



**NEO-2010**  
**CNS Workshop on Nuclear**  
**Education and Outreach**  
**Calgary, Alberta, Canada**  
**University of Calgary's Hotel Alma**  
**Calgary, Alberta, Canada**  
**June 20 to 22, 2010**



## SPONSORS

We are pleased to acknowledge the generous financial support provided by the following organizations:



<http://www.aecl.ca/>



<http://www.aveva.com/>



<http://www.cameco.com/>



<http://westinghousenuclear.com/>

## **Welcome from Jay Harris, Workshop Chair**

I would like to take this opportunity to welcome everyone to the Nuclear Education and Outreach Workshop 2010. This is meant to be the first regular meeting on the topics of outreach, education and communications. Given the widening interest in Nuclear applications in areas that have not traditionally been home to nuclear activities, events of this nature are becoming more and more important as ever more, and ever newer participants add their voices to the discourse.

In my own limited experience there have already been circumstances where the message of one group or party has caused some inconvenience for other parties. This meeting will hopefully provide an opportunity for all the players to get together and discuss the most successful practices to get the message out. Hopefully the informal interaction of the group will also permit the exchange of ideas and material where such outcomes can be avoided in the future.

Realizing that a further challenge to the Nuclear Renaissance is one of succession, and industry 'grey out'. A number of speakers are contributing their expertise, and experiences in the education of the industry's future professionals. Additionally we hope to discuss the training and development of the needed skilled labour which are also at present in short supply.

With the current ecological disaster in the Gulf of Mexico still unfolding ever more emphasis has been placed on the Alberta Oilsands. Outside of the existing proposed new-build projects, other interests in isotope production and small-reactor applications have begun to spark interest in Canada's Western Provinces. These new interests also fall into those territories traditionally occupied by Canada's uranium, and other resource developers'.

As these new developments move forward it is important to share information, and experiences. What works? What doesn't? What are the political realities, and who needs to be included in the message?

We have worked hard to make this a national event, and while there are some regional-specific topics we believe that they convey experience and best practices which can be applied elsewhere.

As an item admittedly of some self interest, we have encouraged content relevant to Aboriginal Issues. As the somewhat ill defined area of "Duty to consult and accommodate First Nations" is a constantly evolving area of case law and accepted practices, we have asked our participants with the most expertise in this area to include some content detailing their experience.

Overall I hope that everyone finds this event to contain material relevant to their own expectations, and that we all take something beneficial away from the event.

Thank you and I look forward to seeing all of you at NEO 2010,

Jay Harris,

Chair NEO 2010

## Schedule of Events

Day	Time	Event	Location
Sun June 20	6:00-8:00 pm	Workshop Registration and Opening Reception (Finger Foods, Beer & Wine) – Included in registration fee; Registrants' guests are welcome	Senate Room, Hotel Alma
Mon June 21	Early Morning	Breakfast – included in room package for those staying in Hotel Alma	Hotel Alma
Mon June 21	7:30 am	Workshop Registration	Blue Room, Dining Centre
Mon June 21	8:00 am -noon	Workshop Sessions (coffee break in mid morning)	Blue Room, Dining Centre
Mon June 21	Noon	Workshop Lunch – included in registration fee; extra lunch tickets can be purchased for guests (please let us know in advance)	Blue Room, Dining Centre
Mon June 21	1:00-5:00 pm	Workshop Sessions (coffee break in mid afternoon)	Blue Room, Dining Centre
Mon June 21	6:00-9:00 pm	Host Bar and Workshop Dinner – included in registration fee; extra dinner tickets can be purchased for guests (please let us know in advance)	Blue Room, Dining Centre
Tues June 22	Early Morning	Breakfast – included in room package for those staying in Hotel Alma	Hotel Alma
Tues June 22	8:00 am -noon	Workshop Sessions (coffee break in mid morning)	Blue Room, Dining Centre
Tues June 22	Noon	Workshop Lunch – included in registration fee; extra lunch tickets can be purchased for guests (please let us know in advance)	Blue Room, Dining Centre
Tues June 22	1:00-5:00 pm	Workshop Sessions (coffee break in mid afternoon)	Blue Room, Dining Centre
Tues June 22	5:00 pm	End of Workshop	

## Workshop Session Schedule

Sunday June 20		
6:00 pm – 8:00 pm	Reception in the Senate Room of the Hotel Alma “Appetizers, Finger Foods and Drinks”	
Monday June 21		
7:00 – 7:45 AM	Conference Registration	
8:00 – 8:15 AM	Opening Statements of Welcome by Jay Harris, Conference Chair	
8:15 – 8:45 AM	Neil Alexander, OCI, “Rebuilding the Voice of Nuclear in Canada”	7
8:45 – 9:15 AM	Petre Ghitescu, University Tehnica Bucharest, “European Approaches and Initiatives for Nuclear Education & Training and Knowledge Management”	8
9:15 – 9:45 AM	Cheryl Cottrill, WiN, “Putting a Fresh Face on the Nuclear Industry through Education and Outreach”	9
10:15 – 10:30 AM	Coffee Break	
10:30 – 11:00 AM	Albert Cooper, Bruce Power, “Nuclear a Part of the Energy Mix in Alberta”	10
11:00 – 11:30 AM	Lisa Stiles, “ANS Outreach Activities”	
11:30 – Noon	Claudia Lemieux, CNA, “The Canadian Nuclear Association's Education and Outreach”	12
Noon – 1:00 PM	Lunch – Jeremy Whitlock, CNS, “Memes to an End: Making the Message Stick in the Public Brain”	13
1:00 – 1:30 PM	Cherie Ferrari, Kinectrics Inc., “An Integrated Framework for Utility Sector Human Resources and Training”	14
1:30 – 2:00 PM	K.L. Peddicord, Texas A&M University, “Meeting the Human Resources Needs for the Future Use of Nuclear Energy”	15
2:00 – 2:30 PM	Victor Snell et al., UNENE, “UNENE - Advances in Nuclear Education for the Nuclear Industry”	16
2:30 – 3:00 PM	Lee Dodds (University of Tennessee) et al, “Nuclear Engineering Distance Education at the U. of Tennessee: a Possible Model for Canada?”	17
3:00 – 3:30 PM	Pascal Mertins, “Past and Future Issues of Nuclear Energy in Germany”	18
3:30 – 3:45 PM	Coffee Break	
3:45 – 4:15 PM	Bryan White et al, CNS, “The CNS School Geiger Program”	19
4:15 – 4:45 PM	Alistair Miller. AECL, “AECL and Insights Through the Deep River Science Academy”	20
4:45 – 5:15 PM	Eric Mohun, TransCanada Pipelines, “Aboriginal Engagement and the Duty to Consult”	21
5:15 – 5:45 PM	Ramesh Sadhankar, AECL, “AECL R&D Partnerships”	22
5:45 – 6:15 PM	George Bereznai, UOIT, “A Comprehensive Program of Degrees and Diplomas for Canada's Nuclear Industries”	23
6:15 – 7:30 PM	Dinner	
7:30 – 9:00 PM	Round-Table Discussion on the Needs of Nuclear Education and Outreach	

Tuesday June 22		
8:00 – 8:30 AM	Brad Moore, AECL, “AECL Community Outreach and Speaker's Program”	24
8:30 – 9:00 AM	Engin Özberk, Cameco Corporation, “Innovation and Communications at Cameco”	25
9:00 – 9:30 AM	Claude Guet, CEA (France), “Sharing the French Offer in Nuclear Education and Training”	25
9:30 – 10:00 AM	Michael Godfrey, “Westinghouse Nuclear Education and Outreach”	
10:00 – 10:15 AM	Coffee Break	
10:15 – 10:45 AM	Alun Richards, AREVA Resources Canada Inc., “From Social Licence to Social Media”	27
10:45 – 11:15 AM	Jason Donev, University of Calgary, “A Physics Professor Learns To Teach Nuclear Power To Science And Non-Science Students.”	29
11:15 – 11:45 AM	Don Wiles, Carleton University, “The Rise and Fall of Radiochemistry in Canada”	30
Noon – 1:00 PM	Lunch	
1:00 – 1:30 PM	John Roberts, University of Manchester, “Nuclear Education and Outreach in the UK”	31
1:30 – 2:00 PM	Cosmos Voutsinos , CNS AB Branch, “Lessons Learnt from some Outreach Efforts”	32
2:00 – 2:30 PM	Paul Hinman and Jeremy Whitlock, “The Role of Lay Outreach Personnel”	33
2:30 – 3:00 PM	Leon Lau, Central Memorial Lord Shaughnessy High School, “Nuclear Content in Alberta Grade 12 General Science Education”	34
3:00 – 3:15 PM	Coffee Break	
3:15 – 3:45 PM	Corina Andreoiu et al., Simon Fraser University, “Undergraduate and Graduate Opportunities in Nuclear Science at Simon Fraser University”	35
3:45 – 4:15 PM	Dan Brady (NRCAN) et al., “Enhancing University R&D capability in supporting Generation IV”	36
4:15 – 4:45 PM	Jason Glabik, Mile Zero News, “Nuclear Power in the Media”	37
4:45 – 5:15 PM	Duane Bratt, Mount-Royal University, “Debating About Nuclear Power”	38
5:15 – 5:45 PM	Closing Statements and Discussions	

# **Rebuilding the Voice of Nuclear in Canada**

**Dr. R.N. Alexander, President, Organization of CANDU Industries**  
[alexander.neil@sympatico.ca](mailto:alexander.neil@sympatico.ca)

Surveys show that Canadians are generally supportive of nuclear power but this is a theoretical support, few actually understand the issues or have any solid commitment. The status of CANDU as a Canadian industry has progressively declined and despite winning an award for being one of Canada's top ten achievements it is now not even mentioned in the list of inventions given in the guide book for new Canadians. The history books our children read talk of the industry's problems and not of its success.

Part of the decline in popularity arises from the fact that for a long time the industry lapsed into relative silence as a way of avoiding negative publicity. While this strategy has some merits because it did indeed minimize negative publicity, it has resulted in all the publicity being negative with the industry only responding when it needed to defend itself. Clearly such an approach cannot lead to a win but instead just controls the speed at which you lose.

Now as the renaissance kicks in we need to rebuild support and we need to do that quickly and efficiently. Massed at our disposal are the tremendous resources of CNA, CNS, OCI, AECL, OPG, Bruce Power, SPEA, PWU, etc, etc, and the stakeholders, employees and members. Many have started their campaigns and there has been progress but it is not enough and it is not fast enough. Much of the impact is lost through inconsistent or incomplete messaging and we are all independently making and learning from the same mistakes.

To make our message effective we need to harness all of the voices, build consistency in our messaging, work together to ensure that the right people are carrying the right message in the right places and use appropriate expertise to get our messaging so that it plays effectively to its audience.

The Nuclear Energy Outreach conference provides an opportunity to start this process of rebuilding. This presentation highlights why it is so important to rebuild our voice and proposes some concepts by which this might be achieved.

# **European Approaches and Initiatives for Nuclear Education & Training and Knowledge Management**

**Petre Ghitescu, University Politehnica Bucharest, Romania**  
[ppghites@hotmail.com](mailto:ppghites@hotmail.com)

The project “European Nuclear Engineering Network - ENEN” aimed to establish the basis for conserving nuclear knowledge and expertise, to create a European Higher Education Area for nuclear disciplines and to facilitate the implementation of the Bologna declaration in the nuclear disciplines by creating the European Nuclear Education Network Association.

ENEN Association goals are oriented towards the Universities by developing a more harmonized approach for education in the nuclear sciences and engineering in Europe, integrating European education and training in nuclear safety and radiation protection and achieving a better cooperation and sharing of resources and capabilities at the national and international level, as well as towards the End-users (industries, regulatory bodies, research centres, universities) by creating a secure basis of knowledge and skills of value to the EU, maintaining an adequate supply of qualified human resources for design, construction, operation and maintenance of nuclear infrastructures and plants, and by maintaining the necessary competence and expertise for the continued safe use of nuclear energy and applications of radiation in industry and medicine.

One of the achievements of ENEN is the establishment of the European Master of Science in Nuclear Engineering (EMSNE), which provides common reference curricula and mutual recognition among ENEN members, promotes and facilitates mobility of students and teachers and permitted definition and assessment of ENEN international exchange courses. EMSNE addresses topics related to reactor engineering, reactor physics, nuclear thermal hydraulics, safety and reliability of nuclear facilities, reactor engineering materials, radiology and radiation protection, and nuclear fuel cycle and applied radiochemistry.

The knowledge management activity involves development of the ENEN Web Site [www.enen-assoc.org](http://www.enen-assoc.org), creating the national contact points to maintain and update information on education and training courses, delivering textbooks on nuclear topics, multimedia presentations addressing the general public, as well as introducing distance learning tools and E-learning modules.



## **Putting a Fresh Face on the Nuclear Industry Through Education and Outreach**

**Cheryl Cottrill, Women in Nuclear**  
[cheryl.cottrill@brucepower.com](mailto:cheryl.cottrill@brucepower.com)

Our paper will go back to 2004 when Women in Nuclear (WiN) Canada was re-established in Canada. At that time the public polls on the nuclear industry showed a large gap between the support of men and women. WiN was the first to ask why. In 2004 WiN conducted gender based research to answer the question, “Why women were less likely to support nuclear than men?” That research and the commitment to WiN-Global’s three goals set the framework for WiN’s nuclear outreach and education programs going forward.

The paper will explain the research findings from 2004 and show how programs have been built to address some of the issues that women identified in the research, as well as explain how WiN is influencing young girls and women to become more involved in non-traditional roles and studies. The paper will explain our:

- Post-research educational forums for women;
- GIRLS Science Club and Camp;
- Our partnership with Skills Canada to introduce young women attending secondary school to skilled trades workers from the nuclear industry;
- Our partnership with The Learning Partnership producing a video talking about careers in the nuclear industry to be used in all secondary schools across Ontario and nationally; and
- Other programs WiN has created or is planning for the future.

WiN is committed to making the public aware, especially women, of the benefits of nuclear and radiation applications and the safety that ensures protection of the public and the environment. Members of WiN all have one thing in common: they want the general public to have a better understanding of nuclear and radiation issues.

Through its outreach and educational program WiN is working diligently to put a fresh face on the nuclear industry.

WiN (Women in Nuclear) is a world-wide association of women working professionally in various fields of nuclear energy and radiation applications.

WiN-Canada was formed in early 2004 and has been working to emphasize and support the role that women can and do have in addressing the general public's concerns about nuclear energy and the application of radiation and nuclear technology.

## **Bruce Power's Plan for New Nuclear in Alberta**

**Albert Cooper, Bruce Power**  
**[Christine.Bowman@brucepowerab.ca](mailto:Christine.Bowman@brucepowerab.ca)**

With Alberta's growing need for electricity, the impending closure of many of our coal plants, and Alberta's need to reduce emissions it may be time to look at Nuclear for our province. Bruce Power has a plan, and a project, that could just make Nuclear a part of the Energy mix in Alberta.

# **ANS Outreach Activities**

**Lisa Stiles**

**[lisaanstiles@yahoo.com](mailto:lisaanstiles@yahoo.com)**

# **The Canadian Nuclear Association's Nuclear Technology: Exploring Possibilities**

**Presented by Claudia Lemieux, Director of Communications and Media Relations,  
Canadian Nuclear Association**  
[lemieuxc@cna.ca](mailto:lemieuxc@cna.ca)

The Canadian Nuclear Association's Nuclear Technology: Exploring Possibilities Website (<http://www.cna.ca/curriculum/default.asp>) is a free educational resource now available to secondary teachers across Canada. Development of the content of the site began in 2006, and in 2009 the Canadian Nuclear Association partnered with Let's Talk Science to develop lesson plans for the site and develop strategies to increase use and implementation of the website. The Nuclear Technology: Exploring Possibilities website consists of eight modules that showcase the diverse impact of nuclear technology on all aspects of Canadian society, with informative text, rare photographs, videos and supporting material including a glossary, downloadable publications and interesting links. Each module also has at least three ready for classroom use lesson plans that are aligned to curriculum used by educators in all provinces and territories, including an issues-based lesson, a hands-on/minds-on inquiry or investigation and a Jeopardy-style game that can be used for diagnostic assessment or consolidation of learning. While electricity generation is obviously a major focus of the lessons on the site, a wide range of topics are covered, from atomic theory to food irradiation, from nuclear non-proliferation to the transport and storage of nuclear materials. A searchable database allows teachers to find lessons on the website based on province, grade, subject and concept.

The website has been developed with input from educators from across the country who for the last three years, have come together for a one-day symposium held with the CNA's annual conference. These teachers and government education officials have helped to identify the educational resources needed by teachers to effectively teach about nuclear technology, provided valuable insight into the complexities of provincial and territorial education systems, and will play a major role in promoting awareness of the website in the coming months.

In order to reach our goal of making the CNA's Nuclear Technology: Exploring Possibilities website the destination of choice for any Canadian educator looking for information and resources about nuclear technology, we need the help of our members. Thanks to educator input, several areas have been selected for further development on the website: enhanced multimedia, career information and outreach providers. We would like to populate the site with more photographs, graphics and videos, and wish to draw upon the resources of the CNA to make this website richer. Second, new content is being developed for the website that will highlight the diverse career opportunities available in the nuclear industry. Profiles of people working in the nuclear industry that feature information about their education, background and responsibilities will help to bring this section of the website to life for high school students who are considering career options. Who better than employers in the nuclear industry and research fields to provide this information? Finally, a new page will be added to the website which will make educators aware of organizations in their region which have outreach and educational programs or provide tours of facilities; we need information from CNA members about what they offer so that this list is comprehensive. If you have material that you can contribute to the CNA's education website or education and outreach programs that you would like to make teachers aware of, please contact Let's Talk Science via Scott Taylor at [staylor@letstalkscience.ca](mailto:staylor@letstalkscience.ca).

# MEMES TO AN END: MAKING THE MESSAGE STICK IN THE PUBLIC BRAIN

Jeremy Whitlock, Canadian Nuclear Society  
[whitlockj@aecl.ca](mailto:whitlockj@aecl.ca)

Effective public communication is about both quality and quantity. The nuclear industry has excelled at both over the years, but seldom at the same time. The need for effective communication is of utmost importance for the nuclear industry, as the enterprise is both dependent upon public money, and saddled with a negative public bias. This bias does not necessarily show up in the public's polling responses (which indicate general apathy with a shot of luke-warm support), but rather in the public's response to negative events – the “tipping point”, in other words, is always the very next accident. The negative “nuclear meme”, which is another way of describing this societal bias, requires strong positive memes to counter it. Unfortunately memes are not easy to come by, and often come by chance. They are the holy grail of advertising agencies and public relations firms, which means that nuclear communication starts out behind the eight ball: the elusive holy grail is in fact the only strategy that works. This talk will relate the author's experiences in memetic communication on nuclear topics, from pioneering forays into social media (“The Canadian Nuclear FAQ”, [www.nuclearfaq.ca](http://www.nuclearfaq.ca)) to games with ping-pong balls that let students “live” the reactor experience.

# **Does Your Utility Learn? An Integrated Framework for Utility Sector Human Resources and Training**

**CHERIE C. TRUDEL-FERRARI, KINECTRICS INC., CANADA**

[cherie.ferrari@kinectrics.com](mailto:cherie.ferrari@kinectrics.com)

This paper and companion presentation will present the following three topics and three supporting Case Studies to describe “An Integrated Framework for Utility Sector Human Resources and Training”.

1. Human Resources: Workforce needs for the utility sector in Ontario and Worldwide
2. Knowledge, Skills & Abilities: Training & Learning Framework for The Learning Utility
3. Education and Training Technology Drivers: How do today’s learners learn? Data will be provided by referencing industry and government reports. For example, of the 100,000 Canadians in the generation, transmission and distribution of electricity, 28.8% are eligible to retire by 2012. In response to growing demand for mission-critical work, coupled with a skilled technical workforce in transition due to retirement, Canadian utilities will need to have a framework and strategy for human resources and training. A framework will be presented. The new generation of learners learn in many ways and “just-in-time” using Web 2.0 collaborative tools such as social websites and the internet, CBTs, e-Learning, wikis, cell phones and personal mobile devices. An examination of these tools and how they can be integrated into the framework will be presented.

Case Study 1: Human Resources: Training to Identify, Attract and Recruit How an Ontario Utility, partnering with Universities, used training programs to identify high potential engineering students for recruitment and rapid school to workplace transition.

Case Study 2: Knowledge Management: How to Capture, Transfer & Disseminate Knowledge How an Ontario Generation company conducted a Knowledge Risk Assessment to assess knowledge loss and determine risk of work completion to develop action plans.

Case Study 3: Using Training to Create a Knowledge Database How an Ontario Engineering Services company, providing engineering resources to the generation, transmission and distribution utilities worldwide, used training to create and share a Knowledge Database encompassing 100 years of research and development.

## **Meeting the Human Resources Needs for the Future Use of Nuclear Energy**

**K.L. Peddicord, Director, Nuclear Power Institute, Texas A&M University**  
[k-peddicord@tamu.edu](mailto:k-peddicord@tamu.edu)

A well-prepared workforce is fundamental to the future utilization of nuclear energy. Some utilities have indicated this to be on the critical path to initial plant operation. Countries considering the first time use of nuclear have identified human resources as their most pressing issue.

New plants will require up to 500 personnel with a broad spectrum of backgrounds and skills ranging from technicians to engineering staff. The Nuclear Power Institute (NPI) is responding to the nuclear workforce challenge in Texas where as many as eight new reactors in the state have been announced to the U.S. Nuclear Regulatory Commission in Washington, DC. NPI is a partnership of six universities, six community colleges, industry, state agencies, high schools and middle schools, teachers, and elected and civic leaders. Academic programs have been established at the associate degree in nuclear power technology, radiation protection, and digital instrumentation and control. At the baccalaureate level, a four course, 12 semester hour certificate program in nuclear power technology allows students in mechanical engineering, electrical engineering, chemical engineering, engineering physics and engineering technology to gain the background in nuclear power plants fundamentals, systems, operations and human performance requirements to move directly into accelerated utility training programs.

Equally important is the outreach component to inform and attract young students into the various academic options that lead to careers in the nuclear industry. The outreach efforts include visits and presentations to high schools and middle schools, and participation in college days and career nights. New programs with a nuclear theme have been developed such as POWER SET (Powerful Opportunities for Women Eager and Ready for Science, Engineering and Technology) to encourage students at the high school and middle school level to take courses leading to science, technology, engineering and mathematics (STEM) opportunities. Several initiatives directly engage teachers. For example, the Research Experience for Teachers Enrichment Experiences in Engineering program (RET-E3) pairs teachers with nuclear engineering professors for a four week term in the summer to develop curricula, demonstrations and laboratory experiences that can be taken back to high school science courses.

Through an integrated partnership, the Nuclear Power Institute is responding to the full breadth of workforce needs for the future use of nuclear energy.

## **UNENE - Advances in Nuclear Education for the Nuclear Industry**

**Dr. V.G. Snell, UNENE Programme Director; and President, VGSSolutions**  
[vgssolutions@rogers.com](mailto:vgssolutions@rogers.com)

**Dr. B. Rouben, UNENE Secretary-Treasurer; and CNS Executive Administrator**  
[roubenb@alum.mit.edu](mailto:roubenb@alum.mit.edu)

**B. Shalaby, UNENE President**  
[basma.shalaby@rogers.com](mailto:basma.shalaby@rogers.com)

**Dr. W. Garland, UNENE Academic Consultant and Past-President**  
[garlandw@mcmaster.ca](mailto:garlandw@mcmaster.ca)

This paper reviews recent advances in formal nuclear education for employees of the Canadian nuclear industry. Among other activities, the University Network of Excellence in Nuclear Engineering (UNENE) coordinates a course-based Master's of Engineering degree, structured so that people with a full-time job can earn the degree by taking courses on weekends. The enrolment from nuclear utilities and design organizations has been consistent and slowly increasing, as the value is recognized by both students and employers. The number of UNENE University members has also increased this past year.

The courses are given at a central location (Whitby, Ontario), which is quite far to travel for people from some of the nuclear sites. To date the optimum trade-off between effective learning and travel time has been to run the course over four alternate weekends. Recently, however, distance learning has been implemented for all the UNENE courses, to enable students from sites remote from the Greater Toronto Area, such as Bruce Power, Chalk River and the Canadian Nuclear Safety Commission (CNSC), to participate without the hazards of frequent long-distance winter travel. So far the feedback from these students has been positive.

A further challenge is that some of the students have become rusty in a few of their senior undergraduate science and mathematics skills. A series of optional not-for-credit refresher courses has therefore been implemented this academic year to ensure students enter the UNENE courses with the appropriate level of knowledge.

The UNENE educational material is posted on the UNENE web site and is available to the public. It is supplemented by the CANTEACH project, a public nuclear-knowledge repository that provides high quality technical documentation relating to the CANDU nuclear energy system. Together this material represents a valued source for nuclear educators.



# **Nuclear Engineering Distance Education at the U. of Tennessee: A Possible Model for Canada?**

**H. L. Dodds, U. of Tennessee Nuclear Engineering Department**

[hdj@utk.edu](mailto:hdj@utk.edu)

**R. E. Pevey, U. of Tennessee Nuclear Engineering Department,**

[rpevey@utk.edu](mailto:rpevey@utk.edu)

**Ibrahim Attieh, Atomic Energy of Canada Limited,**

**Alumnus of the U. of Tennessee Nuclear Engineering Department**

[attiehi@aecl.ca](mailto:attiehi@aecl.ca)

The University of Tennessee-Knoxville (UTK) offers 19 Masters' programs (15 MS and 4 MBA) that are delivered synchronously (i.e., interactive in real time) via the Internet to students located almost anywhere in the Western Hemisphere. One of the 19 programs is the MS in Nuclear Engineering (NE).

This paper will describe the MS in NE program as well as six other distance education programs offered by the UTK Nuclear Engineering Department; namely, MS in Reliability and Maintainability Engineering; Graduate Certificate in Nuclear Criticality Safety; Graduate Certificate in Reliability and Maintainability Engineering; a one week short course on Nuclear Criticality Safety; a one week short course on Neutron Transport Theory; and a Colloquium Program that is free and open to the public. This paper will also describe the technology that is used to deliver the seven distance programs including a brief movie that demonstrates the technology.

Our distance courses are taught simultaneously to both distance students located anywhere and local students located on campus. A few of our distance courses are taught by instructors located off campus to distance students located anywhere and local students located on campus. In other words, instructors can be located anywhere and students can be located anywhere, provided all participants have access to the internet (a dialup connection is sufficient) and a computer with a microphone and speakers. This model for graduate education could be particularly beneficial to large countries such as Canada, China, and Russia.

Finally, our distance education programs are responsible for ~ 25% of our graduate student enrolment and have brought us considerable visibility and recognition. Most importantly, we have received genuine appreciation from our distance students who otherwise would not have the opportunity for graduate education because of their remote location.

# **Past and Future Issues of Nuclear Energy in Germany**

**Pascal Mertins**

First I would like to speak about the German situation (east - west) after the Chernobyl disaster. Second I'll tell about the decision to shut down every nuclear power plant till 2021 after CDU/FDP lost the ballot in 1998. Third I am interested to explain the situation in Germany regarding the development of the nuclear research, education and industry just now.

## **Assisting Science Teachers with Radioactive Decay – Putting Geigers in the Classroom**

**P. Lang, Canadian Nuclear Society (Pilot, Air Canada)**

**J. Whitlock, Atomic Energy of Canada Limited, Chalk River Laboratories**

**B. White, Canadian Nuclear Society (Retired, AECL Chalk River Laboratories)**

[bwhite\\_cns@sympatico.ca](mailto:bwhite_cns@sympatico.ca)

The Canadian Nuclear Society Education initiatives include the development of a workshop on Ionising Radiation intended for high school science teachers. This workshop introduces the use of a sensitive Geiger-Müller detector with Naturally Occurring Radioactive Materials (NORM) to provide students (and teachers) with personal, real experience with ionising radiation. The experience gained with 7 presentations of the workshop is described. The feedback received from teachers whose schools received CNS over 60 Geiger Kits is summarized. The plans for the balance of 2010 are presented.

## **AECL and Insights through the Deep River Science Academy**

**Alistair Miller, Atomic Energy of Canada Limited**  
[millera@aecl.ca](mailto:millera@aecl.ca)

Well over a thousand alumni have graduated from the first 22 years of operation of the Deep River Science Academy (DRSA). Inspired by this unique experience of direct participation in real R&D, most have gone on to careers in science, engineering, medicine or teaching. All have gained awareness of the role of science and technology in modern society as well as of the nuclear industry. AECL's sustained sponsorship has achieved excellent returns in raised awareness of the depth and quality of our industry.

Back in 1986, the DRSA's founders wanted to change the answer to the question: "Does no-one understand the consequences of neglecting R&D?" Cuts then to government-funded nuclear R&D had been met with total disinterest by the wider public and it was this apathy that provided the impetus for the DRSA's launch. Reflection had led us to conclude that the apathy was rooted more in incomprehension than in disinterest. So we conceived of a summer program in which bright, science-inclined high-school students would be given an opportunity to experience the R&D process through hands-on experience. Unlike high-school learning, we aimed to show that R&D could not find answers (pre-Google) at the back of the textbook. We couldn't hope to expose a significant proportion of the population to direct insight but we hoped for a knock-on effect from the modest numbers who could participate.

The result is that, after six unforgettable weeks of intensive involvement, the DRSA's participating students have confronted the realities of exploration that is R&D and have overwhelmingly become enthused. For many, incipient career paths have been redirected. While the DRSA can hardly claim to have created broad enlightenment among the entire Canadian public – not yet, anyway – we have created a cadre of graduates with awareness of how R&D works and its importance and with respect for the nuclear industry.

The external financial support to the DRSA's operation has been and is both essential and an endorsement of the underlying promotion of R&D. Much of the support has been nuclear-related – from AECL, the CNS, and other organizations associated with Canada's nuclear industry – as well as from Federal and provincial governments. We can point to AECL's sustained and substantial support of the Academy as clear evidence that the arrow of benefit points in both directions between the nuclear industry and the DRSA.

Like R&D itself, nothing remains the same. So the internet is offering the DRSA an opportunity to multiply exposure with a distance-learning version that we have dubbed "Inreach".

## **Aboriginal Engagement and the Duty to Consult**

**Eric Mohun, TransCanada Pipelines**

**[eric\\_mohun@transcanada.com](mailto:eric_mohun@transcanada.com)**

The duty to consult and accommodate First Nations is a legal duty that ultimately rests with the federal and/or provincial government. The obligation for industry to consult or “engage” with aboriginal communities arises from statutory and policy requirements as well as from the business risks associated with not undertaking “meaningful consultation”.

Lawyers advise us that if you want to avoid the legal ramifications of the duty to consult, industry should seek to establish positive, trusting relationships with the communities that are potentially affected by the Crown’s decision and/or the proposed development activities. An aboriginal community leader has observed that “The better your relationship, the less you’ll have to consult”.

This presentation will discuss the best practices for undertaking Aboriginal Engagement and how building positive relations will successfully avoid or at least lessen the risk to your business objectives.

# **AECL R&D - PARTNERSHIPS IN NUCLEAR EDUCATION AND RESEARCH**

**Ramesh Sadhankar, Atomic Energy of Canada Limited**  
[sadhankarr@aecl.ca](mailto:sadhankarr@aecl.ca)

AECL R&D organization is actively promoting and supporting the creation of nuclear research capabilities at the universities and also effectively leveraging the R&D at the universities. It has also put in place several new initiatives to attract and develop the talented young people for pursuing education and career in nuclear science and engineering. This paper describes various interactions and collaborations with the universities that supports the nuclear R&D and educational programs at the universities.

# **A Comprehensive Program of Degrees and Diplomas for Canada's Nuclear Industry**

**George Bereznai, University of Ontario Institute of Technology**  
[george.bereznai@uoit.ca](mailto:george.bereznai@uoit.ca)

A critical aspect of the continuing safe and reliable operation of the nuclear industry in Canada and throughout the world is having the highly educated personnel to design, construct, commission, operate, maintain and decommission the facilities that use nuclear technology. This paper describes the comprehensive set of degree and diploma programs in nuclear science and engineering that are offered by the University of Ontario Institute of Technology (UOIT).

# **Community Outreach and Speakers Program**

**Brad Moore, Atomic Energy of Canada Limited**  
[moorebg@aecl.ca](mailto:moorebg@aecl.ca)

Presentation on AECL Community outreach and Speaker's program. Covering such topics as:

1. What it is
2. The benefits
3. How we focus on community outreach
4. A typical presentation: generally given to High school/Univ students and Rotary clubs



# **COMMUNICATION, INNOVATION, OUTREACH NUCLEAR SCIENCE and CAMECO**

**Engin Özberk**

**Vice President, Innovation & Technology Development, Cameco Corporation**

**[engin\\_ozberk@cameco.com](mailto:engin_ozberk@cameco.com)**

The power of communication played an important role in the progress of science and technology of nuclear energy, a source for clean energy. It is continuing to play an important role in all current activities. The future belongs to the power of knowledge and innovation and effectively communicating these to the stakeholders. “Outreaching” is one way of reaching to the stakeholders and interactively communicating the knowledge and innovation. Communication, innovation and outreaching are taken very seriously and their significance in advancing the nuclear science is deeply appreciated. In the light of historical background, some of the activities fostering innovation, communication of advances of knowledge base and on going activities in outreaching to the communities at Cameco’s Innovation and Technology Development are reviewed.

## **Sharing the French Offer in Nuclear Education and Training**

**Claude Guet, Director for Nuclear Education and Training, CEA, France**

In its continuing use of nuclear power (78% of electricity production), France faces numerous challenges, including the operation and maintenance of its existing array of reactors, waste management, the decommissioning of obsolete reactors, and research and development for future nuclear systems. In addition France has made a commitment to support countries that are ready to create the human, institutional, and technical conditions required to establish a civilian nuclear energy programme that meets all the requirements of safety, security, non-proliferation and environmental protection for present and future generations.

All of these efforts must recognize and conform to international requirements. These activities mean that all participants in the French nuclear industry continually update their approaches and skills, with respect to both domestic and worldwide nuclear power development. Over the next ten years, domestic and international nuclear power activities in France will call for the recruitment of about 13,000 engineers with Master of Science or Ph.D. degrees, and 10,000 science technicians and operators with Bachelor of Science degrees. In response to the need for competence-building in nuclear energy production, France now offers training opportunities in both French and English education programmes.

In 2008, the French Minister for Higher Education and Research created a Co-ordination Committee for nuclear education and training. This Committee advises the Office of Higher Education on opening new academic curricula. It also coordinates the international recruitment of students. It promoted the creation of new curricula and a threefold increase in nuclear graduates within a three-year period, with a total of about 450 B.S., 900 M.S. and 100 Ph.D. graduates in nuclear engineering expected by July 2010.

It was recently decided to open an "International Institute for Nuclear Energy". This institute will be the entrance gate for foreign students willing to prepare a Master degree or a doctoral degree. It will also host a Centre of Excellence for sustainable nuclear energy.

This invited talk will give the opportunity to present the whole French offer in nuclear education and training with the aim to share the best practices.

# **Westinghouse Nuclear Education and Outreach**

**Michael Godfrey, Westinghouse**

## **From Social Licence to Social Media: Communications Development in AREVA Resources Canada**

**Alun Richards, Communications Manager, AREVA Resources Canada Inc.**  
[alun.richards@areva.ca](mailto:alun.richards@areva.ca)

Public support for uranium mining in Saskatchewan and, in particular, support from the northern primarily Aboriginal communities requires AREVA Resources to engage in constant communication with our stakeholders. Methods used to develop and maintain our social licence to operate mines in northern Saskatchewan have changed based in part on successes achieved and changing technologies that allow us to begin to engage youth, a key stakeholder group traditionally not involved in these types of discussions. Over the decades, our public communication has developed from traditional meetings, to web and email, and now to entering the new world of social media.

Central to engaging stakeholders with AREVA's mining activities has been implementing ongoing employment, economic and community support programs through surface lease and impact management agreements for northern Saskatchewan communities. Our Corporate Social Responsibility programs will continue to be the basis of our community activities and a core value in our operations. But there is a vast community out there interested in information and engagement – on their terms and with the technology that they choose.

Social media has fundamentally shifted the way we communicate and is affecting the way a worldwide company like AREVA operates. AREVA Resources has responded through YouTube and Facebook projects as well as using videos in meetings to establish a connection with the public. This has involved taking some chances with new actions such as a “save the planet” video contest, developing a corporate YouTube brand channel that includes videos submitted by the public, answering challenging questions posted on our Facebook page, and even developing off-the-wall videos such as “high grade haulers” to talk about transporting uranium ore on northern roads.

Over 100,000 video views on the AREVA Resources YouTube page, recruitment success from our Facebook page, and many comments on our videos have shown an initial success. The goal is to be relevant with our stakeholders. The risks are embarrassment (not so far) and being ignored (normal risk in communications), but the benefits have been significant public engagement and having a lot of fun.

Next to come are more videos, project-specific blogs and an attempt to keep up with the changing technology as part of the ongoing care and maintenance of our social licence.

# **A Physics Professor Learns To Teach Nuclear Power To Science And Non-Science Students**

**Jason Donev, University of Calgary**  
[jason.donev@ucalgary.ca](mailto:jason.donev@ucalgary.ca)

This talk will discuss efforts made by the author to teach nuclear power at a university where this had never been taught before. As the presenter is not from the nuclear industry, the talk will also include difficulties in finding sources that people from outside the industry trust. A brief discussion will also include difficulties of starting a politically hot issue from scratch at a university.

# **The Rise and Fall of Radiochemistry in Canada**

**Don Wiles, Carleton University**

[dwiles@ccs.carleton.ca](mailto:dwiles@ccs.carleton.ca)

A brief history of radiochemistry will be given, with a focus on Canada, and using examples from my own career, which spans some 64 years. The excitement of the 1930s, -40s and -50s, the effect of war-time secrecy, and post-war secrecy were followed by a burgeoning of Radiochemistry in Canadian Universities. This has been followed by a decrease in research in pure radiochemistry. It is now contended that essentially everything is now known, so that there is no need for further research in Radiochemistry. Since all universities have become strongly research-oriented (for budgetary reasons), this has now led to a shutting down of radiochemistry courses. Because of this, further training in radiochemistry will become very hard to find, since there are no longer Radiochemists of University Faculties. This, it appears, is a world-wide phenomenon. The future of Radiochemistry lies now in its application to medicine, pharmacy and the environment, but what about the Nuclear Industry? Where should radiochemistry be taught, and by whom? This may raise more questions than answers, but even the questions may be important.

# **Nuclear Education and Outreach in the UK – Ensuring and Enhancing our Nuclear Future**

**J. W. Roberts, Dalton Nuclear Institute, The University of Manchester**  
[j.w.roberts@manchester.ac.uk](mailto:j.w.roberts@manchester.ac.uk)

The Dalton Nuclear Institute at The University of Manchester co-ordinates the Nuclear Education offered by the University through the various programmes at different educational levels. At Ph.D level there is the Nuclear Industrial Doctorate Centre and the Nuclear Doctoral Training Centre, at Masters level Dalton hosts the NTEC Co-ordination Centre and at undergraduate there is the newly introduced Mechanical Engineering with Nuclear Engineering programme. These programmes provide the education required for the nuclear workforce of the future but how do we persuade students to choose these courses? The Dalton Nuclear Outreach Programme has recently been boosted by a £250k grant that will enhance our existing programme of engagement with school children and training for teachers. This presentation will provide an overview of our nuclear education and outreach programmes that ensure the recruitment and education of our nuclear future.

## **Lessons Learnt from Some Outreach Efforts**

**Cosmos Voutsinos, Retired, Vice Chair CNS AB Branch**  
[cosmosvoutsinos@yahoo.ca](mailto:cosmosvoutsinos@yahoo.ca)

This presentation includes the analysis and the lessons learnt from outreach efforts in: a) the Alberta school system, b) the Alberta anti nuclear Societies, c) the Peace River area and d) the Alberta, Saskatchewan and Federal Governments.

The conclusion is to conserve resources and to seed only in fertile grounds of significance. Then let the seeds germinate, grow and spread on their own strength.



# The Role of the CNS Lay Member in Nuclear Outreach

**Paul S. Hinman, Jeremy J. Whitlock**  
[paul.hinman@shaw.ca](mailto:paul.hinman@shaw.ca), [whitlockj@aecl.ca](mailto:whitlockj@aecl.ca)

In most cases the people involved in nuclear outreach are either employed in, or retired from, the nuclear industry or academia. Increasingly, Canadian Nuclear Society (CNS) members with no past or present link to the nuclear industry or academia are engaging the public. This was initially a matter of practicality as public interest in nuclear energy spread to regions of traditionally low nuclear industry involvement, and therefore few available nuclear industry outreach personnel. It has been observed, however, that “lay CNS members”, as we may refer to them, possess a unique credibility with the public. They are perceived to be untainted by attachment to the nuclear business, and therefore portray a sincerity that often escapes the traditional nuclear industry spokesperson. These people often bring to the task eloquence and enthusiasm, and lack only expertise. If sufficiently trained, lay members can act as effective ambassadors of nuclear technology, sometimes acting in concert with traditional spokespersons.

If more and more Canadians are to benefit from nuclear energy in the future, there will be an increasing need to engage the public in regions of the country where nuclear energy has never been previously employed. Demand for public engagement will also increase in traditionally nuclear regions, where available industry spokespersons may not be sufficient. In both cases the CNS can help marshal lay members to help the cause.

Currently, lay CNS members are being used in the High School Geiger program, displays and presentations at science teacher conventions, speaking at forums, and for arranging events for other members of the CNS who might be available.

This presentation explores how the lay members are currently active, and how they might provide further benefits in the area of nuclear outreach.

# **Nuclear Content in Alberta Grade 12 General Science Education**

**Leon H. Lau, Central Memorial Lord Shaughnessy High School**  
[lhlu@cbe.ab.ca](mailto:lhlu@cbe.ab.ca)

This oral presentation will provide the audience with background information on the content of nuclear education in the Science 30 curriculum. Science 30 is a general science course offered to Grade 12 students in the province of Alberta. The presentation will discuss the students' academic background, strengths and weaknesses, the extent of nuclear education. It will discuss areas of potential community involvement.

# **Undergraduate and Graduate Opportunities in Nuclear Science at Simon Fraser University**

**Corina Andreoiu, Jean-Claude Brodovitch and Krzysztof Starosta**  
**Simon Fraser University**  
[brodovit@sfu.ca](mailto:brodovit@sfu.ca)

Simon Fraser University is in the unique position of having a core faculty with expertise in Nuclear Science, this for historical reasons and, now for being located across town from the TRIUMF proton accelerator facilities. In this context, the SFU chemistry department has been offering a Nuclear Science minor program for many years to SFU students. The goals and the academic components of the program are presented in this paper along with enrolment statistics for the last ten years. In addition, the implication and the interaction with on-going research programs in Chemistry which are using the TRIUMF facilities are described.

# **Enhancing University R&D Capabilities in Support of Generation-IV Nuclear Reactor Development**

**D. Brady, Natural Resources Canada, [dabrady@nrcan.gc.ca](mailto:dabrady@nrcan.gc.ca)**

**T. Anderson, Natural Sciences and Engineering Research Council of Canada**

**D. Guzonas & L. Leung, Atomic Energy Canada Limited, Chalk River Laboratories**

**J. Poupore<sup>1</sup> & W. Zheng, Natural Resources Canada**

Canada, a founding member of the Generation IV International Forum (GIF), has chosen to focus its effort on the development of the Supercritical Water-Cooled Reactor (SCWR) system. Given the fundamental nature of the research required to support the development of the SCWR, there arose a unique opportunity to establish a three way collaboration between NSERC, NRCan, and AECL to support university research. The result of the collaboration was the establishment of the NSERC/NRCan/AECL Generation IV Energy Technologies Program, in which each collaborator plays a uniquely important role. This university-based program is a major component of Canada's GEN IV National Program that allows Canada to honour its international obligations, improves the research capability and infrastructure at universities, and provides training to highly qualified personnel in support of the Canadian nuclear and non-nuclear industries.

This paper provides background information on the GIF and Canada's role, highlights the establishment of the university program, describes the resulting collaborations in four key areas of research, and lists some lessons learnt to date.

**Keywords:** Generation IV, GIF, SCWR, Supercritical Water-Cooled Reactor, University

## **Nuclear Power in the Media**

**Jason Glabik, Mile Zero News**  
[milezeronews@mackreport.ab.ca](mailto:milezeronews@mackreport.ab.ca)

Ontario-based Bruce Power has proposed a nuclear power plant in the Peace River region and the location is in the direct coverage area of the Mile Zero News and in the county that is home to many Banner Post readers.

As the first major nuclear power facility proposed in Alberta, the project presents specific challenges to local media outlets, which are accustomed to covering youth hockey games and small-town politics.

The presentation will cover a handful of topics:

- Geographical and statistical information about the coverage area of the newspapers, relationships between the media and local pro/anti-nuclear groups.
- Getting the facts on an emotionally charged issue.
- A timeline relating to the proposed project and related media coverage.
- How controversy surrounding the nuclear power plant proposal has challenged traditional journalistic principles
- An outline of an eight-week written nuclear debate offered by the newspapers which the Canadian Nuclear Society participated in.

If time permits, the floor will be opened up to questions.

# Debating about Nuclear Power

Duane Bratt, Mount Royal University  
[dbratt@mtroyal.ca](mailto:dbratt@mtroyal.ca)

A major part of nuclear education and public outreach is debating hard core anti-nuclear activists. This can occur in formal debates, presentations with critics in the audience, or via written newspaper articles and letters. What strategies work? What strategies do not work? How can nuclear scientists get their message out? A panel discussion of Canadian Nuclear Society members who have been active in public debates will discuss their experiences and provide advice.