned societies in Canada, mainly in the context of the Engineering Institute of Canada (EIC). The CNS has a seat on the Council of the EIC and participates in common activities such as a career database and the organisation of conferences such as the very successful series of Climate Change Conferences, of which the next will be held in Montréal in 2013. The EIC also has a fellows and awards program for which several CNS members have been nominated successfully in recent years.
- The Program Committee, chaired by Frank Doyle, oversees the program of the CNS. It is described in more detail elsewhere in the Yearbook.

Continued on page 19...

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The CNS Bulletin – over three decades of communication

By Fred Boyd, Publisher, CNS Bulletin

The most visible publication of the *Canadian Nuclear Society is the Canadian Nuclear Society BULLETIN Société Nucléaire Canadienne*, most commonly known as the *CNS Bulletin*. A combined technical journal and news magazine, it is published quarterly with a circulation of about 1400 composed of members of the Society and key figures in the Canadian nuclear program and associates overseas. For the last decade the *Bulletin* has accepted advertisements from some of the major organizations associated with the Canadian nuclear program.

Volume 1, Number 1 of the ***CNS Bulletin***

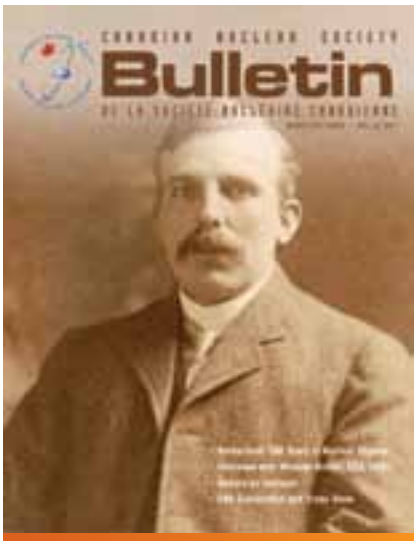
Background

The *Bulletin* began as a mimeographed newsletter back in May 1980 a few months after the CNS had been formally created as the *Canadian Nuclear Society – the Technical Society of the Canadian Nuclear Association*. John Hewitt, one of the organizers of the CNS and subsequently its third president, was the creator and editor.

In 1983, David Mosey took on the role of editor and the Bulletin became a typeset printed publication of, initially eight pages. David was succeeded in 1987 by Jatin Nathwani (now at the University of Waterloo and a frequent commentator on things nuclear) but pressure of work caused him to step down and David returned with a co-editor, KeithWeaver. That continued until the end of 1989. During much of that decade the Bulletin was published bi-monthly with just two issues in the last half of that year.

Having just taken early retirement, this writer offered to take on the editor role in 1990 with the proviso that there not be any overseeing committee or board. CNS Council agreed, and that arrangement has continued until the present. At that time the Bulletin had a typical size of 24 to 28 pages (printers tend to print in four-page segments.).

It was agreed to continue publishing on a quarterly basis with the format essentially unchanged, until the spring of 1994 when a colour cover was introduced. Content gradually increased with the adoption of the concept of making the Bulletin a combination of a technical journal and news magazine. That has continued until



The current issue of the ***CNS Bulletin***

the present with the only constraint being a target size of 56 pages which is optimum for mailing purposes.

Ric Fluke joined as associate editor in 1998, continuing until 2004 when pressure of work caused him to withdraw. But then in 2008 when the writer announced his wish to gradually withdraw, the position of "publisher" was created and Ric re-conscripted as editor.

For further information about the Bulletin contact Fred Boyd, Tel. 613-592-2256; E-mail: fboyd@sympatico.ca.

...CNS Committee Actvities, Continued from page 17

Another important activity of the CNS is to publish a quarterly Bulletin that outlines current activities and industry highlights. Fred Boyd and Ric Fluke manage all aspects of the Bulletin. A more detailed description of the Bulletin is given elsewhere in this Yearbook.

The interface committees are generally chaired by persons who are members of both the CNS and the other organisation. They are (Chairperson in parentheses): Canadian Nuclear Association (CNA, Dietwald Claus), Women in Nuclear Canada (WiN, Jad Popovic), CANDU Owners' Group (COG, Frank Doyle), Organisation of CANDU Industries (OCI, Frank Doyle), Young Generation in Nuclear (NA-YGN, Natalie Sachar), Partnership Group for Science and Engineering (PAGSE, Fred Boyd). The purpose of the interface committees is to maintain the relationship with the other organisations and to report to Council on activities that are relevant to the activities of the CNS.

It should be stressed that all committees of the CNS have volunteer members and are chaired by volunteers. During 2010/2011, the Society had another successful year – thanks to the efforts of the many volunteers serving on the various committees.

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Canadian Nuclear Association (CNA) Report

By Denise Carpenter, President and CEO

As we look back on the past year, we can reflect on changes, challenges and opportunities for Canada's nuclear industry.

Throughout 2010, the CNA began and completed a comprehensive exercise in partnership with our members that resulted in our Board-approved five year Strategic Plan: "Dialogue for Understanding and Growth." The intent of the Strategic Plan is to provide a living tool which contains the CNA Vision, Guiding Principles, Core Objectives and Strategy for the next five years. The Strategic Plan will be used to track progress, mark milestones and ensure coordinated actions on all fronts toward achieving our vision, which is to seize the opportunity presented by the global nuclear renaissance by building and sustaining a strong, vibrant and expanding nuclear-based industry, benefitting Canadians, our members and stakeholders.

To support the Strategic Plan in addition to daily emerging issues, the CNA also initiated Advisory Committees, Working Groups and Task Forces over the past year to cover areas of Governance, Regulatory Affairs, Policy and Communications, and Government Relations. This new structure allows for greater collaboration with our members, and I am confident these Committees are facilitating our work as an industry, streamlining our operations and providing an effective reporting mechanism to the CNA's Executive and Board of Directors.

Our work continued to evolve and grow as we entered a new year. In February, 2011, the CNA hosted our annual Conference and Trade Show themed Competing in World Markets: Strategies for Growth. The event was a great success, with more than 700 delegates from over 15 countries joining us in Ottawa to discuss the future of nuclear in Canada and abroad. We heard about exciting commitments going forward here in Canada, such as Ontario's plans for new nuclear units and refurbishments. Hearings for the Darlington New Nuclear Plant began on March 21, and on April 2, the CNA presented to the Joint Review Panel in support of OPG obtaining a favourable environmental assessment decision and a license to prepare the future site of the Darlington Project. This project is an important step in fulfilling Canada's growing energy demands and is an integral part of the Government of Ontario's plan to maintain its baseload nuclear generation capacity. We have seen significant interest in the province of Saskatchewan as their commitment to nuclear research and technology has been strong and supportive.

Of course, uncertainties do remain such as the Government of Canada's plans to privatize the commercial interests of Atomic Energy of Canada Limited. The path forward for the Chalk River Laboratories, Canada's primary nuclear industry research and development infrastructure, will also be analyzed.

In response, the CNA has been working with members and developed a position paper on the need for re-investment in nuclear research and development infrastructure as essential to Canada's future domestic and international competitiveness. We are requesting formation of a small expert panel to review the status, potential, and governance of nuclear R&D in Canada. This would send a positive signal to all stakeholders that the government is giving thoughtful consideration to the future of the R&D side of our industry, regardless of the status of the AECL restructuring. Our position was presented to the federal Government and an advocacy program is currently underway.

In addition to the R&D issue, the CNA is researching and advocating other priority policy issues. One is the safe transport of radioactive materials – an activity that goes on every day in most transport corridors and has an outstanding safety record. Another is the fair treatment of nuclear power versus other electricity sources – comparing public support for various sources, also known as the "level playing field" question.

As we reflect on the tragic events of March, 2011, our collective thoughts are with the Japanese people as they begin their path to recovery. They are facing their present challenges with solidarity and courage.

Canada's nuclear industry is very proud of our safety record, but we are never complacent and the tragedy in Japan will be examined thoroughly for lessons we can apply to safety here in Canada. At home and abroad, our industry is participating in discussions on lessons learned from this event and how to address any necessary changes required to enhance our safety systems.

We encourage you to contact us directly if you have any questions or require information at 613.237.4262. Please find below the updated listing of 2011 CNA Staff members:

Sincerely,
Denise Carpenter

You can also visit us online at:
www.cna.ca
Twitter: @talknuclear
Facebook: www.facebook.com/talknuclear

Denise Carpenter
President and CEO

Marie-Danielle Davis
Executive Assistant, Corporate Secretary

John Stewart
Director of Policy and Research

Heather Kleb
Director of Regulatory Affairs

Kathleen Olson
Director of Communications

Steve Coupland
Director of Environmental Affairs

George Christidis
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Dietwald Claus
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Laura Allardyce
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Kaitlin Walker
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Organization of CANDU Industries (OCI) Report

By David Marinacci, General Manager

The Organization of CANDU Industries is an industry association representing the interests of suppliers of goods and services to the global nuclear industry. OCI represents 160 companies, spanning all of Canada's major engineering firms' constructors and large scale fabricators to the many small and medium equipment providers, logistics operators and nut-and-bolt manufacturers that make up the Canadian nuclear industry.

Long before OCI was incorporated in 1979, our members were supporting Canada's nuclear program and have been integral to its success. This began with the building of the Zero Energy Experimental Pile at the Chalk River Laboratories. ZEEP went critical on September 1945, as the first operational nuclear reactor outside of the United States. Our members have continuously supported Canada's nuclear program since then. In the 40's & 50's they supported the design and construction of six domestic and international research reactors and the Nuclear Power Demonstration reactor (NPD), the prototype for the CANDU reactor design. NPD was built by General Electric Canada, in partnership with Atomic Energy of Canada Limited and Ontario Hydro. For the project, Babcock &Wilcox Canada provided a scaled-down 20 MW version of the high power boiler used in a US Navy nuclear submarine.

Our members' participation and support has been critical to the success of Canada's vast nuclear build program. Records show that Canada built 36 power reactors and 16 research reactors for domestic and export markets. Two prototype/demonstration reactors and 6 heavy water plants were also built in Canada over this period. Between 1991 & 2007 six CANDU 6 reactors, plus Cernavoda 1, started in the late 1970's, were completed on or ahead of schedule and budget, a record unsurpassed in the nuclear industry. This performance is a testimony to the depth and experience of Canada's nuclear supply chain.

This past year has been very busy at OCI, as the industry eagerly awaits a decision on the future of AECL, and for OPG to proceed with the Darlington new build project. OCI held regular discussions with government officials at various levels to promote the industry and its many benefits to Canadians. OCI continued to work with local municipalities to provide information and support for economic development and action plans. Suppliers' days were held with OPG, Bruce Power and AECL, where our members set up booths and met with buyers. OCI and its members actively pursued international markets supporting AECL's efforts in China, and attended the Nuclear Industry China 2010 conference in Beijing; where international opportunities were explored.

2011 looks to be another exciting year. We plan to hold regular discussions with government officials at local, provincial and federal levels, promoting the nuclear industry, as well as working with local municipalities. OCI plans to increase the number of suppliers' days, including Ontario Power Generation, Bruce Power, AECL SP, AECL CRL and New Brunswick Power. OCI will focus on more international markets, having hosted an Indian delegation in Canada and working with government officials to arrange a trade mission to India.

It is anticipated that a decision on AECL is imminent, and the Ontario government just announced that it intends to proceed with the Darlington project, and to refurbish ten CANDUs. These developments, along with international plans to build more than 155 reactors, 65 of which are currently under construction, provides the Canadian supply chain with enormous opportunities. With over 65 years of nuclear experience covering all aspects of power reactor projects, prototype plants, research reactors, heavy water plants, nuclear operations and supply of services to operating plants, the Organization of CANDU Industries stands eager and ready to support the nuclear renaissance.

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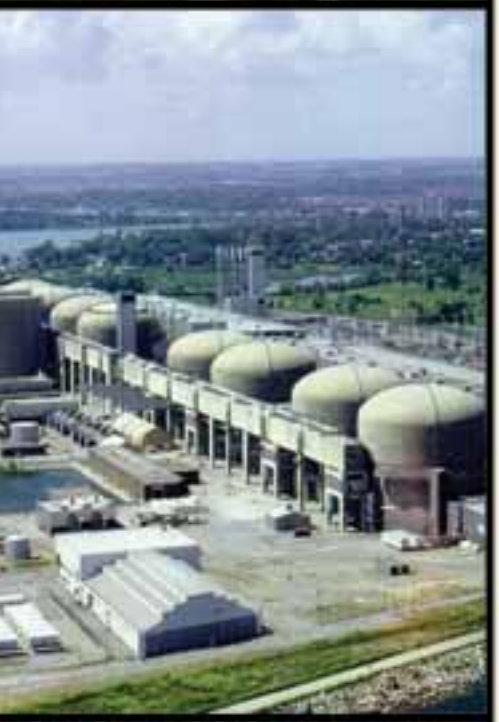

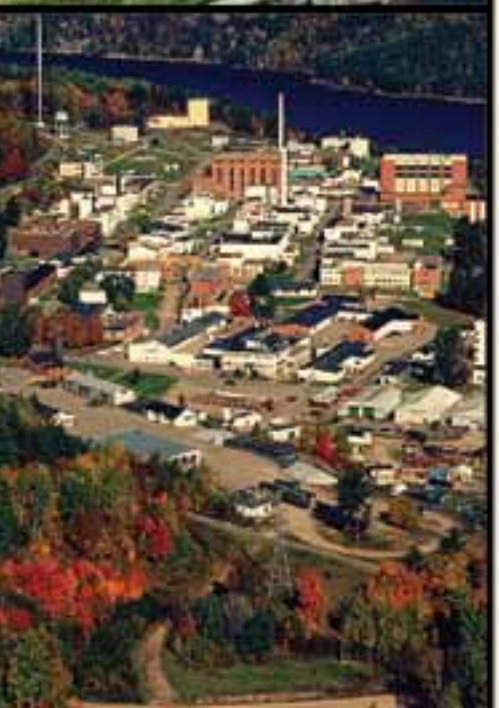

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CANDU Owners Group (COG) Report

By Bob Morrison, President and CEO

CANDU Owners Group Inc. (COG) is a private not-for-profit corporation funded voluntarily by its Members. Membership in the CANDU Owners Group is open to all CANDU owners/operators and Atomic Energy of Canada Ltd. (AECL).

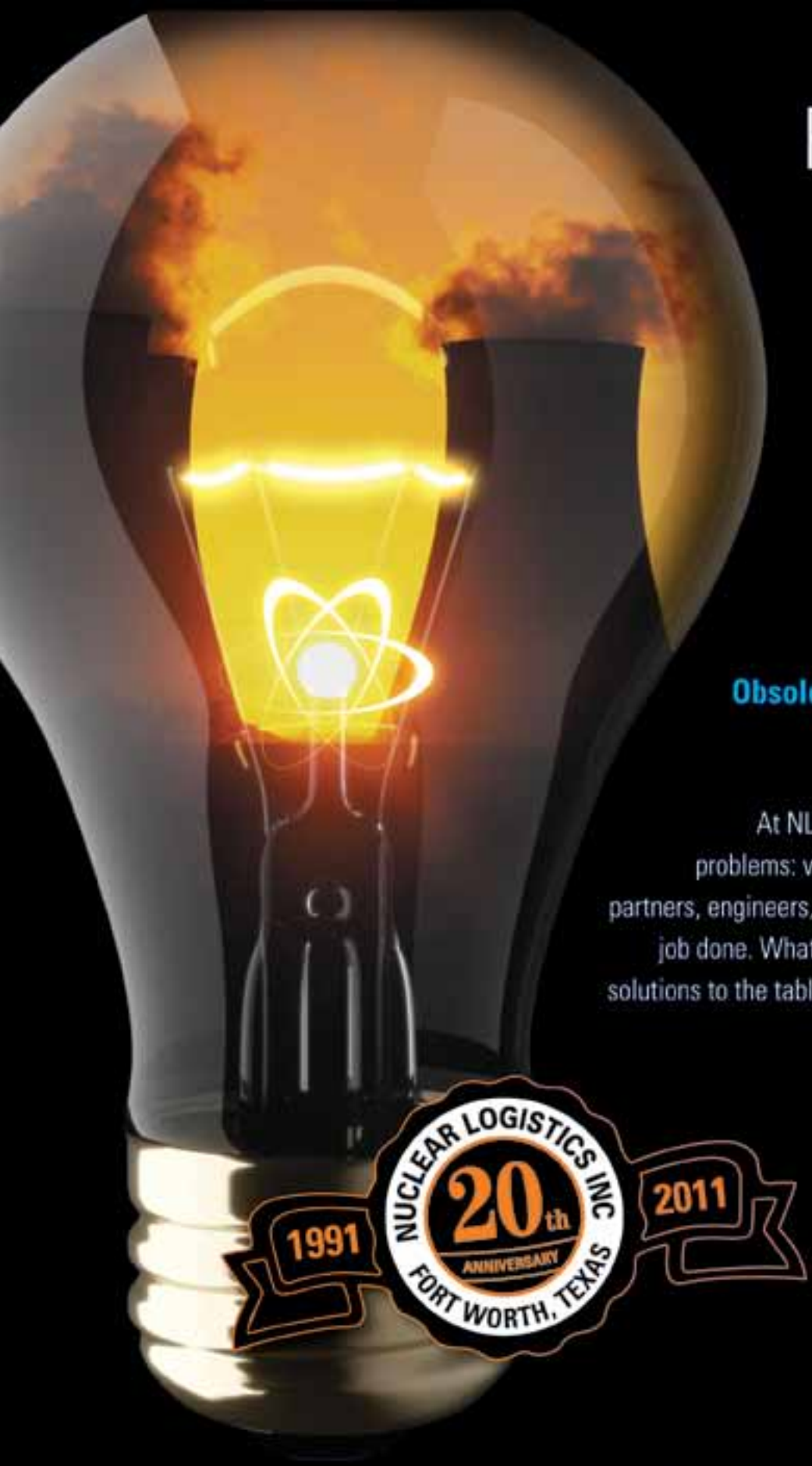
COG is dedicated to providing programs for co-operation, mutual assistance and exchange of information for the successful support, development, operation, maintenance and economics of CANDU Technology.

COG has two categories of Members: Voting and Non-Voting. Voting Members are those who, in addition to their membership fee, fund a significant portion of the overall COG program (Voting Members currently provide 90% of COG funding). Non-Voting Members enjoy the same rights and obligations as Voting Members, except that they do not have the right to vote at the Annual General Meeting and they do not nominate a Director to the COG Board of Directors.

COG has a Supplier Participant Program whose objectives are to increase the capability base for identifying and resolving Member issues, and to ensure that organizations considered crucial to Members' success have access to event information and issues in the CANDU industry. Eligibility is limited to suppliers that have made a significant investment in CANDU technology or are major suppliers of services directly related to CANDU technology. Supplier participants are accepted by unanimous approval of the COG Board of Directors.

COG has four major lines of business to assist its Members. The base program, Information Exchange, includes the dispensation of important operating information to all Members and facilitates many Workshops and Working Groups to allow member representatives to share challenges, solutions and good practices. Research and Development has programs in Safety and Licensing, Fuel Channels, Chemistry and Metallurgy, and Health and Safety. Joint Projects are those in which two or more Members combine on initiatives important to them but not necessarily all COG Members (e.g. Fuel Channel Life Management Project). The Regulatory Affairs program primarily assists Canadian COG members in their initiatives with the federal regulator, the Canadian Nuclear Safety Commission.

COG's Management Team is entrusted with day-to-day operations as well as longer term strategic planning subject to the oversight of the Board of Directors.



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Canadian Nuclear Workers Council (CNWC) Report

2011

By David Shier, President and CEO

The Canadian Nuclear Workers' Council (CNWC) was founded in 1993 as an umbrella organization of Unions to represent workers in all sectors of the Canadian nuclear industry. Represented sectors include electric power utilities, uranium mining and processing, radioisotope production for medical and industrial purposes and nuclear research.

CNWC activities are focused on the following objectives:

- Ensure that the interests and perspectives of nuclear workers are heard by decision-makers;
- Strengthen the collective role of nuclear workers as a partner in their industry;
- Enhance public knowledge and understanding of nuclear issues by providing factual information, and;
- Build support for the nuclear industry and its future potential

During 2010, the CNWC submitted briefs to the Senate Standing Committee Hearing on Bill C-9 related to the sale of Atomic Energy of Canada Limited (AECL). In addition, briefs were submitted to the Canadian Nuclear Safety Commission (CNSC) regarding AECL's NRU Restart, GE Hitachi's license renewal application, Bruce Power's Transport license application and Ontario Power Generation's (OPG) license renewal for Pickering A. CNWC education and outreach activities included attendance and an exhibit at the Canadian Nuclear Association's 2010 Annual Conference, meetings with the President and staff of the CNSC and the International Nuclear Workers' Union Network (INWUN) and ongoing communications – four newsletters, an article in North of 60 on unions and uranium mining in Saskatchewan and a fact sheet on the benefits of CANDU reactors.

In 2011, the CNWC will focus on Bruce Power's steam generator shipments to Sweden, the review of the Canadian Environmental Assessment Act, and the Darlington New Build EA hearings. Developments associated with the ongoing restructuring of AECL, the Bruce Restart Program, refurbishments of Point Lepreau and Gentilly 2 and related waste management facility, the Nuclear Waste Management Organization's program, and other CNSC licensing activities will also be priorities.

The CNWC plans to attend several conventions/conferences in the coming year including the Canadian Labour Congress, CUPE National Convention, Ontario Federation of Labour and the Annual INWUN. The CNWC also holds a basic nuclear 101 seminar at these conventions. Outreach and communication activities will support these initiatives. The CNWC will also be participating along with other Canadian unions and nuclear industry stakeholders in the delivery of basic radiation protection training for mine workers in Namibia.

CNWC Member Unions:

- Canadian Union of Public Employees – Locals 1500 & 267
- Communication, Energy & Paper Workers Union – Local 599-O & Local 48 – S
- International Association of Firefighters
- International Association of Machinist & Aerospace Workers – Local 608
- International Brotherhood of Electrical Workers
- Power Workers' Union
- Professional Institute of the Public Service of Canada (PIPS) – CRPEG & WRPEG
- Public Service Alliance of Canada
- United Steel Workers – Locals 8914, 7806, 14193, 13713
- Chalk River Technicians and Technologists Union
- Allied Trades Council
- Society of Professional Engineers & Associates (AECL)
- Hydro Quebec Professional Engineers Union
- International Brotherhood of Boilermakers Local 128

The Point Lepreau nuclear power reactor in New Brunswick.

Chalk River Laboratories: a sample of nuclear physics research programs in 2010

By Shelley Rolland-Poruks, Site & Community Affairs, AECL

Atomic Energy of Canada Limited's (AECL) Nuclear Laboratories play an integral role in driving science and technology innovation for the nuclear industry. The Nuclear Laboratories works to safely and securely bring energy, health, environmental and economic benefits from nuclear science and technology to Canada and the world.

While the significant work to return the NRU reactor back to service in 2009 and 2010 took precedence in the public realm, many other important scientific activities continued to take place within the Nuclear Laboratories.

Below is an update with respect to three R&D programs located at the Chalk River site that are making great strides in advancing nuclear science and technology. These programs are just some of the many was that the Nuclear Laboratories contribute to the nuclear community in Canada and abroad.

Molten Fuel Moderator Interaction (MFMI)

Steam explosions are not a new phenomenon. All that is required is a small amount of water mixing with a small amount of molten metal.

AECL's steam explosion studies, otherwise known as the Molten Fuel Moderator Interaction Program (MFMI), began at the Chalk River Laboratories (CRL) in 1999 as a joint-agreement between the CANDU Owners Group (COG), AECL and the Canadian Nuclear Safety Commission (CNSC) to examine the potential for steam explosions inside a CANDU reactor when the coolant flow to a single fuel channel is severely reduced. Such reduction to coolant flow may occur in the unlikely event that debris floating in the primary heat transport system plugs the inlet flow, or a feeder tube supplying the coolant to the fuel channel ruptures under operating conditions.

Prior to the launch this program, large-scale experiments of this size had yet to performed anywhere in the world.

Although this scenario has never occurred, in the event of such a blockage, the fuel bundle would melt. The hot molten material would break through the channel that holds the fuel bundle in place. The potential for a steam explosion occurs when that molten material interacts with the heavy water moderator.

No steam explosions occurred during the MFMI experiments. The experiments showed that although a steam explosion is possible in theory, it is unlikely to occur in a CANDU nuclear reactor due to the high pressure that exists within the pressure tube.

Experimental Results

For steam explosions to occur, the molten particles must be released as large pieces (>5 mm in diameter), which will then release the stored energy within very short time scales (a few milliseconds long). The energy released within the short time scales can produce shock waves with very high peak pressures.

Because a CANDU is operating at a pressure approximately 100 times above the ambient pressure, the molten fuel breaks into fine particles as it comes out of the fuel channel. These fine molten fuel particles cool down as they disperse through water, thus producing steam only at moderate pressures over long time scales.

The test results demonstrated that at ejection pressures of 3.4 MegaPascals (MPa) or higher, the dominant mode of interaction is forced interaction, indicating no steam explosion, giving rise to a modest pressure rise that can be sustained inside the calandria vessel.

Thanks to the R&D team at the Chalk River Laboratories and their hard work on this program, CANDU reactor safety was further demonstrated and the Nuclear Laboratories leadership position in nuclear safety was once again confirmed. The international community has found the results extremely valuable. Although the experiments draw conclusions only about the potential for events in CANDU reactors, the results are applicable to events in other types of reactors as well.

Chalk River Laboratories is one of the world's most important research laboratories in nuclear physics.

Fuel Development: An integral part of new fuel concepts and features

Fuel research and development (R&D) is an integral part of the work that brings new fuel concepts and features into reality. The facilities and staff of the Fuel Development branch deliver an ongoing program to maintain and augment expertise and capabilities in nuclear fuel with the purpose of:

- Improving energy efficiency;
- Increasing safety and reliability; and
- Decreasing environmental impact.

The extensive technical expertise, fabrication facilities and infrastructure at Chalk River Laboratories (CRL) allow relatively large-scale fabrication and testing of fuel under operating or close to operating conditions. The facilities are used to test new fuel concepts as input for next generation reactors. Fuel Development capabilities include:

- Fabrication of prototype and experimental fuel;
- In-reactor testing;
- Out-reactor testing;
- Cause of failure analysis;
- Development of new manufacturing methods;
- Application and development of new analytical techniques and test methods;
- Demonstration of regulatory compliance; and
- Fitness for service determination.

A large scale project was initiated to explore the use of recovered uranium from light water reactors in a CANDU reactor and to prove that it is the simplest and most environmentally-friendly process to utilize alternative fuel.

A CANDU reactor in China was the first to directly use recovered uranium fuel, achieving a major milestone in demonstrating CANDU's fuel cycle flexibility.

Throughout 2010, a total of 24 Natural Uranium Equivalent (NUE) fuel bundles were inserted into two separate fuel channels at the Qinshan Unit 4 reactor in Haiyan, China. NUE fuel is made by mixing recovered uranium from light water reactor spent fuel with depleted uranium.

The NUE fuel cycle opens up a sustainable development path leading to an overall extension of uranium fuel resources while, at the same time, reusing the spent fuel from light water reactors.

Muon Detectors: Nuclear Monitoring through Cosmic Rays

In line with its commitment to the peaceful use of nuclear knowledge and technology, AECL has a long history of expertise and leadership towards the safeguarding of nuclear materials and non-proliferation. Instrumentation developed by AECL, such as its Cerenkov Viewing Device for remotely examining spent fuel assemblies, has played an important role in addressing the challenges that face the international community around nuclear safety and security.

With millions of shipping containers around the world and over 45,000 trucks crossing North American borders every day, one of today's significant challenges is the effective monitoring of transport vehicles for nuclear materials. Port and border inspection agencies are continually faced with the unrealistic task of detecting illicit content in transportation containers with only limited resources to do so.

As part of a coordinated effort to confront this issue, AECL is working in partnership with Carleton University, Defence Research and Development Canada, the Canadian Border Services Agency, the Radiation Protection Bureau, Advanced Applied Physics Solutions and International Safety Research to develop a new detector that uses Cosmic Rays (called Muons) to image the content of shielded containers. Muons – which are charged particles created by the interaction of cosmic radiation with the upper layer of the atmosphere – can be used to image the interior of structures because of their unique ability to penetrate matter.

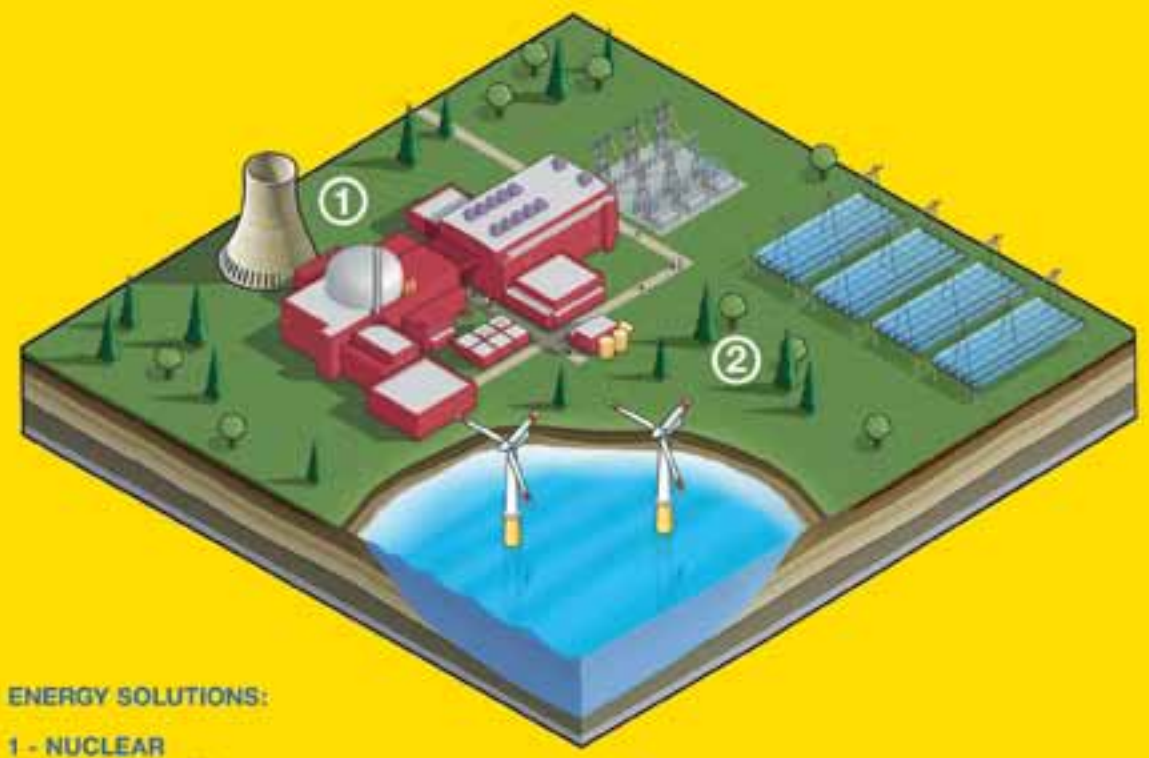
The new instrument will be designed to make use of these naturally occurring particles to create a 'snapshot' of the contents of transport vehicles. Once completed, the detector will measure the particles entering and exiting containers, which will enable border inspectors to create a tomographic image. By reviewing the imagery, inspection officers can differentiate nuclear materials inside a truck from other materials, such as lead or iron, and do so non-invasively in near real-time.

In addition to being a safe, efficient and more reliable alternative to monitoring containers without radioactivity, Muon detectors may eventually be used for industrial purposes and facilities involved in the legitimate use and transfer of nuclear materials. AECL's contribution to the design of this instrument is another proof point of its leadership in the development of knowledge and technology to support international efforts in nuclear materials accountancy.

Because of its world-class expertise, the Applied Physics Branch at Chalk River Laboratories is an important contributor to the development of the Muon detection technology. For decades, AECL has had proficiency around nuclear non-proliferation and, more recently, started developing innovative instrumentation for waste characterization. The division has also developed computational methods for simulating "exotic" radiation detectors in its Dynamic Simulation Facility.

This specialized expertise means Chalk River Labs is well positioned to participate in the Muon detection collaboration. Specifically, the group has the knowledge to develop the advanced dynamic simulation methods required for the modeling of Muon interactions, and to develop the imaging and detection algorithm for the identification and verification of spent fuel and nuclear waste.

Chalk River Laboratories is also the only facility in Canada where 'real life' tests could be conducted using nuclear waste under the appropriate nuclear safeguards.



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2 - RENEWABLES

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2011 Conference Schedule

2011 June 19 – 24
International Conference on Radioecology and Environmental Radioactivity (ICRER 2011)
McMaster University and Sheraton Hamilton Hotel, Hamilton, ON
Organized by ISRN, NRPA and McMaster University,
Co-sponsored by: CNS
Website: www.ecorad2011.net

2011 September 4 – 9
Global 2011 Innovative Nuclear Energy Systems Towards 2030 and Beyond
Japan
Organized by JAEA
Co-sponsored by CNS
Website: global@jaea.go.jp

2011 September 11 – 14
CNS Conference on Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities
Toronto Marriott Downtown Eaton Centre Hotel, Toronto, ON
Organized by: CNS, E&WM Division
Conference held in co-operation with the IAEA and Co-Sponsored by ANS, NEA-OECD and AESJ
Contact: Elizabeth Muckle-Jeffs
Tel: 1-800-868-8776
E-mail: Elizabeth@TheProfessionalEdge.com
or Canadian Nuclear Society Office
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca/waste_2011.html

2011 September 25 – 29
14th International Topical Meeting on Nuclear Reactor Thermalhydraulics (NURETH-14)
Toronto Hilton Hotel, Toronto, ON
Organized by CNS NSE Division
Contact: Denise Rouben, Canadian Nuclear Society
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2011 September 26 – 28
International Conference on Physics and Technology of Reactors and Applications (PHYTRA 2)
Fez, Morocco
Organized by GMTR in collaboration with CNESTEN
Co-Sponsored by CNS
E-mail: phytra2@gmail.com
Website: www.gmtr-association.com/phytra2/

2011 October 2 – 5
International Conference on the Future of Heavy-Water Reactors
Ottawa Marriott Hotel, Ottawa, ON
Organised by CNS NSE Division
Contact: Laurence Leung
E-mail: leungl@aecl.ca
Website: www.cns-snc.ca/events/cns-fhwr/

2011 October 2 – 5
COM2011, Conference of Metallurgists
Hilton Bonaventure Hotel, Montreal, QC
Arranged by METSOC
Co-sponsored by CNS
Website: www.metsoc.org/com2011/index.asp

2011 October
CNS CANDU Fuel Technology Course
Organized by: CNS, FT Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2011 Autumn (tentative)
CANDU Reactor Safety Course
Toronto, ON
Organized by CNS NSE Division
Contact: B. Rouben
E-mail: roubenb@alum.mit.edu
Website: www.cns-snc.ca

2011 December
9th CNS International Conference on CANDU Maintenance
Metro Toronto Convention Centre, Toronto, ON
Organized by CNS O&M Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2011 December (tentative)
CNS Operations-Related Courses
CANDU Configuration Overview
Chemistry of Preservation, Degradation and Activity Transport
Organized by CNS
Co-Sponsored by OCI
Website: www.cns-snc.ca

2012 February
CNA Nuclear Industry Conference and Tradeshow
Westin Hotel Ottawa, ON
Organized by CNA
Website: www.cna.ca/conference/cna/en/

2012 Spring
CANDU Reactor Safety Course
Toronto, ON
Organized by CNS NSE Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2012 April 15 – 20
International Topical Meeting on Advances in Reactor Physics (PHYSOR 2012)
Knoxville, TN
Organized by ANS
Co-Sponsored by CNS
Website: www.physor2012.org/

Full conference list: www.cns-snc.ca

2011 Conference Schedule

2012 June 10 – 13
33rd Annual CNS Conference & 36th Annual CNS/CNA Student Conference
Saskatoon, SK
Organized by CNS
Contact: Denise Rouben, Canadian Nuclear Society
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2012 Autumn
CANDU Reactor Safety Course
Toronto, ON
Organized by CNS NSE Division
Contact: B. Rouben
E-mail: roubenb@alum.mit.edu
Website: cns-snc.ca

2012 Autumn
7th International Steam Generator Conference
Toronto, ON
Organized by CNS, D&M Division
Contact: Denise Rouben, Canadian Nuclear Society
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2012 Autumn
24th Nuclear Simulation Symposium
Ottawa, ON
Organized by CNS; NSE division
Contact: Denise Rouben, Canadian Nuclear Society
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2012 Autumn
CNS CANDU Fuel Technology Course
Organized by CNS, FT Division
Contact: Canadian Nuclear Society Office
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2013 February
CNA Nuclear Industry Conference and Tradeshow
Westin Hotel Ottawa, ON
Organized by CNA
Website: www.cna.ca/conference/cna/en/

2013 Spring
CANDU Reactor Safety Course
Toronto, ON
Organized by CNS NSE Division
Contact: Denise Rouben Canadian Nuclear Society
Tel: 416-977-7620
E-mail: cns-snc@on.aibn.com
Website: www.cns-snc.ca

2013 May 31 – June 1
Third Climate Change Technology Conference
Concordia University, Montreal, QC
Organized by EIC including CNS

2013 June
34th Annual CNS Conference & 37th Annual CNS/CNA Student Conference
Toronto, ON
Organized by CNS
Contact: Denise Rouben, Canadian Nuclear Society
Tel: 416-977-7620
E-mail:cns-snc@on.aibn.com
Website: www.cns-snc.ca

2013 Autumn
CANDU Reactor Safety Course
Toronto, ON
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2013 Autumn
CNS CANDU Fuel Technology Course
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Tel: 416-977-7620
E-mail:cns-snc@on.aibn.com
Website: www.cns-snc.ca

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Anchor down. Forge ahead.

Nuclear Power and Uranium Resources

World Reactor Performance

Top 25 units by capacity factor, December 31, 2010

Rank	Country	Plant	Type	Capacity (MW)	Capacity (%)
1	US	South Texas 1	PWR	1368	103.6
2	US	Byron 1	PWR	1105	102.4
3	Switzerland	Leibstadt	BWR	1165	101.21
4	Switzerland	Goesgen	PWR	970	101.05
5	South Korea	Yonggwang 4	PWR	1350	100.9
6	Taiwan	Maanshan 2	BWR	890	100.82
7	Switzerland	Beznau 1	PWR	365	100.8
8	South Korea	Yonggwang 1	PWR	950	100.69
9	Switzerland	Beznau 2	PWR	365	100.5
10	US	Diablo Canyon 2	PWR	1160	100.22
11	South Korea	Kori 3	PWR	903	100.12
12	Taiwan	Chinshan 2	BWR	604	100.11
13	US	Cooper	BWR	764	100.00
14	US	Braidwood 1	PWR	1120	100.00
15	US	Beaver Valley 2	PWR	833	100.00
16	US	Comanche Peak 2	PWR	1150	99.95
17	Spain	Cofrentes	BWR	1063	99.82
18	US	McGuire 2	PWR	1100	99.8
19	US	Vogtle 1	PWR	1148	99.8
20	China	Ling Ao I -1	PWR	935	99.77
21	US	Palo Verde 2	PWR	1243	99.76
22	**South Korea**	**Wolsong 4**	**PHWR**	**700**	**99.73**
23	US	LaSalle 2	BWR	1078	99.7
24	Belgium	Tihange 2	PWR	1008	99.49
25	Switzerland	Muehleberg	BWR	355	98.98

All figures taken from Nucleonics Week. All numbers have been rounded.

Nuclear Power and Uranium Resources

CANDU Nuclear Reactor Performance

December 2010 Reactor	In Service	Capacity (MW)	Performance In 2010 (%)	Lifetime Performance (%)
Point Lepreau	1983	680	0*	74.0
Gentilly 2	1983	675	60.1	77.7
Wolsong 1	1983	622	0*	81.2
Wolsong 2	1997	730	93.7	93.6
Wolsong 3	1998	729	97.1	95.0
Wolsong 4	1999	730	94.3	95.9
Embalse	1984	648	74.6	85.0
Cernavoda 1	1996	706	95.1	89.2
Cernavoda 2	2007	705	97.2	94.9
Qinshan 4	2002	700	89.5	91.5
Qinshan 5	2003	700	93.4	89.9
Pickering 1	1971	542	53.1	63.6
Pickering 4	1973	542	71.3	65.8
Pickering 5	1983	540	84.1	74.3
Pickering 6	1984	540	86.3	78.2
Pickering 7	1985	540	66.1	77.6
Pickering 8	1986	540	68.8	76.4
Bruce 3	1978	805	66.6	63.9
Bruce 4	1979	805	90.6	63.6
Bruce 5	1985	845	93.6	84.0
Bruce 6	1984	872	76.2	80.5
Bruce 7	1986	872	94.0	84.2
Bruce 8	1987	845	98.7	82.5
Darlington 1	1992	934	94.6	84.7
Darlington 2	1990	934	81.3	77.7
Darlington 3	1993	934	97.9	86.1
Darlington 4	1993	934	73.6	85.4
Total/Average		**19 655**	**77.5**	**81.7**

COG CANDU/PHWR Performance Indicators, December 2010.
*These reactors were under reconstruction during part or all of 2010.

World Uranium Production – 2009

Country or area	Production (tU) 2006	2007	2008	2009
Australia	7 593	8 611	8 430	7 982
Brazil	190	299	330	345
Canada	9 862	9 476	9 000	10 173
China*	750	712	769	750
Czech Rep	359	306	263	258
France	-	4	5	-
Germany	65	41	-	-
India*	230	270	271	290
Kazakhstan	5 279	6 637	8 521	14 020
Namibia	3 067	2 879	4 366	4 626
Niger	3 434	3 153	3 032	3 234
Pakistan*	45	45	45	50
Romania*	90	77	77	75
Russia*	3 262	3 413	3 521	3 564
South Africa	534	539	566	563
Ukraine*	800	846	800	840
USA	1 672	1 654	1 430	1 453
Uzbekistan	2 260	2 320	2 338	2 429
Other				112
Total	**39 429**	**41 279**	**43 764**	**50 722**

* UI estimate
All figures taken from the World Nuclear Association

World Reactor Capacity

July 2010

Country	Operating		Planned or Under Construction		Electricity Generation (2007)	
	No	MW	No	MW	%	TWh
Argentina	2	935	4	2 199	7.0	7.6
Armenia	1	376	1	1060	45	2.3
Bangladesh			2	2000		
Belarus			2	2000		
Belgium	7	5 728			53.8	43.4
Brazil	2	1 901	1	1 245	3	12.2
Bulgaria	2	1 906	2	1 900	32.9	14.7
Canada	18	12 679	9	9 700	14.8	85.3
China	11	8 587	177	183 130	1.9	65.7
Czech Republic	6	3 686	2	3 400	33.8	25.7
Egypt			2	2 000		
Finland	4	2 696	2	2 600	32.9	22.6
France	58	63 236	3	4 890	76.2	391.7
Germany	17	20 339			26.1	127.7
Hungary	4	1 755	2	2 000	43	14.3
India	19	4 183	43	44 274	2.2	14.8
Indonesia			6	6 000		
Iran			4	3 115		
Israel			1	1 200		
Italy			10	17 000		
Japan	55	47 348	15	20 588	28.9	263.1
Kazakhstan			4	1 200		
Korea, N			1	950		
Korea, S	20	17 716	12	14 890	34.8	141.1
Lithuania			2	3 400		
Mexico	2	1 310	2	2 000	4.8	10.1
Netherlands	1	485	1	1 000	3.7	4
Pakistan	2	400	5	2 900	2.7	2.6
Poland			6	6 000		
Romania	2	1 310	3	1 965	20.6	10.8
Russia	32	22 811	54	51 810	17.8	152.8
Slovakia	4	1 760	3	2 040	53.5	13.1
Slovenia	1	696	1	1 000	37.9	5.5
South Africa	2	1 842	27	7 565	4.8	11.6
Spain	8	7 448			17.5	50.6
Sweden	10	9 399			34.7	50
Switzerland	5	3 252	3	4 000	39.5	26.3
Taiwan	6	4 927	8	10 600	20.7	39.9
Thailand			6	6 000		
Turkey			3	3 600		
UAE			14	20 000		
UK	19	11 035	10	16 200	17.5	62.9
Ukraine	15	13 168	22	28 900	48.6	77.9
USA	104	101 119	31	39 980	20.2	796.9
Vietnam			10	10 000		
Total	**439**	**374 690**	**522**	**550 101**	**14**	**2 558**

All figures taken from the World Nuclear Association

CNS Council and Staff

CNS Executive

Adriaan Buijs
President

Frank Doyle
1st Vice-President

E.M (Dorin) Nichita
Past President

John Roberts
2nd Vice President

Mohamed Younis
Treasurer

Len Simpson
Secretary

Benjamin Rouben
Administrator

Ken Smith
Financial Administrator

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 to benefit from the office support structure of the CNA. In 1979, 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 Executive Officers plus up to nineteen Members-at-Large – all volunteers. Various members of Council are appointed to Chair Committees that look after specific issues. A list of Committee Chairs appears on the next page. The Council is supported by a full time Office Manager, and by other part-time specialists.

Elected Executives for June 2010 to June 2011:

Adriaan Buijs President	Frank Doyle 1st V-P	John Roberts 2nd V-P	Len Simpson Secretary	Mohamed Younis Treasurer	Eleodor Nichita Past President

Part-time Specialists and Office Staff:

Ben Rouben Executive Administrator	Ken Smith Financial Administrator	Brian Blosser Accountant	Amanda Blosser Bookkeeper	Denise Rouben Office Manager	Bob O'Sullivan Office Assistant

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.

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

CNS Members at Large


Blair Bromley


Denise Carpenter, President, Canadian Nuclear Association, Ex-Officio


Emily Corocoran


Mohinder Grover


V.S. (Krish) Krishnan


Peter Lang


James Lévêsque


David Malcolm


Kris Mohan


Dave Novog


Duane Pendergast


Jacques Plourde


Jad Popovic


Tasfia Preeti


Melanie Sachar


Nick Sion


Michael Stephens


Jeremy Whitlock


Syed Zaidi

CNS Staff


Denise Rouben
CNS Office Manager


Fred Boyd
Publisher
CNS Bulletin


Ric Fluke, Editor
CNS Bulletin


Brian Blosser
Accountant


Amanda Blosser
Bookkeeper

International Nuclear Organizations

ARGENTINA

Autoridad Regulatoria Nuclear (ARN)
Av. Del Libertador 8250
(1429) Buenos Aries
Tel: 54-1 704 1218
Fax: 54-1 703 2845

Comision Nacional de Energia Atomica (CNEA)
Avenida del Libertador 8250
Buenos Aires 1429
Tel: +54 1 70 7711

AUSTRIA

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

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

AUSTRALIA

Australian Nuclear Science and Technology Organization
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New Illawarra Road
Lucas Heights
Private Mail Bag 1,
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Uranium Information Centre Ltd.
GPO Box 1649N
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Tel: 03 9629 7744
Fax: 03 9629 7207

BANGLADESH

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Energy Commission
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Guide to Nuclear-Related Organizations

2011

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Guide to Nuclear-Related Organizations

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Canada's Nuclear Facilities

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

Information is based upon Canadian Nuclear Safety Commission licensing information in 2006.

Power Reactor Licences

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

Non-Power Reactor Licences

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

Nuclear Research and Test Establishment Licences

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

Nuclear Research and Test Establishment Licences (cont'd)

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

Uranium Mine and Mill Facility Licences

Facility	Activity	Status
Beaverlodge/Dubyna, Saskatchewan (Cameco Corporation)		Decommissioned
Cigar Lake Project, Saskatchewan (Cameco Corporation)	Development	Construction
Cluff Lake, Saskatchewan (Cogema Resources Inc.)		Decommissioning
Key Lake Operation Saskatchewan (Cameco Corporation)	Milling	Operating
McArthur River Project, Saskatchewan (Cameco Corporation)	Ore removal	Operating
McClean Lake Project, Saskatchewan (Cogema Resources Inc.)	Ore removal and milling	Operating
Midwest Joint Venture, Saskatchewan (Cogema Resources Inc.)	Care and maintenance	Siting license
Rabbit Lake Saskatchewan (Cameco Corporation)	Ore removal and milling	Operating
Denison Mines, Elliot Lake, Ontario (Denison Mines Ltd.)		Decommissioned
Stanrock, Elliot Lake, Ontario (Denison Mines)		Decommissioned
Madawaska Bancroft, Ontario (Madawaska Mines Ltd.)		Decommissioned

Canada's Nuclear Facilities

Refinery and Fuel Fabrication Facility Licences

Facility	Annual Licensed Production Limit	Status
GE Canada Inc., Toronto, Ontario	1,800 tonnes of uranium as UO2 pellets	Operating
GE Canada Inc., Peterborough, Ontario	1,800 tonnes of uranium as UO2 pellets in fuel bundles	Operating
Zircatec Precision Industries Port Hope, Ontario	1,500 tonnes of uranium as UO2 pellets in fuel bundles	Operating
Cameco Corporation, Blind River, Ontario	18,000 tonnes of uranium as UO3	Operating
Cameco Corporation, Port Hope, Ontario	12,500 tonnes of uranium as UF6	Operating
	2,800 tonnes of uranium as UO2	Operating
	1,000 tonnes of uranium as ADU	Operating
	2,000 tonnes of depleted uranium metals and alloys	Non-operational
Earth Sciences Extraction Co. Calgary, Alberta	70 tonnes of uranium as U3O8	Non-operational since 1987

Waste Management Licences

Facility	Activity	Status
Radioactive Waste Operations Site 1, Tiverton, Ontario (OPG)	Storage of old solid wastes from Douglas Point nuclear station, no new waste accepted	Storage with surveillance
Western Waste Management Facility Tiverton, Ontario (OPG)	Incineration, compaction and storage of low and intermediate waste, and storage of spent fuel from Bruce NGS	Operating
Pickering Waste Management Facility Pickering, Ontario (OPG)	Storage of spent fuel and retube components from Pickering NGS	Operating
Bruce Heavy Water Plant Tiverton, Ontario (OPG)	Demolition of the heavy water plant and remediation of the site	Decommissioning
Douglas Point Radioactive Waste Storage Facility Tiverton, Ontario (AECL)	Storage of solid waste from Douglas Point Generating Station, spent fuel storage, no new waste accepted	Storage with surveillance
Gentilly-1 Radioactive Waste Storage Facility Gentilly, Quebec (AECL)	Storage of solid waste from Gentilly-1 NGS, spent fuel storage, no new waste accepted	Storage with surveillance
Gentilly-2 Radioactive Waste Storage Facility Gentilly, Quebec (Hydro-Quebec)	Storage of solid waste and spent fuel storage from Gentilly-2 NGS	Operating
Point Lepreau Solid Radioactive WMF Point Lepreau, New Brunswick (NB Power Nuclear Corporation)	Storage of solid waste and spent fuel storage from Point Lepreau NGS	Operating
Darlington Used Fuel Dry Storage Facility Bowmanville, Ontario (OPG)	Construction of a waste management facility for spent fuel at the Darlington NGS	Under construction
University of Toronto WMF Toronto, Ontario (University of Toronto)	Storage, handling and compaction of waste from university	Operating
Central Maintenance and Laundry Facility Tiverton, Ontario (Bruce Power)	Managing waste from decontamination activities	Operating
Monserco WMF Brampton, Ontario (Monserco Ltd.)	Storage, handling and compaction of waste from Ontario and Quebec	Operating
Nuclear Power Demonstration WMF Rolphton, Ontario (AECL)	Storage of solid waste from the partial decommissioning of NPD NGS, no new waste accepted	Storage with surveillance
Port Granby WMF Clarington, Ontario (Cameco Corporation)	Storage of historic waste and chemical treatment of drainage and run-off, no new waste accepted	Storage with surveillance
Welcome WMF Port Hope, Ontario (Cameco Corporation)	Storage of historic waste and treatment of drainage and run-off, no new waste accepted	Storage with surveillance

Waste Management Licences (cont'd)

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

Particle Accelerator Licences

Facility	Type	Status
Provincial Health Services Authority Charlottetown, Prince Edward Island	1 linac	Operating
Region 2 Hospital Corporation Saint John, New Brunswick	1 linac	Operating
Complexe hospitalier de la Sagamie Chicoutimi, Québec	1 linac	Operating
Centre universitaire de santé McGill Montréal, Québec	4 linacs	Operating
Hôpital Maisonneuve-Rosemont Montréal, Québec	3 linacs	Operating
The Board of Governors of the Kingston Hospital, Kingston, Ontario	3 linacs	Operating
Thunder Bay Regional Health Sciences Centre, Thunder Bay, Ontario	2 linacs	Operating
Windsor Regional Hospital Windsor, Ontario	3 linacs	Operating
Cancer Care Manitoba Winnipeg, Manitoba	5 linacs	Operating
Saskatchewan Cancer Foundation Regina, Saskatchewan	3 linacs	Operating
Saskatchewan Cancer Foundation Saskatoon, Saskatchewan	3 linacs	Operating
Alberta Cancer Board Calgary, Alberta	6 linacs	Operating
Alberta Cancer Board Edmonton, Alberta	5 linacs	Operating
Hôpital Général Juif Montréal, Québec	2 linacs	Operating
Centre hospitalier régional de Rimouski Rimouski, Québec	2 linacs	Operating

Canada's Nuclear Facilities

Particle Accelerator Licences (cont'd)

Facility	Type	Status
Cape Breton District Health Authority Sydney, Nova Scotia	1 linac	Operating
Régie régionale de la santé (Beauséjour) Moncton, New Brunswick	2 linacs	Operating
British Columbia Cancer Agency Kelowna, British Columbia	2 linacs	Operating
British Columbia Cancer Agency Victoria, British Columbia	5 linacs	Operating
British Columbia Cancer Agency Surrey, British Columbia	4 linacs	Operating
British Columbia Cancer Agency Vancouver, British Columbia	5 linacs	Operating
The Credit Valley Hospital Mississauga, Ontario	3 linacs	Operating
Newfoundland Cancer Treatment and Research St. John's, Newfoundland	1 linac	Operating
Centre hospitalier universitaire de Sherbrooke Sherbrooke, Québec	2 linacs	Operating
Centre hospitalier universitaire de Québec Québec, Québec	5 linacs	Operating
Capital District Health Authority Halifax, Nova Scotia	5 linacs	Operating
Hamilton Health Sciences Corporation Hamilton, Ontario	8 linacs	Operating
Centre hospitalier de l'Université de Montréal Montréal, Québec	8 linacs	Operating
Centre hospitalier régional Trois-Rivières, Québec	2 linacs	Operating
Hôpital régional de Sudbury Sudbury, Ontario	5 linacs	Operating
The Ottawa Hospital Ottawa, Ontario	6 linacs	Operating
Sunnybrook and Women's College Health Sciences Centre Toronto, Ontario	9 linacs	Operating
Centre hospitalier des vallées de l'Outaouais Gatineau, Québec	1 linac	Operating
University Health Network Toronto, Ontario	16 linacs	Operating
Grand River Hospital Corporation Kitchener, Ontario	4 linacs	Operating
London Health Sciences Centre London, Ontario	8 linacs	Operating
McMaster University Hamilton, Ontario	1 tandetron accelerator	Operating
McMaster University Hamilton, Ontario	1 tandetron accelerator	Operating
McMaster University Hamilton, Ontario	2 Van de Graaff	Operating

Particle Accelerator Licences (cont'd)

Facility	Type	Status
University of Guelph Guelph, Ontario	1 Pelletron accelerator	Operating
University of Western Ontario London, Ontario	1 tandetron accelerator 1 Van de Graaff	Operating Operating
Queen's University at Kingston Kingston, Ontario	1 particle accelerator	Operating
Université de Montréal Montréal, Québec	1 Van de Graaff tandem accelerator 1 tandetron accelerator	Operating Operating
Université Laval Ste-Foy, Québec	1 Van de Graaff tandem accelerator	Operating
Acsion Industries Incorporated Pinawa, Manitoba	1 particle accelerator	Operating
National Research Council Canada Ottawa, Ontario	1 Elekta Philips Precise 1 Vickers Electron Linear Accelerator	Operating Operating
Inco Limited Toronto, Ontario	Neutron Generator	Operating
Schlumberger Canada Limited Calgary, Alberta	Neutron Generator	Operating
Precision Drilling Technology Services Inc. Calgary, Alberta	Neutron Generator	Operating
Baker Hughes Canada Company Calgary, Alberta	Neutron Generator	Operating
Scientific Drilling International (Canada) Calgary, Alberta	Neutron Generator	Operating
Hotwell Canada Ltd. Calgary, Alberta	Neutron Generator	Operating
Montreal Neurological Institute and Hospital Montreal, Quebec	1 Cyclotron	Operating
Alberta Cancer Board Edmonton, Alberta	1 Cyclotron	Operating
Centre for Addiction and Mental Health Toronto, Ontario	1 Cyclotron	Operating
Centre hospitalier universitaire de Sherbrooke Sherbrooke, Québec	1 Cyclotron	Operating
Hamilton Health Sciences Corporation Hamilton, Ontario	1 Cyclotron	Operating
University of Ottawa Heart Institute Ottawa, Ontario	1 Cyclotron	Operating

Nuclear Substance Processing Facility Licences

Facility	Type	Status
New Processing Facility Chalk River Laboratories Chalk River, Ontario	Production and processing	Operating
MDS Nordion Ottawa, Ontario	Production and processing	Operating
SRB Technologies	Processing	Operating
Shield Source Inc.	Processing	Operating

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Sponsoring Societies

The Conference is being organized by the Canadian Nuclear Society in cooperation with the International Atomic Energy Agency, and is co-sponsored by the American Nuclear Society, the Argentina Nuclear Technology Association, the Atomic Energy Society of Japan, the Chinese Nuclear Society, the Indian Nuclear Society, the Korean Nuclear Society, the Nuclear Energy Agency of the OECD and the Romanian Nuclear Energy Association.

This three-day Conference is organized into plenary sessions and six concurrent technical tracks that will interest waste management, decommissioning and environmental technology practitioners; delegates from industry, academia, and government agencies and regulators; consulting engineers; financial and legal experts; and other specialists working in the field.

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Two post-Conference Technical Tours are planned: one to the Ontario Power Generation Deep Geologic Repository (DGR) and Western Waste Management Facility (WWMF) at Kincardine, Ontario and the other to the Port Hope Area Initiative (PHAI) Welcome Waste Management Facility , Port Hope, and Ontario Power Generation's Darlington Waste Management Facility, Clarington, Ontario.

Optional Day Trips for accompanying guests to various attractions in the Toronto and Niagara regions will also be offered. Details will be posted on the Conference website.

The Canadian Nuclear Society greatly appreciates the financial sponsorship of the Conference from the following organizations. Sponsorship opportunities are still available. Please refer to the Conference web site for details and updates.

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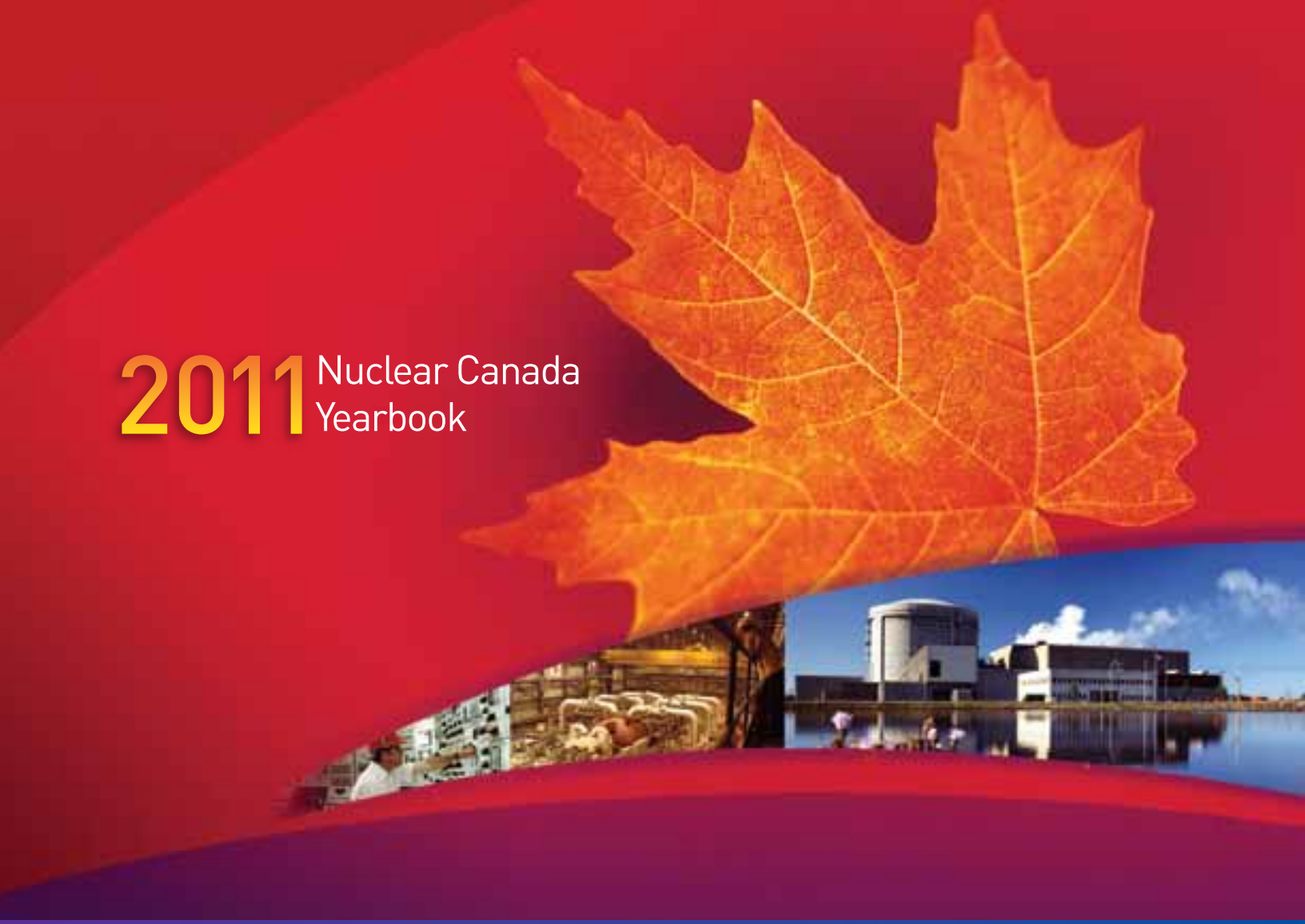

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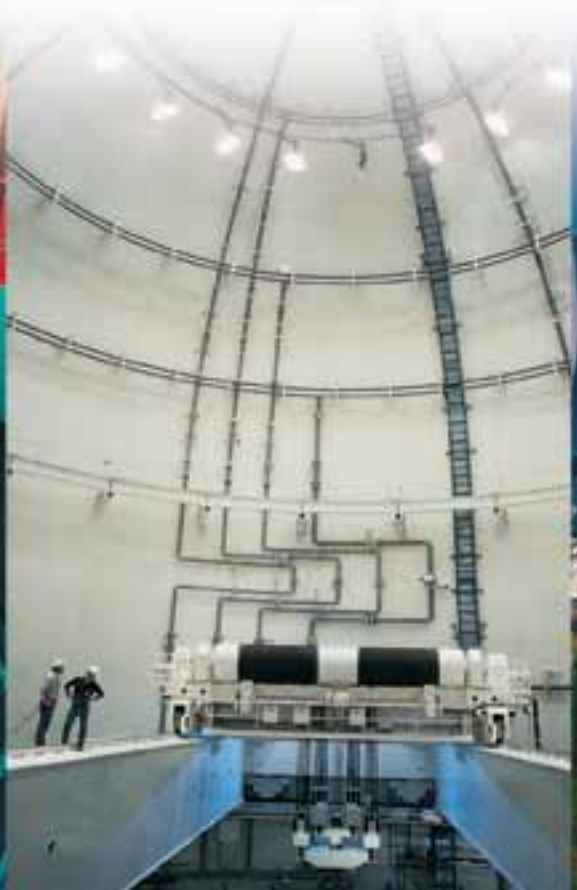

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- Wolsong South Korea (4 Units)
- NBP Point Lepreau (1 Unit)
- OPG Darlington (4 Units)
- OPG Pickering (8 Units)
- OPG/BP Bruce (8 Units)
- Quinshan China (2 Units)
- Embalse Argentina (1 Unit)

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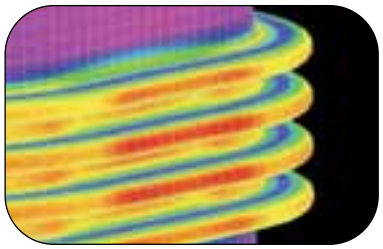
- AECL, GE , SNC-Nuclear



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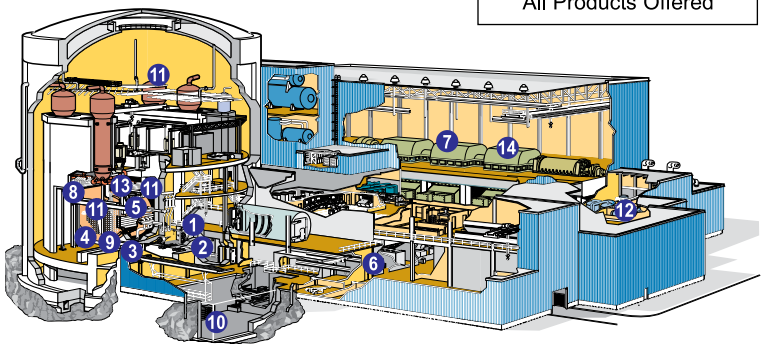

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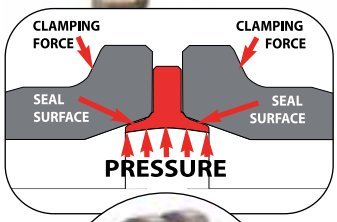

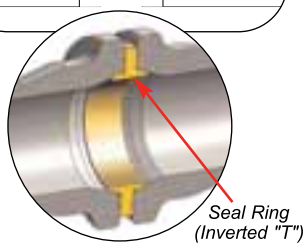

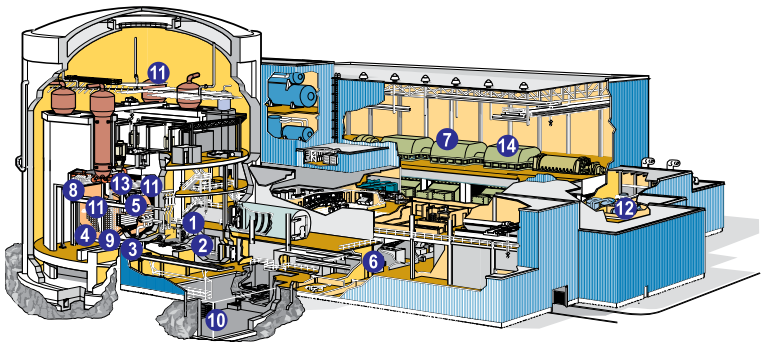

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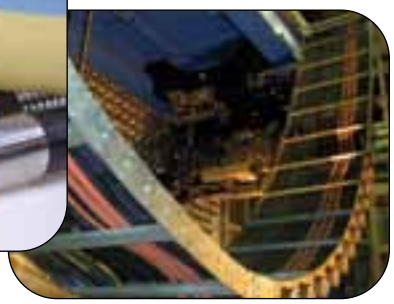

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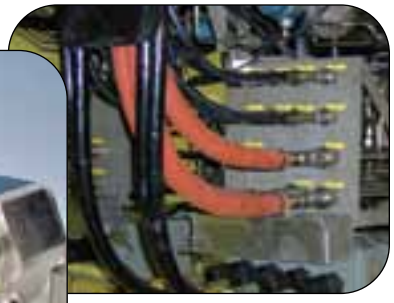

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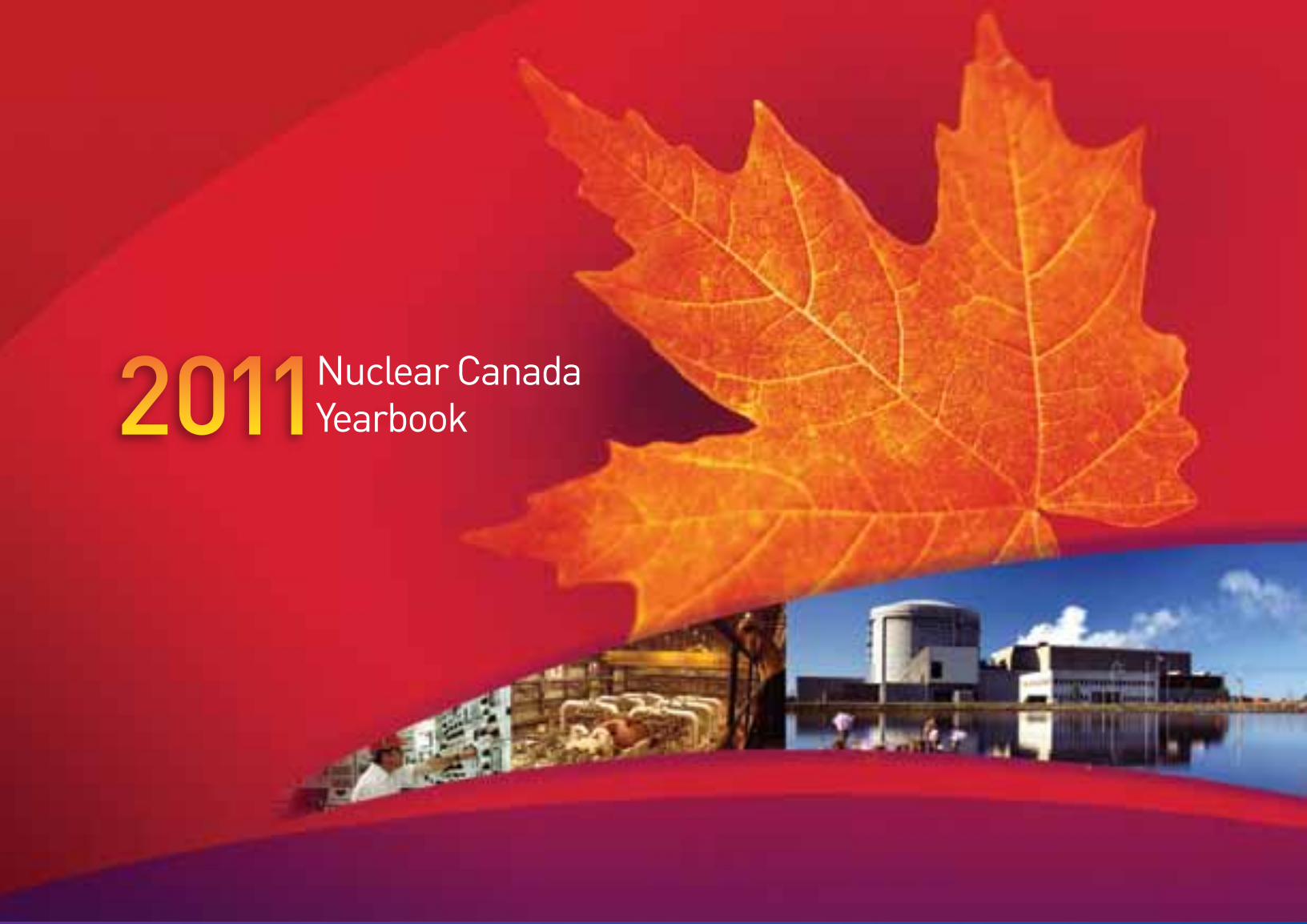

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