CANADIAN NUCLEAR SOCIETY

Bulletin

DE LA SOCIÉTÉ NUCLÉAIRE CANADIENNE

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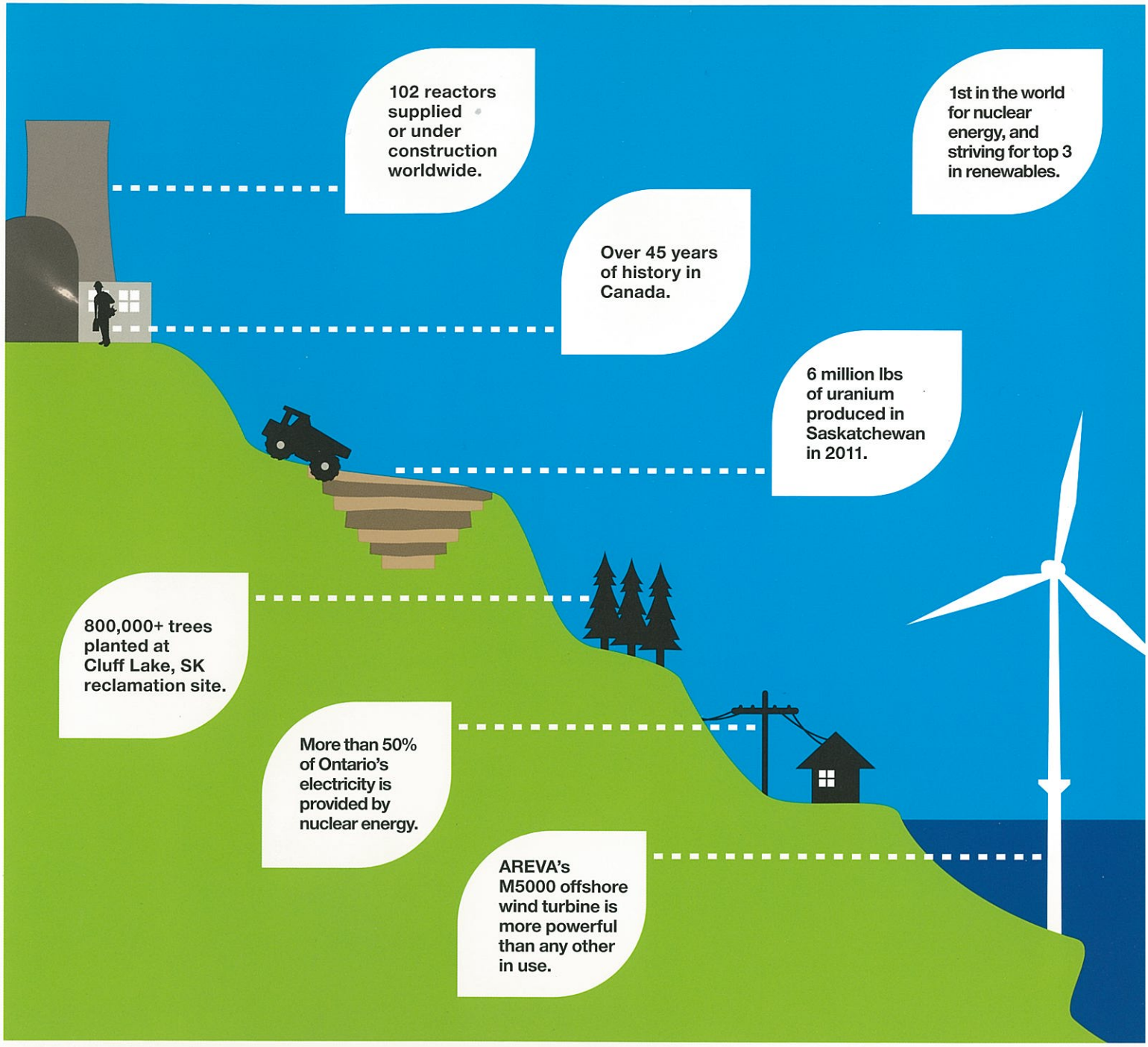
- SGC2012 Course and Conference
- Simulation Symposium
- Small Reactors Meeting
- Nuclear History Project



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Proroguing the Rogue

The sudden resignation of Premier McGuinty last October is the prerogative of any leader, but has his rogue government gone off the rails? Facing a backlash of furor over his failed energy plan, and deceiving us by withholding documents related to the cost of two gas power plant cancellations in his party's ridings he has invoked a process that will stop the truth from emerging from his government. Proroguing his rogue government puts everything on hold – including question period. No more embarrassing truths about why electricity prices are skyrocketing.

In his early campaigns he promised that coal fired electricity would be phased out by 2007 and be replaced by wind and solar energy. In 2005 the Lakeview coal station was closed and in 2007 its "Four Sisters" smoke stacks came crumbling down, much to the delight of Mississauga residents. However, this created another yet-to-be-solved problem – getting power to the west GTA area where it is needed! This lack of forethought may be the reason that two gas plants were to be located in Mississauga and Oakville. Gas plants? We were told that wind and solar would replace coal.

Perhaps disillusioned by images of those quiet and modest windmills seen on postcards from Holland residents soon began to see the horror of "monster" turbine farms with blades longer than wings on a 747. Understandably, local opposition began to emerge. McGuinty made it clear in his Green Energy Act that the Liberal Government world not tolerate "NIMBY" (Not In My Back Yard) and removed the rights of local municipalities to have any say in gas, wind and solar power plant siting. However, the hypocrisy became apparent when he made an exception to the NIMBY rule if the plant was to be in a Liberal riding, namely the two gas generating plants in Mississauga and Oakville. He cancelled them just before the last election to save a couple of Liberal seats.

So instead of wind and solar replacing coal, as McGuinty would have us believe, it appears that gas is replacing coal. Although new wind power is indeed coming on line, it is an intermittent source and gas turbines must be spinning to pick up the slack as winds fluctuate.

With McGuinty's introduction of a mandatory Feed-In-Tariff (FIT) that would pay ten times the going rate for electricity, rural residents invested their life savings to install solar panels with the promise of a secure long-term income. But for technical problems, those solar panels cannot be connected to the grid in many areas. This is another example of the Liberal Government's push for an ideology without forethought.

What is the real cost of cancelling those two gas plant? Time will tell. McGuinty resigned and prorogued his government before more damaging documents could be released, but truth always finds its way to the surface. The cost of contract cancellations is only one part of the true cost of that decision. The two plants will not be cancelled outright, but will be relocated: one to a site that is too far to the west to help the GTA, and the other one too far to the east to help the GTA. The problem of the power shortage in the west GTA area will not be solved by this decision. Instead it will be solved by costly changes to the configuration of the grid, which could be ten times the cost of those "cancellations"..

Governments have no place in managing something that is so important and complex as the electricity system in Ontario.

In This Issue

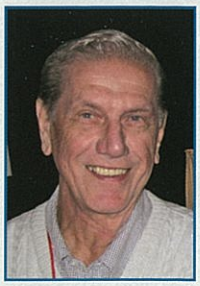
We congratulate Bruce Power with the return to service of Units 1 and 2 after being shut down by Ontario Hydro in the mid-90s. We also congratulate New Brunswick Power with the return to service of its Point Lepreau generating station. In both cases the reactors have undergone a massive refurbishment project that will give at least 25 more years of safe, reliable and inexpensive electricity.

The main CNS event was the 2012 Steam Generators to Controls (SGC2012) course and conference. In this issue is an overview, a technical summary by W. (Bill) Schneider, and a provocative technical paper from the plenary session by J. Cairncross on what Canada's F-35 Fighter Jet has to do with us. Overviews are also included of this year's Simulation Symposium and Small Reactors meetings.

We are also pleased to present a report by James Arsenault on Canada's nuclear history, which is now available on CD (see article). The CNS News section begins with a message from our president, John Roberts, and we end with Jeremy Whitlock's timeless view of Miscommunication in EndPoint.

We wish you a happy end to 2012 and a healthy and productive 2013!

From The Publisher



The Society

This has been a busy fall for the CNS, especially for organizers of the three meetings held over October and November: the **Simulation Symposium** in October; the **Small Reactor Meeting** and the **Steam Generator and Controls Conference** (both in November). All are reported in this issue of the *Bulletin*.

These were quite different events, in their size; their focus; and their participants.

The *Simulation Symposium*, as the name implies, was a very specialized event and, as such, drew a significant number of those active in the very complex field of developing computer programs that will accurately replicate the behaviour of reactor systems under various imposed conditions.

To one who has difficulty operating his DVD player, the expertise demonstrated in the various presentations was awesome. Nevertheless, I continue to have reservations about depending on such modelling, regardless of the expertise involved, in the absence of "real" experiments. That skepticism was only partially appeased by the statement by Joanne Ball that a major effort is proceeding on integrating the various programs developed over the years for specific conditions. But it is reassuring that the need for this integration and updating has been recognized and is being pursued.

The *Small Reactor Meeting*, which was organized and sponsored in cooperation with AECL, presented a very different scope of presentations and a more diverse participation. The papers ranged from specific designs to questions about sociological and other challenges of placing a small nuclear power plant in a relatively remote location in the north. The attendance, close to twice that anticipated, indicated how topical the concept of small nuclear plants has become in the past few years. The interest comes from various reasons. Small countries with modest electrical grids cannot accommodate large units. In the USA many utilities cannot afford the escalating price of current large designs. Canada has a particular need and opportunity for small generating plants to support isolated communities in the north.

The third event, *Steam Generators and Controls Conference*, or, *SGC 2012*, concentrated on the challenge of operating, maintaining and refurbishing the large complex nuclear units which provide half of the electricity in Ontario and a significant fraction in New Brunswick. Although the human factor was emphasized in the plenary presentations, the detailed technical papers demonstrated the complexity of the current generation of nuclear power plants.

While these major events were unfolding the governing Council of the Society met three times to deal with the challenge of managing the affairs of the Society. Unfortunately, money, or more correctly, the forecast of less of it, has occupied much of the discussion. As everyone knows, it is relatively easy to expand programs, difficult to cut them back.

In parallel, as mentioned by president John Roberts in his note (see CNS News), a small task group has been meticulously revising the current By Laws of the Society (written at the time of incorporation in 1998) to meet the requirements of the new federal Not for Profit Corporations Act. Despite the inconvenience of teleconferencing the process was completed and the proposed modified By Laws are being considered by Council. After a review by lawyers contracted by the Society they will be presented to members and, hopefully, endorsed at the 2013 Annual General Meeting.

The Canadian nuclear scene

Just as all of us involved in the Canadian nuclear program were rejoicing with the return to service of Bruce units 1 and 2 and the one at Point Lepreau, along came the Québec elections. The new assembly, led by the Parti Québecois, quickly announced that it was going to shut-down the Gentilly 2 station. This was a particular blow to all of those who had spent several years preparing for a refurbishment. It was illogical but indicative of the perception members of the PQ have about things "nuclear".

That misperception is shared by others, including members of the Québec medical community. Twenty doctors resigned from the hospital at Sept-Îles to object to the possible development of a uranium mine in the area.

As Jeremy Whitlock so adroitly expresses it (see Endpoint at the back of this issue), **communication** is the challenge and the nuclear community, as a whole, has been doing a woefully poor job of that.

It is ironic that the best spokesperson for nuclear matters has been the head of our nuclear regulatory organization, Michael Binder. No other prominent member of the nuclear community has spoken out as clearly as he has. The announcement of his reappointment was the most positive item of news in the last month.

In closing I wish all of you a happy holiday and a fulfilling new year.

Fred Boyd

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~ Cover Photo ~

Authorized Nuclear Operators John Binnendyk (L) and Brian Doose monitor system panels in the Bruce A Main Control Room as Unit 2 is synchronized to the provincial grid on Oct. 16.

Photo courtesy of Bruce Power

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La SNC procure aux Canadiens intéressés à l'énergie nucléaire un forum où ils peuvent participer à des discussions de nature technique. Pour tous renseignements concernant les inscriptions, veuillez bien entrer en contact avec le bureau de la SNC, les membres du Conseil ou les responsables locaux. Les frais d'adhésion par année de calendrier pour nouveaux membres sont 82.40$, et 48.41$ pour retraités.

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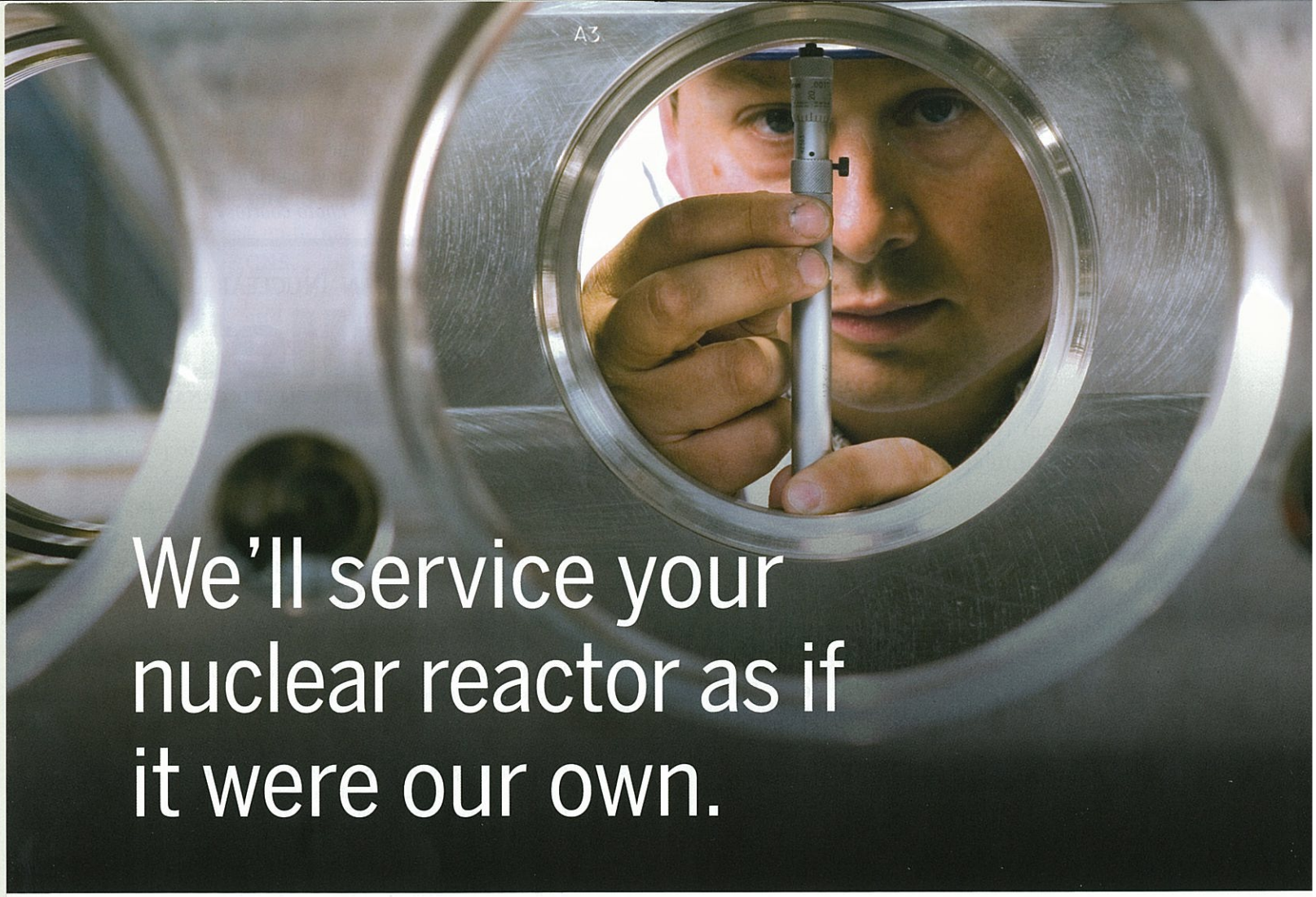

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SGC Conference had wide agenda

An overview

by FRED BOYD

SGC 2012, otherwise known as ***Steam Generators to Controls Conference***, which was held in Toronto, November 11 – 14, 2012, covered all of the critical elements of large nuclear power plants, with a particular focus on refurbishment.

Bill Schneider, semi-retired but still associated with Babcock & Wilcox Canada, was the principal designer of the conference. He noted the deliberate expansion from earlier Steam Generator conferences to include controls, valves, pumps and other components. (See his paper that follows this overview.)

The conference was held in the large Toronto Convention Centre. For various reasons attendance was smaller than planned but those who did attend were very involved.

It was preceded by a half day course on the Sunday afternoon, which took the, mostly young, attendees through four broad topics:

- *Steam Cycle Conditions and Chemistry;*
- *Task Leadership, Process Verification and Controls;*
- *Steam Generator Thermal Hydraulic and Functional Architecture;*
- *Reactor Configuration Overview – A Refurbishment Perspective.*

The conference proper began early Monday morning with a welcome from **Juris Grava**, Conference General Chair, who referred to the new concept for the conference, with the emphasis on learning and networking.

The first plenary speaker of the day was **Paul Spekkens**, Vice President, Science and Technology Development, Ontario Power Generation, who spoke on: *Steam Generator Life - Management, Reliability, Maintenance and Refurbishment.* Steam generator problems have largely been solved in CANDU units, he commented, except for Embalse.

Ron Oberth, President, Organization of CANDU Industries (OCI) was second plenary speaker/ He titled his address: *Engaging Service Providers and Future Industry Leaders in Improving Industry Performance.*

He noted that OCI represents 180 companies that collectively employ more than 12,000 people. These member companies, he said, can assist in the planning, procurement, contracting and delivery of items, parts and services.

After the lunch, **Jim Cairncross**, a consultant, spoke on the provocative title: *What Does Canada's F-35 Fighter Jet Have to Do With Me?*

(His presentation is reprinted in this issue of the Bulletin.)

That evening there was a modest poster session combined with a reception.

Day 2 was devoted to *Controls, Valves, Pumps and Electrical Systems and Equipment* and began with three plenary papers.

The first one was on *Digital Upgrades at Ontario Power Generation* by **Rick Hohendorf**, Manager, Computers and Control Design, OPG.

He noted that most of OPG's nuclear plants already had real-time process control and monitoring systems. Therefore the emphasis has been on upgrading digital systems rather than analog to digital conversions.

Next was **Tony Maselli**, Vice-President, Global Nuclear Sales, Invensys Operations Management, who titled his presentation: *Implementing Digital Technologies in Nuclear Utilities.* The introduction of digital technologies where analog had been used can present challenging issues, he stated.

The third plenary speaker of the morning was **Phil Smith**, Vice President, Engineering Design and Projects, AMEC NSS Limited, who continued the theme with a presentation titled, *Real-Life Considerations of Analogue-to-Digital Conversions in Nuclear Power Plants.* Referring to the life-extension programs of older reactors he commented that digital systems fail differently than analogue ones and may have a larger number of failure modes. The issues are not purely technical, he commented, so stakeholder involvement is important.

That evening, instead of the typical conference dinner, there was a short session on *"CANDU Around the World"* with brief presentations by speakers representing all of the countries having CANDU plants. That was followed by an extensive buffet with four stations which presented foods from the countries represented.

The third day focussed on *Reactor Components and Refurbishment.* It began with two plenary presentations.

Gary Newman, Chief Engineer and Vice President Engineering at Bruce Power, opened with a paper on

Utility-Vendor Partnerships for Refurbishment Projects. Drawing on the extensive experience Bruce Power has had with refurbishment he emphasized the need for clear quality assurance and control. He noted that Bruce Power had held and will continue to hold sessions with key vendors to ensure the requirements are understood and followed.

The final plenary speaker was **David McNeish**, Senior Technical Specialist, Major Components Programs, Bruce Power. He titled his presentation, *Reactor Refurbishment Options for a Changing Climate.* He began by stating that the traditional way of retubing a [CANDU] reactor is a daunting challenge. Innovations are needed, he stated, to mitigate the long downtime and large one-time investment that has been associated with recent refurbishments. This could include complete calandria and shield tank replacement.

The conference organizing team had many members. The Executive Committee consisted of: Juris Grava as General Chair. Bill Schneider, Executive Chair; Mohinder Grover, Treasurer; John Roberts, CNS President. Others involved included: Eric Williams; Ron Oberth; Simon Weston; Victor Janzen; Revi Kizhatil; Bob Morrison; Dan Meraw.

7th CNS Int'l Steam Generators to Controls 2012 Conference

by BILL SCHNEIDER, SGC 2012 CONFERENCE DEVELOPER

[Ed. Note: The following report is a technical summary of the 7th CNS International Steam Generators to Controls Conference held in Toronto, Ontario, Canada, November 11-14, 2012.

The 'Operating Utility Engagement Initiative' consists of a Joint Steering Committee that drives the programs of the Nuclear Operations & Maintenance (NOM) and Design & Materials (DM) Divisions. This committee consists of the two Division Chairs and Utility Representatives appointed by the Operating Utilities (NB Power, OPG, Bruce Power & AECL-NRU). It serves as a bi-directional link between the CNS and the Utilities and ensures that (1) the NOM & DM Division programs address 'the needs and interests of the Utilities', and (2) the CNS has a strong, visible presence at the operating sites.]

This SGC 2012 Conference along with the 2011 CANDU Maintenance Conference can be seen as part of the CNS Utility Engagement Initiative begun by the CNS Operations & Maintenance and Design & Materials Divisions (OM+DM) in order to encourage participation in CNS programs and interests by Utilities, Universities, CNS Branches at/near Utility sites and by the Service Provider Community.

This Conference was organized under the vision and leadership and with the extensive senior-level Operating Utility connections of SGC 2012 General Chair Juris Grava and CNS President John Roberts. They along with CMC2011 Chair Jacques Plourde and then CNS President Frank Doyle founded the OM+DM Initiative – an initiative which is serving not only the above purposes but also to maintain 'continuity' between these events.

This 'report' endeavors to present the position and views of 'The Conference' regarding various issues and perspectives of importance to the industry – all as learned during the organization of the event and via the SGC2012 Issue-Identification Program. Those positions might be summarized as follows:

SGC 2012 – The Conference;

i) ***This industry, its organizations and priorities are changing***

ii) ***All revolves around NIOU (the Needs &Interests of the Operating Utilities)***

iii) ***There are many 'issues' requiring attention – and they need to be dealt with***

iv) ***Issue-Identification & Definition (I-I&D) is an essential tool for dealing with that***

v) ***Some kind of Independent Process Verification Audit capability is needed for execution-processes which are too critical to risk their failure***

SGC 2012 - The Course

vi) ***Young people need grounding in the basics and in Task Leadership – they do not need or want 'accommodation' because of their advanced computer skills***

vii) ***Those new-to-the-industry also need grounding in the basics***

viii) ***Many with years of narrow experience who are not-so-new, do as well***

SGC 2012 'The Conference' – And It's I-I&D Focus

The focus of SGC2012 Conference on NIOU [needs and interests of the operating utilities] was intended to bring attention to 'what needs attention'. For what-needs-atten-

tion, the Issue-Identification [I-I] initiative was undertaken. To determine what needs to be done to deal with such issues, the Issue-Definition Program [I-D] was initiated [I-I and I-D collectively known as I-I&D]. This approach was similar to that taken by the recent successful CANDU Maintenance Conference [CMC2011].

The Issue-Identification Program was initiated under the Executive Lead of COG President Bob Morrison. I-I was the starting point for development of the conference program and the basis for the 'Issue-Definition work and dialogue' upon which the conference presentations were to be based.

The I-I Program involved dialogue with senior and front-lines utility people whose input became the drivers of this conference. I-I is an essential utility role – utility staff being the only people who know what their issues may be.

Having developed initial I-I Lists and having already received a number of paper-proposal abstracts, the I-I Team evolved into the Organizing Teams for Programs A, B and C under the leadership of the three Developer Co-Chairs. The Developer Co-Chairs and their Teams then undertook the hard work of developing their sessions, engaging with their presenters and along with the Host Chairs, chairing their respective conference sessions.

Note that the term 'papers' is used loosely here as formal papers were not, in most cases, required - the reason being that in the planning and discussion of 'what should be' or 'what might be', papers would have been too restrictive. Abstracts and presentations are required for inclusion in the Proceedings in all cases.

Note: It is essential that the body of work reflected in the Issue-Identification lists is retained as the basis for future conferences, courses and training programs – and for the ongoing 'exploration of the challenges ahead' within the CNS OM+DM initiative. Too much effort has been put into this by both the utility leaders and the SGC 2012 organizers to do otherwise.

We look forward to your suggestions as to means of exploiting these I-I Listings going forward.

Powerful Opening Messages - A Feature of the Plenaries and Luncheon

The following plenary and luncheon messages as detailed further below provided focus and inspiration which carried the intensity of the conference throughout:

- Gary Newman, Bruce Power – 'Utility-Vendor Partnerships for Refurbishment Projects'
- Ron Oberth, OCI – 'Engaging Service Providers and Future Industry Leaders in Improving Industry Performance'
- Paul Spekkens, OPG – building on the theme - 'Operate Clean – Build Clean – Plant Wide'
- Jim Cairncross – 'What Does Canada's F-35 Fighter Jet Have to Do with Me? You'd Be Surprised' (see paper in this Bulletin Edition)

SGC 2012 – 'The Course'

'...engaging those younger *and the not-so young* in the basics of system and equipment thermal hydraulic and functional architecture - and in the development of their task leadership capability – all as required to deal with the challenges ahead ...'

At the SGC2012 Conference someone stood and asked a question of the senior utility people at the podium – a question which in one form or another has been asked many times over the past decade or two – '... what measures are being taken to 'accommodate' younger people who come to the nuclear industry with advanced computer/ etc skills'.

Accommodation is exactly what younger people do not need. While that may be their job, they do not need (nor should they want) to spend all of their time at a computer with 'all resources provided'. They need to spend some of their time learning '...how to deal with things' – how to do I-I&D in order to set up new work and to address newly-breaking problems – how to approach problems which are initially identified in 'vague anxiety' terms – how to do alternate calculations to verify their work – operating chemistry and fluid mechanics – and issue-definition mapping.

A Secret - The Course was promoted as being for those who are young and new to the industry – but its un-sung objective was to provide a means for those long-in-the-industry but who never did have the opportunity to learn the basics by attending as 'mentors' while quietly getting a bit of an up-date – an opportunity which many have happily taken advantage of at this and past courses.

The course was presented in four parts as follows;

i) Part 1: Steam Cycle Conditions and Chemistry – Understanding the steam cycle is essential to understanding the operating chemistry environment of the respective components, and understanding that is key to doing life-cycle management.

   Part 1 opened with 15 second fun self-introductions (name?/ from?/ famous for?) to encourage participant engagement. To the same end, it also included doing a CPT (corrosion product transport) calculation as a 'Test Item'

ii) Part 2: Task Leadership, Process Verification & Controls - Side-Stream Issue-Definition Mapping (critical path method) was introduced as an essential task leadership tool.

   Conference General Chair Juris Grava delivered an extensive and highly-informative introductory overview to Reactor Controls, an area to which Juris brings great interest and a lifetime of expertise

iii) Part 3: Steam Generator Thermal Hydraulic and Functional Architecture – an informative presentation on steam generator sizing by Rick Klarner, B&W Canada

The latter part of this segment was a review of the environmental/ chemistry conditions of the range of nuclear plant heat exchangers

iv) Part 4: A Reactor Configuration Overview – this very well received segment presented by Juris Grava, was built upon overviews provided at prior courses

v) Part 5&6: Test and Graduation – a test (four Test Items were part of the course) is essential if engaged participation is to be achieved. Graduation certificates may sound quaint but they are treasures to the recipients and a tradition of CNS Courses

SGC 2012 – The Conference

A Story of Intensely-Engaged NIOU-Focused Issue-Definition Dialogue

Never has there been a conference in which the participants of each and every session were so intensely focused on what was being discussed. Presumably a by-product of a focus on 'what needs attention' is a spirit of intensity once people begin to understand why the subject at hand is of such interest to them.

Having an NIOU focus, the Organizing Committee decided that we must focus on 'what needs attention' which led to the initiation of the 'Issue-Identification & Definition (I-I&D) Program'. In the context of this conference, Issue-Identification is a utility responsibility – only they can know what their issues, needs and interests are – and only they can know when those needs have been satisfied.

Issue-Definition ('determining what needs to be done to deal with the situation at hand') then becomes a joint effort between a responsive Service Provider and the Utility working together with the service provider providing both the overall lead and also the technical lead in their area of expertise. In that context, all of the papers and presentations at this event were intended to be Issue-Definition papers – the conference was looking for pro-active issue-definition work and not just pre-existing 'solutions' from the past.

The starting point for Issue-Definition work is of course Issue-Identification realizing that issues of ultimate significance are usually first identified in less-than-definitive terms – or as someone once said and as has often been re-confirmed:

'...anything that ends up being 'big' usually starts out being identified in 'vague anxiety' terms by a plant manager ...'

SGC 2012 Program A:

Steam Generators & Heat Exchangers – Their Management, Refurbishment and Architecture

Program A despite being the longest established and most scientifically intense part of this event was also the slowest to embrace Issue-Identification.

This Steam Generator and Heat Exchanger (SG and HX) area, as was discovered during the I-I process, is typified currently by tiny islands of intense expertise in areas such as degradation and vessel analysis which are widely separated by areas where prior expertise has grown thin or been lost altogether – not a good thing.

Program A is best discussed in three parts – i) the Program A Plenary and Luncheon presentations, ii) expert presentations on established practices and technologies and iii) presentations addressing 'issues requiring attention' as identified during the Program A I-I process.

Plenary and Luncheon Presentations – These presentations as noted in an earlier section above, delivered three very strong but different messages. The first plenary paper by Paul Spekkens, OPG opened the conference with the message of 'Operate Clean – Build Clean – Plant Wide' (making that an integral part of plant culture and practice), and went on to discuss challenges to be dealt with in these changing times of this industry.

OCI President Ron Oberth delivered a very strong and tone-setting message regarding Engagement of Service Providers and Future Industry Leaders in Improving Industry Performance.

Luncheon Speaker Jim Cairncross provided the thought-provoking message that '... critically-important execution-processes require some sort of independent process verification audit using tools already in use in other industries' in his talk entitled 'What Does Canada's F-35 Fighter Jet Have to Do with Me? You'd Be Surprised'.

Established Practices and Technologies – The Tuesday sessions of Program A focused largely on state-of-art technologies for the management and cleaning of SGs, on SG life cycle management, and on repair and cleaning technologies. These presentations provided the perfect balance of proven practice to the more exploratory pursuit of issues in the earlier part of Program A.

'Issues (Three) Requiring Attention' – The sessions opened with a presentation by Pierre Bertrand of the French Utility EdF on the subject of SG tube support plate deposition and the issues caused by that – a theme which drove much of the discussion of this part of the conference. A paper by Roger Staehle addressed the critically-important and always-controversial subject of the degradation performance for Alloys 800 and 690 SG tubing materials. In the final session of the day, Pawel Trocki of B&W Canada addressed the topic highlighted in the first plenary of 'Operate Clean – Build Clean – Plant Wide' and the work and understanding of plant processes required to achieve that.

SGC 2012 Program B:

Controls, Valves, Pumps, Electrical

The subject of 'Controls, Valves, Pumps & Electrical' or 'Program B' along with the Reactors segment of Program C were new additions to the Steam Generator

and Heat Exchanger Conference; the SGC Conference had been held every four years or so since 1990.

Rick Hohendorf, Manager, Computers and Control Design, OPG served as Program B Host Chair and delivered the first plenary paper addressing the primary focus of Program B entitled 'Digital Upgrades at Ontario Power Generation'.

Vinod Chugh, Manager, Performance Engineering, AMEC NSS Limited, Program B Developer Co-Chair, served as developer of the Program B sessions – work that included engaging the plenary speakers, working with the respective presenters, and generally orchestrating the activity of the sessions in order to achieve the value and focus that they brought to the conference.

Newness to this event notwithstanding, the Program B Developer Team was way ahead of everyone else when it came to Issue-Identification. They immediately understood the value to the utilities of proactively identifying 'what needs attention' – or as one senior utility person was heard to say – "... no-one every asked us before what our needs and issues might be".

When it is in operation, controls - as those of us involved with equipment come to realize - 'is the reactor'. Controls brought a much needed pro-active focus and energy to this conference – they also brought forward a number of 'tools' widely used elsewhere that the rest of us need to exploit in trying to demonstrate that things work as expected – tools like FMEA (failure modes and effects analysis).

Again – the Program B Team led by Vinod Chugh is to be commended for their energy and for the proactive spirit they brought to this event.

SGC 2012 Program C:

Reactor Components & Refurbishment

Program C, Reactor Components & Refurbishment brought new thinking to the conference on a number of fronts. That started, as noted above, with the first Plenary Presentation by Host Chair Gary Newman, Chief Engineer and Senior Vice President Engineering, Bruce Power entitled 'Utility-Vendor Partnerships for Refurbishment Projects' – a paper which laid out the utility's expectations regarding both engagement with and performance by the Service Provider.

Program C was developed by Developer Co-Chair Rob Bouchard of B&W Canada. Rob's program focused on new and innovative means of achieving refurbishment objectives, thus reducing the need for the multi-year, multi-billion dollar outages we have become used to.

That theme was developed in the plenary paper by David McNeish, Bruce Power entitled 'Reactor Refurbishment for a Changing Climate'.

Program C also brought an interesting paper by Heather Roth, B&W Canada addressing the incredible complexity of managing certain off-reactor refurbishment programs – in this case valves.

The first Program C session-paper presented by William Crocker, AMEC NSS Limited entitled 'Application of System-Level FMEA in the Nuclear Industry' thus putting substance to the process verification theme of the Monday luncheon message.

SGC 2012 – Conference Participation

2012 has been a difficult year for organizing conferences – there having been a nuclear conference most every week from February to November. The numbers for SGC 2012 were down as a result. However because of our focus on 'what needs attention', the quality was up – all as attested to by the keen attention observed during every session right down to the last presentation on the Wednesday.

As noted above, it has been a major objective of Program A and of the Course to encourage engaged dialogue around issues requiring attention. Note also that trying to get people to address what needs attention - is neither easy – nor necessarily popular – nor necessarily conducive to a large attendance. It is nevertheless worthwhile – the only alternative for a steam generator conference in this age where utilities have other equipment worries is shrinking or even total extinction of the SG Conference and the loss of value that this event has brought to the industry since its founding in 1990.

SGC 'The Conference' - Going Forward

Fortunately, SGC 'The Conference' is part of the new CNS OM+DM Utility Engagement Initiative which works to connect this event and the CMC conferences with the interests of the Utilities, with local CNS Branches and Universities and with Service Providers – an excellent initiative which sustains this and other operations-related activities – you will enjoy getting involved.

Fortunately times of uncertainty are also times of opportunity – so let's 'go for it'

Young attendees at B & W display.

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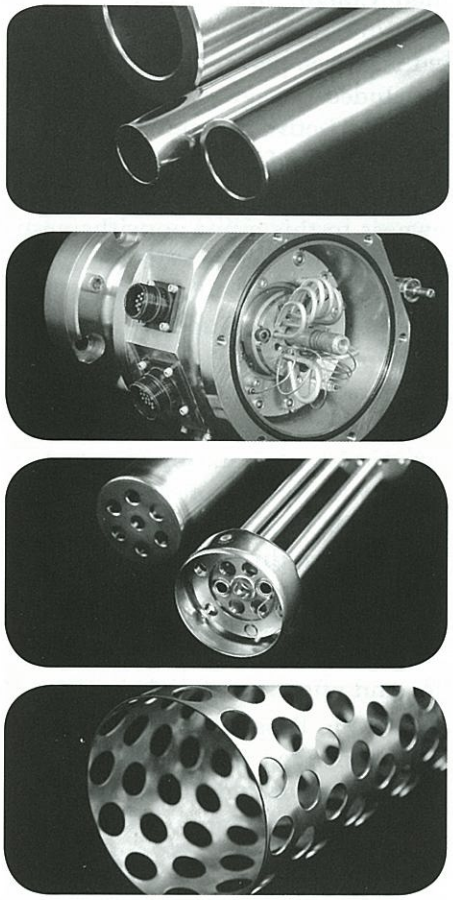

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24th Nuclear Simulation Symposium

by FRED BOYD

Over 60 specialists gathered in Ottawa, October 14 - 16, 2012, for the *24th Nuclear Simulation Symposium* where they reviewed and discussed developments in the field of simulation of nuclear systems, under the sub-title, *Progress in Simulation Tools and Methods.*

Following a modest reception combined with registration on the Sunday evening, the symposium began early the next day with a brief welcome from the symposium chair, Gilles Sabourin, from Candu Energy Inc. followed by a plenary session.

The first plenary speaker was **Joanne Ball**, Director, Reactor Safety Division, at Atomic Energy of Canada Limited, who described AECL's *Advanced Code Project.*

Most of the simulation codes being used in Canada were developed two decades ago, she commented, and are becoming increasingly difficult to maintain. They consist of many independent tools which makes integrated analysis difficult and time consuming. Therefore, AECL has undertaken to develop a new suite.

The existing codes were developed on a "top down" systems approach, she said, and are generally complex with strong interfaces. The new program is taking an analytical "bottom-up" approach which will have simple, deterministic interfaces.

Safety analyses can be very difficult, she commented, involving physics, fuel behaviour and thermal hydraulics. The objective of the new safety codes is to have an integrated suite of advanced codes to enable regulatory evaluation. They will have the attributes of being integrated, flexible, accurate, usable, maintainable and sustainable.

Although the need was recognized a decade ago, the development program was launched in 2011 and has a three to five year horizon. Current activities include developing prototype "next generation" physics and thermal-hydraulics toolsets and investigating techniques for coupling them. AECL is collaborating with several partners, including Universities of Waterloo and Saskatchewan; Ðcole Polytechnique, and Candesco.

The next presentation, by **Charles Blahnik**, of CBA Inc., was titled, *Perspective on Analyses of Core Damage in CANDU Reactors.*

He began by noting analyses for limited core damage in the 1970s. That was followed by codes for estimating wide-spread fuel damage due to sustained loss of cooling. He referred to the more recent MAAP-CANDU code for analysis of moderator accidents and development of codes for multi-unit plants with vacuum buildings. He commented that modelling these different scenarios was "challenging".

After a mid-morning break the Plenary session continued with three further presentations.

The first speaker of this session was **Tony Williams**, a research scientist at AECL, who spoke on *New Techniques for Fuel Modelling.* The objective, he said, is to determine the source term, i.e., the release of fission products, from an accident. He noted such a release required fuel sheath failure which could be caused by mechanical damage or chemical attack. This is all driven by temperature, he stated. There are limitations to current one dimension models so three dimension ones are being developed, he noted.

Next was **Dumitru Serghiuta**, of the Canadian Nuclear Safety Commission, who titled his presentation, *Independent Review and Verification of Nuclear Safety Analysis and Design in the Face of Uncertainty.* The nuclear regulator needs strong technical support, he asserted, noting that some nuclear regulators have their own laboratories.

Referring to his title he raised the rhetorical question of Why Uncertainty Quantification? This is needed, he said, to support continued operation under changing conditions, such as: ageing and life extension to confirm safety margins. There is a need for a new framework and standard for verification and validation, he stated in closing, noting that there are more than 20 conflicting nuclear verification and validation standards.

The final plenary speaker, **Fred Dermarker**, Vice-president, Engineering Strategy, Ontario Power Generation, titled his presentation, *Actions Taken in Response to Fukushima.* He began by showing a short film titled, *Severe Accident Management Guidelines.* OPG has created an interdisciplinary group to study how to mitigate "beyond design basis" events, he noted.

He mentioned a number of attributes of the CANDU design that would prevent fuel failure for eight hours,

such as the large heat sink of the moderator and shield tank. Nevertheless, he emphasized, most important is the human factor, citing knowledge-based decision making, which requires training, validation, drills and communication.

That afternoon and the next day were devoted to a series of technical presentations, grouped into the following subject headings:

- Code Development
- Safety
- Simulator Development
- Reactor Physics
- Thermalhydraulics and Safety
- Benchmarks and Uncertainties

A pleasant banquet was held the evening of the first day.

The Symposium was organized by a large committee chaired by Gilles Sabourin. Members included: Mohamed Younis; Elisabeth Varin; Adriaan Buijs; Geneviéve Harrison; Ovidiu Nainer; Sophie Pham; Constantin Banica; Ben Rouben; Glen McGee; Haykel Raouafi.

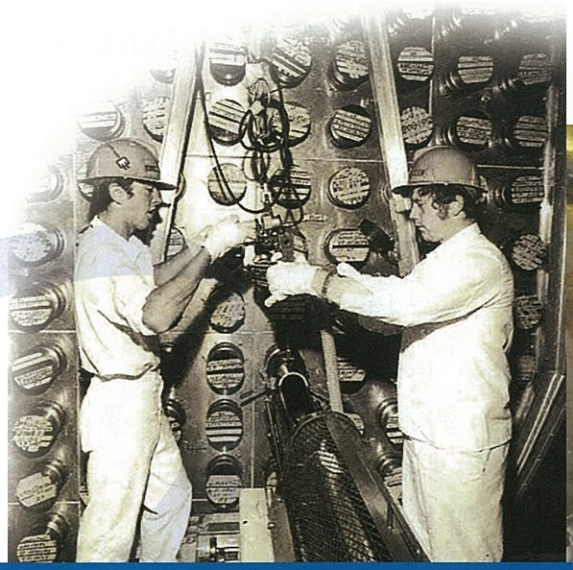
Several organizations supported the Symposium financially: AECL; Candu Energy; OPG; AMEC; Genivar; L3 Mapps; Dessau; CNS.

A CD with the proceedings will be available from the CNS office.

Symposium organizing committee:

L to R: *Benjamin Rouben; Sophie Pham; Gilles Sabourin; Geneviève Harrisson; Constantin Banica; Elisabeth Varin; Glen McGee; Mohamed Younis; Adriaan Buijs; Haykel Raouafi.*

At the reception.



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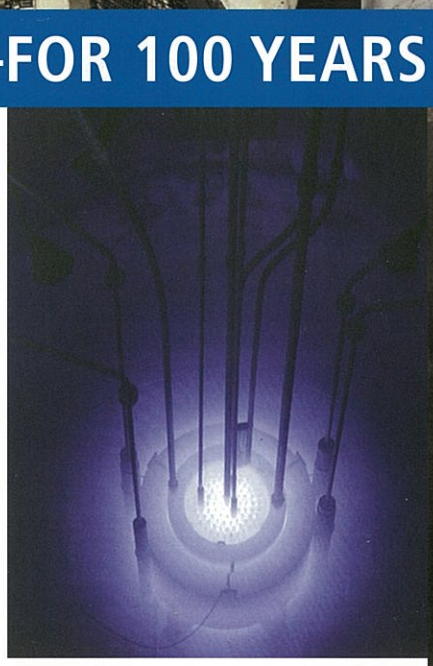

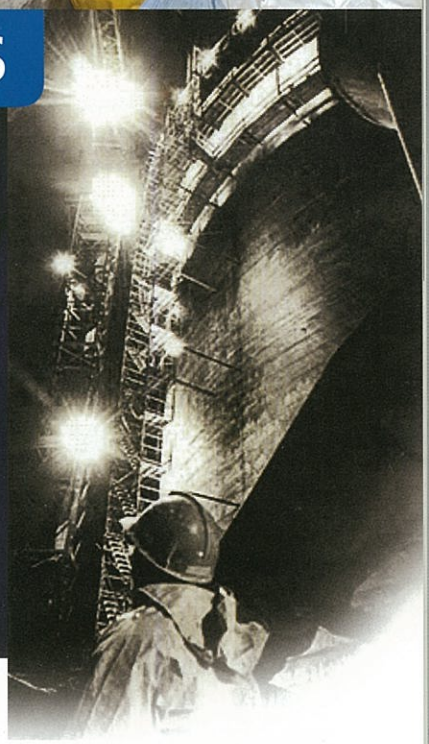

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2nd International Technical Meeting on Small Reactors

by FRED BOYD

With the growing interest in small reactors, the Canadian Nuclear Society and Atomic Energy of Canada Limited joined together to stage a second meeting on the subject with the cooperation of the International Atomic Energy Agency. It was held in Ottawa, November 7 – 9, 2012, with over 130 attendees, including representatives from seven countries.

The meeting had a wide format with papers going beyond the specific titles of the technical sessions. That applied also to the Plenary session on the first morning.

Taking advantage of the gathering, the Canadian Nuclear Safety Commission held a workshop on the day before the meeting which focussed on the regulatory issues presented by small power reactors. A summary of that Workshop was presented during the meeting.

On the evening before the opening of the Technical Meeting, a reception was held at the Museum of Science and Technology.

For those who had pre-registered, there was a visit to the Chalk River Laboratories of AECL on the Friday after the meeting.

The official meeting opened the morning of November 7 with greetings from **David Sears**, conference general chair; **John Roberts**, CNS president; and **Michael Lees**, president Babcock & Wilcox Canada, the principle sponsor of the meeting. Lees noted that B & W Canada is a major player in the B & W Corporation work on the design of its mPower® Small Modular Reactor.

The first presentation was by **Robert Walker**, President AECL, who titled his talk, *Small Reactors – More Than a Technological Challenge.*

Canada is an energy super-power, he asserted and that includes a comprehensive nuclear sector which is internationally competitive, has an effective regulatory regime, is populated by highly qualified people, and has excellent science and technology capabilities.

He then turned to the broad context of government policy objectives which, he noted, are focussed on the debt, economic growth and the health, safety and security of the public. Ontario, he commented, is in a conundrum over its debt. The question of new nuclear has to be considered within these factors. He noted that energy is within provincial jurisdiction but the federal government plays a role in regulation, investment, international trade and science and technology. There are opportunities and challenges, he commented. The role of science and technology in the nuclear field, he added, is to reduce regulatory uncertainty, capital cost, liability risk, and time to market.

Next was **Iain Harry**, General Manager, Clean power, at Saskpower, who titled his presentation, *The Clean Energy Future of Saskatchewan.* He began by identifying, for overseas visitors, where the province is situated. The province's economy is resource driven, he noted, with large exports, which has led to significant growth over the past five or more years. This has resulted in an increase of electricity demand, which is met primarily by coal-fired stations. His group is looking at alternatives, such as geothermal, solar, and nuclear. He commented that with their relatively small and widely distributed demand large nuclear is not feasible. A 36 month study is underway to evaluate small nuclear units, which will include public participation.

The third speaker before the morning break was **Ray Sollychin**, from the International Atomic Energy Agency, who titled his address *Nuclear Reactor Technology – the Next 50 Years.* He began by noting the increasing use of coal for electricity generation, especially in rapidly developing countries such as China. Then he turned to the case of many smaller countries which have smaller electrical grids and can not accommodate large generating stations. Therefore nuclear plants must be small or medium sized and they must be able to be integrated with renewable generation.

Some developing countries already have small research reactors, he noted. This provides the basis, he suggested, for the introduction of small power reactors, provided the organizations involved have developed a culture with strong emphasis on safety, health and environmental protection.

Following the intermission, **Terry Jamieson**, Vice-President, Canadian Nuclear Safety Commission spoke on *Moving forward with Small Rectors in Canada: A Regulatory Perspective,* who began by noting there is a regulatory continuum embracing all sizes of reactors. Canada has considerable experience

with small reactors, he commented, noting ZEEP, NRX, NRU, NPD, and SLOWPOKE.

He mentioned a relatively new CNSC process, Pre-licensing Vendor Design Review, outlined in regulatory document GF-385. This is a three-phase process, he noted, involving: vendor design intent; CNSC assessment of design fundamentals; follow-up reviews requested by the vendor. There are currently three designs in the early phase of this process: B & W Canada (mPower); NuScale Power Systems; and StarCare Static Pebble Bed reactor.

Where the use of codes or standards from other countries is proposed, the CNSC will demand that the applicant demonstrate their equivalence to Canadian codes and standards through a gap analysis.

He noted that, although the CNSC is not involved in site selection, it will examine the suitability of a proposed site for construction and operation. In closing he mentioned that the CNSC is now responsible for environment assessment.

The final plenary presentation was by **John Root**, interim director of the Canadian Centre for Nuclear Innovation (CCNI), which, he noted had just been renamed as the Sylvia Fedoruk CCNI, after Dr. Sylvia Fedoruk, a nuclear medicine and science pioneer who later became chancellor of the University of Saskatchewan and subsequently Lieutenant Governor of the province, who died shortly before the meeting.

The Centre has four objectives, he said:

- advance nuclear medicine
- advance knowledge of materials
- improve safety and engineering of nuclear systems
- manage risks and benefits of nuclear technology for society and the environment

At this stage of the project they are still working on developing programs and facilities. A new cyclotron is proposed.

The Centre has been set up as a not-for profit incorporation, as a subsidiary of the University of Saskatchewan. The province has provided a start-up grant of $30 million.

That afternoon and the next day were devoted to technical presentations, with the second day running two parallel sessions. Following are the titles of the technical sessions, although the presentations sometimes did not directly fit the title.

- Small Modular Reactors (2)
- SMR Designs and Concept Development (20
- Safety and Licensing
- Proliferation, Remote Monitoring & Control
- Research Reactors (2)
- Physics and Analysis (2)

Several different designs were noted, such as: the pool-type NuScale and mPower ones in the USA; the small PWR ACP 100 in China; several molten salt designs and a small modular CANDU.

Broader topics such as the challenges of locating a small nuclear power unit in isolated communities in Canada's artic regions and proliferation resistance were also addressed.

At the banquet, held the first evening, plaques marking the 50th anniversary of the start-up of the small (20 MWe) Nuclear Power Demonstration (NPD) plant in 1962, were presented to representatives of the three organizations involved in that project which initiated the CANDU design concept. On hand to receive the awards were: Bill Kupferschmidt, vice-president, AECL; Peter Mason, president of GE Hitachi Nuclear Energy Canada (for Canadian General Electric) and Paul Spekkens vice-president, Ontario Power Generation (for Hydro Electric Power Commission).

The after dinner speaker was **Romney Duffy**, recently retired Senior Scientist, AECL. Titling his talk, *Fukushima and the Future*, he began by quoting the author George Eliot that "we had the experience but missed the meaning". Although some risks are perceived as tolerable, or at least, insurable, Fukushima was different, he stated. The media produced startling headlines which led to panic. Global society is more sensitive now, than in the past, to risk effects, he asserted.

It is a fallacy to believe or state that it will not happen again, he said. Noting that he had been on the ASME Fukushima Task Force, he quoted its report, that "we must forge a new safety construct". In conclusion, he stated that reactors of the future must meet a list of criteria: acceptable; desirable; useful; competitive; and advanced. At the same time, he said, they must not be: threatening; expensive; hazardous; risky; or radioactive. His talk evoked a spirited question period.

The meeting was organized and run by an organizing committee chaired by David Shears, and program committee chair, Shuwei Yue. Members were: Bhaskar Sur; Mike O'Shane; Bruce Wilkin; Julian Atfield; Ken Kozier; Arjun Das; Sinh Nguyen; Ruxandra Dranga; Ben Rouben; Tracy Pearce; Ashley Godin.

Only some of the presentations were prepared as full papers. The program, containing abstracts, is available from the CNS office.

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"Déjà vu all over again", Yogi Berra

As one involved in the nuclear industry since 1950 and a part-time spokesman while performing my duties as a scientist at AECL-CRNL and AECL Research I was interested in the Report on the 3rd NEO Workshop (CNS Bull. Vol. 33 No. 3 p.5). I found that I have a somewhat different perspective on this period and the Communication Challenges.

The Workshop did not state explicitly what message should be communicated. Early in my contacts with the public I concluded that they had four major concerns:

- Fear of radiation from which stem the other fears
- Fear of a major reactor accident
- Fear of nuclear wastes
- Fear of nuclear weapons.

Soon I realized that people had little interest in nuclear energy unless they appreciated the need for energy; that the wise use of energy is beneficial, not sinful; and that all cost-effective sources will be needed. So I inserted as introduction:

- Need for energy.

I addressed these in print, on the radio and television, in public meetings and debates. In my view these topics still need to be addressed. The only new approach at the Workshop, apart from two academic proposals for more studies and dialogue, was to focus on "social media". I never did agree with Marshall MacLuhan's "The media is the message"

For me the debate on nuclear wastes had started well before the Porter Commission: in 1964 AECL had developed and issued a detailed proposal for the management of nuclear fuel wastes that differed little from what is now being implemented. This was the subject of public meetings. The requirement for "more transparency" should have been challenged to provide specifics. These may seem like quibbles but if those at the Workshop believe that there was no work or debate on wastes before Porter and that the nuclear industry is secretive there is no wonder that the critics exploit these myths.

To end on a more positive note I suggest:

- The false *promise* of wind, widely believed by the public, is an impediment to further nuclear so wind proponents should be challenged head on using *total* cost estimates explained in previous issues of the Bulletin. There has been limited criticism on health grounds of primary interest to neighbouring communities but it is electricity costs that will excite the public at large.
- Similarly for conservation proposals and other renewables which are not cost effective.
- Since the case for wind, etc., depends on the unproven hypothesis that carbon-dioxide emissions are causing alarming warming, proponents should be challenged to produce any scientific evidence for the hypothesis: an unverified computer model is not evidence.
- When I was engaged in public-relation activities I was teamed with one of AECL's Public Relations staff, or "handler", who would obtain invitations for me to radio and television programs, presenting me as a scientist untainted by "PR". I could never have done what they did so we complemented each other. The same technique could be used again.

J.A.L. (Archie) Robertson
2012 October 26

Photo of Darlington NPP which was the focus of a four day public hearing December 3-6, 2012 which attracted dozens of interveners, mostly critical.

Ontario's already "flexible nuclear" CANDU even better by satisfying IESO requirements to replace flexible coal

"The existing coal fleet, though running at vastly reduced levels from previous years, provides the IESO with desirable flexibility, such as quick ramping and operating reserve, under all market conditions. As Ontario's coal-fired generation is shut down over the next two years, its associated flexibility will be lost. Therefore, future capacity additions should also possess this flexibility to help facilitate the management of maintenance outages, provide effective ramp capability, supply of operating reserve and even provide regulation when necessary".

This statement appeared as the last paragraph in the "18-Month Outlook from 2012 Sept. to 2014 Feb." put out by the Independent Electricity System Operator (IESO) on 2012 Sept. 12. Similar comments have appeared in previous 18-Month Outlooks and referenced in the Canadian Nuclear Society's BULLETIN. If there is to be any hope for significant nuclear new build in Ontario it must meet this IESO operational requirement. The Enhanced CANDU 6 (EC6) should meet this by its combination of up to 100 percent steam bypass for rapid manoeuvring followed up by slower reactor power adjustments when the reactor is available to manoeuvre.

The IESO has categorized the output of the eight units at Bruce A and B stations as "flexible nuclear". This is because Bruce Power has offered up to 300 MWe of manoeuvring capability for each operating unit using steam bypass while holding reactor power constant - presumably because of restrictions in the operating licence on reactor load-following/cycling. Even this limited capability comes with limitations that the IESO assumes when moving the nuclear units. Each unit must be curtailed between 100 - 300 MWe; the unit must remain at the reduced power condition for at least three hours; only one unit per station can be curtailed per hour, and any shutdown would last for at least 72 hours. The IESO says that the exact amount of manoeuvring available will vary from time to time based on prevailing technical and regulatory restrictions.

Likely one of the regulatory restrictions on Bruce Power would be the water temperature in the station condenser cooling water discharge duct. When steam bypass is used on a unit with the reactor held at full power the cooling water discharge temperature from the unit into the common discharge duct increases, by around 15 percent above normal full power operation for a unit electrical output of 515 MWe to grid (the output of a Bruce B unit after dropping 300 MWe to the grid by steam bypass).

For any nuclear new build using lake water cooling and not air cooling the condenser cooling water discharge duct temperature limits set by the Ontario Ministry of the Environment must not constrain the multi-unit station from providing full electrical manoeuvrability, zero to 100 percent of full station output, when dispatched by the IESO. For a Bruce B unit, reducing reactor power to around 60 percent with steam bypass allows unit house-load to be supplied with zero output to grid (so called "poison prevent" operation) with a unit condenser cooling water discharge temperature around 84 percent of that at normal full power operation. This means that Bruce B could potentially provide over 3,000 MWe of manoeuvring to the grid without exceeding cooling water temperature limits if it were allowed to manoeuvre its reactors for load-following, or even load-cycling at night and weekends.

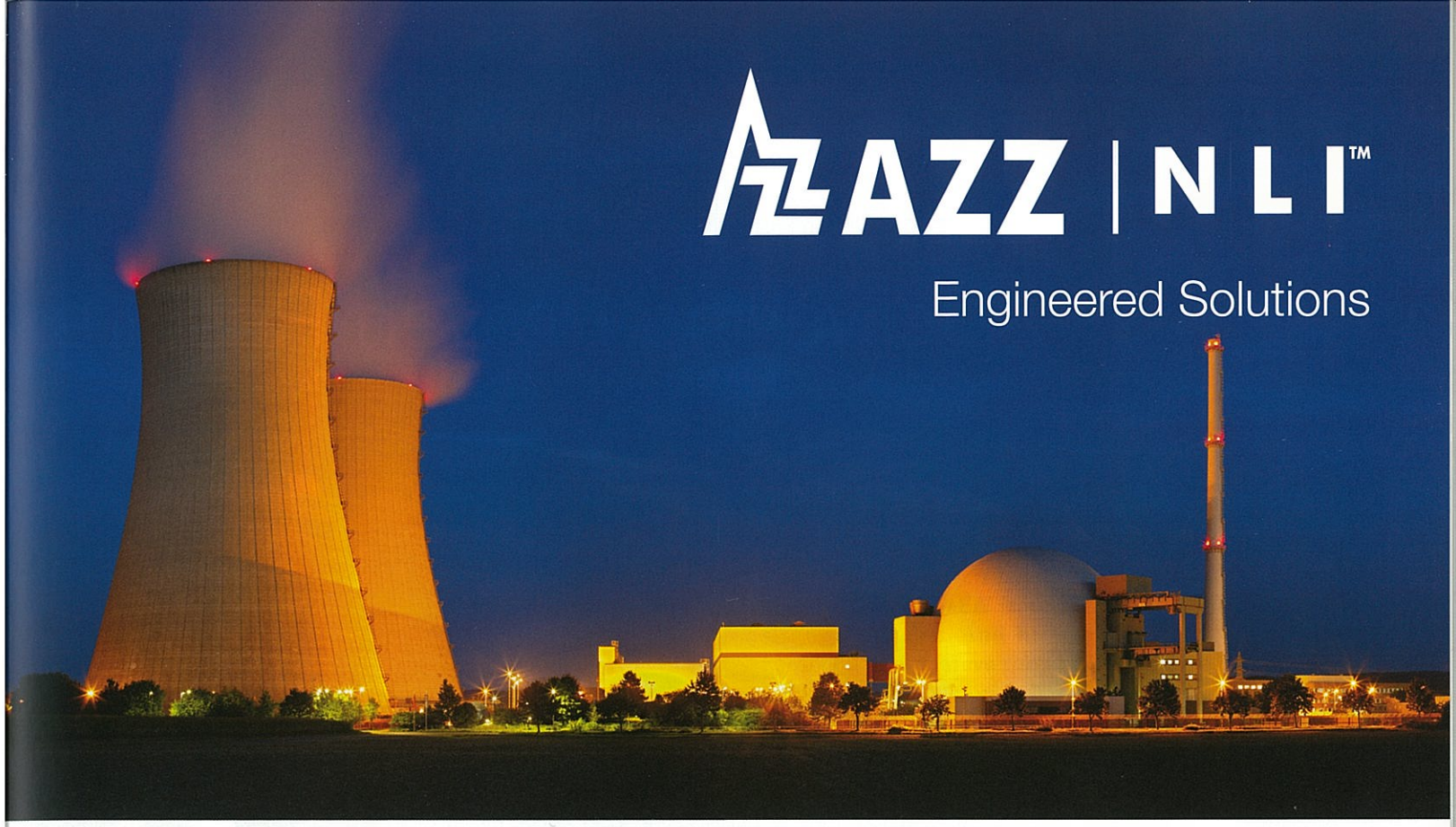
Although not providing "future capacity additions" the refurbished Bruce B will virtually be a new station and should include the changes necessary to enable the reactor to be manoeuvred to meet the IESO operating requirements for new build. It may not even be necessary for the required changes to be done during refurbishment, they could be started earlier after making the safety case and getting permission from the nuclear licensing authority. As can be seen steam bypass alone is not enough to match the flexibility of coal. Without adjuster rods it may be more difficult to give Bruce A units the same capability but they can still improve their curtailment capability by adding more condensing capacity.

Darlington is not categorized as "flexible nuclear" by the IESO since it takes no part in the reduction of surplus base load generation. The refurbishments due to start in 2016 should, like Bruce B should, include the changes needed to meet the IESO operating requirements for new generation in Ontario.

The IESO performance requirement for flexible new generation arises because of the need to integrate the increasing amount of intermittent wind and solar generation and the need for dispatchable load-following generation to replace flexible coal. Of course such flexibility comes with an additional energy cost mainly from lower capacity factors and wear and tear that applies to all generation sources to different degrees. Between Bruce A/B and Darlington there is the potential for 9,000 MWe of curtailment.

Don Jones

Ed. Note: For the full version of this article see, http://thedonjonesarticles.wordpress.com/2012/10/20/ontarios-already-flexible-nuclear-candu-even-better-by-satisfying-ieso-requirements-to-replace-flexible-coal/



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What does Canada's F-35 Fighter Jet have to do with me? You'd be surprised!

by JIM CAIRNCROSS[1]

[Ed. Note: The following paper was presented at the 7th CNS International Steam Generators to Controls Conference held in Toronto, Ontario, Canada, November 11-14, 2012.]

Abstract

The Auditor General's Performance Audit earlier this year of the F-35 "next generation" Fighter Jet Program has significant application in the nuclear industry - the attributes and mechanics of such performance audits and reviews are equally as applicable there. The review of the F-35 Jet Fighter Program illustrates many of the important points raised in last year's CANDU® Maintenance Conference (CMC 2011). It also reinforces the focus of the SGC 2012 Conference which is on 'Issue Identification & Definition' and on '...what needs attention'.

As the CMC 2011 Conference highlighted and this year's conference is reinforcing, there needs to be a process to address execution-process issues that is:

- Transparent/ Independent/ Pro-active
- Rigorous and serves the interests of the ultimate guarantor
- Appropriately timely, and
- That uses process-assessment 'tools' well-established in the nuclear as well as other industries

For these discussions our interest is not in 'financial audits' or 'project management overviews', but in 'execution-process audit' capability for specific processes – an audit that can verify that the particular process can be 'done-right, done-once' - that being the only means of ensuring that cost and performance goals are achievable. While the approach and objectives of the F-35 Program audit may not be exactly the same as what we are talking about here, there is much to learn from the Auditor General's review.

This presentation touches on the following subjects and how they are relevant to any refurbishment or new-build project in the nuclear industry:

- What were the objectives of the F-35 Fighter Jet project review?
- What was the scope and approach to the review?
- What criteria were used to assess due diligence?
- What issues were identified and defined?
- What conclusions and recommendations arose from the review?
- What can we learn and apply from the review of the F-35 Fighter Jet Project?

Regardless of the details of the particular approach, the message we need to get from a discussion such as this is that a successful and cost-compliant outcome depends entirely on the satisfactory execution of each and every detail. No amount of high-level oversight can prevent individual process steps from going wrong – only good solid step by step assessment using proven tools such as FMEA (failure modes and effects analysis) can do that. And no amount of cooperation and good will can achieve the objectivity of an independent audit that is done on behalf of a project's guarantors.

1. Overview of F-35 Joint Strike Fighter Program

In July 2010, the Government of Canada announced its decision to buy 65 F-35 Lightning II jets to replace Canada's CF-18 fleet. The announcement was the culmination of nearly 13 years of Canada's participation in the United States-led Joint Strike Fighter Program.

The Joint Strike Fighter (JSF) Program started in the late 1990s. It is the United States Department of Defense's largest-ever development and procurement program, aiming to produce an aircraft able to perform in combat operations. The JSF Program is unique. Led by the United States, and with eight international partners (Australia, Canada, Denmark, Italy, Netherlands, Norway, Turkey, and United Kingdom), the JSF Program is undertaking concurrent design, development, and manufacturing of the F-35. It will eventually include a regime for long-term sustainment. Supporters of the F-35 expect it to be the most technologically advanced strike fighter jet in the world.

Canada's participation has been formalized by signing international memoranda of understanding–in 1997, 2002, and 2006–for each of the three major phases of the JSF Program. As of September 2011, the government had disbursed about CAN$335 million toward participation in the JSF Program and related support to Canadian industry. The government has committed a total of US$710 million to the Program.

The JSF Program has experienced cost increases, schedule delays, and technological problems. These issues are

1 James Cairncross & Associates, Toronto, Ontario, Canada.

not uncommon for a major development program. As of April 2011, the US Government Accountability Office estimated total development funding to be US$56.4 billion to complete the project by 2018. This represents a 64 percent increase in estimated costs since the system development and demonstration phase started.

2. Why is this project relevant to SGC 2012 and specifically me?

The Auditor General's review of the F-35 Jet Fighter Program illustrates many of the important points raised in last year's CMC 2011 Conference. These included: a focus on what needs attention; striving to find ways to make improvements in the industry generally; and recognition that future projects will need early identification and resolution of issues. As I read from the transcripts of last year's conference, in order to be able to address the problematic 15% issues, there needs to be a process that is:

- Transparent/ Independent/ Pro-active
- Rigorous and serves the interests of the ultimate guarantor
- Appropriately timely, and
- That uses process-assessment 'tools' well-established in the nuclear as well as other industries

And I believe the Auditor General's review reinforces the focus for the SGC 2012 Conference – Issue Identification and Issue Definition.

Before preparing this paper and presenting it at your SGC 2012 Conference, I touched base with the Auditor General's Office to be certain I was in compliance with requirements the Office might have related to the audit. As I was not directly involved in this performance audit, I can draw from the report that is a public document and the most reliable source of information.

Specifically, I'll touch briefly on the following:

- Why is this subject important?
- What were the objectives of the review?
- What criteria were used to assess reasonableness?
- What was the scope and approach to the review?
- What issues were identified and defined in the review?
- What conclusions and recommendations arose from the review?
- What can we learn and apply from the review of the F-35 Fighter Jet Project?

1. Why is this subject important?

Buying and maintaining the F-35, or any other fighter jet, will require a significant long-term financial commitment. It will have far-reaching economic and operational impacts on Canadians and the Canadian Forces. Decisions taken to date as well as those yet to come will have impacts for the next 40 years. I'm sure you can see a parallel with your own industry and, to use your own acronym "NIOU", the needs and interests of operating utilities.

Buying major defence equipment is subject to decision-making and project management processes that aim to ensure decisions are well founded; projects are managed effectively; and goods and services are acquired in a way that enhances supplier access, competition, and fairness. National Defence, Industry Canada, Public Works and Government Services Canada (PWGSC), and central agencies are involved in the F-35 Fighter Jet Program.

2. What were the objectives of the review?

This audit examined whether the three main departments involved in acquiring military equipment–National Defence, Industry Canada, and Public Works and Government Services Canada (the government's contracting authority)–applied due diligence in managing Canada's participation in the Joint Strike Fighter Program and managing the federal decision-making process to replace the CF-18 fighter jets.

The objectives were clearly defined as you would expect for a review of any major project. They were to determine whether:

- National Defence and Industry Canada applied due diligence in managing Canada's participation in the US-led Joint Strike Fighter Program, and whether
- National Defence and Public Works and Government Services Canada (PWGSC) applied due diligence in managing the F-35 project for the replacement of the CF-18 fighter jets.

"Due diligence" was defined to mean that the departments have, in support of key decisions and related management activities,

- performed and documented analyses of benefits and risks, operational requirements, options, and costs;
- clarified rules, roles, and responsibilities;
- consulted with other entities; and
- obtained approvals and provided oversight.

You're probably saying to yourselves, these are pretty broadly stated objectives. How did the review team decide what was important that needed to be examined in detail? And what criteria were used to measure "due diligence"?

3. What criteria were used to assess due diligence?

The federal process to procure major defence equipment is governed by legislation, policy, and departmental guidance. Together, these specify the respective roles of federal departments and agencies, the key steps to be followed, the types of information and mandatory documents required, and the approvals that must be obtained as procurement proceeds.

Criteria reflected basic principles of good management practices and due diligence. These were based on relevant Treasury Board policies that support decision making and sound stewardship and contribute to transparency, accountability, and value for money. The criteria were essentially the same as you would see in a review of any major project or program whether in the public or private sector. For example, the Project Management Institute, as you would know, has defined guidelines and standards for good project management practices that are recognized around the world for projects of any type and ownership.

Some of the criteria used to assess National Defence, Public Works and Government Services Canada and Industry Canada and their participation in the Joint Strike Fighter (JSF) Program included:

- Have each of the participants identified, assessed, and managed risks and benefits related to the Canadian participation in the JSF Program?
- Have they carried out and sought appropriate oversight and approvals at key decision points to replace the CF-18 fighter jets?
- How does Industry Canada know that it has met its contribution commitments in accordance with the stated terms and conditions of agreements?
- Have they identified, assessed, and managed key project management activities to support the decision making related to the project?
- Do they each have a governance and management approach to carry out its activities, within its mandate and authorities, and applied it to the project?

It is important to note that the criteria used to assess due diligence all tied back to sources including acts and regulations, as well as policies on the management of projects, standards for project complexity, and framework for the management of risk. The sources address requirements for effective decision making, sound stewardship, and value for money.

It is also important to note that management in each of the participating organizations reviewed and accepted the suitability of the criteria used in the review. This reinforces the importance of conducting such a review in an open, transparent and co-operative manner. These are all important elements that were highlighted in your CMC 2011 Conference last year and are being emphasized throughout the SGC 2012 Conference.

4. What was the scope and approach to the review?

To focus on what needed attention, the review was divided into three lines of enquiry: one for each of the participants in the project – National Defence, Industry Canada; and the third line for National Defence's and Public Works and Government Services' management of the Fighter Capability project. Each line of enquiry examined the extent to which the departments applied due diligence in managing their respective responsibilities.

The review team obtained background information to better understand the history of the JSF Program and to provide context for Canada's participation in it.

As you would expect, the review involved extensive examination of documents and correspondence contained in National Defence's project and payment files; Industry Canada's industrial participation and contribution files; and Public Work's procurement files. Interviews were conducted with individuals who are currently or were formerly involved in the management of the JSF Program. Also interviewed were officials at the JSF Program Office, the Program Evaluation directorate at the US Department of Defense, the US Government Accountability Office, and Lockheed Martin, the F-35 manufacturer. Members of the review team visited the Canadian Forces' Wing in Cold Lake, Alberta, one location of the CF-18 fleet.

In determining whether the federal government applied due diligence with respect to Canada's participation in the JSF Program, the review team examined the extent to which key decisions, especially those taken in 2006, were supported by appropriate information and analyses, consultation, departmental oversight, and government approvals.

As you would imagine, a review of this nature involves extensive digging and probing. This is a rigorous process. You need to gather the evidence necessary to assess performance against the criteria I outlined earlier. Issue identification requires detailed work and knowing when to probe further and when to back off. The team needed to determine what was being well managed as well as areas where improvement was needed. It was important to be able to put the findings from the review in perspective and report both positive and negative findings.

I'll turn briefly to what the review found and some of the key conclusions.

5. What issues were identified and defined in the review?

The following is a brief summary of the main issues the review team identified and further defined in the audit report:

- The Government of Canada's Industrial Regional Benefits Policy seeks to ensure that defence purchases generate high-value business for Canadian industry. National Defence, consistent with this policy, took appropriate steps in managing Canada's participation in the Joint Strike Fighter (JSF) Program to develop the F-35. National Defence engaged Industry Canada early, and together they managed industrial participation well. Early efforts by National Defence and Industry Canada to secure contract opportunities for Canadian companies were successful.
- The audit report outlined significant weaknesses

in the decision-making process used by National Defence in acquiring the F-35 to replace the CF-18. Briefing materials for decision makers and ministers, in the majority of cases, only provided the most optimistic scenario rather than a range of potential benefits reflecting inherent uncertainties. Key decisions were made without required approvals or supporting documentation. Although National Defence identified and communicated risks of participating in the F-35 program, the review team was unable to find adequate documentation to determine the completeness and appropriateness of the risk assessments.

- National Defence engaged Public Works and Government Services Canada late in the decision making process. This hampered PWGSC's ability to fully carry out its role as the government's contracting authority to ensure the integrity of the procurement process. PWGSC endorsed the key decision to sole source the acquisition of the F-35 in the absence of required documentation and completed analyses. By 2010, practically speaking, Canada was too involved with the aircraft and the JSF Program to run a fair competition.
- National Defence did not provide complete information in a timely manner. For example, briefing materials prepared for decision makers did not explain the basis for and limitations of projections of industrial benefits to Canadian companies. Nor were the risks made clear of relying on the projections for decision making. Briefing materials did not inform senior decision makers, central agencies, and the Minister of the problems and associated risks of relying on the F-35 to replace the CF-18.
- Treasury Board policies require consideration of all relevant costs over the useful life of equipment, not just initial acquisition or contract cost. The audit found that National Defence likely underestimated the full life-cycle costs of the F-35. The budgets for the F-35 acquisition (CAN$9 billion) and sustainment (CAN$16 billion) were initially established in 2008 without the aid of complete cost and other information. However, there was no documented analysis to show how they were developed. Some of that information will not be available until years from now. If the budgets prove insufficient to cover total costs, the Department will have to find ways to cover additional costs that may be incurred.

6. Conclusions and Recommendations arising from the review

The Auditor General's conclusions relate only to the management practices and actions of public servants. The review team did not audit private sector contractors and, consequently, their conclusions did not pertain to the contractors' practices or to their performance. Further, the Auditor General did not audit the merits of the F-35 aircraft.

The Joint Strike Fighter (JSF) Program is unique. In this context, National Defence, as the lead department, exercised due diligence in managing Canada's participation in the Program. National Defence, together with Industry Canada, managed industrial participation well; identified and communicated risks and mitigation strategies related to JSF Program participation; and assessed options before signing the 2006 Memorandum of Understanding (MOU). This Memorandum committed Canada to the third phase of the JSF Program that included production, sustainment, and follow-on development. However, the audit reported that National Defence did not fully inform decision makers of the implications of participation in the JSF Program for the acquisition process. In some cases, documented analysis was not provided to the audit team to support decisions.

Industry Canada exercised due diligence in managing Canada's industrial participation in the JSF Program. In partnership with National Defence, Industry Canada worked to secure industrial participation.

According to the performance audit report, National Defence did not exercise due diligence in managing the process to replace the CF-18 jets. The Department did not appropriately consult Public Works and Government Services Canada on the procurement implications of the 2006 MOU for the third phase of the JSF Program. Further, National Defence did not develop an appropriate plan for managing the unique aspects of the acquisition. Problems relating to development of the F-35 were not fully communicated to decision makers, and risks presented to decision makers did not reflect the problems the JSF Program was experiencing at the time. Full life-cycle costs were likely understated in the estimates provided to support the government's 2010 decision to buy the F-35.

The audit team reported that Public Works and Government Services Canada did not demonstrate due diligence in its role as the government's procurement authority. Although it was not engaged by National Defence until late in the decision-making process, PWGSC relied almost exclusively on assertions by National Defence and endorsed the sole-source procurement strategy in the absence of required documentation and completed analysis.

Both National Defence and Public Works and Government Services Canada disagreed with the Auditor General's conclusion that they did not demonstrate due diligence in their respective roles in the replacement of the CF-18 jets. The departments believed that the level of due diligence was appropriate within the time frame covered by this audit.

Procuring developmental equipment can bring unique risks and challenges. In the Auditor General's opinion, the experience with the acquisition of the F-35 has potential lessons for development and acquisition of other military equipment. In this context, while National Defence

did several things well, the Auditor General described several concerns in the audit report. The review team did not believe a recommendation based on these concerns was required, given that best practices and policies governing these areas are sufficient.

The main recommendation in the report was that National Defence should refine its estimates for complete costs related to the full life-cycle of the F-35 capability and provide complete estimated costs and the supporting assumptions as soon as possible. Furthermore, National Defence should regularly provide the actual complete costs incurred throughout the full life-cycle of the F-35 capability.

National Defence responded that it agreed with the recommendation. It would continue to refine its full life-cycle cost estimates for the F-35 capability and committed to making the estimates and actual costs of the F-35 available to the public.

Since the audit was conducted the government reported in September 2012 that the accounting firm of KPMG had been hired to review the controversial cost projections for the F-35 fighter jets. It was also reported in September that the job will include reviewing National Defence's acquisition and sustainment project assumptions for replacing Canada's aging CF-18 jets. In addition, KPMG will work with National Defense to develop a framework to assess the life-cycle cost estimate of a fleet of 65 F-35 fighter jets throughout their expected operational life.

7. What can we learn and apply from the review of the F-35 Fighter Jet Project?

What can we learn from the Auditor General's review in a process-sense that we can apply to our own projects? I believe the principles are the same regardless of the size or complexity of the project or program. What the Auditor General's team applied to their performance audit of the F-35 project are the same review principles you are focusing on in the SGC 2012 Conference and in CMC 2011. They are that:

- Reviews need to focus on what's important to the success of the endeavour.
- They need to be timely for the results to have a positive impact on future results. This applies as much to when a review is conducted as well as its duration and timing of reporting results.
- Reviews need to have clearly defined objectives. These are not fishing expeditions.
- They need to have clearly defined criteria against which management of projects can be assessed. As with the F-35 project, management of each of the participants agreed with the suitability of the criteria the audit team proposed to use to assess the project.
- Reviews need to be open and transparent. Those responsible for managing a project or program need to be kept informed on progress; on emerging findings; and have input to the review findings, conclusions, recommendations and timelines for any necessary corrective actions.
- Reviews need to be conducted by teams that are capable, independent of the project being reviewed, and made up of an appropriate combination of technical and audit capabilities.
- Communication throughout any review needs to be open, transparent and well managed to ensure those involved are kept informed of the objectives and scope of a review; its progress; and any issues that may need resolution during the review.

Early refurbishment work at Bruce A showing the reactor face.
Photo courtesy of Bruce Power.

Development of a CANDU Full Scope Simulator For The Embalse Nuclear Power Station

by R. DIMITRI-HAKIM, M. CHATLANI[1]

[Ed. Note: The following paper was presented at the 24th Nuclear Simulation Symposium held in Ottawa, Ontario, Oct. 14-16, 2012.]

Abstract

L-3 MAPPS has developed CANDU 6 full scope operator training simulators for nearly four (4) decades (since 1973). The last full scope CANDU simulator that was developed was for Qinshan Phase II plant in Zhejiang, China and the simulator was put into service in the first quarter of 2003. Up to this point, L-3 MAPPS simulators for CANDU plants had largely capitalized on legacy technologies developed in the 1970's and 1980's. In the meantime, significant technology advances were made on simulator programs for Light Water Reactors and gas-cooled reactors and through upgrades to select CANDU plant simulators. In the third quarter of 2010, L-3 MAPPS was awarded the contract for a full scope simulator for the Embalse nuclear power station in Córdoba Province, Argentina. Through the development of this project, L-3 MAPPS has devised a full scope operator training simulator base on state-of-the-art technologies (both hardware and software) and simulation techniques.

1. Introduction

L-3 MAPPS has been developing CANDU 6 full scope operator training simulators since 1973. In the last four (4) decades L-3 MAPPS was contracted for eleven (11) separate full scope simulators as well as several upgrade projects, as seen in Table 1. The last full scope CANDU simulator that was developed was for the Qinshan Phase III plant in Zhejiang, China and the simulator was put into service in the first quarter of 2003. Up to this point, L-3 MAPPS simulators for CANDU plants had largely capitalized on legacy technologies developed in the 1970's and 1980's. In the meantime, significant technology advances were made on simulator programs for Light Water Reactors and gas-cooled reactors and through upgrades to select CANDU plant simulators. In the third quarter of 2010, Nucleoeléctrica Argentina S.A. (NA-SA) awarded L-3 MAPPS a contract to develop, install and commission a full scope simulator for the Embalse nuclear power station in Córdoba Province, Argentina.

The Embalse nuclear power station is one of two operational nuclear power plants in Argentina. It is located on the southern shore of a reservoir on the Rio Tercero, near the city of Embalse in Córdoba Province, 110 kilometers southwest of Córdoba City. The single unit at Embalse is a CANDU pressurized heavy water reactor with a net output of 600 MWe, which went into commercial operation on 20 January 1984. Embalse also produces the cobalt-60 radioisotope, which is used for cancer therapy and industrial applications. With the ongoing plant refurbishment, the plant's life is expected to be extended for another 25 years.

The Embalse full scope simulator uses L-3 MAPPS' cutting-edge graphical simulation PC/Windows-based tools for the plant models and instructor station. The majority of the simulator's models are developed, validated and maintained in L-3's Orchid® simulation environment. The plant computer systems, known as Digital Control Computers (DCCs), are represented with a fully emulated dual DCC that is integrated in the full scope simulator. The simulator is also equipped with full replica control room panels. A simplified block diagram of the Embalse simulator hardware architecture is shown in Figure 1.

In this paper, L-3 MAPPS outlines some of the novel Orchid® technologies applied to building the Embalse full scope simulator.

2. Orchid® suite of simulation tools

The Orchid® suite (Figure 2) developed by L-3 MAPPS is the result of almost forty (40) years of nuclear power plant simulation experience. The Orchid® tools have been designed to be highly integrated with one another to create an effective and efficient working environment. Each tool follows a standardized approach, providing the same guidelines for menu structure, icons, documentation and even training material. A focus on using common icons, layouts, themes, and menus has greatly helped reduce the user's (both L-3 MAPPS developers and utility simulator personnel) learning curve when adopting the Orchid® products.

With all tools having a graphical user interface and high level of customizability, the Orchid® suite is the ultimate toolbox for all simulator development, operation and maintenance needs. Table 2 summarizes the wide range of tool set Orchid® provides.

1. L-3 Communications MAAPS Inc., Montréal, Québec, Canada

Table 1 L-3 MAPPS experience with CANDU simulation

Plant	Country	Owner/Operator	Project Scope	Project Start
Point Lepreau	Canada	NB Power	I/O Replacement	2011
Embalse	Argentina	Nucleoeléctrica Argentina S.A.	Full Scope Simulator	2010
Gentilly-2	Canada	Hydro-Québec	Simulator Rehost, Instructor Station, Models Upgrade, Stimulated & Emulated Plant Control Computers	2009
Cernavoda 1,2	Romania	Nuclearelectrica	Desktop Simulator	2009
Wolsong 2	Korea	Korea Hydro & Nuclear Power Co.	Simulator Replacement	2007
Cernavoda 1,2	Romania	Nuclearelectrica	Major Upgrade	2003
Gentilly-2	Canada	Hydro-Québec	Virtual Panels	2002
Cernavoda 1,2	Romania	Nuclearelectrica	Instructor Station, Desktop Simulator	2000
Gentilly-2	Canada	Hydro-Québec	Simulator Rehost	1999
Qinshan Ph. III	China	Third Qinshan Nuclear Power Co.	Full Scope Simulator	1998
Pickering A	Canada	Ontario Power Generation	I/O Replacement	1995
Wolsong 2,3,4	Korea	Korea Hydro & Nuclear Power Co.	Full Scope Simulator	1994
Pickering A	Canada	Ontario Power Generation	Major Simulator Upgrade	1992
Cernavoda 1,2	Romania	Societatea Nationala Nuclearelectrica	Full Scope Simulator	1992
Point Lepreau	Canada	NB Power	Full Scope Simulator	1988
Gentilly-2	Canada	Hydro-Québec	Full Scope Simulator	1985
Darlington	Canada	Ontario Power Generation	Full Scope Simulator	1983
Bruce B	Canada	Bruce Power	Full Scope Simulator	1982
Pickering B	Canada	Ontario Power Generation	Full Scope Simulator	1980
Bruce A	Canada	Bruce Power	Full Scope Simulator	1979
Pickering A	Canada	Ontario Power Generation	Full Scope Simulator	1973

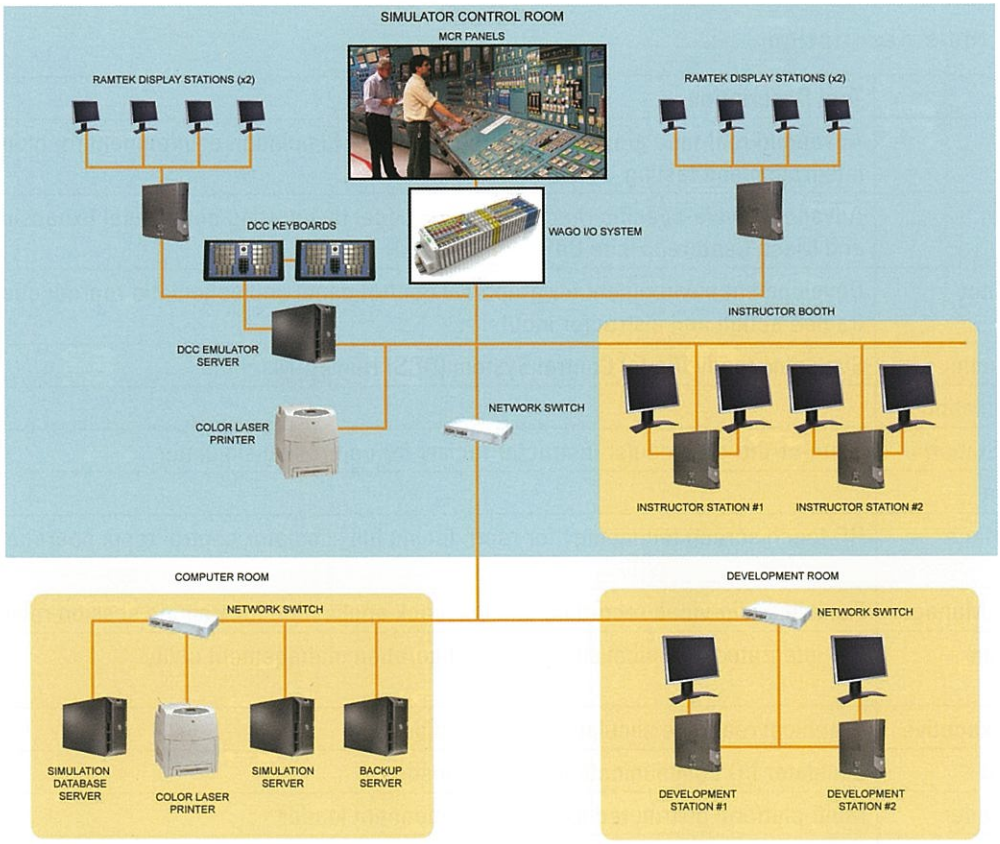


Figure 1: Simplified block diagram of Embalse simulator hardware architecture

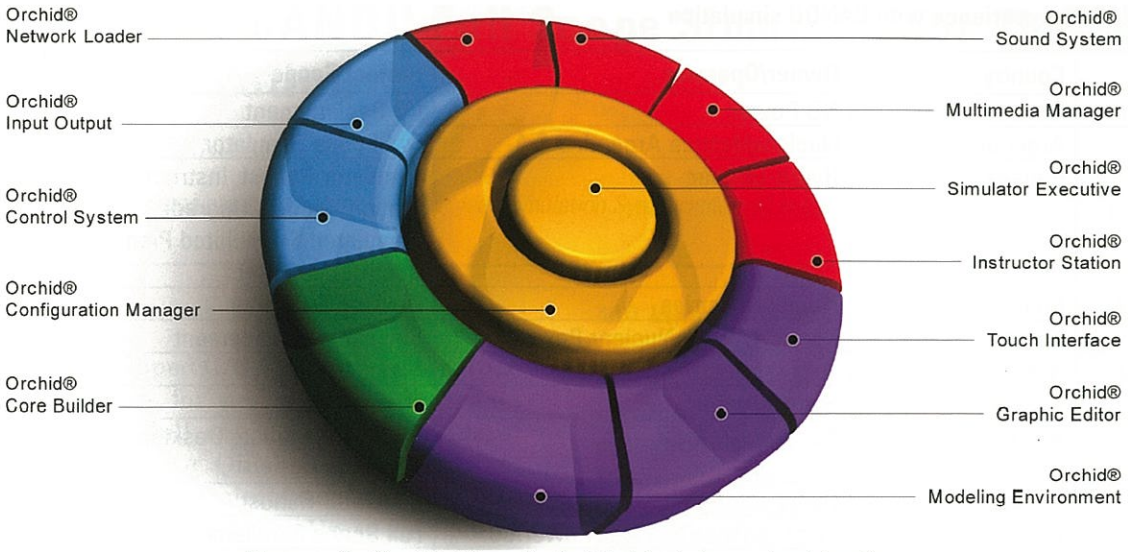


Figure 2: Orchid® suite's highly integrated tools

2. Orchid® suite of simulation tools

The Orchid® suite (Figure 2) developed by L-3 MAPPS is the result of almost forty (40) years of nuclear power plant simulation experience. The Orchid® tools have been designed to be highly integrated with one another to create an effective and efficient working environment. Each tool follows a standardized approach, providing the same guidelines for menu structure, icons, documentation and even training material. A focus on using common icons, layouts, themes, and menus has greatly helped reduce the user's (both L-3 MAPPS developers and utility simulator personnel) learning curve when adopting the Orchid® products.

With all tools having a graphical user interface and high level of customizability, the Orchid® suite is the ultimate toolbox for all simulator development, operation and maintenance needs. Table 2 summarizes the wide range of tool set Orchid® provides.

Table 2: Orchid® tools description

Orchid® Tool Name	Tool Description
Orchid® Modeling Environment	Advanced real-time graphical component-based Simulation environment for model development, integration and testing
Orchid® Core Builder	Advanced cycle-specific reactor kinetics model (supporting both Nodal Expansion Method (NEM) and Mesh Centered Finite Difference (MCFD) model)
Orchid® Graphic Editor	Development environment for graphical control panel and schematic reproductions for simulator trainee action and instructor input
Orchid® Control System	Simulator-ready Digital Control System (DCS) Human-Machine
Interface (HMI) simulation	
Orchid® Instructor Station	State-of-the-art modular instructor facility for controlling simulator
training environment	
Orchid® Touch Interface	HD touch screen technology for reproducing full simulator control room operations in the classroom
Orchid® Multimedia Manager	Flexible audio-video recording and playback application for training session reviews
Orchid® Configuration Manager	Full integrated graphical simulator configuration management utility
Orchid® Simulator Executive	Graphical real-time simulator task scheduler
Orchid® Input Output	Simulator I/O communication and diagnostics
Orchid® Network Loader	Multi-platform distributed simulation component loader
Orchid® Sound System	Simulator control room sound and noise utility

3. Simulator software

3.1 Plant system modeling

For the Embalse full scope simulator, all of the plant systems are simulated, including the reactor, nuclear steam supply systems, balance of plant systems, electrical systems and I&C systems. The majority of the systems are developed using Orchid® Modeling Environment (Orchid® ME), resulting in high-fidelity plant models. Orchid® ME is used for the entire simulator life cycle, from model design through to testing, documentation and long-term maintenance. With this tool, modelers (L-3 MAPPS, its partners and/or utility simulator personnel) create simulation models by dragging and dropping graphical objects representing plant components from libraries onto a schematic, by entering object calibration data, and by making the appropriate connections between objects. Calibration tools are also available to facilitate the calculations of specific constants required to calibrate an object instance. The schematic layout and component symbols are similar in appearance to the actual plant drawings for the system being modeled (Figure 3). Orchid® ME is used to model:

1. Homogenous, equilibrium thermal-hydraulics
2. Non-homogenous, non-equilibrium thermal hydraulics
3. Electrical distribution and generation
4. Electrical switchyard and power grid
5. Relay control logic
6. Analog and binary control logic
7. DCS control, if applicable
8. Nuclear containment and ventilation

The reactor kinetics model is the only model that is developed, tested and maintained outside of Orchid® Modeling Environment. The core neutronics model is founded on the fundamental equations of time-dependent neutron diffusion theory. Diffusion equations are solved at each time step using reactor design code techniques. The models developed with Orchid® Core Builder (Orchid® CB) are true two-group, three-dimensional, multi-nodal, fully dynamic models computing in real-time the flux for each node at each time step. Orchid® CB provides 2D and 3D graphics to fully validate and document the input fuel data and the output model, together with user-defined test reports (Figure 4).

The simulation models are validated against plant data when available and/or other plant information such as safety analysis reports. Figure 5 provides an example of a simulator transient test showing simulator results against plant data. An extensive set of tests, consisting of normal and abnormal plant operations as well as major accidents, is performed by L-3

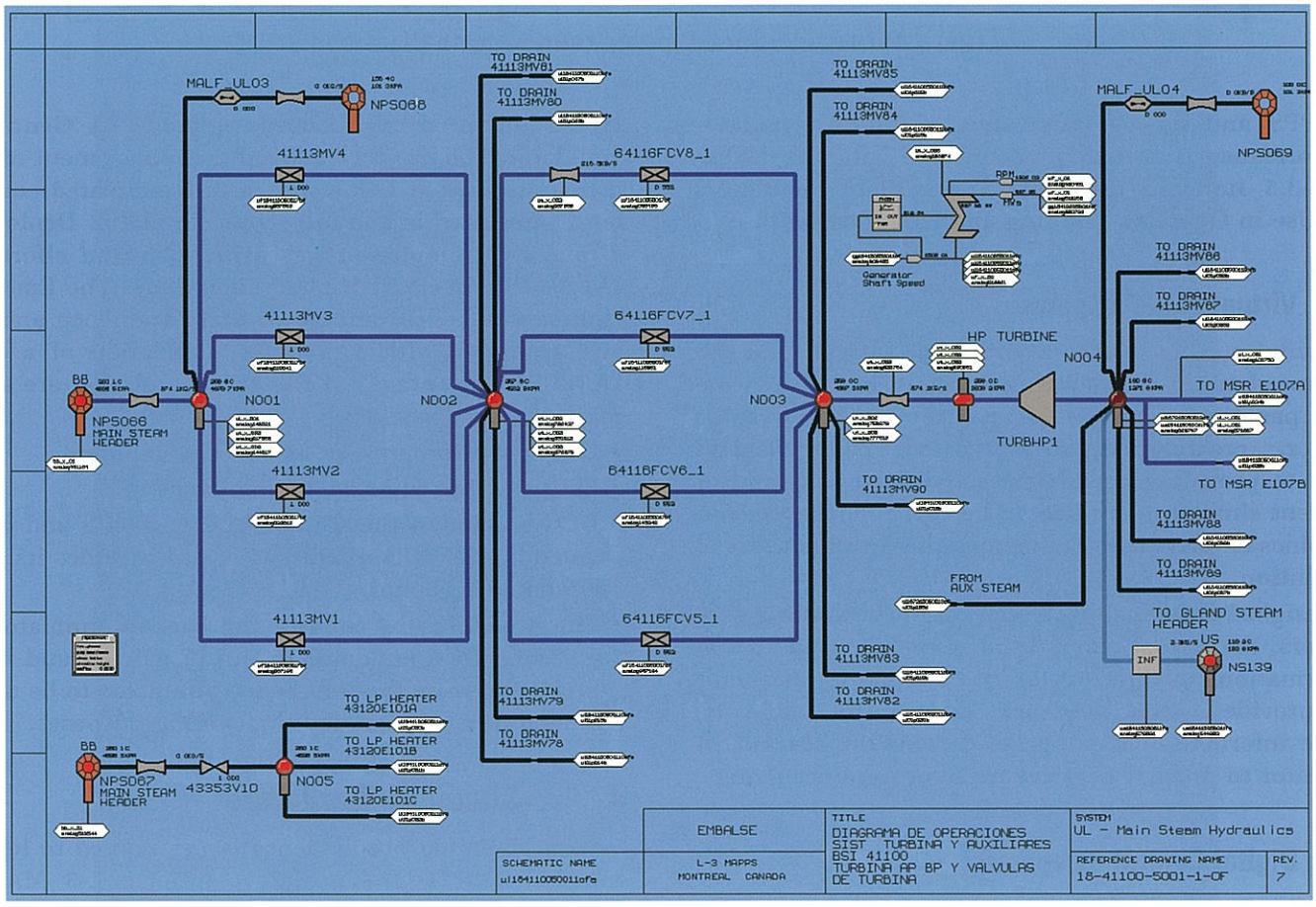


Figure 3: Orchid® Modeling Environment system schematic

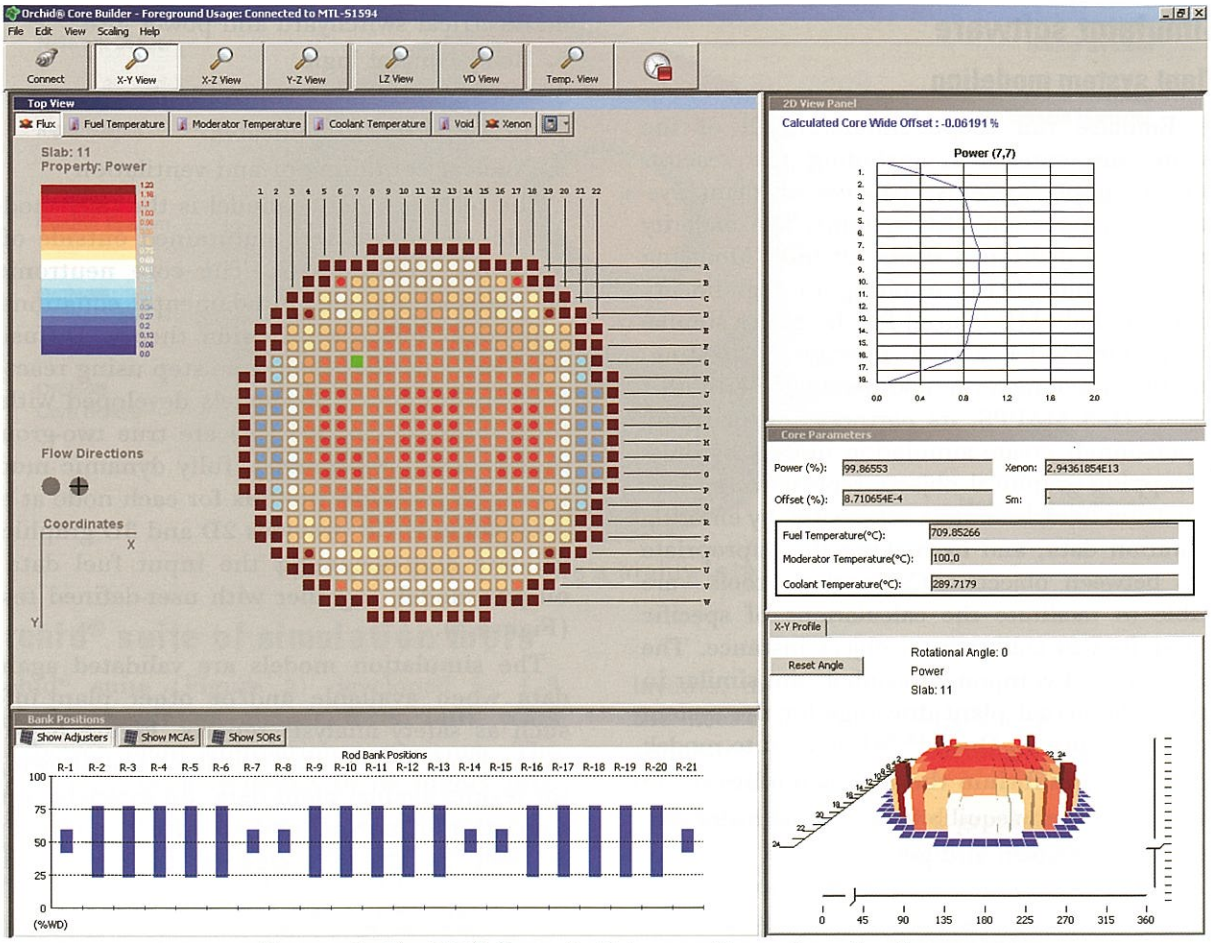


Figure 4: Orchid® Core Builder runtime visualization.

MAPPS and its customers. As a minimum, simulator performance is tested in accordance with the ANSI/ANS-3.5 standard ("Nuclear Power Plant Simulators for Use in Operator Training and Examination").

3.2 Virtual panel displays

Using a true world coordinate system and an advanced tiling and layering scheme, Embalse's control panels are reproduced using Orchid® Graphic Editor, creating dynamic virtual panel displays used to provide a useful interactive instructor and/or student simulator interface. The tool produces vector-graphics displays that can be magnified without loss of resolution.

Designed specifically for application in training simulators, the virtual panel displays can show additional information, visible only to the simulator instructor to provide better feedback and control, while the same information is suppressed from the student or operator to prevent negative training from occurring.

3.3 Digital Control Computers

In 2009, L-3 MAPPS was awarded a contract from Hydro-Québec to significantly upgrade its Gentilly-2 simulator. The project included the replacement of the actual stimulated DCCs with a fully emulated equivalent, integrated in the full scope simulator. Deploying a dual DCC emulation was a first-of-a-kind effort for L-3 MAPPS in CANDU plant simulation. The Embalse simulator takes advantage of that experience and is also equipped with a complete emulation of a dual DCC. The advantages of the DCC emulation are summarized as follows [1]:

- Low cost alternative to real DCC computers
- Easy and cost effective maintenance
- DCC emulation that can be operated with and without the physical keyboard as it also includes its own emulated keyboard
- The possibility to connect the backup simulator to a second DCC emulator to run in parallel and independently from the Full Scope Simulator to be used, among other things, for engineering purposes.

4. Simulator hardware

With emerging obsolescence issues related to legacy input/output (I/O) hardware solutions, L-3 MAPPS performed a one (1) year study to investigate new I/O

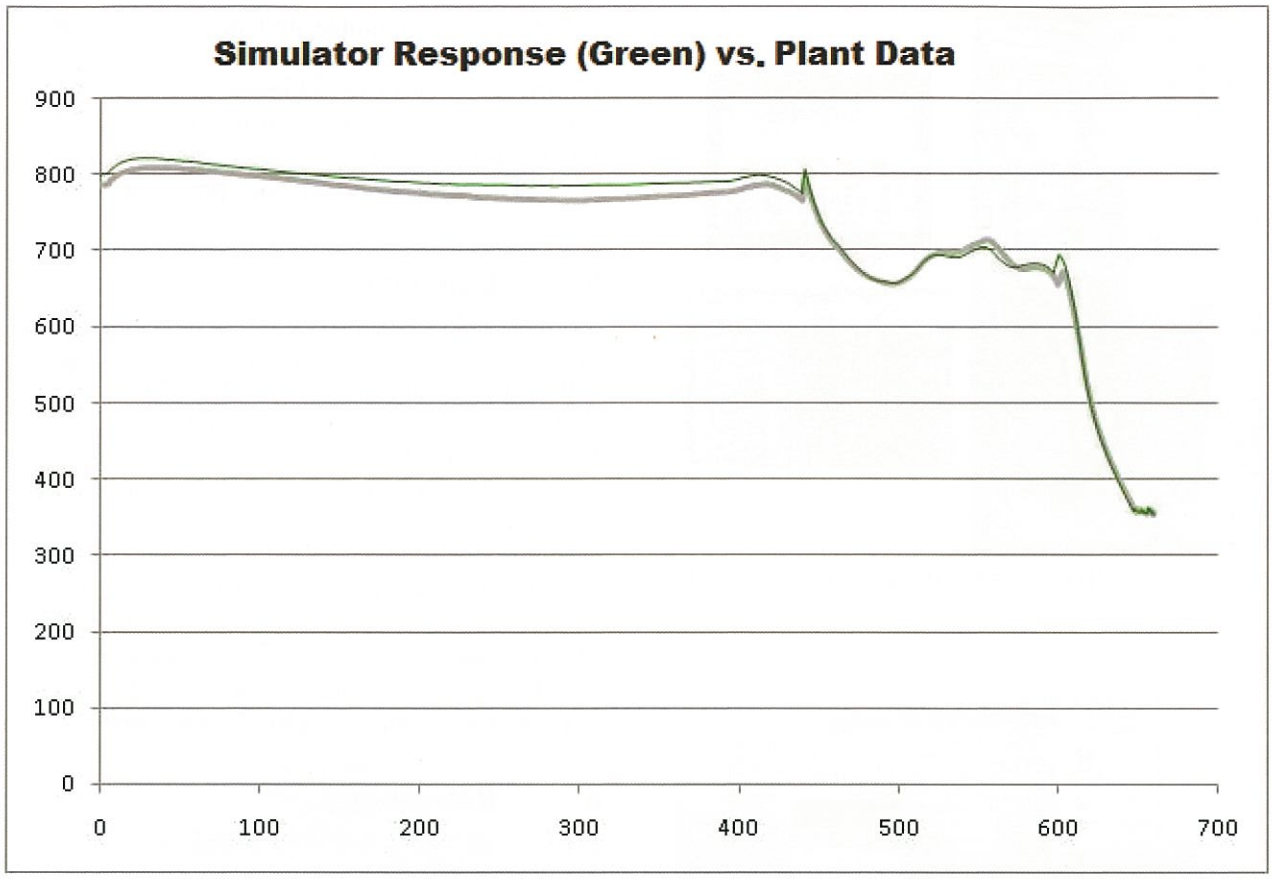


Figure 5: Simulator validation against plant data.

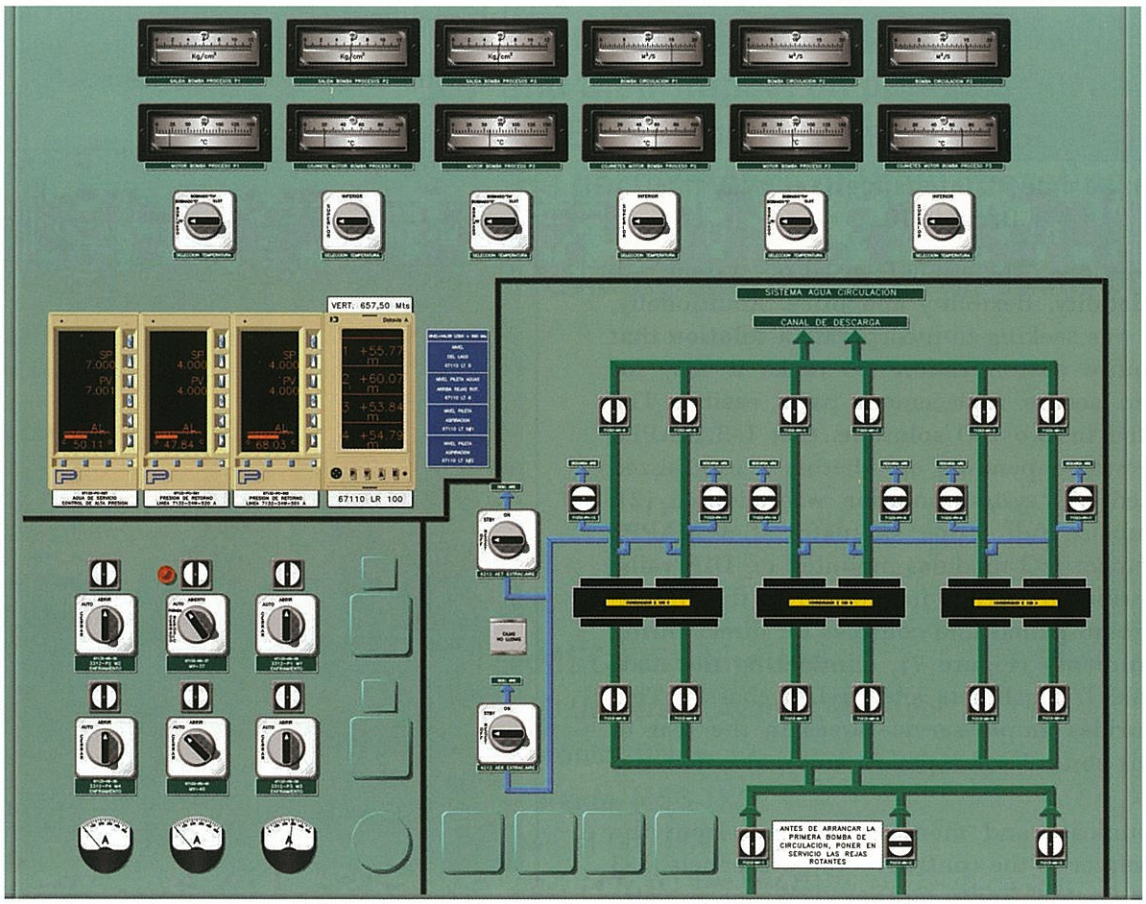


Figure 6: Embalse virtual panel displays.

Figure 7: Embalse distributed I/O hardware solution.

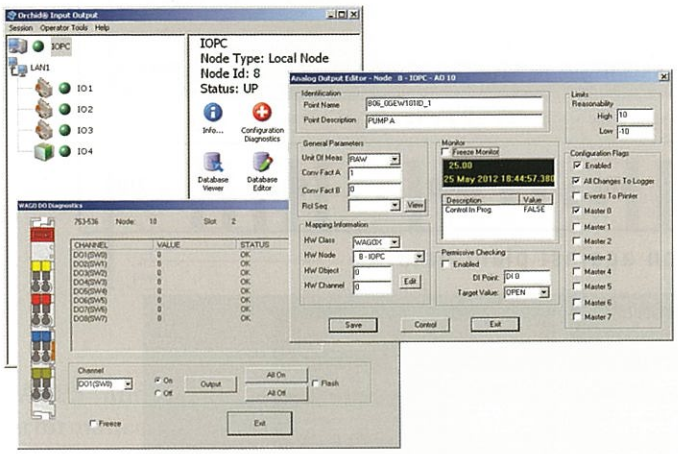


Figure 8: Sample maintenance facility within Orchid® IO.

hardware solutions. The study focused on system reliability, availability, flexibility and price. Additionally, L-3 MAPPS was seeking to incorporate a solution that did not require customization (to make it easy for customers to secure replacement parts easily). The study resulted in two I/O solutions that L-3 MAPPS has worked with depending on whether a centralized or distributed I/O system solution was adopted [2]. For the Embalse full scope simulator, L-3 MAPPS selected compact I/O modules mounted on DIN rails, that are distributed directly in the rear of the simulator control room panels and consoles for direct wiring to the instruments (Figure 7), eliminating the need for traditional I/O cabinets and/or I/O chassis. This solution provides ample service areas in the rear of the simulator control room panels and makes for easy maintenance.

To communicate and monitor the data from the simulation server to the control room hard panels, L-3 MAPPS uses Orchid® Input Output. The tool provides simulator maintenance and instructor personnel with full graphical control, monitoring, debugging and reporting capabilities (Figure 8). With the graphical user interface, the user can obtain information on the I/O modules and drill down to the individual I/O point level to view or set individual point values.

5. Conclusion

Since 1973, L-3 MAPPS has developed and fielded numerous full scope simulators, including numerous full scope simulators for CANDU plants.

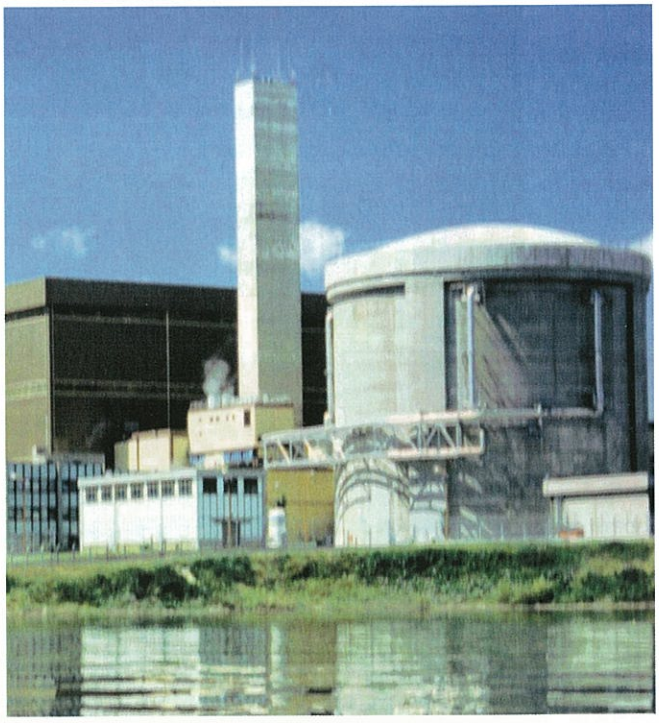
Most recently, through the Embalse full scope simulator program, L-3 MAPPS has had the opportunity to extensively apply its Orchid® technology making the Embalse simulator the most state-of-the-art CANDU simulator in the world.

With the combination of Orchid® and the thorough validation that is being conducted on this program, L-3 MAPPS will be well aligned to modernize the legacy CANDU plant simulators and to deploy the same advanced solution to CANDU new build programs.

6. References

[1] C. Vincent, G. Jaar, "Modernization of the Wolsong 2, 3, 4 Simulator", 2009 International Conference on Simulation for Power Plants, 9 February 2009.

[2] F. Mathieu, "The Simulator Input/Output System: 2011 and Beyond", 2011 International Conference on Simulation for Power Plants, 14 February 2011.



Embalse Nuclear Generating Station in Argentina.

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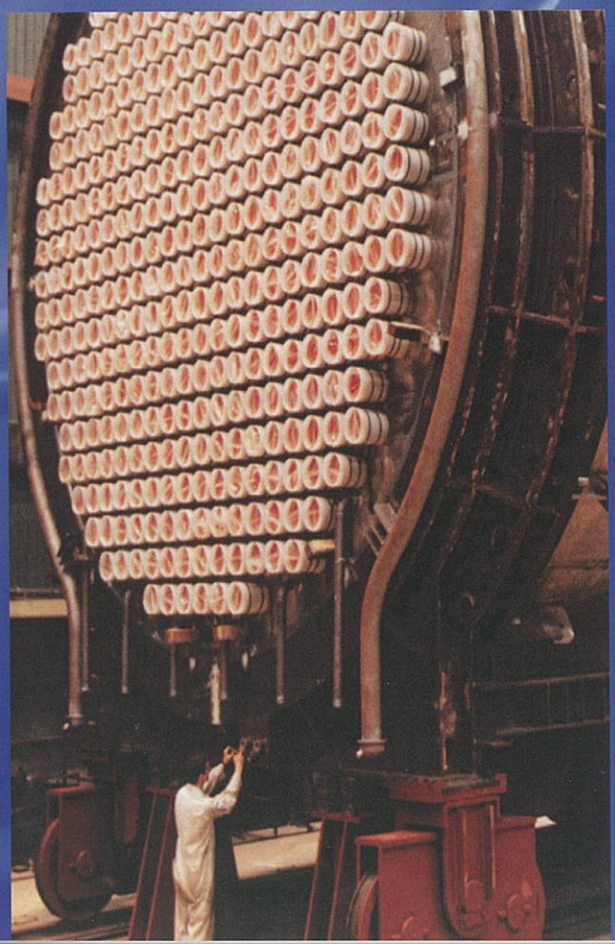

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GENERAL news

(Selected by Fred Boyd from open sources)

Australia to expand radioisotope production

A view of the open pool Opal reactor.

The Australian Nuclear Science & Technology Organisation (ANSTO) has announced a A$ 168 million expansion of its Sydney facilities, principally for molybdenum-99 production, the source of technetium-99 which is widely used in nuclear medicine for diagnosis.

Current world demand is about 45 million doses (23,000 six-day TBq/yr) per year, and the new plant will be capable of meeting about one quarter of this from 2016 at a time when the main plants in Canada and Europe are set to close.

The new plant will more fully utilise ANSTO's new OPAL reactor, which irradiates low-enriched uranium targets that are then processed to recover the Mo-99. The investment also covers building a plant for Synroc waste form.

Binder re-appointed at CNSC

Michael Binder has been re-appointed as President of the Canadian Nuclear Safety Commission.

The official announcement from the Privy Council was issued on November 22, 2012. It read, in part,

His Excellency the Governor General in Council, on the recommendation of the Minister of Natural Resources, pursuant to sections 10 and 13 of the Nuclear Safety and Control Act:

(a) re-appoints Michael Binder of Ottawa, Ontario, as a permanent member of the Canadian Nuclear Safety Commission to hold office during good behaviour for a term of five years;

(b) designates Michael Binder as President of the Canadian Nuclear Safety Commission; *effective May 9, 2013.*

Dr. Michael Binder was appointed in January 2008 as the President and Chief Executive Officer of the Canadian Nuclear Safety Commission (CNSC).following the "isotope crisis" of 2007 and the firing of Linda Keene in early 2008.

His previous position was as Assistant Deputy Minister of Spectrum, Information Technologies and Telecommunications, Industry Canada. There he oversaw Canada's transition to a network economy. He also managed the regulation of telecommunication industries, promotion of electronic commerce, and development and use of world-class information and communications technologies for the economic, social and cultural benefit of Canadians.

As CNSC President, Michael Binder has transformed the organization into one of the world's best nuclear regulators and has been an outspoken advocate of clarity and correctness whenever inaccurate statements or accusations have been made publicly. He refers to the CNSC as Canada's nuclear watchdog and repeatedly states that safety is in their DNA.

As CNSC President, Michael Binder is responsible for overseeing the use of nuclear energy and materials in Canada. He leads and manages the Commission in order to protect the health, safety and security of Canadians and the environment, and to respect Canada's international commitments on the peaceful use of nuclear energy. He appreciates the challenges and opportunities of being the watchdog of the nuclear industry, and his avowed mission is to ensure that Canadian nuclear facilities and activities are the safest and most secure in the world.

Michael Binder holds a Ph.D. in physics from the University of Alberta.

Bruce Update

Bruce Power's groundbreaking Restart Project (of Units 1 and 2 of Bruce A) was officially completed on Oct. 31 with Unit 2 being declared commercially operational just two weeks after the unit first generated electricity.

Ontario's Long Term Energy Plan has earmarked 6,300 megawatts (MW) from the Bruce Power site to meet the province's long-term energy needs, and to build a modern, clean electricity system. Returning Units 1 and 2 to service is a key element to achieve this. Units 1 and 2 had been out of service since the mid-1990s and only by returning these units to service could the site meet its full operating potential of eight units and 6,300 MW.

The return to commercial operation of Unit 2 came just over a week after Unit 1, which achieved this milestone on Oct. 22. Bruce Power's Bruce B units and Unit 3 at Bruce A are also operating at full power, while Unit 4 at Bruce A is still undergoing a planned outage, which is expected to be completed later this year.

Aerial view of Bruce A

First arch of cover for Chernobyl 4

The first arch of the giant structure that will protect the ruined Chernobyl unit 4 and enable its dismantling was raised November 24, 2012.

Construction of the New Safe Confinement (NSC) structure for Unit 4 at Chernobyl was officially launched in April 2012 during a visit by Ukrainian President Viktor Yanukovych.

The arched structure - some 108m high, 257m wide and 150m long - will be assembled on concrete rails and slid into place over the broken buildings of Chernobyl 4.

The NSC has now started to take shape with the first section of arched steel work being raised to an initial height of 22 metres. This section, weighing some 5300 tonnes, will form part of the top of the arch. More sections will be attached to extend the arch. After a second and third lifting operation, this initial section will be raised to a height of over 100 metres.

The NSC will be assembled in two halves. Once the first half is completed, it will be pushed into a holding area in front of unit 4 while the sections of the second half are assembled. When this is complete, the two sections will be joined together. The completed structure will have some 86,000 square metres of cladding.

The NSC is being constructed in two stages. The initial

The first arch of the Chernobyl NSC has been raised off the ground (Image: WNN)

stage involves assembly of the arched structure, while the second stage will involve installing infrastructure (such as cranes) for dismantling the shelter structures and the removal of fuel. Assembly of the NSC is expected to be completed by the end of 2014, while installation of systems will take place during 2014 and 2015.

Once this second stage is completed, the entire structure - weighing some 31,000 tonnes - will be pushed over unit 4 and part of its turbine hall using hydraulic jacks. This sliding operation - expected to take three days - is scheduled before the end of 2015. End walls will then be built to strengthen and seal the NSC. The structure is not designed for radiation shielding: gamma radiation doses outside of the NSC will be about the same as they are now.

The NSC is designed to last at least 100 years, by which time most of the decommissioning work on unit 4 should be completed.

CNSC issues open letter re uranium mining

In late November 2012, Michael Binder, president of the Canadian Nuclear Safety Commission issued a strong open letter to the media in response to various cries for a moratorium on uranium mining. Following are excerpts of that letter which carried the head "Uranium Moratoriums are Not Supported by Science".

Following the Canadian Nuclear Safety Commission's (CNSC) recent decision to license a uranium exploration project in Quebec, I'm dismayed that recent statements and discussions over the safety of uranium mining have been based neither on fact nor science. Uranium mining and milling in this country is tightly regulated by the CNSC.

Uranium mining is the only type of mining that has a dedicated federal regulator that oversees all aspects of operation on an ongoing basis. Provincial oversight is also strictly applied. In fact, uranium mining is the

most regulated, monitored and understood type of mining in Canada.

Activists, medical practitioners and politicians who have demanded moratoriums may have various reasons for doing so, but their claims that the public and environment are at risk are fundamentally wrong. The provincial governments that have decided to ban uranium exploration have done so ignoring years of evidence-based scientific research on this industry.

The numbers speak for themselves. Metal mining effluent data reported to Environment Canada demonstrates that uranium mining operations from 2007 to 2010 was 100% compliant with federal release limits for all seven types of contaminants. Uranium mining operations were the only type of metal mine to have 100% compliance during this period.

Both the CNSC and provincial environmental regulators closely monitor and analyze industry releases to ensure streams, lakes and rivers downstream of mining operations are safe for people, animals, fish and plants.

We also monitor miner safety. The average annual radiation dose to miners is well below the CNSC annual dose limits, which are conservatively established to protect workers. Radiation doses to the public and the environment near uranium mines are negligible.

The CNSC has carried out and validated numerous studies over the decades that have repeatedly provided sound evidence that workers and residents near these facilities are as healthy as the rest of the general population. The same is true of people who live near nuclear power plants.

L-3 MAPPS to develop human factors simulator

L-3 MAPPS, of Montreal, has won an order from the Idaho National Laboratory to supply a human factors simulator.

INL is working with numerous US nuclear utilities to perform research related to extending the life of their nuclear power plants through digital control room upgrades focussed on human factors. The vision is to upgrade analog-based control rooms to digital ones considering plant operations from a human factors perspective. To enable INL staff to design, develop and test digital prototype replacement displays INL will use full scale simulators with digital control room mimics of existing analog instrumentation and controls to accurately replicate the control room layout.

INL is currently conducting research to support the upgrade of the main control room at the San Onofre Nuclear Generating Station (SONGS) in southern California.

CNA appoints new president

On November 15, 2012 Grant Isaac, Board Chair, Canadian Nuclear Association, announced that Heather Kleb had been appointed interim President of the CNA effective immediately, replacing Denise Carpenter.

On behalf of the CNA Board he thanked Denise Carpenter for her contributions over the three years since her appointment which included the development of a Five-Year Strategic Plan adopted by the Board in 2010.

Ms. Kreb had held the position of Vice-president.

She has a Master of Science in Ecology and 17 years of experience working on multi-million dollar projects supporting a variety of industries. Her background includes the position of Manager, Regulatory Affairs, at Atomic Energy of Canada Limited, for the cleanup and long-term management of historic low-level radioactive waste in Port Hope and Clarington, Ontario. Prior to joining AECL, Heather worked as an environmental consultant, monitoring Luscar Limited's coal mines and conducting environmental assessments of Weyerhaeuser's Forest Management Plans. Heather has also worked overseas. As an employee of Anglo American she provided environmental assessment, environmental monitoring and management services to AMCOAL, De Beers, and AngloGold while in South Africa, Botswana and Mali.

Phase II of Port Hope Clean-Up Approved

Following a public hearing held on October 24, 2012, in Ottawa, Ontario, the Canadian Nuclear Safety Commission (CNSC) announced its decision to authorize the release of the hold point, allowing Atomic Energy of Canada Limited (AECL) to begin Phase II of the Port Hope Long-Term Low-Level Radioactive Waste Management Project, and to extend the licence expiry date to December 31, 2022. The project is a component of the Port Hope Area Initiative, a community-based project established by the Government of Canada and the Municipalities of Port Hope and Clarington to develop and implement a safe, long-term management solution for historic low-level radioactive waste in the Port Hope area.

Removal of the hold point allows AECL to complete Phase I and proceed with Phase II of the project, which is anticipated to last seven to ten years. Phase II includes construction of the long-term waste management facility, integration of the waste from the Welcome Waste Management Facility and cleanup and remediation of the off-site historic waste within Port Hope.

CNSC Statement on Canada-India arrangement.

On November 6, 2012, the president of the Canadian Nuclear Safety Commission (CNSC) issued the following statement regarding the nuclear agreements reached between Canada and India.

"I am pleased that the CNSC and the Department of Atomic Energy (DAE) have successfully concluded negotiations. This is an important milestone as the Appropriate Arrangement is a final element of the Nuclear Cooperation Agreement which was signed between Canada and India in June 2010.

The Arrangement establishes a new Joint Committee between Canada and India to ensure ongoing discussions and information sharing in a number of areas. This committee will further build on Canada and India's relationship and allow both countries to share expertise in areas such as research and development, safety, and next generation nuclear facilities.

The Arrangement will also ensure that the appropriate oversight is exercised with respect to the information required by Canada. Through this Arrangement, Canada will receive the necessary assurances on the peaceful use of Canadian exports to India of nuclear material, equipment and technology, equivalent to arrangements with other countries."

The Appropriate Arrangement will come into effect following a signing by officials. Following the signing, Canada will have 28 Nuclear Cooperation Agreements covering 45 countries.

NWMO invites comment on 2013 -2017 program

The Nuclear Waste Management Organization has issued a document *Implementing Adaptive Phased Management 2013 to 2017* – in draft form for public review.

It is their current five-year strategic plan for implementing Canada's plan for the safe, long-term care of used nuclear fuel. It is available on their website at www.nwmo.ca/implementationplan.

The document presents highlights of their planned work program in seven key areas. Activities are proposed in each area to support continued progress on this important national initiative.

Based on the comments and ideas received, NWMO will refine the Plan and publish the final document along with its Annual Report in March 2013. Their progress in 2013 against this Plan will be described in its Triennial Report to be published in March 2014.

The Plan is a living document that is regularly assessed, strengthened and redirected in the face of new information, advances in technology and science, changes in societal values and evolving public policy.

Comments can be submitted through the NWMO website (www.nwmo.ca) until January 10, 2013.

In a separate earlier release, on September 30th, 2012, NWMO suspended its "expressions of interest" phase for communities wishing to engage in the site selection process for Canada's Used Nuclear Fuel Repository and Centre of Expertise. At that time NWMO stated that 15 communities were actively engaged in the site selection process, including several that have asked the NWMO to begin more detailed preliminary assessment studies.

Russian nuclear ships clears passage to Japan

Russian nuclear-powered icebreakers have enabled the first ever liquid natural gas (LNG) delivery via the Northern Sea Route from Norway to Japan, where it will be used to replace generation lost from shut down nuclear reactors.

The carrier *Ob River* carried the LNG from Hammerfest in Norway to the Japanese port of Tobata, taking nine days to travel the Northern Sea Route portion of the trip. On the second half of the trip there was fresh ice up to 30 centimetres thick. This was tackled by three icebreakers powered by pressurized water reactors: the *Vaygach*, *Rossiya*, and *50 Let Pobedy*.

When travelling by sea from northern Europe to northeast Asia, the Northern Sea Route can offer time savings of 40% compared to other routes such as the Suez Canal or Panama Canal. It also offers lower carbon emissions and less evaporation of LNG cargo en route. The *Ob River* features four LNG tanks with total capacity of about 150 thousand cubic meters of LNG, weighing over 66 thousand tonnes.

Both the shipment mode and the cargo symbolise the stark differences in energy situation between Russia and Japan. Although both have faced the effects of major nuclear accidents Russia remains committed

The view from the Ob River *(Image: Gazprom)*

to the technology and employs it widely, even enacting specific policies to use nuclear instead of gas at home to free up more gas for export. Japan is considering abandoning nuclear power and has dramatically increased fossil fuel imports.

(From World Nuclear News)

Obituary

John Runnalls

Oliver John Clive Runnalls, Ph.D., F.R.S.C., F.C.A.E., P.Eng., passed away peacefully on October 14,, 2012 in his 88th year. Cherished and devoted husband Of Vivian Constance (nee Stowe) for 65 years.

John mentored many and was respected by all including not only family and friends but the scientific community.

He began his career in 1951 in Chalk River with Atomic Energy of Canada Ltd. and held various senior research and development positions over a 20-year period. During his last 2 years with AECL he served as Chief Liaison Officer, Europe.

From 1974-1979. John was the Senior Advisor, Uranium and Nuclear Energy, for the Department of Energy, Mines and Resources in Ottawa (now Energy and Natural Resources Canada) and was Executive Vice-President of Uranium Canada Ltd.

In 1979 John was appointed the first incumbent of a new Chair in Energy Studies with the Faculty of Applied Science and Engineering at the University of Toronto and in 1983 became Chairman of the Centre for Nuclear Engineering.

When he retired in 1989 at 65 he continued to consult internationally in the energy field. John was on the Board of the Canadian Energy Research Institute; Canadian Nuclear Association; Ontario Hydro; and was the Canadian Representative on the International Advisory Committee of Nuexco. He was recognized by a number of prestigious awards, medals and fellowships for his contribution to the energy field throughout his career, including the Ian McRae Award in 1980.

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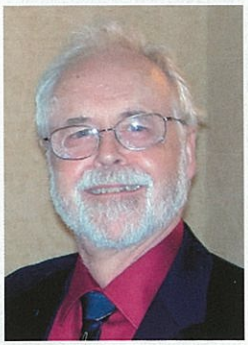
CNS news



Message from the President

The year is speeding by and we have, unfortunately, lost some remarkable friends and members of the CNS.

September saw us in a cool and wet Paris at the sixteenth conference of the Bournemouth series – the International Conference on Water Chemistry of Nuclear Power reactors and the ninth International Workshop on Radiation Chemistry, Electrochemistry and Materials Performance. I represented the CNS (at my expense) and advertised the 2014 Pacific Basin Nuclear Conference (PBNC) in Vancouver. Similarly, I advertised PBNC 2014 through the Radiochemistry Group Committee of the Royal Society of Chemistry.

The Symposium on Nuclear Simulation, held in October, was an excellent meeting for which the organisers deserve high praise.

Similarly, high praise goes to the organisers of the Second International Meeting on Small Reactors. The assembled throng had the venue "bursting at the seams"!

I had the pleasure of addressing the Ottawa Branch of the CNS in early November. At their request I talked initially about the future direction that the CNS was taking and wrapped up with a discussion on chemistry issues.

On this occasion I started writing from warmer climes having recently attended the ANS winter meeting. This meeting was held at an excellent facility in a cool and wet San Diego. During the same period the CNS International Steam Generator to Controls Conference was being held in Toronto. Some of you are aware that Steam Generator Chemistry is close to my heart; with ambivalent feelings I went to San Diego as opposed to Toronto. However I ensured that I would be seen in Toronto, courtesy of Richard Thomas of Owen Sound, whose expertise allowed me to be in two places simultaneously! It is reported that the CNS International Steam Generator to Controls Conference was enjoyed by all in attendance and was an excellent networking event.

In San Diego, at least twelve delegates from different countries (some delegates represented multiple countries so in effect there were more countries represented) met at the International Nuclear Societies Committee. Delegates from at least nine countries met at the meeting of the Pacific Nuclear Council. Frank Doyle and Bill Kupferschmidt continued to drum up international support for PBNC 2014. Blair Bromley kindly provided the photographic record.

I have to thank Fred Boyd who should have been in San Diego representing the CNS but chose instead to report on the Steam Generator to Controls conference.

Discussions with ANS executives have resulted in their President elect agreeing to address the CNS at our 2013 Annual Conference. In addition, I have agreed that the practice of the CNS President addressing the ANS at their conference should be reestablished. This practice is intended to assist furthering cooperation between ANS and CNS.

The committee to review the CNS by-laws, continues to meet via electronic means – there has been excellent and passionate discussion. We remain on schedule to have the by-laws available for review by CNS members well ahead of the 2013 Annual General Meeting.

There was excellent news from Bruce Power with respect to Units 1 and 2 being declared in service, and from New Brunswick Power with respect to Point Lepreau, once again, generating power. The earlier news from OPG, with respect to Darlington refurbishment has been tempered, somewhat, with the politically motivated decision to shut down, as opposed to refurbish, Gentilly II.

AECL and CNS have agreed to discuss the "AECL Nuclear review" on-line journal to determine how we can mutually support each other.

Finally, last evening I had the pleasure of addressing the CNS Branch at UOIT. At their request we discussed what is involved with being the CNS President and followed it up with some aspects of Nuclear Power Station Chemistry.

The weather... rain and cool weather have followed Teresa and I on our travels so far during my Presidency. This could be viewed as "raining on my parade"! However, the upside is that neither of us have received radiation burns nor have come close to drowning. The downside is that I did not benefit from as many of the heart-lifting observations that accompany hot weather!

Finally, I would like to wish everyone "Best Wishes" as 2012 comes to a close and a "Happy and Healthy 2013".

John Roberts

The History Project: the NRC Record 1942 – 1952

by JAMES E. ARSENAULT, P.Eng.

Introduction

This CNS project began some time ago when it became clear that much of the early Canadian nuclear scientific record was not readily available, in particular, the work of the Montreal Laboratory (ML) from which the origins of current nuclear capabilities in Canada can be traced. The ML was essentially a joint effort between Canada, Great Britain and the United States and was formed to explore the use of heavy water reactors for the production of fissile material for use in nuclear weapons during World War II. Some investigations for the use of reactors for power production were also pursued. In 1944 the ML was relocated to form the Chalk River Nuclear Laboratories (CRNL).The laboratories were administered by the National Research Council (NRC) from 1942 until 1952, when the Atomic Energy of Canada Limited (AECL) was formed.

During this fertile and innovative period, significant advances were made by scientists working in Canada. The record of their work has been in danger of being forgotten and ultimately lost. From this sentiment the History Project originated.

First steps

The Canadian Nuclear Society (CNS) was approached in early 2010 with a proposal to support a joint effort with AECL to identify the ML material still held at AECL's Chalk River Laboratories (CRL). This proposal was accepted by the CNS Council and in May 2010 a letter was sent to AECL requesting access to the material. In August a Non-Disclosure Agreement (NDA) was signed between CNS and AECL. By February 2011 CRL staff had identified about 3500 Index Cards associated with the NRC work

It was apparent that the only effective way to manage such a large volume of index cards, which were hand typed and each represented a document, memo, etc., was to create a computer-based, searchable catalogue.

Creating the catalogue

In April 2011 CNS contracted the services of a Library and Information Science expert who proceeded with the design of the catalogue system. It would be executed in Excel, the standard spreadsheet program for passing information between libraries and archives. By June, a Handbook for cataloguing the Index Cards was produced.

Encoding of the Index Cards was completed in about three months (in-house at CRL, after appropriate security clearance was granted for the contractor). When the Catalogue was essentially complete, it was realized that some documents were subject to security requirements and thus a security review by AECL was required. The cataloguing was completed and a compact disk (CD) containing the Catalogue was released to the CNS in March 2012.

The NDA between AECL and CNS stipulated that specific contacts of each party were required to whom requests for documents in the catalogue could be made. With all necessary information in hand, the production of the History Project CD began in July 2012.

The History Project CD

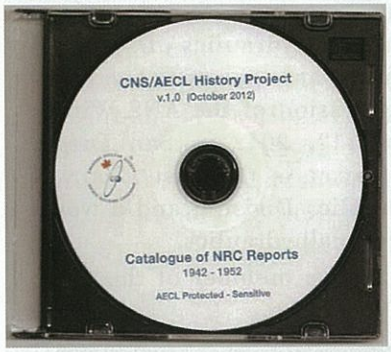


Photo of History Project CD in its case.

The CNS History Project CD, see illustration, includes four documents and was approved for release by the CNS in October 2012. These documents are described briefly below.

1. Read Me File

The Read Me File provides a brief introduction to the CD and points to the Security, Handbook and Catalogue documents. Suggestions for using the Catalogue are included, and the document also provides version control for the CD. Instructions are provided on how to request documents listed in the Catalogue.

2. Security

Users are alerted that certain security restrictions apply to the CD, which has been designated by AECL as Protected - Sensitive.

3. Handbook

This document specifies how the Catalogue is designed and how it is encoded. It is suggested that

the Handbook should be used to create standardized catalogues from collections of similar documents.

4. Catalogue

This document is the Catalogue created in Excel, sorted by date and by author. Users are free to run searches as they wish.

Requesting a copy of the CD

Members of the CNS may request a copy of the CD by contacting the Executive Director at the CNS head office. Contact information is given on the CNS Bulletin masthead.

Conclusion

For the first time the work of the early Canadian nuclear scientists performed under the auspices of the NRC during the period 1942–1952 has been catalogued in accordance with accepted contemporary library/archive standards. It is hoped that other related material will be catalogued based on the Handbook developed for this project.

Acknowledgments

The author would like to thank Fred Boyd, who secured financing from the CNS for this project and was instrumental in shepherding it through some very deep waters that evolved from time to time, and for constant encouragement. At CRL, Leslie Fleury (Manager, Information Asset Services) must be thanked for the many valuable concepts that she contributed to the project; also thanks to her staff who accessed and organized the 3500 Index Cards. Thanks to Morgan Brown of CRL, who provided suggestions that led to a Professional Services Contract for the design and eventual encoding of the Catalogue. The efforts of Tanya Wright (M. Lib. & Info. Sci.) are much appreciated in the imaginative execution of that Contract. She acted in a most professional and proactive manner at all times. As usual, Lyn Arsenault deserves thanks for supporting the project in many ways, by providing valuable ideas, recording minutes of meetings, editing, and for driving Fred and me on those long trips to CRL.

John Luxat Receives ANS Award

Professor John Luxat, UNENE Chair at McMaster University, received the American Nuclear Society Thermalhydraulics Divisions' Technical Achievement Award. The award was presented at the opening session of the ANS Winter Meeting on November 12, 2012 in San Diego, California. Professor Luxat is the past Chair of the ANS Thermalhydraulics Division and a world respected expert in thermalhydraulics.

John is along-time active member of the CNS. He was president 2005-m 2006.

John Luxat is shown R with Paul Turinsky of the ANS Awards Committee, centre and Hisashi Ninokata of Japan who also received an award.

Be Part of the Future of the Canadian Nuclear Society

Expression of interest is being solicited from qualified candidates willing to serve as an active volunteer member of the CNS Council commencing in June 2013. Candidates must have a passion to work collectively with other members of Council to foster CNS Objectives in a sustainable manner. Prior experience leading committees and working in a volunteer not-for-profit professional organization are desirable.

Interested and qualified candidates are invited to provide a brief profile and summary of interest and qualifications to Bob O'Sullivan at the CNS Office (cns-snc@on.aibn.com).

A summary of nominal expectations and duties of council members can be obtained from the CNS Office (please e-mail Bob at cns-snc@on.aibn.com or call him at 416-977-7620).

The CNS would appreciate your help in our continuing efforts to provide value to our members and stakeholders. We eagerly look forward to hearing from you.

ALBERTA – Duane Pendergast

Energy Collegium – A dual presentation to the Southern Alberta Council on Public Affairs has been arranged in conjunction with the Energy Collegium for January 24, 2013. Speakers Professor Kent Peacock and Cosmos Voutsinos will discuss the need for, and essential elements, of a national energy strategy.

Alberta Science Teachers Conference 2012 - Members Rob Varty, Aaron Hinman, Shaun Ward and Duane Pendergast are making preparations to man a booth at the Science Teachers Conference in Banff. Karin Gordon will make the NORM presentation.

CHALK RIVER – Ruxandra Dranga

Speakers:

- On October 16th, the Chalk River Branch held its Annual General Meeting. The new executive committee for 2012-2013 was chosen. After the AGM, Harry Peery, Post Doctoral Fellow at AECL presented on "An Ancient Disease in Modern Times: Anti-NMDA Receptor Encephalitis". This was a very interesting presentation, which showed the audience a different aspect of nuclear science and technology, and sparked a great conversation during and after the seminar.

2012 - 2013 Executive Committee

Co-Chairs:	Ruxandra Dranga and Bruce Wilkin
Treasurer:	Tracy Pearce
Secretary:	Ken McDonald
Program Coordinator:	Ashlea Colton
Education and Outreach:	Bryan White and Duncan Barber
Communications:	Jeremy Pencer
PEO Liaison:	Dave Wilder
DRSA Liaison:	Tracy Pearce
High School Liaison	Karthik Kannan
NA-YGN Liaisons:	Natalie Sachar
Algonquin College RP Liaison:	Bruce Wilkin
Members-at-Large:	Laura Blomeley, Kannan Krishnaswamy

Education and Outreach:

- On October 23rd, representatives from DRSA, CNS - CRB and PEO met to plan for next year's Science Olympics in the Renfrew County. After this year's inaugural event, more schools are interested in participating. We are expecting 8 - 9 high schools to participate in 2013. Also, teachers seemed interested in helping out with the activities, which is a great response from this year's event. Furthermore, in 2013, we will be expanding the event to also include groups of students from grades 11 and 12, along with the grade 9/10 groups. Our branch will continue to participate and support this event, as it proves to be a great means of reaching students and getting them interested in nuclear science and technology.

DARLINGTON – Jacques Plourde

The Chair of the Pickering Branch (Leon Simeon) and I met with OPG Executives (Pierre Tremblay – Chief Operating Officer and Mark Elliott – Chief Engineer) to discuss the merger of our Branches into Durham Branch and to seek their engagement in our NOM and DM Divisional activities. They confirmed their continuing support of the CNS, and a number of actions and conclusions resulted from the discussion:

- The Branch Merger should go ahead, with the support of CNS Council (motion to that effect at Council Meeting #132).
- OPG (Mark Elliott) will appoint a Utility Representative
- A future meeting will be held with Mark Elliott to address the challenges of CNS membership numbers at OPG.
- The new Durham Branch will be chaired in the interim by Leon and me, as advisor.
- Leon will call a first 'interim executive' meeting to assemble representatives from all key OPG sites in Durham (Pickering, Pickering Learning Centre, OPG-Nuclear at 889 and 777 Brock, Darlington, Darlington Refurbishment), to dissolve the Darlington and Pickering Branches, proceed with the formal merger, and elect the Durham Branch Officers.

GOLDEN HORSESHOE – Kurt Stoll

On October 3rd, the CNS Golden Horseshoe branch hosted an event to commemorate the 50th anniversary of the first delivery of nuclear-generated electricity to the Ontario grid by the NPD reactor in Rolphton on June 4, 1962.

Dr. Ben Rouben, the CNS executive director, introduced the audience to the design of the NPD reactor and highlighted some of its unique technical features, such as on-power refuelling, which are now standard features of the CANDU fleet of reactors.

His introduction was followed by Jon Jennekens, former president of the AECB (now CNSC) and Officer in the Order of Canada, who gave a very personal and passionate view of the wide history including events in the United States and Europe that led to the establishment of the nuclear industry in Canada.

The event was well attended by about 25 members of the Golden horseshoe branch.

OTTAWA – Mike Taylor

The major, and very sad, news this month is the death of our Past-Chair, Jim Harvie who passed away peacefully in hospital on Sunday 21 October.

Jim will be greatly missed by the branch. Personally, I have valued his friendship and advice immensely. I know that Jim's wife, Marion, and his family,have appreciated the recognition of Jim's character and contribution from so many CNS members.

Early in the month the Branch heard an interesting and lively talk by Dr. Bill Diamond on Accelerators and Isotope Production. We look forward to hearing from our President next month.

The new Executive was elected in October and is:

Mike Taylor –	Chair
Fred Boyd –	Treasurer
Ron Thomas –	Speaker's Convenor (to be replaced by Ruth Brinston)
Jeet Khosla –	Secretary (replacing Ted Thexton)
Christine O'Malley –	Webmaster and Education
Ruth Brinston –	Director at Large
Ken Kirkhope –	Director at Large
Satyen Baindur –	Director at Large

We very much appreciate the fact that Ken and Satyen have stepped forward and will fill the gaps left by Jim's passing and Ted and Ron's retirement.

PICKERING – Leon Simeon

Please see Darlington Branch Report for details.

TORONTO – Paul Gillespie

Recent Events

- A public seminar was held on October 4. Jon Jennekens presented a talk titled "Celebrating 50 Years of Nuclear Power in Canada."
- Two branch committee meetings have been held so far this year with a focus on recruiting additional committee members to help organize events.

Upcoming Events

- We are currently looking for a speaker for one additional seminar for 2012, to be held either late November or early December.

Past Events

- In 2011, the Toronto branch held 2 public seminars:
  - Peter Ottensmeyer: CANDU Used Fuel "Waste" in Canada: A $36 Trillion Energy Resource in Fast Reactors
  - Jerry Cuttler: Is the Supply of More Nuclear Energy to the People of Ontario Environmentally and Socially Acceptable?
- Paul Gillespie was endorsed as the new chair of the Toronto Branch at CM#123.

For further information please contact me by phone at 416-217-2445; or by email at paul.gillespie@amec.com

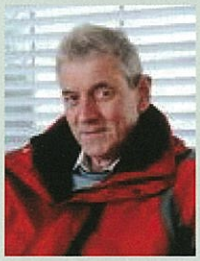
UOIT – Terry Price

Events Held:

- August 28: Beginning of the Year Social
- August 30 'Soft Sensors for the monitoring of control of Nuclear Fusion Experiments and Industrial Processes" by Dr. Alessandro Rizzo from Politecnico di Bari held in conjuction with the IEEE Nuclear and Plasma Sciences Society
- September 10: "The Origins of Nuclear Science and CANDU Technology" by Dr. Bem Rouben from the CNS
- September 1: Soccer Social
- September 20: "Future opportunities in the Nuclear Industry" by Mark Arnone from OPG and James Gandhi from Aecon
- September 24: "The Future of Energy" by Dr. Dan Meneley from AECL
- October 8-12: Branch Elections Voting Period
- October 9: CANDU discussion group
- October 12: Participation in the 'World's Largest Practical Science Lesson' in conjunction with the Science Council
- October 16: CANDU discussion group
- October 1th: "Commentary on the Appropriate Radiation Levels for Evacuation" by Dr. Jerry Cutler from Cutler and associates.
- October 22: "Radiation Hazards and Countermeasures in Space Missions" by Dr. Nick Sion of Interchan Technology

In January 2013, **Terry J. Price** will be ending his term as branch chair. **Ray Mutiger** is the new elected chair of the chapter.

Obituary



Jim Harvie

Jim Harvie, a former President of the Canadian Nuclear Society, died peacefully in his sleep at the Ottawa General Hospital at 8:20 pm on Sunday, October 21st, at the age of 67.

Jim leaves behind his wife, Marion, his three children Derek, Lisa, and Amber, his grandchildren Jamie, Andrew, Jena, and Sean, and his brother Naismith.

Jim retired from the Canadian Nuclear Safety Commission in 2002 as Director General of Reactor Regulation, and immediately became active in the CNS. Following a period as chair of the Ottawa Branch in 2004, he was elected as a member of the CNS Council and rose to become President for 2008-2009. He was named a Fellow of the CNS in 2011.

His funeral was in the small St. Andrew's United Church, in Cumberland, Ontario (just east of Ottawa) on Sunday, October 28, 2012 with an overflowing gathering of friends and family.

After leaving university in Scotland in 1966, Jim immigrated to Canada to take up a position with AECL at Chalk River. As a mathematician, he was employed doing calculations to support various projects with the Thermo-hydraulic Analysis Unit. He is also remembered for his prowess on the soccer field. It was during this period, in 1967, that he returned to Scotland to marry Marion.

In July 1974, Jim moved to the Atomic Energy Control Board (AECB) and started work as an AECB Project Officer at the Bruce Nuclear Power Development. As Bruce "A" developed, he turned his attention more to commissioning and start-up procedures. He was promoted to Senior Project Officer in 1977, overseeing the entry into operation of the Bruce "A" reactors.

In 1979 Jim moved with his family to Ottawa to take up a series of posts as manager of various divisions of the AECB responsible for the safety and licensing of nuclear reactors.

In 1991 Jim was promoted to Director-General of the Research and Safeguards Directorate. He became deeply involved with the IAEA and Canada's international partners in Safeguards and Non-proliferation, resulting in a further widening of his already considerable nuclear experience.

Jim returned to power reactors in 1996, this time as Director-General of Reactor Regulation, a position he held until his retirement in 2002.

Jim was an ardent sailor. He acquired a 28 foot Niagara sailboat in 1989, which he named Charlotte Rose.

Up until a few years ago Jim also pursued bicycling, taking a number of bicycle tours overseas, including Swaziland, Vietnam and Central America.

During his last days Jim penned a moving note of reminiscences which were referenced at his funeral. A few excerpts are printed below.

Excerpts from "A Note from Jim"

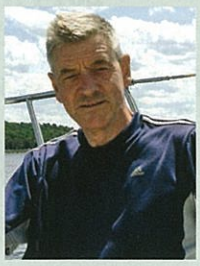
Marion says I should write my memoirs, but there would be so much to write about and my memory isn't good enough, not to mention the time it might take. However, I'll write down a few random thoughts.

I'll not pretend that my current situation isn't difficult. After working for 35 years, and getting into a situation of being financially comfortable, with my wonderful wife and a home location we love,.it would have been great to enjoy it all for another 20 years, but that's not to be.

I've generally enjoyed good health all my life, except for a year or two of back problems. I have been lucky enough to avoid some of the things I would have difficulty in dealing with, such as a severely handicapped child or going blind. And hey, I'm not going to get Alzheimer's!

Most importantly, I have been lucky enough to have the love of my life, soulmate, and best friend Marion, for 45 years of happy marriage, to have her support when I've needed it, and her unfailing love and affection. I've had three wonderful children. Marion and I have already been Grandparents to two great grandchildren and we are delighted to have two more recently arrived whom we recently visited in New York.

We really enjoyed our five years in Kincardine. From a work point of view, that period was probably the most enjoyable, as we had a fabulous variety of different responsibilities and, with our management in Ottawa, plenty of local authority to make decisions. We worked hard, but I learned a lot.



If I had to do it all again, I would make music a bigger part of my life – learned to play an instrument properly and listened to more of the great music that is available.

Jim's chosen photo.

Obituary

Ragnar Galt Dworschak

(October 22, 1964 - October 8, 2012)

After a life of intellectual curiosity, discovery and passion for learning, Ragnar Galt Dworschak, beloved son of the late Diana Elizabeth Warren and Hermann Gerald Dworschak, and brother of Cathy Szata and Caroline Anne Dworschak passed away on October 8th, 2012.

Ragnar attended D. Roy Kennedy Public School, Ottawa, followed by Merivale High School, Ottawa. He graduated with a B.Sc. in Applied Physics from University of Waterloo in 1987, an M.Sc. in Applied Physics from Queens University in 1990 and a Ph.D. in Physics from the University of Manitoba in 2004. During his Masters program, he also worked for NRC, developing techniques for explosives detection for civil aviation anti-terrorism. From 2005 to 2010, he worked at Atomic Energy of Canada Limited, first in the Fuel Channels Division and then in the Reactor Physics Branch, performing reactor core physics modelling for GEN-IV Reactors. In 2010, he left AECL and joined Best Theratronics Ltd. as Director of Technical Services, where he acted as the technical interface between Physics, Engineering, Sales, Marketing, the agent and client base and the academic community. His work at Best Theratronics allowed him to travel around the world, engage in discussions about physics and nuclear medicine and participate in numerous working groups at the International Atomic Energy Agency in Vienna.

Through his work and personal travel, he appreciated living and working with many diverse cultures around the world. He was also an active member of both the Canadian Nuclear Society (CNS) and Canadian Association of Physicists (CAP). While in Chalk River, he was elected Chair of the CNS Chalk River Branch for 2 consecutive years, inspiring young minds to get involved with the Society and participate in Educational and Outreach activities. After leaving Chalk River, he remained active in the CNS as part of the Ottawa Branch, where he continued to participate in Technical Seminars or as a judge in Regional Science Fairs and other activities. Ragnar was also an active member of the CAP, where he acted as Regional Councillor from 2007 to2009. He participated in CAP Congresses, often as the representative at AECL's exhibit booth. He was instrumental in encouraging AECL to create a best student paper award in fields relevant to the work carried on at AECL.

Ragnar had a unique combination of a scientific mind with its openness and analytical capabilities, a highly creative artistic mind, and a deeply compassionate side, full of empathy for others. His engagement in the fine arts, especially music, was integral to his life. He was the recipient of a Gloucester Achievement Award for his outstanding contribution to Music. He played his trombone in many ensembles and lent his beautiful deep voice to many choirs, including the United Nations Choir in Vienna. Ragnar delighted in his years working with the Deep River Players. His commanding presence, voice and sense of humour added greatly to the various productions. For 17 consecutive years, Ragnar volunteered at the Winnipeg Folk Festival and was a very valued and respected daytime stage manager at the Bluestem Stage.

Ragnar derived much pleasure from bicycling for fundraisers such as the Multiple Sclerosis Society and enjoyed playing racquetball or squash. Outdoor life especially appealed to him and he spent many of his summers with his Manitoba family working on farms and enjoyed developing his own farm near Chalk River. He also received an outstanding award from the Canadian Blood Donor Society for his well over 200 blood and plasma donations.

He will be greatly missed by all those who knew him.

CNS Membership Note

It is time to renew your CNS membership for 2013. Please log in to your personal CNS profile: You can access your account at any time by logging in to https://cns-snc.ca/accounts/cns_member_renew (or via the Membership page of the CNS website, www.cns-snc.ca). You can then very easily and quickly renew your membership.

Earlybird renewal fees are available right now, until December 31, so I strongly encourage you to take advantage of the discount!

And please remember to keep your CNS profile current when there are changes in your information.

Best regards,

Ben Rouben
Chair, Membership Committee

Note d'adhésion à la SNC

Il est temps de renouveler votre adhésion à la SNC pour 2013. Accédez à votre compte personnel en visitant https://cns-snc.ca/accounts/cns_member_renew ou bien à partir de la page des adhésions au site de la SNC (www.cns-snc.ca). De là vous pourrez renouveler votre adhésion très facilement et rapidement.

Il y a un escompte sur les renouvellements jusqu'au 31 décembre. Je vous encourage donc d'en profiter !

Et veuillez bien vous rappeler de mettre vos données à jour chaque fois qu'il y a un changement.

Bien cordialement,

Ben Rouben
président du comité d'adhésion

CNS member receives IEC Award

Mohinder Grover, of A&A Consulting, formerly with AECL Candu, was presented with an IEC 1906 Award for his contributions in standardization and related activities in the field of electrotechnology, at a ceremony hosted by the Standards Council of Canada in Ottawa 12 October 2012.

The International Electrotechnical Commission develops international standards for electrical, electronic and related technologies. It is one of three organizations, along with ISO and ITU, that develop international standards.

The IEC 1906 Award was created in 2004 to commemorate the IEC's year of foundation.

CNS congratulates Bruce on refurbishment

Ed. Note: When Units 1 and 2 were finally restored to service in October 2012. John Roberts, president of the Canadian Nuclear Society sent a brief message of congratulations to Duncan Hawthorne, president of Bruce Power. Following are the two brief exchanges.

(Attachment to e-mail from John Roberts, CNS president to Duncan Hawthorne, president of Bruce Power)

Congratulations Bruce Power!

Bruce Power is to be congratulated for successfully completing its large refurbishment project of the Units 1 and 2 reactors and resynchronizing their electrical generators to the Ontario grid.

These sources of clean and environmentally friendly energy are a welcome addition to electrical generation in Ontario, and Canada.

The Canadian Nuclear Society applauds Bruce Power for these magnificent feats.

(Reply from Duncan Hawthorne)

John,

Thanks to you and CNS for the letter and for the critical support from CNS members as we worked our way through this "First of a Kind" project that called upon the skill, commitment and innovation of your members.

Regards
Duncan

Canadian Nuclear Society
Société Nucléaire Canadienne
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Tel: (416) 977-7620 Fax: (416) 977-8131
E-mail/Courriel: cns-snc@on.aibn.com

CNS Scholarship for an undergraduate summer project

The Canadian Nuclear Society is pleased to offer scholarships to support undergraduate summer work projects in nuclear science and engineering at Canadian universities.

Two awards of $5000 are available
for the summer of 2013

Each scholarship will be awarded to an undergraduate student for a specific summer work project related to nuclear science and engineering. There must be a faculty member supervising the project.

The awards will be applied as partial payment of each student's earnings during the project period. The faculty supervisor must provide at least an additional $1500.

Awards will be based on the academic standing of the student and the merit of the proposed project. An independent panel, appointed by the CNS, will review submissions and make award decisions.

Guidelines for submission

The student and the faculty member responsible for the project must be CNS members in good standing.

The student must be enrolled in an undergraduate degree program.

The project duration must be at least three months.

Applications should include:

- Student CV and grades
- Description of supervisor's research field
- Description of the work proposed, including its relevance to nuclear science and engineering in Canada, its objectives, and the proposed schedule (maximum 2 pages, in 12pt, MS Word document).

Submission procedure

The scholarship application must be sent by e-mail to: cns-snc@on.aibn.com

Deadlines

- Submission deadline: March 1, 2013
- Notice of Awards: April 15, 2013 (all applicants to be informed).
- Payment: May 15, 2013

Reports

At the end of the summer project, the student should provide the CNS with a report on the work project. These reports may be published on the CNS web site, and the student may be invited to present the work at CNS branch seminars or at the 2014 CNS annual conference.

Questions should be addressed to:
e-mail: cns-snc@on.aibn.com

Canadian Nuclear Society
Société Nucléaire Canadienne

12th International Conference on CANDU Fuel

"CANDU Fuel: Safe, Reliable and Flexible"
"Combustible CANDU: sûr, fiable, polyvalent"

Holiday-Inn Waterfront Hotel and Conference Centre,
Kingston, Ontario, 2013 September 15-18

CALL FOR PAPERS

Following the highly successful 11th conference held at Niagara Falls in 2010, the 12th International Conference on CANDU Fuel will bring together international experts of the nuclear fuel industry involved in design, R&D, fabrication, operation, modelling, safety analysis and regulation. Under the theme of *CANDU Fuel: Safe, Reliable and Flexible,* papers are solicited for the following categories:

A. ***Fuel Performance:*** PIE studies/techniques, fuel behaviour (normal operating conditions and extended burnup), and station experience.
B. ***Fuel Safety:*** Licensing issues, accident studies, fission-gas release, fuel behaviour, LOCA initiative and experimental simulation, fuel acceptance criteria, and fuel deformation and dryout.
C. ***Fuel Design & Development:*** Modifications to fuel designs and quality assurance in fuel design and development, MOX, inert matrices, DUPIC, slightly enriched uranium (SEU), recovered uranium (RU), thoria-based fuels, SCWR fuel, and economical and societal implications of fuel cycles.
D. ***Fuel Code Development:*** Predictive capability for thermal, mechanical, irradiation and fission-gas release behaviour under normal operating and accident conditions, and predicting aerosol behaviour.
E. ***Fuel Manufacturing:*** Fuel manufacturing experience, advances in manufacturing & inspection technologies, blending Recycled Uranium (RU) & Depleted Uranium (DU), and fuel manufacturing issues and improvements.
F. ***Fuel Management:*** Fuel management schemes, load following, fuel physics analysis, and specific operational problems.
G. ***Fuel Bundle Thermalhydraulics:*** CHF and CCP assessment and enhancement, reactor aging, crept pressure tube and fuel simulation and testing.
H. ***Spent Fuel Management:*** Fuel handling technology, spent fuel storage, and in-storage fuel behaviour
I. ***Advanced Code Development:*** Development of models that support fuel performance and safety assessments.

Also we are now accepting nominations for a new award to recognize senior or retired individuals who have contributed greatly to the field of **Nuclear Fuel.** Please send your nomination letters to Dr. Paul K. Chan at Paul.Chan@rmc.ca by 31st May 2013. For further details on this award please visit our website.

Abstract and full paper must be prepared and submitted to https://www.softconf.com/d/CANDU2013/ according to guidelines in the conference website at **http://www.cns-snc.ca/events/candufuel2013/**. The following are important deadlines for paper submission. Late submissions may not be accepted.

- **2013 January 30** **On-line submission of Abstracts**
- **2013 March 15** **Notification of the Acceptance of Abstracts**
- **2013 May 31** **On-line submission of final version of papers**
- **2013 June 30** **Notification of acceptance of full paper**

For more information and latest news, please visit the conference website at:
http://www.cns-snc.ca/events/candufuel2013/

Conference Chair:
Dr. Paul K. Chan
Chemistry & Chemical Engineering
Royal Military College of Canada
(613) 541-6000 x 6145
Paul.Chan@rmc.ca

Technical Program Co-Chair:
Dr. Hugues W. Bonin
Chemistry & Chemical Engineering
Royal Military College of Canada

Technical Program Co-Chair:
Mr. Mark R. Floyd
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CANADIAN NUCLEAR SOCIETY ®
SOCIÉTÉ NUCLÉAIRE CANADIENNE

Join us in Toronto in June, as we boldly explore where the next generation of "enterprising" Canadians will take nuclear science and technology

34th Annual CNS Conference and 37th CNS-CNA Student Conference

NUCLEAR
THE NEXT GENERATION

CNS 2013 SNC
TORONTO

2013 June 9-12· Marriott Toronto Downtown Eaton Centre

- **Who** The CNS Annual Conference and Student Conference gathers scientists, engineers, technologists, senior management, government officials, and students from across Canada and from other countries interested in nuclear science and technology. Guests will also enjoy an engaging Guest Program.

- **Why** The central objective is to exchange views on how nuclear science and technology can best serve the needs of humanity, now and in the future.

- **Where** This year's conference returns to vibrant downtown Toronto, where decisions about the future of nuclear electricity in Ontario will be made - decisions that affect the economy of Ontario, and the well-being of Canadians.

- *2013 W.B. Lewis Lecture/Luncheon*
- *Three plenary sessions + many technical sessions*
- *Canadian Nuclear Achievement Awards luncheon*
- *Student poster session*
- *Main conference banquet*
- *North American Young Generation in Nuclear Professional Workshop*
- *Reception, breaks, exhibits, and other networking opportunities*
- *Guest program*

info: www.cns-snc.ca

34th Annual Conference of the Canadian Nuclear Society and 37th Annual CNS/CNA Student Conference "NUCLEAR, the Next Generation"

Toronto Marriott Downtown Eaton Centre Hotel
Toronto, Ontario, Canada
2013 Jun 9 - 12

Call for Papers

The 34th Annual Conference of the Canadian Nuclear Society and the 37th Annual CNS/CNA Student Conference will be held at the Toronto Marriott Downtown Eaton Centre Hotel, Toronto, Ontario, Canada, 2013 Jun 9 - Jun 12.

The central objective of this conference is to provide a forum for exchange of views and ideas and information relating to application and advancement of nuclear science and technology, and nuclear-related issues in general.

Please note that this is NOT the "Call for Papers" for the Student Conference. There is a separate "Call for Students' Extended Abstracts" for the Student Conference. This "Call for Papers" is to solicit papers in Technical Sessions of the Annual Conference covering, but not limited to the following Technical Topics:

- Reactor and Radiation Physics
- Thermalhydraulics
- Reactor Safety and Licensing
- Uranium, Prospecting, Purification and Utilization
- Advanced Reactors (EC6, GEN-VI, Small Modular Reactors)
- Advanced Fuel Cycles (RU, NUE, Thorium, etc.)
- Process Systems
- Chemistry and Materials
- Instrumentation and Control
- Plant Life Extension, Refurbishment and Aging
- Operating Experience, Maintenance and Plant Transients
- Materials Issues for Existing and New Reactors
- Environment and Spent Fuel Management
- Medical Physics, Isotope Production and Applications
- Computer Code Development and Qualification
- **Special Session** on Fusion Science and Technology
- **Special Session** on Treatment of Uncertainties in ROP/NOP and LOCA Physics Calculations
- **Special Session** on Handheld Computers in Nuclear Industry

Important Dates

- **Deadline for submission of full papers: 2013 February 15**
- Notification of paper acceptance: 2013 March 31
- Deadline for submission of revised final papers: 2013 April 15

Guidelines for Full Papers

Papers should present facts that are new and significant, or represent a state-of-the-art review. They should include enough information for a clear presentation of the topic. Proper references should be made to related published information. The name(s), affiliation(s), and contact information of the author(s) should appear below the title of the paper. A short abstract of ~100 words must be placed at the beginning of the paper. A length of ~10 pages with an electronic file size of no more than 5 MB is suggested for a typical paper.

Paper Submission Procedure

Please note that ONLY FULL PAPERS are to be submitted and will be peer-reviewed for this conference (abstracts or summaries will not be accepted). Please plan accordingly as February 15, 2013 is fast approaching! Submissions of full papers should be made electronically, preferably in MS Word format, through the Annual Conference electronic submission system at:
https://www.softconf.com/d/CNS2013Technical/
To help with planning, authors should log onto the electronic submission system and input the title, author(s), and affiliation(s) of their planned paper even before making the full submission. Note that for a paper to appear in the conference Proceedings, at least one of the authors must register for the conference. Information regarding paper template and copyright can be found at the conference website: http://www.cns-snc.ca/en-ca/events/conf2013

Technical Program Chair

Dr. Eleodor Nichita
University of Ontario Institute of Technology
eleodor.nichita@uoit.ca

General inquiries regarding the Conference may be addressed to

Conference Executive Chair

Dr. Adriaan Buijs
McMaster University
buijsa@mcmaster.ca

CNS Office

Denise Rouben or Bob O'Sullivan
cns-snc@on.aibn.com
416-977-7620

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E-mail/Courriel: cns-snc@on.aibn.com

CNS WNU Bursary

The Canadian Nuclear Society will award a bursary of up to $5000 to assist one CNS member to attend the WNU Summer Institute 2013:

www.world-nuclear-university.org/summerinstitute/introduction.aspx

This bursary is intended to assist with the travel, accommodation and tuition costs for attending the WNU Summer Institute. The recipient is responsible for reporting to CNS Council his/her experience at the WNU Summer Institute and for providing an expense summary to demonstrate that the funds were applied as intended.

CNS Members in good standing are eligible to apply for this bursary by email to the **CNS Office (**cns-snc@on.aibn.com**) by 2013 March 21**.

Please note:

- The application must include information that demonstrates a need for financial support to attend the WNU Summer Institute.
- The application must include a personal resume and summary of work experience.
- The applicant must notify the CNS Office by email with a copy of their acceptance for admission to the WNU Summer Institute 2013, by 2013 March 21.

The Education and Communications Committee of CNS Council will review the applications received and rank them.

The Bursary recipient will be notified by mid-June.

If no suitable recipient is identified, the Bursary will not be awarded.

Questions should be addressed to: **e-mail: cns-snc@on.aibn.com**

Calendar

2013

Feb. 27-Mar. 1 — **Canadian Nuclear Association Conference & Trade Show 2013**
Ottawa, Ontario
website: www.cna.ca

Mar. 3-7 — **6th International Symposium on Supercritical Water-Cooled Reactors (ISSCWR-6)**
Shenhen, China
Contact CNS e-mail: cns-snc@on.aibn.com

Apr. 22-26 — **7th International Conference on Naturally Occurring Radioactive Materials (NORM-VII)**
Beijing, China
Contact CNS e-mail: cns-snc@on.aibn.com

May 12-17 — **15th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH 15)**
Pisa, Italy
email: dlshubring@ufl.edu

May 27-29 — **3rd Climate Change Technology Conference**
Concordia University, Montréal, Québec
(Organized by EIC including CNS)
website: www.cctc2013.ca

June 9-12 — **34th Annual Canadian Nuclear Society Conference and 37th Annual CNS/CNA Student Conference**
Toronto, Ontario
email: cns-snc@on.aibn.com
website: www.cns-snc.ca

June 16-20 — **ANS Annual Meeting**
Atlanta, George
website: www.ans.org

July 29-Aug. 2 — **ICONE-21**
Chengdu, China
Contact CNS e-mail: cns-snc@on.aibn.com

Aug. 18-23 — **22nd International Conference on Structural Mechanics in Reactor Technology SMiRT 22**
San Francisco, California
website: www.smirt22.org

Sept. 15-18 — **12th International Conference on CANDU Fuel**
Kingston, Ontario
website: www.cns-snc.ca

Oct. 27-31 — **Joint International Meeting on Supercomputing in Nuclear Applications and Monte Carlo**
Paris, France
Contact CNS e-mail: cns-snc@on.aibn.com

2014

May 25-27 — **10th International Conference on CANDU Maintenance**
Toronto, Ontario
Contact CNS e-mail: cns-snc@on.aibn.com

Aug. 24-28 — **19th Pacific Basin Nuclear Conference (PBNC 19)**
Vancouver, British Columbia
website: www.cns-snc.ca

Oct. 26-31 — **Nuclear Plant Chemistry Conference 2014**
Sapporo, Japan
e-mail: npc2014@issj.com

IAEA Publication

Safety in the Utilization and Modification of Research Reactors IAEA Safety Standards Series No. SSG-24

This Safety Guide is a revision of Safety Series No. 35-G2 on safety in the utilization and modification of research reactors. It provides recommendations on meeting the requirements for the categorization, safety assessment and approval of research reactor experiments and modification projects. Specific safety considerations in different phases of utilization *and* modification projects are covered, including the pre-implementation, implementation and post-implementation phases. Guidance is also provided on the operational safety of experiments, including in the handling, dismantling, post-irradiation examination and disposal of experimental devices. Examples of the application of the safety categorization process for experiments and modification projects and of the content of the safety analysis report for an experiment are also provided.

STI/PUB/1559; 68 pp.; 2012; ISBN 978-92-0-129110-3; English; 28.00 Euro

The electronic version can be found:

http://www-pu iaea,org/books/IAEABooks/8854/Safetv-in-the-titilization-and-Modification-of-ResearchReactors

Miscommunication Is Everything

by Jeremy Whitlock

"What we've got here is a failure to communicate."
- "Cool Hand Luke" (1967).

A lot has been said, including in this space, about the communication woes of nuclear power – or nuclear anything. There's a good reason for that: We seem to have a handle on the technology, but apparently lack any clue about getting it publicly accepted.

In this 50th anniversary year of nuclear power in Canada, this is an embarrassment. The pioneers who broke ground at Rolphton, Ontario thought they were the tip of an unfathomable iceberg of possibilities for this country. Fifty years later, the concept of building a new reactor in Canada is just as unusual – perhaps even more so – as it was in the 1950s.

In fact, the real surprise is that nuclear power is alive at all in Canada. It leads a somewhat Keith Richards existence – by all accounts deserving to be dead but somehow still around.

Its promise has never diminished, and has, if anything, increased. But it has had trouble living up to this potential: By now Canada's north should be strewn with ultra-safe mini-reactors now decades into their operation. Instead the optimists among us think that we may, just may, have a chance to explore such initiatives in the coming years – if only we could get the technology publicly accepted.

If only we could get the technology publicly accepted - ay, there's the rub.

Some would see this as an impossible task, given the strength of the anti-nuclear meme. Others say that all we need to do is convince folks of the safety (and benefits) of radiation, and support will follow.

The truth is probably somewhere in the middle – the public is reachable, but it's going to take a massive amount of work. Memes are tough to beat, and this meme is one of the toughest of them all. Its roots are in the mushroom cloud of Hiroshima, fertilized with cold-war radiation scares of the 50s and 60s, and super-boosted by Three Mile Island, Chernobyl, and Fukushima.

And it's a lonely battle – the world's fossil interests have much to lose if nuclear technology attains its logical place in global energy supply. They also have everything to gain in shoring up the renewable energy meme – for one thing because it's a proxy for fossil fuels: Every wind turbine connected to the grid is another reason for more gas turbines as dispatchable backup supply.

So why bother at all? How can one even begin to fight a meme that makes the world forget about 20,000 deaths from a tsunami? Or one that makes an entire field of medical diagnostic science, Nuclear Magnetic Resonance Imaging, remove part of its name?

Quite simply, and without apology for the cliché: because it's worth it. This is also why the technology has survived with Keith Richards-like defiance over the years. There is nothing equally sustainable to replace it.

The good news is that it can be done, but it ain't going to be easy. The answer is communication – a lot of it.

In 1998 when the federal Environmental Review panel studying AECL's deep geologic disposal plan for used nuclear fuel concluded that "safety must be viewed from two complementary perspectives: technical and social", the earth could be felt to shatter.

The wisdom of dragging public opinion into the hallowed halls of safety analysis will be debated for years – but the Panel shed light on an inescapable, and perhaps inconvenient, truth: nobody is safe until he/she *feels* safe. The finding sent a brand new agency, the NWMO, into the village halls around this country for three years, leading to a plan for nuclear used fuel that is envied around the world for its public inclusion.

What's needed here is much more than municipal stakeholder engagement, much more than lessons on radiation safety, even much more than reopening our nuclear sites to public tours (all of which are good ideas). The longevity and power of the anti-nuclear meme demands a long-term and comprehensive approach, starting with our education system at its earliest grades, where tomorrow's voters first learn how the world works. We need to be in all schools on a regular basis, and in every community – and the communication needs to work both ways, because as every parent knows (and as the NWMO demonstrated so effectively): listening is half of good communication.

This is as important as developing a new fuel cycle, or a higher temperature coolant. Perhaps, more important. Because without the public in the equation, we ain't gonna get no satisfaction.

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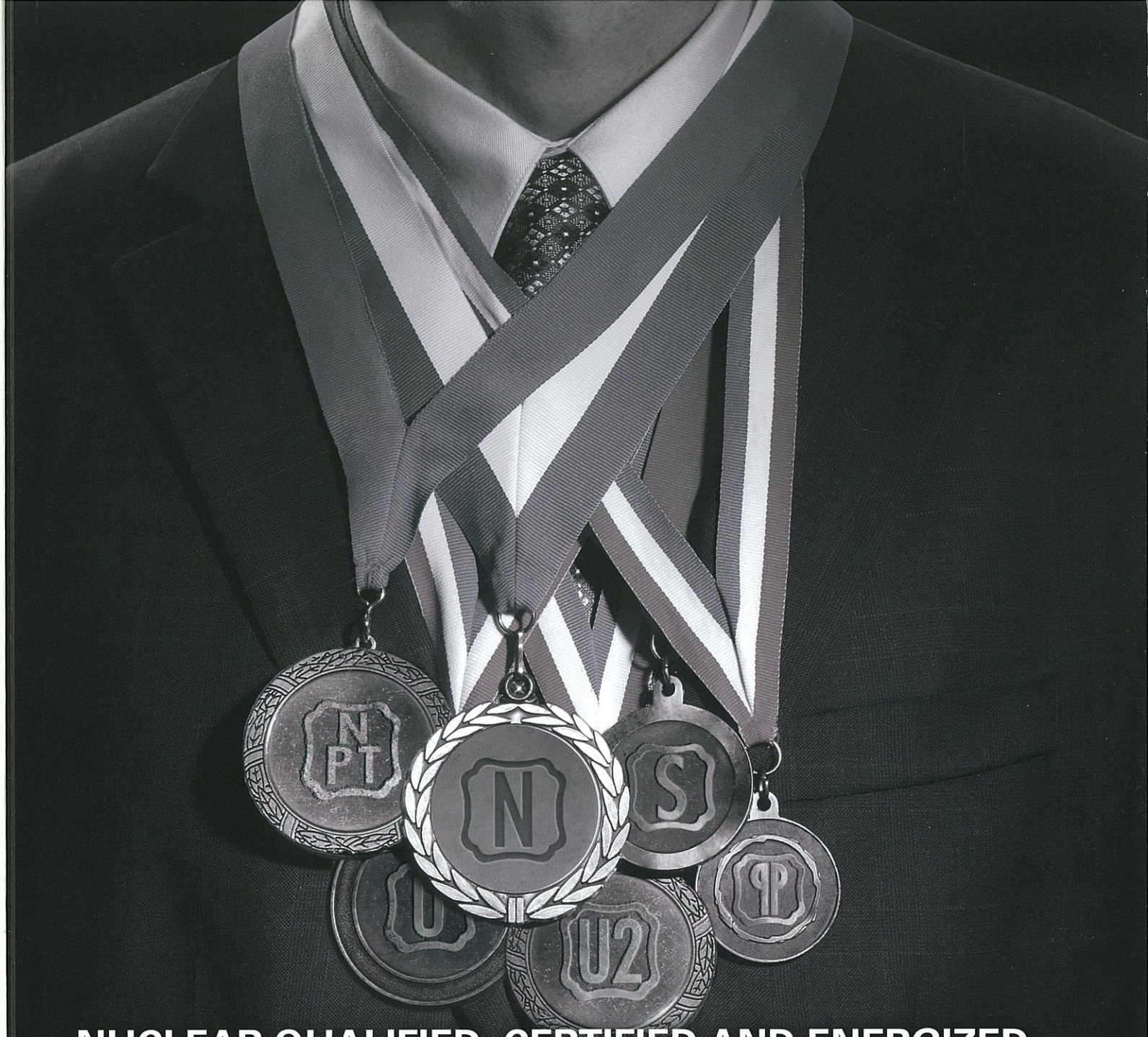

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