CANADIAN NUCLEAR SOCIETY

bulletin

DE LA SOCIÉTÉ NUCLÉAIRE CANADIENNE

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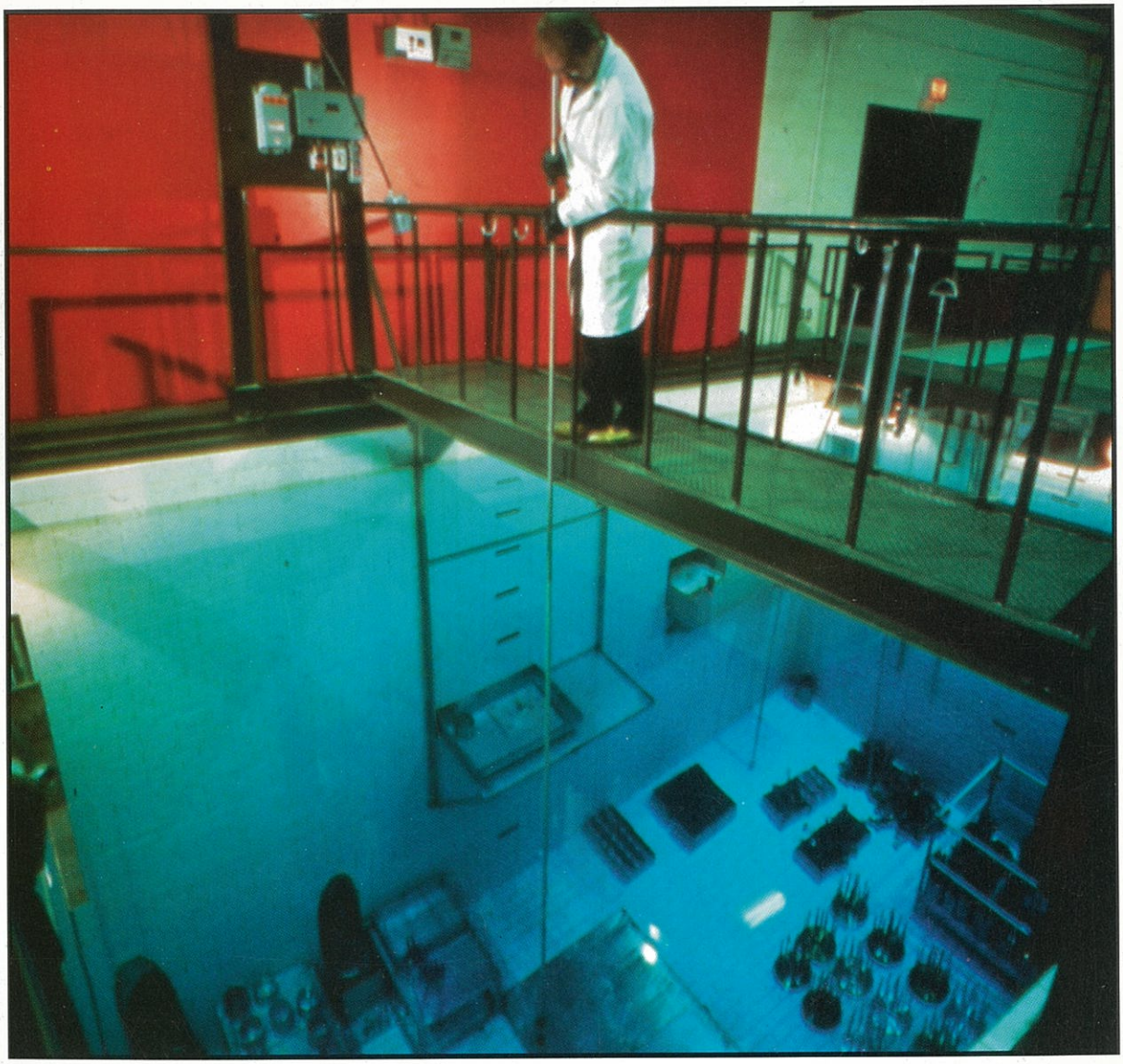

- MDS Nordion
- Winter Seminar
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- Maintenance Conference

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Cover Illustration

The photograph on the cover shows the Cobalt 60 storage pool at the Kanata facility of MDS Nordion.

(Photo courtesy of MDS Nordion.)

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EDITORIAL

WHO IS TELLING THE MESSAGE?

For the past few years the most prevalent topic throughout the nuclear community, especially in the "western" world, has been "public acceptance". The concern with public attitudes towards all things nuclear, not just nuclear power, has intensified in recent months. Epitomizing this was the report from the Environmental Panel on the Nuclear Fuel Waste Disposal Concept with its (irrational to us) conclusion that the concept was "adequately demonstrated technically" but was "unacceptable socially". (See "Viewpoint" on page 2 for a comment on that conclusion.)

Natural Resources Minister Ralph Goodale, in his talk to the Nuclear Winter Seminar in February, emphasized the problem of public perception. Demonstrations in Germany against the transporting of spent fuel to the Gorbelen waste processing and disposal centre have received international TV coverage. Here at home, the proposal to ship small quantities of plutonium to Chalk River has sparked a new round of cries of "extreme danger" which have been picked up by the media.

In the face of all of the exaggerated but effective negative media coverage, where is the Canadian nuclear industry ? As Hugh Segal pointed out in his talk to the CANDU Maintenance Conference, last fall, there is a "market place of ideas" and, he asked, if the nuclear industry does not tell its story, who will ?

Yet the CNA, the industry's supposed voice, dropped its public information program a couple of years ago. Its staff try to fight the public relations fires, but with inadequate resources.

At the same time, the volunteer members of the CNS have managed to contribute in the fields of both public information and education. CNS members frequently give talks to local groups, CNS branches support and participate in science fairs, the Society is sponsoring a course at McMaster University for high school science teachers and members have established a CNS Web site (which will focus on a younger audience). The Society is also the major sponsor of a proposed general interest book which could also be useful for the McMaster course (a project which the CNA has spurned despite its modest investment). In a related area, on a project that will undoubtedly have long-term benefits, the CNS was the first of the few Canadian organizations to support the new Centre for Low Dose Radiation Research at the University of Ottawa (most of its support comes from abroad).

There is no doubt that the pressing priority of the Canadian nuclear power program is to demonstrate that our existing nuclear plants can operate safely and efficiently. And, it is accepted that immediate markets for CANDU are overseas. Nevertheless, if the nuclear industry loses the battle for public support here at home, it will lose political support and, then, like a house built on quick sand, collapse.

F. B.

IN THIS ISSUE

On the next page, under the title "Viewpoint" there is a stinging, but, in our opinion, appropriate, comment by Jeremy Whitlock on the conclusions of the Environmental Review Panel on Nuclear Fuel Waste, entitled **Safety and Acceptability.** Also on that page there are some words from an ardent nuclear advocate in the USA, Theodore Rockwell, to counter the argument that plutonium is the world's deadliest commodity.

Our feature article is entitled, **MDS Nordion: a Canadian nuclear success story.** In it we attempt to provide some insight into that exciting company which is the world's largest single supplier of radioisotopes, yet little known even by those in the Canadian nuclear community. That is followed by a report on the current status of **Food Irradiation,** an application of ionizing radiation that may finally have its day.

Next is a report on the CNA/CNS **Winter Seminar** followed by four extracts from important addresses that day. These include words on, **Federal Government Perspective,** from Natural Resource Minister, Ralph Goodale; a **Report on the Select Committee** from its chairman, Derwyn Shea; and an overview of the **White Paper on Ontario Hydro,** by MPP Helen Johns. To round out the section we offer most of the paper by Dr. Agnes Bishop, president of the AECB, on **A Regulatory Perspective,** in which she counters several of the statements in the Select Committee report.

There follows a report on the **CANDU Maintenance Conference,** which, unfortunately, took place just as the last issue of the *CNS Bulletin* was going to press. This is accompanied by an account of one of the plenary presentations by Paul Lafrenière on **Configuration Management** and two papers selected from the many excellent ones, chosen for their possible broader appeal: **Improved Maintenance by Self Assessment;** and, **New Work Management Processes.**

The final technical article is a brief paper based on a talk by Basma Shalaby on **Lifetime Management.**

Placed under **General News,** for want of a better place, is the **Executive Summary** of the report from the Environmental Review Panel on Nuclear Fuel Waste Disposal Concept. There are a number of other bits of information in that section.

And, of course, there is the section on **CNS News,** with reports from the Branches, a review by the President, and another contribution by Jeremy Whitlock on the **CNS Logo,** which I hope you find as entertaining as we did.

The **Calendar** of events is updated, so that you can plan your trips for the coming year.

Hopefully, you will find something of interest in all of this. We thank our contributors and those authors who agreed to have their work re-printed here, and, as always, look forward to your comments, suggestions, and possible contributions.

VIEWPOINT

Safety and Acceptability: science vs perception

by Jeremy Whitlock

The Environmental Assessment Panel reviewing AECL's plan to bury nuclear waste deep in the Canadian Shield has just released its report, and it is setting a very dangerous precedent. The report concludes that, *"while the safety of the AECL concept has been adequately demonstrated from a technical perspective, from a social perspective, it has not".*

It then recommends against acceptance at this time and calls for the establishment of an independent agency to oversee all activities related to the nuclear waste issue, with full public participation.

This priority given to public acceptability is not a bad idea; what is a bad idea is the inclusion of this acceptability, by the panel, within the definition of "safety". The report states that "safety must be viewed from two complementary perspectives: social and technical". This is an absurd notion. Safety is the "freedom from harm or danger", which is distinct from the perception of safety, or the perception of risk.

While these latter considerations are important in the assessment of a technology's psycho-social impact, they have no place in the assessment of safety. The effect on human and environmental health, now and into the future, is a matter of scientific determination. How we may feel about those findings is equally important, but another chapter altogether.

The precedent is dangerous. Already, anti-nuclear activist groups are assembling behind the banner "Panel Declares Waste Disposal Unsafe", which is a falsehood. Word-processors are busy typing "I told you so" rhetoric in fund-raising literature. The position of the EA Panel is no fluke: For years the more astute anti-nuclear activists, having recognized the low risk of nuclear power's operations, have strategically stressed the social factor. The more legally-minded have invoked our Charter of Human Rights, claiming that radiation dose, no matter how insignificant, and regardless of the direct benefits (e.g. clean electricity, cancer therapy), should be banned if an individual chooses not to be exposed to it, as a matter of personal rights.

This is an engaging debate, and one that leads straight to the question of "personal choice" versus "societal benefit". However, nowhere does it impinge on the question of safety. The EA Panel, by redefining the word, have undermined the credibility of those working to improve safety, and have made Public Opinion the last word on the success or failure of their efforts.

The EA report is well-intentioned, but poorly executed. It will be misinterpreted and misused for years to come, and other technologies will suffer, completely regardless of the societal benefit and risk they represent.

(The Executive Summary of the Panel report is printed in this isue of the CNS Bulletin and the full report by the Panel is available on the Web through the CEAA home page.)

Plutonium and Air

- Theodore Rockwell provides an interesting comparison to illustrate the difference between hypothetical conjecture and the real world.

Ed. Note: In the context of the controversy over bringing small quantities of plutonium to Chalk River for MOX fuel tests, readers might find the following note educational. It is extracted from an "opinion" piece in the March 16, 1998 issue of the US journal The Scientist. Rockwell, is a veteran of the US Navy program under Admiral Rickover and a founding director of the public interest group Radiation, Science & Health. We thank former CNS president Jerry Cuttler for bringing this article and Rockwell's other writings to our attention.

One day consumer activist Ralph Nader was debating radiation pioneer Ralph Lapp. Nader stated that a pound of plutonium could kill every human being on Earth. One could picture a one-pint jar of the stuff spilling on the ground and its deadly vapors spreading until all life was obliterated. That's what Nader's statement means in the common-sense real world. But Lapp put the statement in its proper context by replying: "So could a pound of fresh air, Ralph."

Nader's statement was not actually a lie; he was just trying to make us think that a hypothetical conjecture was a real-world problem. He's saying that the lethal dose of plutonium is a five-billionth of a pound. The only way you could actually kill the world's five billion people with just one pound would be to line them up and have a trained physician inject into each person just the toxic amount of plutonium - no more or there wouldn't be enough to go around. It would have to be in a fine aerosol mist, or it wouldn't be lethal, and it would have to go directly into the lung. Then we would have to wait several decades, protecting the individual from other life-threatening influences such as cars and smoking, until he or she died of lung cancer, because plutonium poses no other health threat.

Nader's statement is truth, of sorts, but it is not reality.

And what about Lapp's statement? It is true in precisely the same way as Nader's. If a tiny bubble of fresh air is injected in just the right way into the bloodstream, a fatal embolism will develop. The only difference from the plutonium case is that you wouldn't have to wait decades for cancer to develop. We do not think of fresh air as deadly, lethal, or dangerous, although people have been killed by air bubbles in their blood.

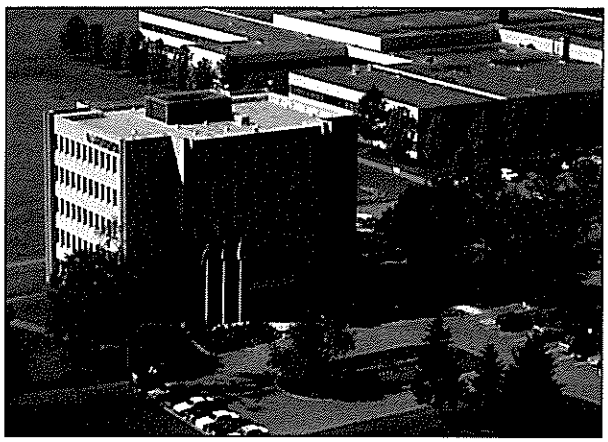
How dangerous is plutonium in the real world? The answer is: Not a single death has resulted from plutonium poisoning, although we've been handling it in tonnage lots for a couple of generations. A sheet of paper, or even a few feet of air, provides enough shielding from its radiation. That's the difference between the world of the imagination and the real world we live in.

MDS Nordion

a Canadian nuclear success story

by Fred Boyd

With so much attention being given to the problems of the nuclear power programs some information on another, happier, segment of our nuclear activity appeared appropriate. That thought led to our visit to MDS Nordion's main facility and this article. Having been associated with an earlier predecessor of what is now MDS Nordion the visit was a nostalgic exercise. Our thanks go to MDS Nordion's V.P., Ian Mumford, who arranged the visit and, especially, to Andrea Coletta of his group who escorted us around the Kanata complex and provided more information than we have been able to digest. We hope you enjoy this brief insight into a part of our nuclear community that is inadequately known. F.B.



View of the Kanata complex of MDS Nordion with the Roy Errington headquarters building in the foreground.

It may have the newest name in the Canadian nuclear industry but the organization celebrated its 50th anniversary last year.

MDS Nordion, the world leading supplier of radioisotopes, had its beginnings as a small division of the crown company Eldorado Mining and Refining Ltd. in the late 1940s. With the end of World War II, Eldorado found itself with a supply of radium left over from the production of uranium during the war and set up a small group in Ottawa to sell it. The group was headed by Roy Errington who led the organization through its many changes over the next three decades.

The team had successfully disposed of most of the stock of radium when the full operation of the NRX reactor made reactor produced radioisotopes available. They turned to selling these and soon focused on Cobalt 60 for its use in cancer therapy. The first Cobalt 60 therapy unit produced by the fledgling organization, given the name "Eldorado", was installed in the Victoria Hospital in London, Ontario, in the fall of 1951.

In 1952 the group was transferred to the newly created Atomic Energy of Canada Limited, to become AECL's Commercial Products Division (CP). As part of one of AECL's re-structuring exercises, the name was changed to Radiochemical Company (RCC) in the late 1970s. Over the years CP or RCC remained somewhat outside the fold of the normal AECL operations and functioned as a separate, usually profitable, business unit. In 1988, as part of the federal government's move towards privatization, the organization was split into two companies, Theratronics, which manufactures the cancer therapy machines and other equipment for the use of radioisotopes, and Nordion International, which continued the primary business of processing, packaging, selling radioisotopes. In 1991 Nordion International was sold to MDS Inc., a large international group of companies in the life and health sciences fields with headquarters in Toronto. As part of an overall change of identity of all of the MDS Inc. companies, the name was changed to MDS Nordion in December 1996.

The first offices were in a "temporary" government building in Ottawa. The growing but still modest group moved to basement quarters in the Ottawa suburb of Eastview (now Vanier) in 1951 and to a new building in the government office park called Tunney's Pasture in 1955. In 1971 the first building of the present complex was built in the satellite community of Kanata, making the company the first "hi - tech" business in that growing city which calls itself "Silicon Valley North". By 1984 all operations were moved to the Kanata campus and the Tunney's Pasture building remained empty until it was the subject of the first large-scale radioactive decontamination exercise in Canada between 1990 and 1993. *(See* CNS Bulletin, *Vol. 15, No. 3, Autumn 1994.)*

From the early beginning in 1947 with just three people, MDS Nordion is now an international company of about 700, with headquarters in Kanata, Ontario (part of the Ottawa-Carleton Region). That location, which employs over 400 people, handles all of the processing of Cobalt 60 and of almost all of the reactor-produced radioisotopes The company operates a division in Vancouver associated with TRIUMF for the processing

and sale of accelerator-produced isotopes and has a recently acquired subsidiary in Belgium which also deals primarily in accelerator-produced radioisotopes. Overall the company supplies about two thirds of the world's reactor-produced isotopes and a wide variety of accelerator-produced radioisotopes. The operations in Canada have been certified to the ISO 9002 series of quality standards and the operations in Europe have received equivalent certification.

A shielded shipping container holding a source of Molybdenum 99 is loaded into an airplane for fast delivery to a hospital in the USA.

In a cooperative venture with the University of Quebec, the company operates the Canadian Irradiation Centre in Laval, Quebec whose role is researching and promoting irradiation technology. CIC provides courses in radiation processing and safety, conducts research and tests in the area of gamma radiation processing, and offers commercial irradiation services. Last year it irradiated almost 1 million kilograms of spices and over 5 million kilograms of proprietary materials.

MDS Nordion is an excellent "corporate citizen". Through activities such as an annual 10K run, celebrity golf tournaments, etc. it has become the major contribute to the local Community Resource Centre. It was also the first Canadian company to support the new Centre for Low Dose Radiation Research at the University of Ottawa.

Cobalt 60

A major part of the company's business is the sale of Cobalt 60, most of which is produced in the Bruce "B" reactors of Ontario Hydro. (Bruce "B" reactors use adjuster rods of cobalt which serve the dual role of helping control the reactors while providing a valuable commodity - Cobalt 60). Overall, MDS Nordion supplies more than 80 percent of global demand for Cobalt 60.

Cobalt 60 is the isotope of choice for gamma irradiators, large or small. It is also used in the cancer therapy machines. For the latter, the Cobalt 60 sources are produced in the NRU reactor because a higher specific activity is desired. Specific activities of 400 curies per gram or more are used in the therapy machines to achieve a physically small source, while the Cobalt 60 coming from the power reactors is typically in the order of 100 curies per gram. (MDS Nordion people tend to use the older units "curie" and "rad" presumably because most of their customers in the USA and elsewhere still do.)

MDS Nordion and its predecessors have sold about 100 large irradiation machines for gamma sterilization using Cobalt 60 which is almost two thirds of the world's total. The large scale irradiators are used mainly to sterilize disposable medical supplies, such as gloves, gowns, scalpels, sutures, needles, syringes, sponges, dressings, and intravenous tubing. Many of these are plastic products which could be damaged by other methods of sterilization. A potential new market for irradiators is the radiation processing of food to eliminate harmful bacteria and extend shelf life (See separate article on "Food Irradiation"). Figure XX illustrates a typical large irradiation facility.

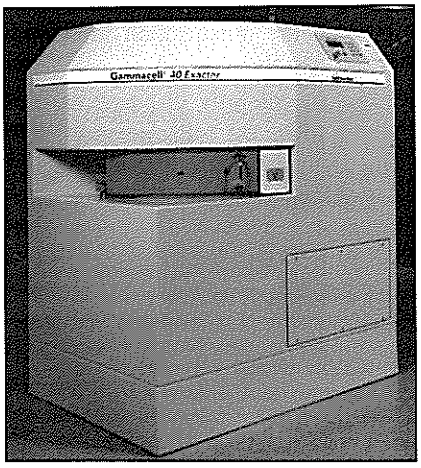
Large-scale commercial irradiators are used to sterilize or disinfect products in bulk. They consist of a large room or warehouse-type space that has 2-metre thick concrete walls. Inside the room is a deep pool of water in which a rack of encapsulated radioisotopes (Cobalt 60) is stored. To begin irradiation, the rack is raised from the pool. The product enters the room on a conveyor belt and is exposed to the radiation. Personnel operating the irradiator work outside the room, protected by thick concrete walls. Although the Cobalt 60 can be tens or hundreds of curies (more than 106 Mbq.) The water in the pool provides sufficient shielding that when the source is submerged personnel can enter the area.

When the rack is in the storage pool, it is safe for workers to enter the room.

Because gamma rays can penetrate even very dense materials, products can be irradiated after they are packaged and boxed. Irradiation is also ideal for sterilizing heat-sensitive products, such as plastics, since irradiation is a "cold" process that generates very little heat.

Among other applications of irradiation, a MDS Nordion irradiator in Australia is used to irradiate shipments of raw wool for export . Parasites found in sheep's wool are killed by the radiation, a requirement of many importing countries. Irradiation is also used for sterilizing male fruit fly larvae, decontaminating archival documents and archaeological artifacts, and preserving wood by destroying insects and molds.

After a hiatus of many years interest is growing rapidly, especially in the USA, in the irradiation of food, which would involve large irradiators such as those supplied by MDS Nordion. *(See separate article on Food Irradiation.)*

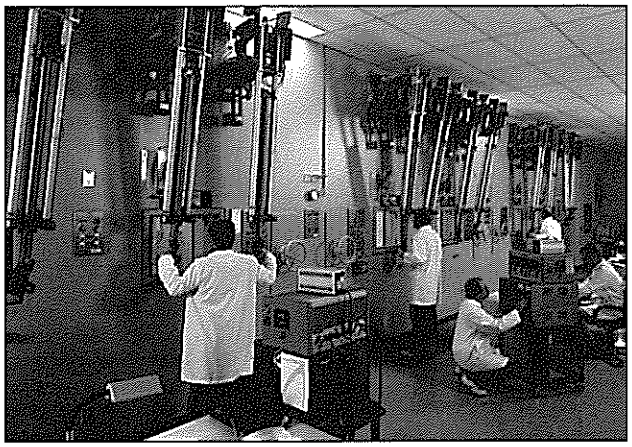


A "Gammacell" irradiator.

A large number of smaller irradiators, with the trade name "Gammacell", using Cobalt 60 as the radiation source, have been sold to hospitals, blood banks and labo-

ratories. Irradiation of blood for transfusions, for example, reduces the risk of Graft Versus Host disease in patients with severely weakened immune systems. The small irradiators are also used to study the effect of radiation on materials, such as space bound electronics.

The Cobalt 60 processing line at the Kanata facility is a series of hot cells, as shown in the accompanying photograph. Rods with the irradiated cobalt are shipped from the reactors in shielded containers. These are unloaded in a cell, the cobalt removed, sorted, measured and re-packaged such as into the long rods of Cobalt 60 used in the large irradiators. Prior to processing or to shipping after processing the Cobalt 60 is stored in a deep water-filled pool, a smaller version of the spent fuel bays at nuclear power stations.

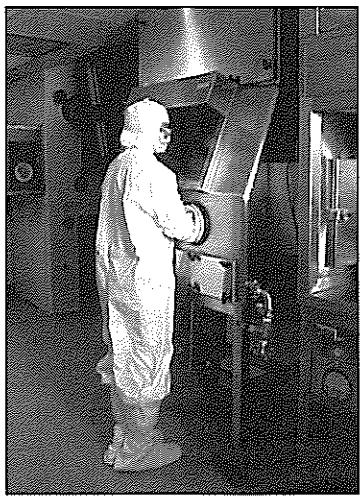


A view of the hot cells in which Cobalt 60 is handled at MDS Nordion's Kanata facility.

Radiopharmaceuticals

Most of the several radioisotopes supplied by MDS Nordion go into radiopharmaceuticals, compounds "labeled" with a particular radioisotope. The company supplies a large percentage of the radioisotopes used in radiopharmaceuticals for the approximately 20 million diagnostic imaging tests conducted annually by hospital nuclear medicine departments around the worlds. Imaging basically involves detecting the radioactive material as it travels through the body by multiple scanners and then producing a computer-generated image. The small quantity of radioactive material used and its very short half-life means that the radiation dose to the patient is minuscule.

The most important radioisotope for this purpose is Molybdenum 99. As part of the radioactive decay process, Molybdenum 99 produces Technetium 99m, a very short-lived radioisotope which has proven to be an ideal "tracer" for diagnosis of problems in many parts of the body, including the heart, brain, liver, lungs, thyroid gland, kidneys and bone.



A technician in complete overalls is shown at a "glove-box" in the new super-clean facility at MDS Nordion for radiopharmaceuticals

Since Mo 99 itself has a half-life of only 66 hours, the logistics of producing it and getting it to hospitals throughout North America are staggering. Mo 99 is produced as a fission product by the irradiation of uranium metal coupons in NRU. (The two Maple reactors now being built at Chalk River will take over this function in the year 2000.) The uranium target is taken out of NRU and given initial processing at Chalk River in the afternoon. It is rushed to Kanata in the evening where MDS Nordion technicians do the final processing overnight. By 7 a.m. the next day the packaged Mo 99 is on its way to the Ottawa airport to be flown by charter aircraft to its destination.

At the hospitals, the Mo 99 is put into a Technetium 99m "generator" by which the very short-lived Te 99m is "milked" off for use in diagnostic tests.

Other commonly used, reactor-produced, medical radioisotopes include: Iodine 131 for diagnosing and treating thyroids; Xenon 133 for lung tests, and Iodine 125 for radioimmunoassay procedures. The Vancouver and Belgium facilities supply cyclotron-produced radioisotopes for similar purposes, such as: Gallium 67 to study tumours, abscesses, etc.; and Indium 111 for the detection of infection and inflammation.

To date, MDS Nordion has primarily suppled bulk radioisotopes to pharmaceutical firms or hospitals which produce their own labeled radiopharmaceuticals. The company is moving towards the production of specialized radiopharmaceuticals itself and, to that end, has installed super clean room facilities. (See accompanying photograph.)

Maple

In July 1996 then Nordion International, AECL and the Government of Canada reached an agreement for the construction of two 10 MW(th) reactors and a new radioisotope processing facility at the Chalk River Laboratories. The reactors will be dedicated to radioisotope production. Under the agreement AECL will build and operate the reactors but they will be owned by MDS Nordion.

A Construction Licence for the reactors was issued by the Atomic Energy Control Board in December 1997. The schedule calls for the processing facility to be completed by July 1999, the first MAPLE reactor in September 1999. MAPLE 1 is slated to be turned ready for commercial production in May 2000 and MAPLE 2 by December 2000.

The MAPLE reactors are small pool type with a low-enriched uranium core. (A description of the generic MAPLE design was presented in Vol. 17, No. 4, Autumn 1996. issue of the CNS Bulletin.)

Further information is available from MDS Nordion's extensive Web site, www.mdsnordion.ca, including a list of the many positions currently open for employment in the company .

Food Irradiation

Ed. Note. Serious outbreaks of food poisoning last year in the USA from contaminated ground meat and the listing of methyl bromide, the most widely used pest control fumigant, as an ozone depleting substance, has led to a resurgence of interest, especially in the USA, in the use of ionizing radiation for the preservation of food. The following is extracted from material provided by Dr. Joe Borsa and Peter Kunstadt of MDS Nordion.

The international "radura" symbol for irradiated food.

History

Studies into the use of ionizing radiation for the preservation of food go back to the early 1900s, not long after the discovery of X-rays and radioactivity. Serious investigation was begun by the United States Atomic Energy Commission in the 1950s, which was fallowed by further work by the US Army in the 1960s.

In Canada irradiation of potatoes to inhibit sprouting was approved in 1960. AECL built a mobile irradiator to demonstrate the process and a private company was set up in Quebec. Unfortunately that initiative ran into financial problems and the company went out of business.

For a number of reasons, principally public uneasiness with radiation and the availability of other, less expensive, methods for fumigating or preserving food, the use of radiation has remained limited until recently. Two major factors in the USA have changed the outlook in that country dramatically in recent months.

One is the growing incidence of food poisoning. In the summer of 1997 a large number of people in the northwest of the USA were made ill as a result of contaminated hamburger served at a chain of burger restaurants. As a result, the meat supplier, Hudson Foods, one of the largest in the country, was forced out of business. The problem was identified as contamination by the E.coli 0157:H7 pathogen. In 1993 several people reportedly died from contaminated food at the Jack in the Box restaurant chain in Seattle.. It is known that up to 60 percent of the poultry and eggs sold in the USA are infected with salmonella. Other problems are parasites in fish and nematodes in pork that cause trichinosis in pork.

As a result many health professional have been advocating the use of radiation for food processing. A major step occurred in December 1997 when the US Food and Drug Administration approved the irradiation treatment of red meat. In November 1997 the USFDA had also modified its labeling regulations so that the disclosure declaration (that the food had been irradiated) need not be more prominent than the list of ingredients.. The "radura" symbol shown in Fig. 1 is internationally accepted as an identification that the food in question had been irradiated

The other factor favouring irradiation is the fact that the Montreal Protocol, under the UN environmental program, listed methyl bromide as an ozone depleting substance. As a consequence its use is being phased out in the USA and other countries. MeBr is the most widely used pest control fumigant in the world. Radiation is the most viable alternative.

Regulation

The first country to grant a clearance for human consumption of irradiated foods was the former Soviet Union. In March 1958, the former Soviet government granted a clearance to irradiate potatoes to inhibit sprouting and a year later, a clearance was given for grain to be irradiated for insect infestation. Canada, in those days, was not lagging far behind and granted a clearance in 1960 for sprout inhibition in potatoes at a maximum dose of 10 kRad (0.1 kGy). This dose was increased in 1963 to 15 kRad (0.15 kGy). In 1965, a clearance to irradiate onions up to the same dose was added to the list. The first clearance to irradiate foods in the USA was granted by the FDA in 1963, as a result of a petition to "Process Wheat and Wheat Products for the Control of Insect Infestation"

A 1981 brochure by the World Health Organization (WHO), on the "Wholesomeness of Irradiated Food" prompted the publication of another UN sponsored document on food irradiation. The Codex Alimentarius, under the auspices of the Food and Agriculture Organization (FAO) and WHO, published in 1984 the "Codex General Standard for Irradiated Foods and Recommended International Code of Practice For the Operation of Radiation Facilities Used for the Treatment of Foods". This document formed the basis of legislation in many countries. It states that "The irradiation of foods up to an overall average dose of 10 kGy introduces no special nutritional or microbiological problems". It also identifies acceptable sources of ionizing radiation and provides dose and energy limit guidelines. The "International Code of Practice" portion of the document provides a recommendation for global standards for the operation of a food irradiation facility.

Historically, Canada and USA listed irradiation under their respective Additives Acts. This caused confusion as it is well known that irradiation is a process, using electromagnetic energy, rather than an additive. The Health Protection Branch

of Health Canada reclassified irradiation as a food process, in March 1989. However, Canada has been very slow to approve the irradiation of food. Each item is considered separately and the only food approved in the last eight years was mangoes.

To date, clearances are in place in the USA for spices and dry aromatic ingredients, fresh fruits and vegetables ("fresh foods"), pork, poultry, food enzymes, and now, red meat. Canadian legislation has remained unchanged since the 1989 reclassification of irradiation as a process, rather than an additive. Foods cleared to date include potatoes, onions, wheat and wheat flour, spices, dry aromatic ingredients, and, in September 1997 after five years of deliberation, mangoes..

Globally, the legislation in various countries is still very divergent. For instance, the European Union has still not reached agreement on a guideline for the regulation of food irradiation, due to resistance from Germany. In contrast to Germany, The Netherlands, Belgium and France routinely irradiate many foods. To date, 40 countries have collectively approved irradiation of more than 50 different foods.

The labeling requirements in Canada and the USA are similar, requiring the international "radura" symbol and either of two statements: "treated with radiation" or "treated by irradiation".

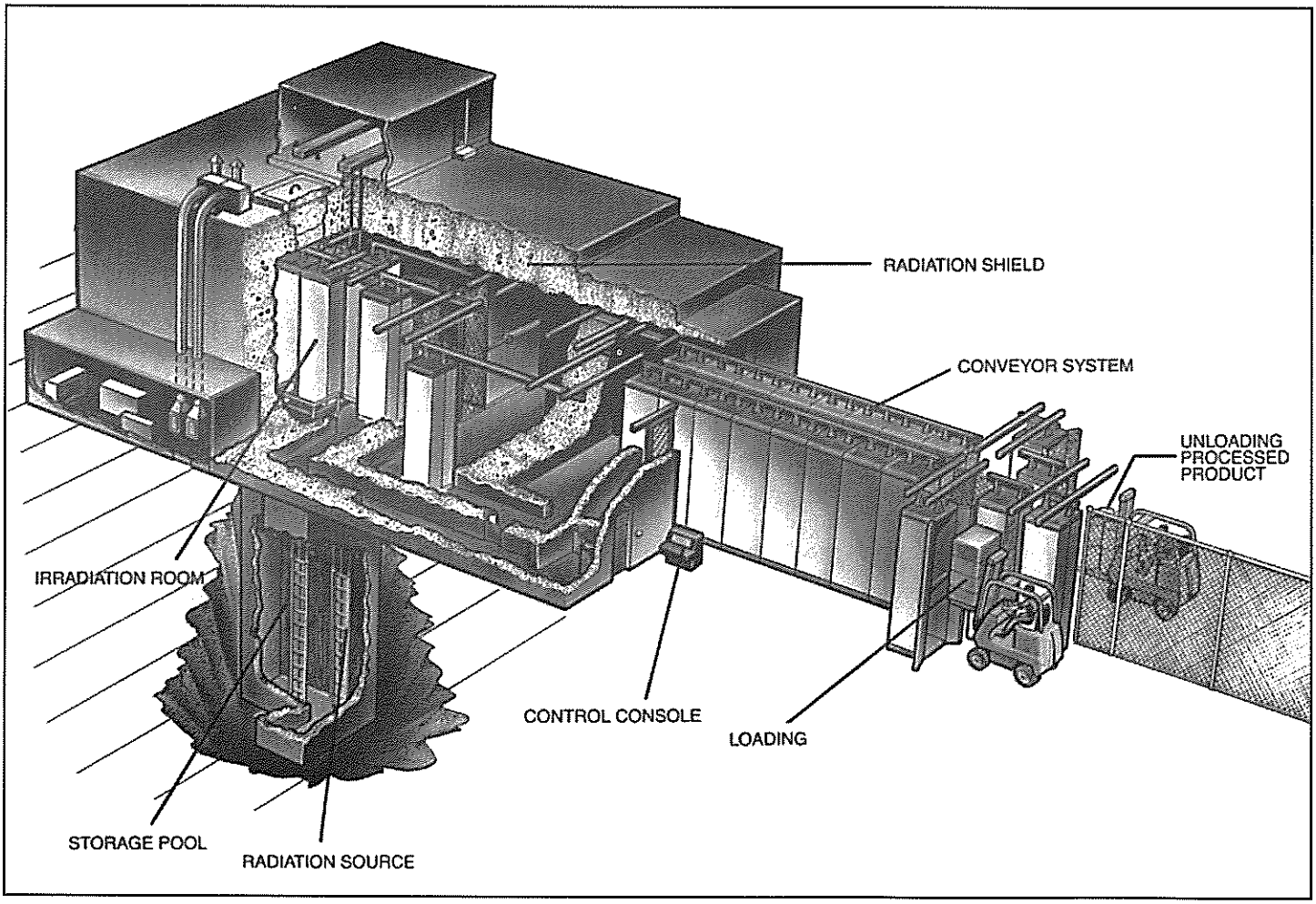
Process

The effect of ionizing radiation is at the molecular level. When molecules absorb ionizing energy they become reactive and form ions or free radicals that react to form stable radiolytic products. It is estimated that a dose of I kilogray (kGy)would break fewer than 10 chemical bonds for every 10 million bonds present. Despite this small number the effect can be dramatic. For example, breaking bonds in the deoxyribose nucleic acid (DNA) results in the loss of a cell's ability to replicate. A relatively small change in the DNA of a bacterial cell can destroy the cell. This disruption of the genetic material in a living cell is the principal effect of radiation on food.

Extensive tests have been conducted on the wholesomeness of irradiated food. A recent WHO review concluded that food irradiation:

- will not lead to toxicological changes that would have an adverse effect on health
- will not increase microbiological risk
- will not lead to nutrient losses that would have an adverse effect on the nutritional status of people.

A 1997 meeting of FAO, WHO and the IAEA concluded, on



the basis of knowledge from over 50 years of research, that irradiated foods are safe and wholesome at any radiation dose.

The most effective method is to treat the food after it has been packaged to ensure that no contamination occurs after irradiation. This, of course, means that the packaging material must not be affected by the radiation. Five Canadian made packaging materials have been accepted by Health Canada for such purposes.

Irradiation of food would be done in a similar manner to that for other commodities in a large radiation facility such as those offered by MDS Nordion.

A display of irradiated produce at one of the few stores in the USA selling irradiated food.

Marketplace

It is estimated that over 10 billion kg of irradiated food is sold in Europe annually. In North America Irradiated foods have been placed on sale in only a few locations. Irradiated fruit and produce from Florida have been available in a few locations since 1992. Market trails at a number of stores and exhibitions have shown a fairly high level of consumer acceptance once the process and its benefits have been explained.

An editorial in the January 1998 issue of the US journal, Food Technology, opined that ".. public acceptance [of food irradiation] in this country has arrived."

Readers wishing more detailed information on food irradiation may contact Dr. Joseph Borsa or Mr. Peter Kunstadt at MDS Nordion. Some further information is available through the MDS Nordion Web site.

CALL FOR PAPERS

Meeting of the Americas:
Nuclear Science, Technologies, Applications
Washington, D.C.
November 15-19, 1998
To be held in conjunction with the Winter Meeting of the American Nuclear Society

This objective of this conference is to advance cooperation and information exchange between the countries of the Americas (North and South) on the application and management of nuclear science and technology.
Papers are invited on current developments in the following areas: Basic and Applied Research; Power Generation; Medical Applications; Agriculture Applications; Waste management; Environmental Issues; Public Acceptance; Education and Training; economics and Business; Food Irradiation; Policy.
Summaries of between 450 and 900 words should be submitted by **June 26, 1998,** to:

Mr. Jorge Spitalnik, Technical Program Chair
Meeting of the Americas
c/o American Nuclear society
555 North Kensington Avenue
La Grange Park, Illinois, 60525 USA
Fax: 708-323-6464

(For information, Canadian residents can contact:
Fred Boyd, tel./fax 613-592-2256; e-mail: fboyd96@aol.com)

CNA/CNS Winter Seminar

With over 180 registrants, this year's ***Nuclear Industry Winter Seminar*** held February 9 and 10, 1998, was the largest in recent years. Sponsored by the Canadian Nuclear Association and the Canadian Nuclear Society, this annual event has been become the major opportunity for representatives of the Canadian nuclear industry to meet with federal Ministers, Members of Parliament and officials from the departments most concerned.

Following the pattern of the past few years the Seminar began with a dinner on the Monday evening. February 9, at which the Minister of Natural Resources Canada, **Ralph Goodale,** was the guest speaker. Referring to the Chinese proverb of "interesting" times, Mr. Goodale noted Canada's leading position as a suppler of uranium and its success of the sale of two CANDU units to China. Then he spoke of the challenges, particularly of "unprecedented" competition for (NPP) sales and the continuing skepticism of the public, especially in the light of the re-structuring at Ontario Hydro. The government's role, he said, was to: communicate the benefits of nuclear energy; ensure nuclear plants are built and operated safely and efficiently; and manage radioactive waste. (*Excerpts from his talk are reprinted elsewhere in this issue of the* CNS Bulletin).

Helen Johns

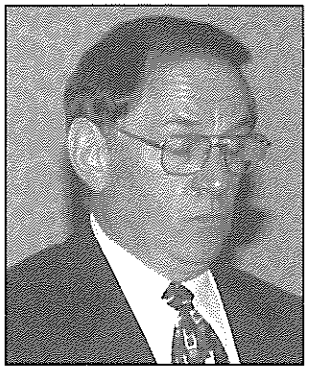
CNA chairman **Ernie Card** then presented Mr. Goodale with a plaque commemorating the long- standing membership of Natural Resources Canada (and its predecessor, Energy, Mines and Resources) in the CNA. Similar plaques were on display around the room which representatives of the various member organizations of the CNA were urged to take home.

The full day seminar on February 10 began with introductory talks by CNA president **Murray Stewart** and CNS president **Ben Rouben.** Stewart mentioned the appointment of three new directors to the CNA Board. Rouben noted that 1997 was a very active year for the CNS, with five conferences or symposia and one course presented. In closing he mentioned the initiative underway to incorporate the Society under federal law as a non-profit organization. *(Rouben's presentation is reprinted in the CNS News section).*

The presentations began with a hard-hitting speech by **Derwyn Shea,** MPP and Chair of the Select Committee on Ontario Hydro Nuclear Affairs. That committee was set up in September 1997 to review Ontario Hydro's restructuring program arising from the performance assessment conducted earlier in 1997, including the role of the Atomic Energy Control Board, and the economic and environmental consequences of the program. Shea visibly annoyed some of his audience by referring to a "nuclear cult" as a major cause of the problems at Ontario Hydro Nuclear. In closing, he emphasized that he and his committee believed that Ontario Hydro's nuclear operations are safe. *(Excerpts from the notes for Mr. Shea's address are presented elsewhere in this issue of the CNS Bulletin).*

Helen Johns, Parliamentary Assistant to the Ontario Minister of Energy, Science and Technology (Jim Wilson) and MPP for Huron, followed with an overview of the "white paper" ***Direction for Change:*** *Charting a Course for Competitive Electricity and Jobs in Ontario* which was issued in November 1997. (This paper had been mentioned by then Minister of Energy, Norm Sterling, at the CNA/CNS Annual Conference in June 1997.) The aim of the Ontario government, she said, was to "restore the vitality and financial integrity of the province's publicly-owned electricity system, to improve Ontario's business climate and create jobs". The paper proposes that Ontario Hydro be restructured into two new commercial companies: "GENCO" which would generate electricity, and "SERVCO" which would manage the transmission and distribution. A third company, an "independent Market Operator" will "ensure that electricity gets to customers in sufficient quantity to meet their needs". She emphasized that the White Paper is the government's road map on "how to" not "whether to" restructure Ontario Hydro. *(The Executive Summary from the White Paper is printed elsewhere in this issue.)*

Ms. Johns referred to two committees that had just been set up to advise on the transition: an **Electricity Transition Committee** and a **Market Design Committee.** Quoting from the news release, the Transition Committee will "provide a formal structure through which the government can hear from industry and consumer stakeholders affected by changes to Ontario's electricity sector". It will be co-chaired by



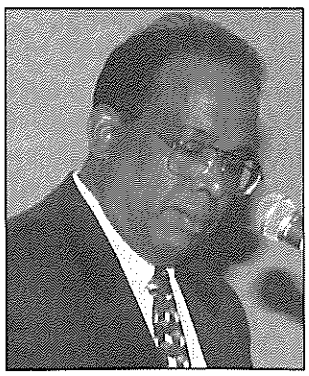
Carl Andognini

David McFadden, chairman of the "Stakeholders Alliance for Competition and Customer Choice", and by Arthur Kroeger, former deputy minister of Energy , Mines and Resources and currently Chancellor of Carleton University.. The Market Design Committee will "provide advice and recommendations on the rules and structure for a new competitive electricity market and on the governance and operation of an Independent Market Operator to manage this competitive market". In the question period Ms. Johns deftly handled some difficult questions aimed at Derwyn Shea who left the meeting immediately after his talk.

To round out the session on Ontario Hydro, **Carl Andognini,** executive vice-president and chief nuclear officer of Ontario Hydro, reviewed the Independent Integrated Performance Assessment (IIPA) which was issued in August 1997 and the resulting Nuclear Asset Optimization Plan (NAOP). "It took a long time for problems to develop", he said, "and it will take a long time to fix them". Among the root causes of the situation, he noted, in particular, the decentralization and downsizing that occurred in 1993. "Ontario Hydro never shifted from a design and construction organization to an operating one", he stated. As a comment to a question, Andognini asserted that he and his associates from the USA "did not come to fail, and will not fail".

David Torgerson

The president of the Atomic Energy Control Board, **Dr. Agnes Bishop,** gave one of her usual pointed speeches, this time on the **Regulator's Perspective** of recent developments in the nuclear power sector. Her comments were directed at Ontario Hydro's nuclear recovery program and at the Ontario government's White Paper on the restructuring of Ontario Hydro. *(Most of Dr. Bishop's remarks are reprinted in this issue of the CNS Bulletin).*



Elagu Elaguppillai

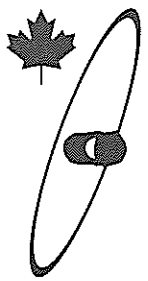
AECL vice-president **David Torgerson,** began his update on CANDU marketing by thanking Carl Andognini for visiting Korea and China to explain that the problems at Ontario Hydro were ones of management not with the CANDU technology.. He presented a quick survey of the market potential in several area: Turkey, Romania, China, Korea and Hungary and noted the constant development of the CANDU 6 design to improve economics, enhance safety, and exploit fuel flexibility. On the last point he commented that some DUPIC fuel would be tested in NRU this year.

Among the other presentations were: an update on uranium mining by **Gerald Grandy**, executive vice-president of Cameco; two views on Global Warming; a mixed message about the status of Food Irradiation by **Peter Kunstadt** of MDS Nordion *(see the feature articles on Food Irradiation in this issue);* a report on the de-commissioning of the sub-critical heavy water assembly at the University of Toronto; and a short encouraging note by **Elagu Elaguppillai** and **Phillipe Duport** on the International Centre for Low Dose Radiation Research which now has been officially sanctioned by the University of Ottawa.

On the "global warming" issue, **Sue Kirby,** director general, Energy Policy Branch , Natural Resources Canada, reviewed the protocol on "greenhouse gases" agreed at the Kyoto conference in December 1997. It sets targets and timetables for the reduction of CO2 and other gases, and creates "flexibility mechanisms" for emission trading and for the accounting of "sinks". The protocol is open for signing in March 1998 and will come into effect when 55 countries have ratified it. Canada has agreed to achieve a reduction of 6% form the levels of 1990 by 2010. Ms. Kirby noted that this is equivalent to a 21% reduction from where we would be if no action were taken.

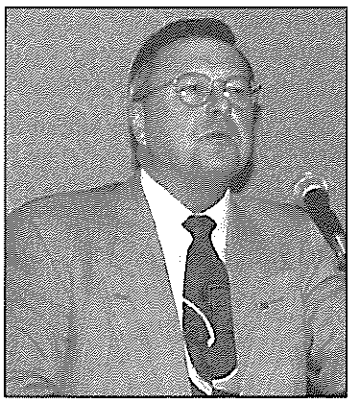
CNS president **Murray Stewart** presented a view from the Canadian nuclear industry on the Kyoto protocol. As an indication of the contribution nuclear power can make in reducing "greenhouse gases" he observed that the shutdown of the Pickering A and Bruce A plants of Ontario Hydro would result in an increase of CO2 production of 20 million tonnes per year. In 1990 Canada produced 564 million tonnes. A recent OECD study, he noted, showed that nuclear was competitive in most countries on a "levelized unit energy cost" basis, even without applying a cost for the detrimental environmental effects of gas emissions from fossil plants. (The full CNA paper, entitled *The Nuclear Option and Climate Change* is available on the CNA Web page at, www.cna.ca, or accessible through the new CNS Web page.)

This successful Nuclear Industry Winter Seminar was organized and run by Colin Hunt, Kristin Plater, Marlene Thomas and Sylvie Caron of the CNA/CNS office. They and the CNA and CNS members attending were pleased with the increased number of MPs and officials who took part this year.



Federal Government Perspective

Ed Note: Following are excerpts from the address by Ralph Goodale, Minister of Natural Resources Canada at the opening dinner of the CNA/CNS Winter Seminar in Ottawa, February 9, 1998.



Ralph Goodale

This is my first opportunity as Minister of Natural Resources to meet with a full cross-section of Canada's nuclear industry. I have been looking forward to sharing some thoughts about the prospects for your important industry in the months and years to come. If I can borrow from an old Chinese proverb, these are indeed interesting times in which we live. This is especially true for the nuclear industry in Canada.

I would like to outline the Government's perspective on some of the issues so that you have an idea of our expectations, as well as our policy priorities in the next few years.

Prospects for Uranium

Canada is the world's leading exporter of uranium, with shipments valued at about $600 million per year and rising. We supply nearly 20 percent of the uranium used in nuclear reactors around the world. Given the long-term contracts being negotiated by uranium producers and the fact that Canada has some of the largest and richest uranium deposits in the world, it is quite possible that we may once again achieve uranium exports of one billion dollars a year.

At present-day prices, there is as much as $25 billion worth of uranium in known deposits in northern Saskatchewan, and environmental assessments have clearly demonstrated that uranium can be mined in Canada in a safe, environmentally acceptable and sustainable manner.

The Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan has just recently brought a six-year environmental review process to a close. This has been a lengthy exercise, but an absolutely essential one to ensure that proper consideration has been given to the potential environmental impact of uranium mining.

Over the past five years, four new uranium mining projects in Saskatchewan have been approved by review panels. Two of these projects are now in production – the Dominique-Janine mine extension and an extension of the Rabbit Lake mine. A third project – the McClean Lake mine – is expected to commence production this year. If all goes according to expectations, the McArthur River mine should open in 1999.

Environmental assessments have also been completed for two additional uranium projects in northern Saskatchewan, the Midwest and Cigar Lake mines. The joint panel has recommended that these multi-billion dollar projects proceed, subject to various conditions and recommendations, and within the next few weeks, my Cabinet colleagues and I will respond officially to this most recent panel.

Prospects for CANDU

On the reactor side of the nuclear industry, the Canadian sale of two 700-megawatt CANDUs to China in late 1996 provided a much-needed international boost. As you know, the Canadian component of this contract will be worth $1.5 billion and will create some 27,000 direct and indirect jobs for Canadians.

At the Qinshan project, the construction of its two reactors is now about 10 percent complete. This project enhances the reputation of Canada's nuclear industry for successfully completing projects that are technically, logistically and financially complex.

In other Asian markets, I am pleased that completion of the two remaining stations in Korea is proceeding on schedule following the successful start-up of Wolsong 2 last summer. I am told that a decision is expected soon on additional units for the Bonggil site adjacent to Wolsong.

AECL is also working on CANDU sales in a number of other export markets. Last fall, the corporation submitted a very comprehensive and competitive proposal for two new CANDU units in Turkey. In Hungary, AECL has responded to an invitation to bid on a project that will involve both nuclear and fossil fuel-generating plants. The Government of Romania has decreed that the completion of Cernavoda 2 is a national priority in that Country.

Other Applications

Of course, there is more to the nuclear industry than uranium and reactors. Nuclear technologies also have applications in other industries, including the petroleum, agricultural and medical sectors. Indeed, for the past five decades, Canada has been at the international forefront in developing medical applications for nuclear technologies – applications that have become critical to the functioning of a modern health care system and that help save lives around the world every day.

In this regard, the decision by MDS-Nordion to invest in two MAPLE reactors at Chalk River dedicated to the production of radio-isotopes is very welcome news. As you know, MDS-Nordion is the world's leading supplier of Moly-99 medical isotopes.

Challenges to the Industry

Internationally, the Canadian industry faces unprecedented competition for reactor sales. To ensure long-term success, AECL and its consortium partners will have to find creative ways to further reduce costs and construction times in order to enhance the competitiveness of the CANDU line. This same creativity will be needed in financing, as well as in forging new strategic alliances that share the risks and rewards of international projects.

Here in Canada, the nuclear industry is also facing new competitive challenges.

Steps are under way to restructure both the market and Ontario Hydro. In this new marketplace, nuclear power plants will be subject to the same market-based cost discipline as other generating options.

What will not change is the need to meet the highest standards of public health and safety in the operation of nuclear plants. And therein, I believe, lies the single largest challenge facing your industry today – the issue of public acceptance of the nuclear option.

The single largest challenge facing the industry today is the issue of public acceptance

And let's be candid: public faith in nuclear energy is delicate, to say the least. The management failures at Ontario Hydro have extracted a heavy toll in many ways, including lost credibility. Without public support, nuclear power has only a limited future.

In my mind, greater public acceptance of the nuclear option comes down basically to three things:

- first, communicating clearly the benefits of the technology from an environmental and energy-supply perspective;
- second, proving we, Canadians, can build and operate our plants safely and efficiently; and
- third, effectively managing radioactive waste.

When it comes to nuclear power, there is a huge gap between perception and reality. It is a gap this industry must tackle both with actions and with effective communication and information programs.

The best way to do that, of course, is to demonstrate to Canada, demonstrate to the world, that CANDU technology is robust, reliable and cost-competitive throughout its economic life. Ontario Hydro's ability to improve the management of its nuclear assets will be integral to the industry's future, both in Canada and in international markets. Quite simply, we need to demonstrate that we can manage our technology – Canadians and the international community are watching very closely.

Government's role

Public health and safety are paramount for the Government of Canada. The need for a strong, independent and responsive regulator goes without question. It is essential that government institutions and the industry be united in the goal of ensuring that nuclear reactors are being operated safely, and that they deal with public concerns openly and effectively.

About a year ago, the Nuclear Safety and Control Act received Royal Assent, and regulations are now being developed to implement the legislation. We plan to publish draft regulations in The Canada Gazette toward the end of March or the first part of April, with the Act and regulations coming into force late this year.

In addition to the health and safety issue, there is serious public apprehension about the long-term environmental impacts of nuclear power, and particularly the disposal of radioactive waste. This is a significant financial and public policy issue, and one this Government intends to address in its current mandate.

Toward this end, implementation of the federal Policy Framework for Radioactive Waste will be a priority for our Government over the next couple of years. As you know, that framework sets out a comprehensive and integrated approach to the long-term management and disposal of radioactive wastes in Canada. It clearly defines who does what through a set of principles governing the institutional and financial arrangements for disposal of radioactive waste by waste producers and owners.

The federal Policy Framework for Radioactive Waste, along with the (soon to be released) from)the environmental) panel, should put the Government of Canada in a position to move toward finding a safe, acceptable and cost-effective solution to the long-term management of used nuclear fuel in Canada.

Once we are in that position, we will work with industry to comply with the framework and to develop and implement disposal plans. Action must be taken, and will be taken, in the short term.

The Future

The long-term viability of this industry will depend on its ability to work together in dealing with such issues as waste disposal.

I would also urge the industry to work together in tackling the issue of public perception. One way I think you can do that is by making the industry and its operations more transparent to the public.

You have a responsibility to ensure that the Canadian people are better informed about your industry, your technology and the various health and safety issues and how they are being dealt with. You have an opportunity to affect whether public acceptance for the nuclear power option will grow, or whether the industry will continue to face public doubts.

The industry must work together to tackle the issue of public perception

Addressing this public perception problem is a very significant communications task, but one that you should tackle with enthusiasm and confidence, recruiting as many partners and participants as you possibly can, because you have the knowledge and insight which you can and should impart in a convincing manner.

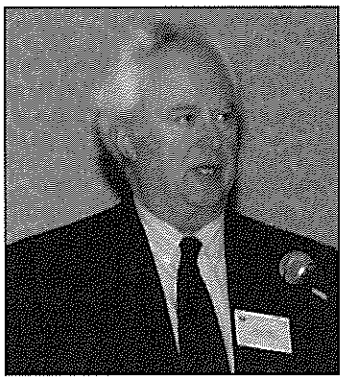
Conclusion

The coming years will be a time of both challenge and opportunity for the nuclear industry. The industry needs to work hard to restore the image of nuclear power here in Canada, through concrete action and measurable results, actions and results that build public confidence. It also needs to find innovative ways to compete both domestically and abroad. And it needs to work closely with Government in addressing the long-term disposal of radioactive wastes.

Given this industry's record of innovation, entrepreneurship, foresight and the ability to rise to a challenge, which you have proven, I have no doubt that Canada's reputation as a world leader in the safe and sound commercial application of nuclear technology can grow and prosper in the future. That future is very largely in your hands.

Report on Select Committee

Ed Note: *Following are excerpts from the prepared remarks by Derwyn Shea, Chairman of the Select Committee on Ontario Hydro Nuclear Affairs to the CNA/CNS Winter Seminar in Ottawa, February 10, 1998*



Derwyn Shea

I would like to give a general overview of the Select Committee's activities, findings, and recommendations.

Committee Structure and Terms of Reference

The Committee was formed on September 22, 1997 to examine the report of the Nuclear Performance Advisory Group's Independent Integrated Performance Assessment (IIPA) as it pertained to the performance and reliability of Ontario's nuclear facilities. We also reviewed the Atomic Energy Control Board's (AECB) report on these matters and made recommendations on training and implementation plans related to safety. In addition, we were charged with the task of examining the costs and environmental impacts of the proposed nuclear recovery strategy, including Ontario Hydro's financial justification for its nuclear recovery strategy; the economics and viability of alternative supply options; and the environmental impacts of all of the above.

The Committee had a deadline of December, 1997 to file its report, and was given full power and authority to examine witnesses under oath.

What We Found

Generally speaking, the Committee learned what had apparently been well known within the industry – that Ontario Hydro was justifiably well recognized around the world for *designing and building* nuclear facilities, but its maintenance programme left much to be desired. We found a system that was well designed and very safe, but in need of a desperate over-haul and upgrading of its maintenance protocol and its human resources pool. It took time for Hydro to come to the painful realization that its operations, were not up to scratch: no doubt pride and self-confidence made this realization difficult.

The Problem – A History of Neglect

In early 1997, Ontario Hydro formed the Nuclear Performance Advisory Group, consisting of independent, outside experts. The situation they found was something just short of alarming. In an industry where a nuclear capacity factor of 90% is seen as achievable, and 85% to be excellent, average capacity at Ontario Hydro Nuclear had declined to 60 to 74% in the last decade.[1] Overall, the study graded nuclear operations to

be "minimally acceptable" and indicated that a significant effort would be required to return the generating stations to world class performance standards. Where Ontario Hydro used to find its nuclear operations ranked in the global top ten in terms of operating reliability during the 70's and 80's, Ontario now found itself closer to the bottom.[2]

On August 13, 1997, the utility announced that the Board of Directors had decided on a recovery stragegy to temporarily "lay-up" seven of its nuclear reactors in an effort to improve the operations at the remaining 12 units. The total cost for the Nuclear Asset Optimization Plan was pegged at $5 - $8 billion dollars, which included alternate energy costs for the lay-up period.

While history will be the final arbiter, in the world of Bill Farlinger, Chairman of the board at Ontario Hydro, Ontario Hydro had been taken over by a "nuclear cult", oriented toward building, rather than running, nuclear plants.

Ontario Hydro seems to have a history of poor management of its nuclear assets that seems to be disturbingly common to many nuclear suppliers. Even the newest facility at Darlington, which began operations in 1991, experienced significant maintenance problems during the first four to five years. Substantial downsizing in the area of human resources during the '93 - '94 fiscal year may have hindered success at achieving nuclear operating improvements, and this has been directly related to the problems at Darlington. This was coupled with Hydro's apparent inability to make the transition from the design and construction focus of the 70's and 80's to asset management once construction was completed. Chairman after Chairman attempted different policies but with little or no net effect. It was finally Bill Farlinger who drew the line in the sand and put a realistic recovery plan in place.

Moving Ahead

In deciding to lay-up the 'A' units at the Bruce and Pickering sites, which amounted to the seven oldest units, the Select Committee came to the opinion that Hydro probably chose the best of a number of options, all of which were costly and all of which had significant risk attached to them.

The choice of option five held serious implications for Hydro in the short term. The Ontario Hydro Board was advised of the following: that a reduction in export sales would be required along with a significant increase in fossil generation and that this increased fossil fuel burning would lead to increased replacement fuel costs. As a result of new fossil generation, there would be a corresponding increase in air emissions over and above voluntary limits set by the corporation in its global greenhouse gas commitments.

The financial impacts of this decision are also serious. Hydro will incur operating losses over the planning period and retained earnings will be drawn down, raising the possibility of negative retained earnings.

Dealing with The AECB

The province relies heavily on the AECB to regulate nuclear safety since jurisdiction over nuclear affairs lies at the federal level. The Atomic Energy Control Act was old, vague, and didn't include modern regulatory enforcement tools, including the ability to level substantial fines, which lay at a maximum of $10,000. The recently passed, but not yet proclaimed *Nuclear Safety and Control Act* is a long overdue update in terms of federal regulation of the nuclear industry.

The Committee was not satisfied with the regulatory relationship between Ontario Hydro and the AECB, which seems to have tolerated safety infractions for several years. The Committee found that the AECB had limited itself too much to safety rather than operational issues in the belief that these issues exceeded their safety mandate. A more formal approach to relations between the two organizations is required and enforcement that is transparent and applied consistently is essential.

Emergency Planning and Fire Prevention

Unfortunately, the theme of "below standard" has become fairly common throughout this address, but is again troubling to find that the IIPA report found this to be the case in terms of emergency planning at all three nuclear sites. Amongst other deficiencies, the report found that communications with local communities was ineffective, and that Ontario Hydro Nuclear had neglected to follow-up on agreed-upon plans.

Hydro officials testified that, in response to the IIPA, the corporation will be spending $151 million to upgrade facilities in the areas of emergency planning, response, fire prevention and suppression.

In the area of fire prevention, the Committee found that divided jurisdictions seem to prevent the Ontario Fire Marshal's office from applying its expertise to fire prevention at Ontario Hydro Nuclear.

The Committee was very concerned over these divided jurisdictions in relation to fire prevention and safety, and to existing deficiencies in terms of emergency planning. The Select Committee was absolutely uncompromising in the opinion that anything less than an 'excellent' rating in these areas especially is unsatisfactory, and the public deserves and demands an effective and immediate response to these issues.

Recommendations

Our report detailed 39 recommendations made to Ontario Hydro and the Ontario government. I offer a few highlights. The number-one guiding principle in all of this was the need to define 'safety' in the broadest terms possible, and to put that issue first and foremost in the minds of everyone connected either directly or indirectly to the operation of Ontario Hydro Nuclear.

Management and unions must work together to ensure adequate management and supervisory leadership, and to quickly resolve outstanding labour issues among all parties.

In terms of the decision to lay-up the seven reactors, the Committee recommended that this be carefully reassessed and documented in the 1998 business plan, and that the communities affected be involved in investigating alternatives to lay-ups.

We encourage the AECB to develop safety benchmarks for nuclear operations as quickly as possible and that it develop a report card system to be publicly issued semiannually. The federal government should also review enforcement policies of the AECB with an eye to developing a more aggressive approach to regulation.

The new Ministry of Energy, Science and Technology should coordinate with the federal government to develop a new federal *Nuclear Safety and Control Act* to achieve a transparent, objective and codified process of regulation of the nuclear industry. In addition, the Ministry must clearly define the Ontario Energy Board's responsibility over Ontario Hydro.

Ontario Hydro should set 1999 as a target for achieving excellent performance ratings for emergency preparedness.

Finally, the office of the Ontario Fire Marshall should work with the AECB to clarify and reduce jurisdictional limits so that the Fire Marshall can increase its role over fire prevention at generating stations.

I am confident that these recommendations, together with an open-minded approach to changes from both management and unions, can result in Ontario Hydro regaining its position among the best in the world in the short-to-medium term.

Conclusions

Our report pulled no punches, and I don't believe that I have done so today either. But with that in mind, let me underline one sentiment in particular: Ontario Hydro's nuclear operations *are safe.* I don't want anyone to leave here today thinking otherwise. Ultimately, problems have been identified early enough that reasonable, rather than Herculean efforts, are now required to address the current situation.

That having been said, however, many important lessons have been learned over the last year. We have learned that nuclear energy cannot be taken for granted. I remain convinced that nuclear energy is a safe, environmentally sound method for meeting the great demand for power that has become an undeniable characteristic of every industrialized economy. But with that enormous power to deliver comes an enormous responsibility which requires nothing short of extreme vigilance. Public confidence is crucial.

I leave you today knowing that the nuclear industry in Ontario is moving forward with its mandate to provide a safe, clean, and reliable source of energy that will move our province strongly into the next millennium.

"White Paper" on Ontario Hydro

Ed Note: *Following is the Executive Sumary of the document "Directions for Change: Charting a Course for Competitive Electricity and Jobs in Ontario", which was issued in late November 1997.*

The Government has developed a plan for introducing full competition into Ontario's electricity system in the year 2000. Implementation of the plan involves legislative change, and is subject to approval by the Legislative Assembly.

Competition among suppliers will create the conditions for lower electricity prices, thereby supporting investment and job creation across the province. It will ensure that investments in electricity generation and transmission are made prudently and that assets are managed carefully and responsibly. It will mean more choices for customers and will lead to new technologies and approaches that are safe, reliable and better for the environment.

The *Advisory Committee on Competition in Ontario's Electricity System*[1] made recommenda tions on how to open up Ontario's electricity market. The Government agrees with the Advisory Committee that the need for change is compelling.

Neighbouring provinces and states are restructuring their electricity sectors and are expecting lower prices. Ontario needs to keep pace to preserve its industrial competitive ness. Favourable electricity prices are critical to attracting investment, and to creating and preserving jobs

The business record of Ontario Hydro has been unsatisfactory, as shown most recently in a highly critical assessment of Ontario Hydro's nuclear division prepared by a team of U.5. experts. Ontario Hydro's problems have continued over a number of years, and are in large part due to the fact that the corporation is a monopoly, and has not been subject to the discipline of the marketplace.

New opportunities are emerging as the North American electricity industry changes from one based on monopoly to one based on competition. Ontario needs to restructure its electricity industry in order to create a business climate which supports new technologies, new services, and new ways of doing business.

The Government's main restructuring objective is to support investment and jobs through the lowest possible electricity prices and the best possible electricity service. The Government continues to place a high priority on safety, reliability, and sound environmental practices, and has designed its restructuring plan to maintain and improve on current perfor mance. Other major objectives include the establishment of more commercially oriented electricity companies and the restoration of financial soundness in the provincially-owned part of the electricity industry.

1 The Committee, chaired by the Honourable Donald S. Macdonald, reported in June 1996.

The Government has developed a nine-part plan for restructuring the electricity industry, re-organizing Ontario Hydro into new companies, and putting the new companies on a sound business and financial footing. It proposes to introduce legislation covering this plan in 1998. If approved, key parts of the plan would be proclaimed and implemented as soon as possible. The Government proposes to consult widely on the legislation and on a number of specific issues that require further consideration and public discussion.

The plan would:

- create a competitive market in the year 2000 for both wholesale and retail customers
- establish an Independent Market Operator, and provide for an interim supply market for replacement power
- separate monopoly operations from competitive businesses throughout the electricit sector
- provide the Ontario Energy Board with an expanded mandate to protect electricity consumers
- take steps to ensure environmental protection
- encourage cost savings in the local distribution sector
- establish a level playing field on taxes and regulation
- restructure Ontario Hydro into new companies with clear business mandates, and,
- take action to put the new electricity companies on a sound economic and financial footing.

The Government proposes to create two new commercial electricity companies to succeed Ontario Hydro. The Ontario Electricity Generation Corporation would take owner ship of Ontario Hydro's generation assets, and have a mandate to ensure safety, reliability, and sound environmental performance, while maximizing the value of the generation business to Ontario taxpayers. The Ontario Electric Services Corporation would be a holding company for other electricity businesses, including transmission, distribution, retail, and operating contracts. It would be required to keep its monopoly and competitive businesses separate from each other through an appropriate structure of subsidiary companies.

Existing Ontario Hydro debt will be held by a publicly-owned financial holding company, as recommended by the Advisory Committee.

The Government will work with Ontarians to ensure that the electricity industry is restructured in a timely and well-managed way, with the necessary protections for both business and residential customers.

An independent Market Design Committee composed of industry and customer represen tatives will have a large role in designing the rules for the new market. Its composition and terms of reference will be announced shortly. Under the plan, a redesigned Ontario Energy Board would ensure that fairness prevails in the operation of the market and the setting of transmission and distribution tariffs. Ontario Hydro and its successors will be expected to work closely with employee organizations to achieve a smooth implementation of the proposed corporate restructuring.

The Government will ensure that Ontarians have opportunities to comment and provide advice every step of the way. It will consult on the drafting of the proposed legislation. It will consult on measures that may be required to recover potentially stranded debt. And it will continue to consult with municipalities and local distribution utilities on aspects of restructuring in the distribution sector.

If adopted, the plan outlined in this paper would ensure the vitality and financial integrity of Ontario's electricity system, increase opportunities within the electricity industry, maximize benefits to electricity consumers, improve reliability, safety and the environment, and, most importantly, support investment and job creation in Ontario's expanding economy. This plan charts a course for competitive electricity and jobs in Ontario.

A Regulatory Perspective
on Recent Developments in the Canadian Nuclear Power Sector

by Agnes J. Bishop
President, Atomic Energy Control Board

Ed Note: *Following is slightly edited version of the text of Dr. Bishop's talk to the CNA/CNS Nuclear Industry Winter Seminar, in Ottawa, February 10, 1998.*

Thank you for asking Atomic Energy Control Board to participate in today's proceedings.

Some significant developments have occurred within the Canadian nuclear power industry during the past year. Associated with these developments there are two issues which I would like to discuss with you from the regulators point of view. While most of my comments are focused on Ontario, they can apply to the other two provinces that use nuclear power to generate electricity.

Dr. Agnes J. Bishop

The two developments I wish to comment on are:

1. Public misconceptions in regard to Ontario Hydro's Nuclear Recovery Program;
2. Economic de-regulation and increased competition within the electricity industry.

Ontario Hydro's Nuclear Recovery Program

The announcement by Ontario Hydro of its Independent Integrated Performance Assessment (IIPA) and the closure of seven of its nineteen operating reactors led certain segments of the public not only to question the industry's capability to operate these facilities safely, but also to question the effectiveness of the AECB.

There are concepts and principles of regulation which appear to be difficult for the public to accept and sometimes difficult for the regulator and perhaps the industry to explain. I believe it is important to look at these issues because it highlights for the AECB some of the areas in which improvement in its communications must occur.

Let me turn to the first misconception.

Only through the findings of the IIPA was it recognized that Ontario Hydro was operating well below the level of good or excellent by world standards.

The reality of the situation was that since 1989, the AECB recognized that the operating and maintenance standards at Ontario Hydro had declined to the point that major corrective actions were required. This was discussed in the public meetings of the Board, and recorded in various documents which were also available to the public. Ontario Hydro agreed with the AECB assessment and furthermore recognized that the problems were significant. They determined it would require three to five years to turn themselves into a good or excellent nuclear operator based on industry standards. They further indicated that they were committed to do so.

Over the next few years several acceptable plans were developed and implemented by Ontario Hydro to correct the situation. For various reasons an acceptable rate of progress or sustainability of improvements achieved could not be demonstrated.

By 1996 AECB judged the situation at Pickering 'A' to be particularly critical and only a six-month licence renewal was granted. In addition the utility was warned that the station was in danger of regulatory shutdown unless improvements were made in management and operational safety. In June 1997, a nine-month licence renewal was given indicating some improvements had occurred but much more was required. Sustainability was not yet demonstrated.

In August 1997 Ontario Hydro announced the findings of its Independent Integrated Performance Assessment (IIPA). and began its Nuclear Recovery Program. The IIPA findings were not a surprise to the AECB since the Board had previously reached similar conclusions. To correct the situation, Ontario Hydro proposed a Nuclear Asset Optimization Plan (NAOP) which involved the lay-up of seven of its nineteen operating reactors.

This led to the second significant misconception.

A large part of the public believed Ontario Hydro shut down the reactors for safety reasons not as part of its recovery and plan and therefore, criticized the AECB for not shutting the reactors down prior to the licensee doing so.

AECB's position was that while Ontario Hydro had urgently to make operational, maintenance and management improvements if they were to continue to be licensed, the reactors were operating safely under the

condition of the licence and for the duration that the licence was granted.

How Ontario Hydro or any other licensee is to manage its operations to achieve and sustain the required improvements is up to the licensee as long as it is acceptable to the regulator. This issue deals with three areas that appear to be difficult for some members of the public to accept.

- The regulator does not manage the operations of a licensee. The regulator does have the responsibility of pointing out the licensee management practices which may be contributing to a decrease in operational standards and which have the potential to erode safety margins.
- The AECB is not responsible for the protection of the licensee's assets.
- The final responsibility for safety does not rest with the regulator but must rest with the operator. We need to continue to explain to the public why it can be no other way.

Other areas in which we must better inform the public include:

- The differentiation between issues affecting safety in the immediate or short term and other issues which do not have safety implications now but will become safety issues in the future if not corrected.
- The licensing process.

This is evidenced by the public not recognizing that a six-month operating licence is the step just before regulatory closure. It is also evidenced by members of the public and certain professional bodies believing that the AECB has no options between granting a licence and withdrawing a licence. In fact, there are several mechanisms open to the AECB which it can and does use during its regulatory activity. Various actions have been taken including shutdown of reactors and the utilization of specific conditions of licensing to name only two.

I cannot leave this topic without pointing out the confusion which can occur when the regulator or the industry uses terminology which can easily be misinterpreted by the public.

Even when there are clear definitions of terms like "below standard" and "minimally acceptable", the licensee, the regulator and the industry may be interpreting them differently. An excellent example of this is the use of these terms in the IIPA report. Ontario Hydro clearly defined what it meant by "below standard", i.e., performance is below industry standards but generally produces the desired results and increased management attention is needed to improve performance.

The public interpreted "below standard" in the ordinary sense that they would use those words, i.e., the utility was not meeting desired results and were therefore unsafe. The regulator in using similar terms does not include cost-efficiency or cost-competitive measurements which the industry does. I believe that when industry or the regulator uses these terms we must not only define what is meant but we must continually repeat the definitions when we use them.

Before moving on to discuss de-regulation, I want to say a few words about one comment in the **Select Committee Report** (our response to the entire report has been made public and is available on our web site).

The Committee observes that the current nuclear safety legislation is too vague and that the new Act will enable the new Commission to institute a transparent process which will be codified through detailed regulations. We fully agree that the new Nuclear Safety and Control Act and its associated Regulations will establish a sound legal basis for the new Commission and that it will give it clearer authority for enforcing its policies and practices. However, even if those new powers had been in place ten years ago, we do not believe that our regulatory action, vis-à-vis Ontario Hydro, would have been vastly different. The difficulties which Ontario Hydro faces today were **not** due to the limitations of the Atomic Energy Control Act.

The Ontario Government White Paper

Let me turn now to the White Paper on Ontario Hydro restructuring, published by the Ontario Government in November 1997.

In order to successfully introduce competition into Ontario's electricity system, this plan proposes, among other things, to create two new commercial electricity companies, responsible respectively for generation and transmission of electricity. An Independent Market Operator would also be established to dispatch power based on least cost bids and to arrange financial settlements between buyers and sellers.

Why are these proposed arrangements of interest to the AECB?

Let me be very clear on this point. It is not the mandate of the AECB to dictate to a provincial government how it should organize its electric utility industry. It is the mandate of the AECB, however, to carefully review all factors which can affect the safety of nuclear installations. Consequently, from the AECB perspective, it is important that structural changes in the electric industry sector be made with full recognition of the specific safety needs of the nuclear power stations.

In this regard, grid stability and reliability of off-site power are examples of considerations which can have a direct impact on the safety of nuclear stations. From an operational point of view, the AECB will expect, for example, power manoeuvres on the grid to be governed by rules which will minimize the probability of power interruptions to nuclear stations or minimize their duration should they occur. We would also expect that nuclear stations will not be required to change their power output frequently just because cheaper power can be imported from elsewhere as market conditions change throughout the week or month. As a minimum, the safety implications of operating in such a mode would have to be properly assessed and found acceptable before it could be authorized.

The proposed restructuring of Ontario Hydro could also affect nuclear safety in other ways. In a market-driven environment, care must be taken to ensure that decisions made in the nuclear sector are not unduly influenced by the pressure to compete successfully against other energy producers or to make short term gains at the expense of longer term safety objectives.

Safety margins in design, plant maintenance, staff training, safety-related research and size of the workforce are examples of areas where cost concerns may affect nuclear safety.

The financial dimension of the proposed restructuring of Ontario Hydro is also of interest to the AECB because there is a direct link with long-term nuclear safety. In its current structure, Ontario Hydro is responsible for the eventual costs associated with the decommissioning of its nuclear stations and disposal of spent fuel. Presently, such costs are identified as a liability on Ontario Hydro's balance sheet with the provincial government providing the necessary financial guarantees. Obviously, the AECB will require that appropriate financial guarantees are maintained under the new structure. In this regard, it will be important for the AECB to clearly understand the respective roles of the new commercial electricity companies and the provincial government in assuming this liability.

Let me take this opportunity to tell you that in response to the obligations specified in the new Nuclear Safety and Control Act (which by the way is expected to come into force by the end of this year), the AECB is in the process of developing a guidance document on financial guarantee requirements for licensed decommissioning activities. This document will clearly specify who will be required to supply financial guarantees, what types of guarantees will be acceptable and how the amount of financial guarantees will be calculated. With respect to the type of guarantee, it is quite likely that different requirements will apply to licensees that are federal or provincial crown corporations, as compared to those that are private companies.

Finally, let me mention that the AECB is not the only nuclear regulator in the world that is interested in assessing the potential impact on nuclear safety of economic deregulation, increased competition, licensees' management practices and other factors that are affecting the electrical industry sector.

In May 1997, senior nuclear regulators from eight nations (Canada, France, Germany, Japan, Spain, Sweden, the United Kingdom and the United States) formed an association called the International Nuclear Regulators Association (INRA) to identify common nuclear regulatory challenges and to exchange views on broad regulatory policy issues. It is very clear from these meetings that similar trends are affecting, to various degrees and in various ways, many other countries and that we share many of the same concerns. In the case of two neighbouring countries like Canada and the United States, trends in one country can have immediate and direct implications in the other. This is clearly demonstrated by the fact that some Canadian provinces have already been authorized by the US Federal Energy Regulatory Commission (FERC) to sell electricity on the US wholesale market. The AECB and the USNRC are in close communication about these issues.

Conclusion

While the AECB at present does have a transparent system open to the public, it is evident that we need to improve our communications and make our information as widely and easily accessible as possible. The industry has also recognized it must improve its communication with the public.

However, better communication does not ensure better acceptance of nuclear power generation.

The industry must demonstrate to the regulator and to the public that it can, on a continuous basis, manage nuclear power facilities in such a way as to meet or exceed the very high safety standards required. Well-managed power reactors not only have the widest safety margins but are also generally the most economically competitive.

The consequences of serious accidents in the nuclear industry do not stop at the border of the nation in which it occurred. For this reason nuclear safety and regulation are an international concern and what happens in one country can greatly influence public opinion and acceptance of the nuclear industry in other countries.

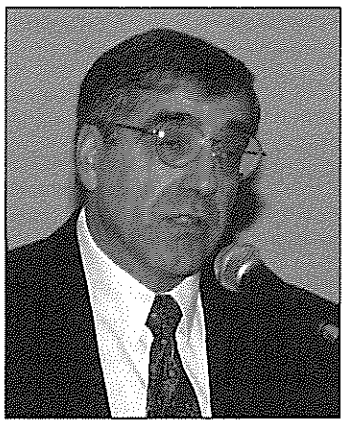
It is also the reason that the AECB along with regulators from other nations are working together and sharing information as never before to improve our regulatory regimes.

The present difficulty experienced within the Canadian nuclear industry is not unique to Canada. Nuclear safety and public acceptance of the industry is an international affair. Leaders in the commercial aspects of the nuclear industry, such as Canada, must not only promote its product from an economic point of view but must also promote and support safety culture and strong regulatory programs within the nations that are their customers if public acceptance is to be achieved.

CANDU Maintenance Conference

Perhaps reflecting the current focus of the Canadian nuclear power program, a record number of close to 300 delegates gathered in Toronto, November 16 to 18, 1997, for the **4th International Conference on CANDU Maintenance.** The theme of the conference was: *Maintenance, the Pathway to Nuclear Excellence.*

During the two and a half day conference delegates listened to excellent papers, examined informative displays and joined in active discussions, all focused on the critical issue of the maintenance of CANDU nuclear power plants. The international flavour was injected through the participation of representatives from Argentina, India, Korea, Pakistan, Romania and Thailand.



Dominic Iafrate

In opening the conference, organizing committee chairman, **Dominic Iafrate,** stated the challenge of returning CANDU plants to their excellent performance of a decade ago. Honourary chairman, **Rod White,** general manager, generation, at NB Power, commented that when he returned to the nuclear field a year earlier he observed both technical problems and the challenge of a skeptical public. "We must perform with excellence", he said, "if we are to regain public acceptance". In the first of two invited plenary papers, **Ed Hinchley,** director, technical services at AECL, spoke of the challenge of improving the maintainability of CANDU as an important aspect of improving its economics.

Paul Lafreniére, (then technical superintendent at Gentilly 2, now general manager, facilities and nuclear operations at AECL's Chalk River Laboratories), gave the other invited paper of the opening plenary session. He presented an excellent overview of "Configuration Management", a subject which proved to be one of the central topics of the conference. *(Excerpts from Lafreniére's presentation are printed in this issue of the* CNS Bulletin.) . Lafreniére gave another technical paper on "Maintenance and Incapability" in one of the later sessions.

The current Nuclear Asset Optimization Plan (NAOP) at Ontario Hydro, with the "lay up" of seven of the older CANDU units and the challenge of bringing the remaining units up to "world class" performance, was a major topic. **Carl Andognini,** executive vice president and chief nuclear officer of Ontario Hydro, gave a succinct but pointed luncheon address in which he asserted that he was committed to the CANDU design despite the current "nightmare". He gave credit to former Ontario Hydro president Al Kupcis who invited him and his colleagues to make a "brutally honest assessment" which they did in the Independent Integrated Performance Assessment (IIPA). A major factor in the decline of Ontario Hydro Nuclear operations was the move (by the Board of Directors) in 1993 to decentralize and downsize. Many of the most experienced operating staff left at that time. The recommended (and subsequently approved) restructuring program (NAOP) was the result of a difficult technical assessment.

Hugh Segal

Bill Hancox, vice president, strategic development at AECL, was the other luncheon speaker. He provided an extensive review of the many overseas projects, actual and potential, in which AECL is engaged, and a brief overview of some of the CANDU development underway. Work in the latter category included: improvements in fuel flexibility, including development of a 43 element CANFLEX element; increasing the understanding of zirconium alloys; increasing heat sinks to cope with severe accident. He mentioned that AECL was studying a 1200 MWe CANDU design.

Gene Preston, recently appointed site vice president Pickering NGS (and a member of the Nuclear Power Advisory Group brought in to review Ontario Hydro Nuclear), and **Joe Kappes,** senior adviser, maintenance, at Bruce, (another US consultant) joined in a special session on *"Business of Maintenance from an International Perspective"* which drew an overflowing audience.

Preston said that the "mission" of a maintenance program is to ensure that:

- installed equipment operates when needed, and,
- equipment malfunctions or deficiencies are corrected in a timely manner and rarely recur.

He identified the fundamental characteristics of an **ineffective** maintenance organization as:

- historical focus
- reactive management style
- lack of management presence in the filed
- heavy reliance on skill-of-the-trade
- no self-assessment process
- combative management and trades.

In contrast, he stated that the characteristics of an **effective** maintenance organization are:

- focus on core safety

- strong management leadership
- conspicuous management filed presence
- established conduct of maintenance principles
- ability to self-assess
- management and trades responsible and accountable to each other.

In closing he proposed that the path to success involved:

- focus on supervisors
- focus on work control systems
- focus on equipment reliability

With the style of an evangelist, Joe Kappes gave an energetic sermon on front line maintenance, stressing the importance of preventative maintenance. These are power reactors, he emphasized, not research reactors. The role of maintenance, he stated, is to support operation not to be an end in itself.. A balanced combination of written guidance, trade skills and work site supervision is necessary, to achieve the quality workmanship essential to safe and reliable operation.

Some idea of the scope of the Conference topics can be gained from a listing of the various technical sessions: Maintenance of Specialized Components; Improving Human Performance; Steam Generator Leak Detection; Fuel Channel Inspection; Rotating Equipment Maintenance; Maintenance experiences; Surveillance Programs; Inspection and analysis Techniques; Maintenance Management Strategies; Valve Maintenance; Steam Generator Performance Monitoring; the U.S. Maintenance Perspective; Reactor Instrumentation; System Surveillance; Preventative Maintenance Management; Maintenance Contribution to Incapability; Radiation Protection; Reactor Face Maintenance; Aging Equipment; environmental Qualification; Steam Generator Cleaning.

Bob Strickert, site vice president of Darlington NGS, gave a "wrap up" presentation which was so interesting that it kept delegates enthralled well after the scheduled closing hour. It is necessary to face the reality of the 90s, he stated, and to learn "to raise the bar". He observed that the capacity factor of almost all CANDU units dropped significantly after 14 years, and for the oldest plants there was a further decrease after 20 years.. The cause appeared to be a combination of technical and non-technical reasons "CANDUs have lived on good design for the first ten years", he commented. Looking abroad he quoted from Swedish operators that, "good maintenance is the key to a long future". He pointed to the USA where most plants have continued to improve over recent years. "A high capacity is essential to be competitive", he asserted. Among his prescriptions for maintenance success were:

- fix before there is an impact
- do the right thing on the right equipment
- do it right the first time
- shorten outages.

Charles Kittmer, of AECL-CRL, explains the CAN 6 seal design at the exhibition of the 4th International Conference on CANDU Maintenance in Toronto, November 1997.

"Let's get on with it", he urged, "we now have the resources".

Augmenting the technical presentations was a modest but excellent exhibition where the following 13 companies displayed their products or services. Bruel & Kjuaer; Hitachi (Canada) Ltd.; 3 M Canada Company; Babcock & Wilcox; General electric Canada; AECL; Thermodyne Engineering Ltd.; Siemans Electric Limited; GE Canada Nuclear Products; York Sensors; Mu-Sigma engineering Consultants Ltd.; OH Technologies; Utex Scientific. The exhibition drew good crowds of interested delegates, helped through the clever arrangement of holding the opening reception, and the coffee breaks, in the exhibition area.

Bob Strickert imports a stirring message in the closing session of the CANDU Maintenance Conference, November 1997.

Presenting a non-technical, but still very relevant, view, **Hugh Segal,** head of staff of former Prime Minister Brian Mulroney, was the guest speaker at the conference dinner. He gave an entertaining while pointed perspective on the Canadian nuclear program. His strongest comments were directed at the nuclear industry's abdication of its public information program. In the context of the Kyoto conference and the concern about global warming and "green-house" gases, why, he asked, is the nuclear industry silent? "If the nuclear industry will not tell its story, who will/", he queried. In closing he argued that the public is waiting to be convinced about nuclear energy. As an indication that he hit a responsive cord in his audience, he was awarded a standing ovation. . *(Most of Segal's talk was reprinted in the last issue, Vol. 18, No. 3, of the* CNS Bulletin.*)*

This very well organized and run combined meeting and exhibition was put together by an organizing committee chaired by Dominic Iafrate from Darlington NGS.

(Copies of the Proceedings of the 4th International Conference on CANDU Maintenance, containing most of the presented papers, are availbale from the CNS office. Contact Sylvie Caron, e-mail: carons@cna.ca.)

Configuration Management

by Paul Lafrenière[1] and Paul Théoret[2]

Ed. Note: The following paper is extracted from the notes used by Paul Lafrenière in his invited address to the opening plenary session of the 4th International Conference on CANDU Maintenance in Toronto, November 1997. The original title was "Top-down Approach to Configuration Management at Gentilly 2". The topic, "configuration management", was the one most discussed at the Conference and has been mentioned repeatedly by senior members of Ontario Hydro's nuclear recovery team.

Introduction

Figure 1 shows a postulated simple model to explain the concept of "Configuration Management" which we define as: management over the life of a nuclear plant that what is there (physical plant) is what we say is there (paper plant) and that both are what should be there (maintained within the requirements of the Design Basis).

The various factors or components identified in Fig. 1 need to be defined.

Constraints: Laws, regulations, codes, rules and design criteria imposed or self-imposed that exist even before design takes place. Examples:

- Laws: Federal (nuclear regulatory), provincial (pressure vessel), municipal
- Regulations: AECB design regulations (Single, dual failure maximum doses to the public)
- Codes: CSA, ASME, IEEE, etc.
- Others: Hypothetical events and probabilities of survival for the SSS, grouping and separation, Design guide, etc.

Requirements: Minimum quality levels identified during the design process for the SSC's. Examples:

- Seismic, EQ, Radiation dosage, Design temperatures and pressures, etc... (these are documented in Design Manuals, Technical Specifications, Specification Sheets, Safety Report, etc...)
- Setpoints: Expected steady state operation value, limits, alarm limits, safety limits, failure limits, allowable tolerances, etc...
- Reliability requirements, minimum testing frequency
- ALARA

Configuration (documented): Physical parts used in the construction of a plant and the description of how each part is linked to the others to form a whole. These are documented on:

- Flowsheets, Manufacturer's Drawings, Wiring diagrams, General Assembly drawings, etc.
- Data such as Manufacturer name and model number, actual dimensions, weight, materials, etc.

These documents and data bases may contain Requirement information and references to Constraints. These documents were initially prepared mostly for Construction purposes.

Configuration (physical): Actual physical parts (SSC's) as found in the plant and spare parts as found in the storage areas. This includes the actual state of each equipment and the actual valve positions.

Reconfiguration: Constraint, Requirement and Configuration information transferred to new documents and databases formatted for O & M purposes. Examples:

- Maintenance calibration sheets (Data taken from other engineering documents)
- Maintenance procedures and spare part reprocurement forms (information taken from Manufacturers manuals)
- Control room flowsheets (from system flowsheets)
- OP & P (from Design Manuals and Safety Report)

Other forms of documented information not shown on the "model" include procedures (describing how an activity is, or should be, carried out) and proof of work, such as reports, history dockets, etc., which provide auditable traces that an activity has been carried out.

Degradation Mechanisms

If the CM objective is to maintain conformity over time between the Design Basis, the Documented Configuration and the Physical Configuration, we must first identify change mechanisms that may upset the equations.

1. The plant's Structures, Systems and Components (SSC) change with time due to ageing, wear and tear. (Physical processes)
2. Other changes are introduced as the result of different types of human activity in the different plant processes (internal human processes). Most changes are meant to be beneficial to the plant. But humans can make mistakes. Some mistakes may have been buried in the original design. Also mistakes can be the result of lost expertise due to the retirement of key people.
3. Finally, constraints and requirements continue to evolve as new information is made available. Old design rules may become invalidated or be found to be incomplete. There is a lessening availability over time of original manufacturers and consultants. (External human processes).

1 General Manager, Facilities and Nuclear Operations, AECL-CRL, formerly Tech. Mgr., Gentilly 2, Hydro Quebec.

2 I & C Engineer, Gentilly 2, Hydro Quebec.

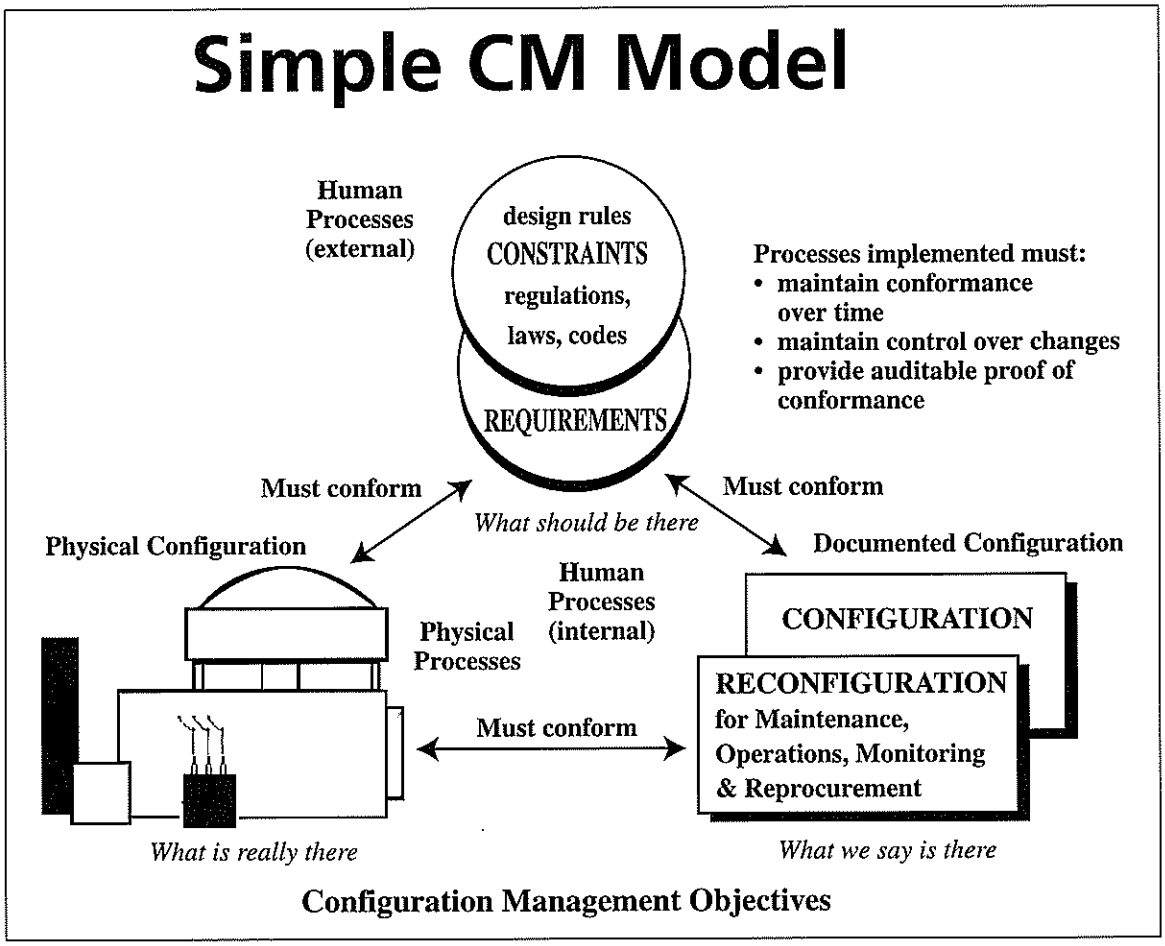


Figure 1

Configuration management process model

It is now necessary to identify all those human processes (direct and indirect) that have the potential to upset the elements in each one of the three poles. (Design Basis, Documented Configuration / Reconfiguration and Physical Configuration). Each process must produce as value added one of the elements in the three poles. For example, Requirements is the value added to Constraints by a process that we will call Design.

Figure 2 shows a proposed unified process model with eight direct processes and one indirect process (Monitoring and Feedback). The latter is the process that monitors all changes including physical degradation and non-conformities picked up by the other processes. It also reviews all available information, including outside sources and performs audits and assessments to identify other types of non-conformities including historical that would not be otherwise uncovered. its added value is to trigger the appropriate direct process to update the documentation or the physical configuration as required. It may also voluntarily dispose of a problem by doing nothing.

Following are brief descriptions of each of the components in the model.

Design:

Design requirements are established by identifying all the applicable Constraints, doing Calculations and Simulations and analyzing the pertinent data taking into account the existing Configuration at the time the design is taking place.

Initial Procurement:

Physical items and Configuration information. Specific physical items are chosen, built, tested, and shipped to the site. They are then stored for future use in the Construction of the Plant. From this choice, new Configuration information (manufacturer drawings and manuals) is produced as well as manufacturer Requirements.

Detailed Engineering:

The Configuration information may have two states: the actual as-built Configuration and the future Configuration for all modifications not yet implemented. This process must be triggered when turning a modification over to operations to change the state from future to as-built.

Construction (Reconstruction):

Parts and Configuration information are turned into a Physical plant (Permanent or temporary modifications). Reconstruction (corrective maintenance) takes place when any existing physical part is replaced by a new one (usually identical). An important

part of this process is commissioning or requalification activities to demonstrate that Requirements are met.

Data Reconfiguration:

Constraint, Requirement and Configuration Information is reformatted to meet Operations, Maintenance, Monitoring and Reprocurement needs. For example, Control room flowsheets are produced from System flowsheets. This process could be made much more effective if the Constraint, Requirements and Configuration information is produced up front in such a way as to be retrievable in a format suitable not only for Construction, but also for all the other processes that require the information as input.

Reprocurement:

The difference between Reprocurement and Initial Procurement is that, in addition to the Requirements, Configuration information is used to purchase a component identical to one that has been chosen previously by the initial Procurement process.

Monitoring and Feed-back:

The Physical plant, the information and the processes are monitored for undesirable changes and appropriate direct processes are triggered as required to return the Information, the Physical plant or the process within acceptable parameters. The Monitoring and Feed-back process does not directly change applicable Constraints, nor produce any Requirements (Design process), Configuration (Detailed Engineering process) or Reconfiguration (Data Reconfiguration process) documentation. Monitoring and Feed-back is probably the most time-consuming process of all for an operating plant.

Application of the model to specific areas of change:

Modifications:

The utility's design group or a consultant usually does the design and detailed engineering with the help of the safety analysis group if required. They may also do some Initial procurement or Reprocurement. The System engineer is in charge of Commissioning and supervises Construction. Then the modification is turned over to Operations and Maintenance. The System engineer is responsible for Feed-back to the design group.

Temporary modifications:

The System engineer and in some cases the Shift supervisor or Maintenance Engineer may take responsibility for Design

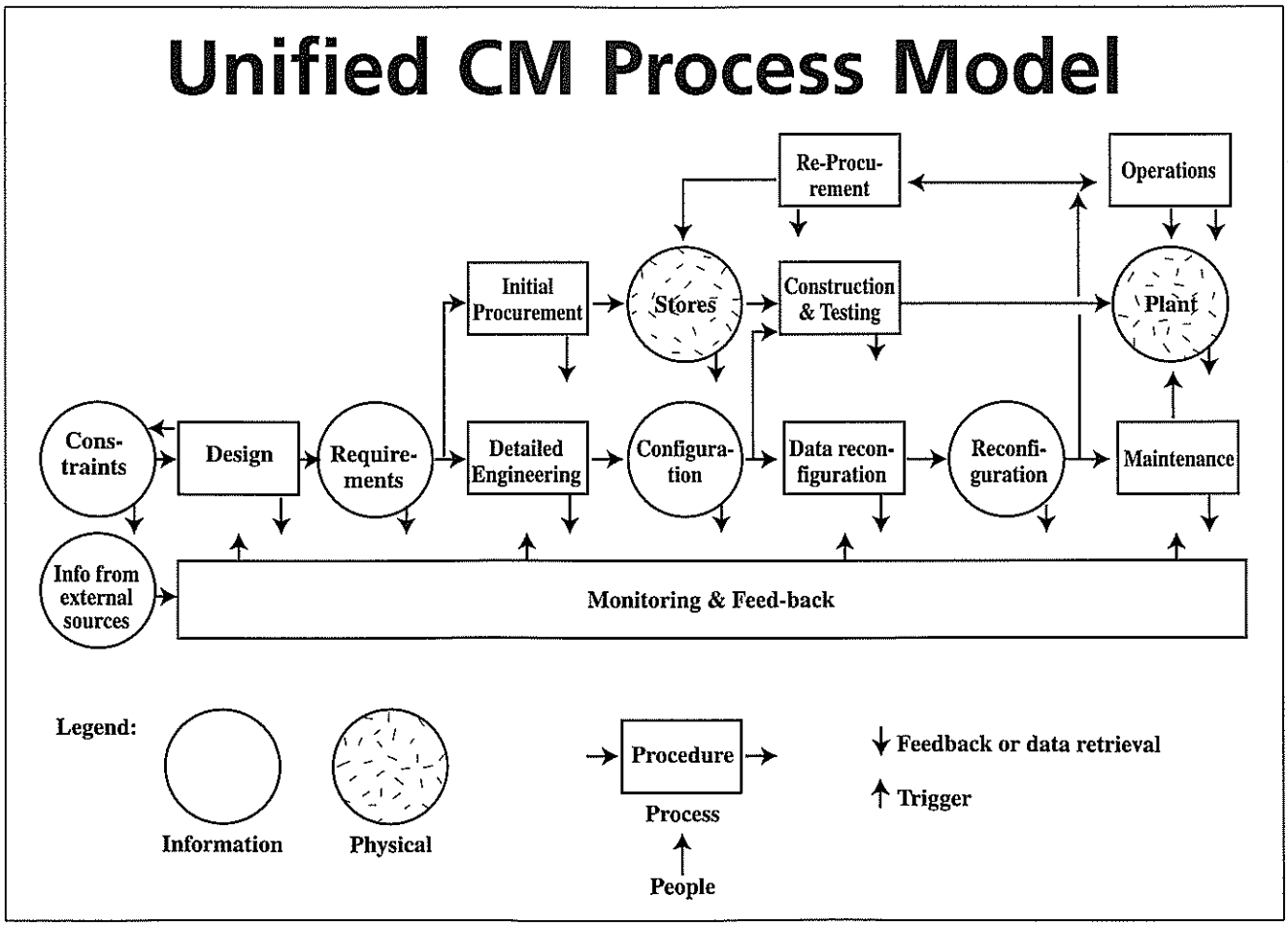


Figure 2

and Detailed Engineering. They may consult a design or safety specialist if they think that they require help for the type of modification involved.

Plant ageing, wear and tear:

During the Commissioning process, the Configuration information is analyzed to determine the requirements for Monitoring, for predictive, preventive Maintenance or Reconstruction and for Procurement of spare parts. Reconfiguration documentation is produced to supplement Configuration documentation and Operating and Maintenance procedures are produced.

New information:

The Monitoring and Feed-back involves receiving and analyzing data provided from outside sources, performing assessments and audits. When new information casts doubt on the adequacy of the Configuration to meet certain Requirements (or worse, certain Constraints), the Monitoring and Feed-back process should trigger the required processes to rectify the situation, such as a modification or a procedural change.

Application of the model to optimize CM information:

Most of the processes rely on input information (Constraints, Requirements, Configuration, Reconfiguration) and on procedures documenting how each process should ideally be carried out successfully within the management structure of a given utility. To optimize CM processes, the large amount of information must be effectively managed.

1. Each process input and procedure information should be made readily available, be accurate and put to effective use. This implies that the required information be suitably documented and provided to all those that need the information to accomplish their task in a given process. This implies also that temporary markups are to be avoided if possible, and integrated as soon as possible to the original so that the new information is available to all those who may have to use it. Finally, it implies that the Constraints and the Requirements should be as carefully documented as the Configuration information for use by the utility personnel.
2. Multiplication of the same information on different mediums (word processor files and paper documents, databases and lists, CAD software and drawings) should be limited and readily identifiable. This implies that the migration of traditional documents and drawings to software platforms should remove the need to maintain up to date the traditional original.
3. Reconfiguration documentation should be minimized by adding features to the Configuration information so that it may be retrieved under different presentations to cater to the different needs of Construction, Operations, Maintenance, Reprocurement and Monitoring.
4. Preference should be given to the use of Requirements information over Configuration information when doing calculations or analysis to confirm that a Constraint is met. For example, if a containment shutoff valve has a Requirement to close in 2 seconds, and a valve is purchased that closes in 1 second (Configuration Information), the analysis of a new LOCA scenario should use the 2 second value so as not to cause the 1 second value to become a Requirement.

Conclusion:

The Configuration Management model presented here gives an overview of all elements involved in satisfying CM needs and providing proof that the Configuration is maintained under control over the life of the plant. It is meant to help move towards better information / process management structure and communications. It can also help to better relate non-conformances to the exact process that created them and better identify the means to prevent reoccurrence.

Improved Maintenance by Self Assessment[1]

Karel Mika[2]

Ed. Note: The following is a slightly edited version of the paper presented by the author to the 4th International Conference on CANDU Maintenance held in Toronto, November 1997.

We in OHN are striving to improve our performance and achieve respectable ratings from independent internal and external evaluations. We have been adopting some new management processes and programs. One of the most significant ones is a self-assessment program. This paper explains the role of self-assessment programs which are being introduced in all three of our plants: Bruce, Pickering and Darlington and outlines how an independent evaluation of these programs could determine whether or not the programs are effective and have a good potential to contribute to the excellent performance of the maintenance department.

My interest in this topic goes back to 1996. For a number of years I have been involved in Quality Assurance (QA) auditing and surveillance. I was on INPO, OHN Peer Evaluations and IIPA evaluating maintenance. The topic of self-assessment immediately raised my attention. The question was how self-assessment related to assessments done by the Station QA Department. I approached the INPO and was given names of three US plants that have been assessed excellent and having a strength in the area of self-assessment. These plants were: B.H. Robinson NPP, Surrey NPP and Palo Verde NPP. Subsequent phone conversations and information exchanges with the responsible personnel gave me a solid picture how these excellent plants deal with the self-assessment programs. That information coupled with my personal experience with QA assessments formed a basis for this presentation.

To have a common understanding of the language used in the presentation, here are some definitions:

Assessment: A documented activity, performed by one or more qualified individuals, which objectively evaluates the performance an activity, process, or program.

Self-Assessment: The critical evaluation of an activity, process, or program performed by the individual or organization accountable for the work, or,

Assessment of the performance, efficiency, and/or compliance of an individual or of an organization... for the purpose of identifying opportunities for improvement of performance, efficiency, and/or compliance.

Performance-Based Assessment: Focus on results through the evaluation of factors affecting plant/organizational performance by observing activities in progress, interviews of personnel, or review of documentation for technical content.

Compliance-Based Assessment: Focus ensuring regulatory requirements are met, primarily through review of completed documentation.

Benchmarking: A technique that compares Ontario Hydro Nuclear programs and performance with best practices. Benchmarking is accomplished through use of peer visits, WANO/INPO Good Practices, etc.

Peer Visits: A form of benchmarking where personnel from OHN visit another company to observe their programs and performance, or another company's personnel come to OHN to observe our programs and performance and then provide critical feedback. This includes exchange visits between Bruce, Pickering and Darlington personnel.

Monitoring: The process all personnel use to compare performance and programs against expectations. This includes management observations, individual observations, self checks, logs and status reporting.

Independent Internal Assessments: Are performed by a station group independent of the group accountable for the activity or program.

Independent External Assessments: Performed by a group or organization outside the station.

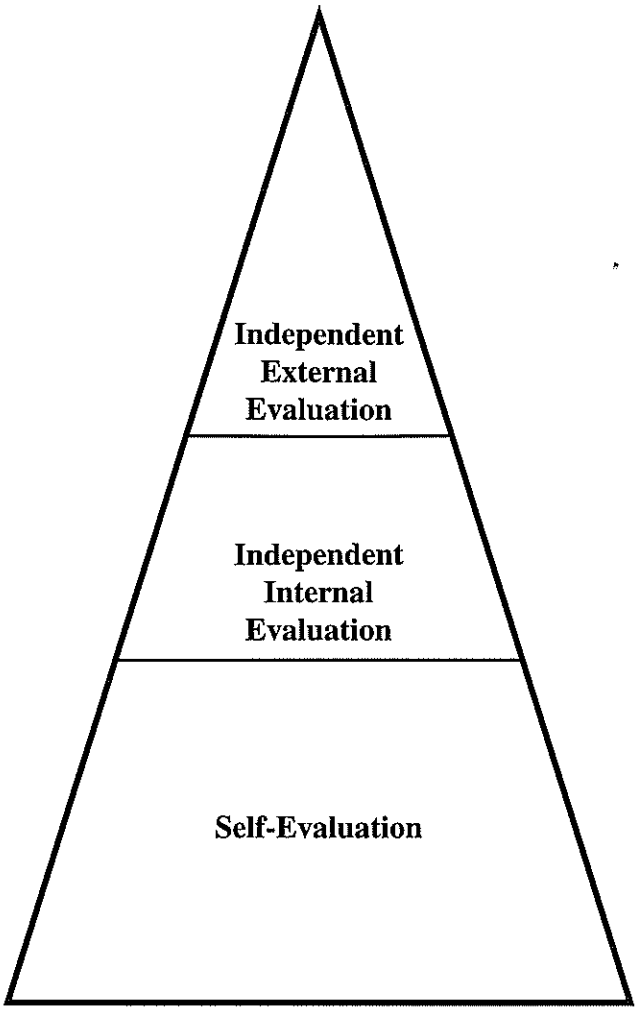
A pictorial presentation of a relationship among different types of evaluation is in the following picture of so called "Evaluation Triangle".

The Triangle shows the hierarchy of evaluations and also gives a quantitative share of these evaluations. It also suggests that the bulk of weaknesses should be identified by self-evaluations before they are identified by independent internal and external evaluations.

There are four different levels of self-assessment. They are listed below along with some characteristics:

1. Individual workers
   - self-checking
   - reviewing performance and lessons learned
2. Management
   - review of work results
   - observation of activities
   - committee reviews
3. Condition Reporting/Trending
   - identifying, documenting and correcting apparent problems and improvements

1. Original title: "How and When Will Self-Assessment Improve Maintenance of CANDU Plants – an Evaluator's View"
2. Ontario Hydro, Bruce Nuclear Station



- identifying and correcting underlying problems

4. Formal Self-Assessment
   - plans and outlines
   - focus area
   - team approach
   - formal report
   - corrective actions/improvements tracked to closure
   - follow-ups

Formal Self-Assessment is the most comprehensive and systematic mode that requires a concentrated effort from the whole organization. It has a broader scope than the other modes and experience shows it to be extremely effective in the maintenance area.

Following is a list of attributes of successful self-assessment programs:

1. Self-Assessment is both a Corporate Value and a Cultural Norm
2. Management Displays Active Leadership and Support of Self-Assessment
3. Assessment plans are Prepared, are Proactive but Flexible Enough to Incorporate Emerging Issues
4. Assessors are provided Necessary Training and Resources to Conduct Assessments
5. Self-Assessments Findings are Addressed in a Timely and Thorough Manner
6. Self-Assessment Results are Shared with others, both within the Station, with other OHN Stations and Interested Predetermined External Organizations
7. Follow-Up Reviews are Conducted to Verify the Effectiveness of Corrective Actions
8. Plant Events and Regulatory Problems are Viewed and Evaluated as Failures of Self-Assessment.

The importance of each of these attributes cannot be overemphasized. Without complete and determined adherence to these attributes, there will not be an effective self-assessment program in our Maintenance Departments. It is safe to say that there would not be an effective self-assessment program anywhere in our stations if it does not have the above attributes.

1. Self-Assessment is Both a Corporate Value and a Cultural Norm

If self-assessment is to become a corporate value and a cultural norm it has to be understood, internalized and practiced by all levels of station staff. Coaching and training play a significant role in achieving this attribute. INPO have realized the importance of self-assessment and the new revision of the Performance Objectives and Criteria from last year spells out the objective and the criteria for this area.

2. Management Displays Active Leadership and Support of Self-Assessment

This attribute sounds like a platitude and can be made of any station activity that is to succeed. However, a new process is being introduced here which in the past belonged to the QA Department and the external auditors. There was no sense of ownership on part of the maintenance staff towards evaluations. The only way to correct this is to have management at all levels visibly and convincingly supporting and leading the program.

3. Assessment Plans are Prepared, are Proactive but Flexible Enough to Incorporate Emerging Issues

It is essential that any management process be planned. In this particular case it is also essential to have flexibility to change the plan when some new issues emerge. As an example, the H.B. Robinson plant, Unit No. 2 plan for 1997 has 23 self-assessments planned for their maintenance department and 150 self-assessments for the whole plant. It is a very ambitious program that will require a lot of determination and resources. The staff at H.B. Robinson are convinced it is achievable and will help them retain their excellent ratings by INPO and SALP. The plan for the Maintenance Department should be approved by the Maintenance Manager who should also approve changes to it.

4. Assessors are provided Necessary Training and Resources to Conduct Assessments

It is the opinion of the author that this is the most important attribute. From his experience in QA it takes approximately a year to train and develop a good evaluator. As a minimum, candidates from maintenance should receive training in field observations techniques, interviewing and report writing. The candidates, as much as possible, should participate in at least one evaluation done by experienced staff. Experience in self-evaluations and training should be recorded.

5. Self-Assessment Findings are Addressed in a Timely and Thorough Manner

Any self-assessment team or individual should produce an assessment report with clearly specified corrective actions, completion dates, and owners of the actions. An effort to complete the specified corrective actions must be a part of the work program and have allocated resources. The completion dates must be realistic and the action owners must be held accountable for timely completion of the actions same as for any other work assignment.

6. Self-Assessment Actions are Shared with Others, both within the Station and with Other OHN Stations

Self-assessment results have a great potential to help focus on identified problems. It is quite common for various units within the same organization to have similar weaknesses. To a lesser degree it can be said about the same industries. That is the reason why there should be a formal system for sharing self-assessment results within the station and within the entire organization.

7. Follow-up Reviews are Conducted to Verify the Effectiveness of Corrective Actions

The author's experience from QA suggests a formal verification of effectiveness of corrective actions needs to be done. It does not suggest any ulterior motives of correction action owners, it merely proposes an independent evaluation of the results.

8. Plant Event and Regulatory Problems are Viewed and Evaluated as Failures of Self-Assessment

A truly effective self-assessment is a very proactive tool. This statement does not mean that there will not be any findings made by the independent internal and external assessments, but they should be minimized. A long term goal of self-assessment should, indeed, be zero findings from all other forms of assessment.

In conclusion, the author hopes this presentation could be useful as a standard for terminology, at least in the OHN self-assessment programs. It can be used by the internal independent evaluators when they face the task of evaluating the station self-assessment programs. Finally, the eight attributes can be used as a yard stick for measuring the success of self-evaluation programs.

New Work Management Processes at Pickering[1]

Stu Seedhouse, Dave Hunter, Terry Chong2

Ed. Note: *The following is a slightly edited version of a paper presented at the 4th International Conference on CANDU Maintenance held in Toronto, in November 1997. In agreeing to the reprinting of the paper, principal author Stu Seedhouse commented that, although there have been further developments in this area at Pickering since the writing of the paper, the basic message remains valid.*

The Need For Change:

For 26 years, we in the Pickering Nuclear Division have relied on the same set of planning practices to operate and maintain the station. This year, after much effort, we've rolled out a new set. The obvious question is, "Why are we embarking on a new course?" Each and every employee in the station knows, all too well, the reasons behind the decision to do so:

- Work delays due to lack of parts, the unavailability of work support groups, and delays in getting work protection in place.
- Wrench time rates as low as 15 to 17%. caused by the inordinate amount of time workers had to spend searching for drawings and parts and getting work protection permits in place.
- Worker frustration that comes from not being able to get a job done
- Constantly high backlogs of preventative and corrective maintenance work that consumed more and more resources for corrective maintenance. Workers spent much of their time "firefighting" in an non-productive work environment. Pickering currently has a corrective to preventative maintenance ratio of about 80 to 20 per cent.
- Planning Groups unable to plan more than a few days in advance.

These problems were also identified in independent audits by Ontario Hydro Nuclear's internal PEER Audit group, World Association of Nuclear Operators (WANO) , and most recently by the Independent Integrated Performance Assessment (IIPA). Each one of them clearly described a planning process that was in desperate need of repair.

The New Work Management Process

The new Work Management process will ensure work follows a consistent path from identification to completion. The process ensures gains in work efficiency, work effectiveness, the effective use of resources, and cost reductions.

The new Work Management process consists of five main steps:

1. Work Initiation
2. Work Approval
3. Work Planning
4. Work Execution
5. Work Completion

Key Elements of the Work Management Process

The most important key elements of the new process for realizing quick efficiency gains, include:

- Functional Equipment Groups (FEGs) The grouping of equipment within a single isolation, or related equipment that can be taken out of service simultaneously, while the unit is operating. (The isolated equipment groups are tagged with the same FEG ID number.)
- Use of a 13 Week Rolling Schedule where each Functional Equipment Group (FEG) is scheduled for review once every 13 weeks. Any work identified within the isolation will be scheduled when the associated FEG is called up. The schedule organizes and co-ordinates all maintenance work. The approach ensures everyone knows well in advance WHAT needs to be done, WHEN it will be done, and WHO is responsible for doing it.
- Centralized Permitry and Work Authorization allows for streamlined authorization by ensuring permitry requirements for work are in place when the field staff arrive to execute the work.
- Comprehensive Work Package (CWP) a standardized detailed package prepared by the maintenance assessing group which pulls together all the required information for the field staff to do the work.
- Staging a process where all parts identified as necessary to complete planned work, are ordered and

1. Original title: Implementation of New Work Management Processes at Pickering Nuclear Division
2. All the authors are with the Pickering Nuclear Division of Ontario Hydro

placed in a Staging Area before the execution week.

- Single Point of Contact The SPOC is a highly experienced individual who assesses and approves the work need and assigns, based on a clear set of standards, a risk based priority to it. This ensures consistent standard is applied to all work and allows for careful monitoring of relative importance of outstanding work.
- Risk Based Priority A standard has been developed to allow for consistent assignment of priority to all work based on risk. There are four categories: Emergency, High, Planned, Minor. Emergency must start immediately and the Shift Superintendent would approve this. High work must start before the next FEG which included this equipment was scheduled. Planned allows the for slotting the work in the next scheduled FEG week. Minor can be done any time and requires no special planning or coordination.

Two other key elements are used to further enhance the work management process

- A Common Scheduling Tool, replacing the different ones used at each station. Even within Pickering Nuclear Division we were different. All stations will use a common tool that will "talk" to other applications- essential for integration of all resources and consistent application to a common set of priorities.
- Work Week Leaders (WWLs): Newly appointed staff who will act as the point of contact for all activities during the assigned work week. The new WWLs are responsible for monitoring all work leading up to and including the execution week.

Implementation

Implementation of these processes has been coordinated through a small core team with support from the affected departments. It's important to realize that while we roll out the new process, we must also continue running the old one at the same time to maintain station operation.

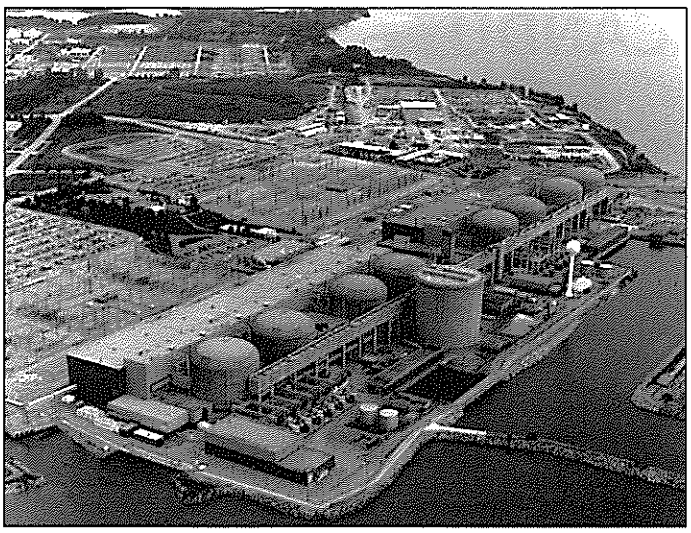
Rolling out the new Work Management process across PND, the largest Nuclear Power plant in the world, requires a sound strategy.

The general strategy consists of :

Deciding that PND-A (Units 1-4) and PND-B (Units 5-8) would each have separate Plans that supported each other where required. This allowed for adequate focus on both sides of the plant where each is controlled by separate shift organizations. The next step was to implement the core 13 week schedule on PND-B with the duty crew work force only. To do this, we needed to build all the infrastructure for expanding the rolling schedule to all work groups on PND-B.

The major steps in the plan included:

- Process Development, which included benchmarking trips to several of the best utilities in the US, as rated by the Institute of Nuclear Power Operations (INPO), combined with an OHN-wide team to develop the Work Management Process described above.
- FEGs, critical building blocks for establishing the framework of the 13 week rolling schedule. The size and number of FEG's can greatly enhance or detract from the ability to build a schedule. Benchmarking trip experience greatly influenced our direction. Once the FEG's were established, the computer-based equipment system needed to be updated.
- 13 Week Schedule: With the FEG's identified, a matrix could be built to schedule each FEG once every 13 weeks. An in-depth review of the matrix with AECB Authorized Operations staff and Reactor Safety Staff was required to ensure the alignment of FEG's did not jeopardize the safe operating envelope.
- Supporting Scheduling Tool, needed to effectively implement the new 13 Week Rolling Schedule, required supporting software. The common scheduling tool needed format customization to support the process. This was achieved by utilizing experienced Planning Technicians, processing experts, and scheduling tool experts. The result was a tool that was both practical and function
- Documentation Strategy, developed for producing procedures for the processes. All procedures were written at the OHN level. To begin convergence towards identical processes at all sites, detailed site Department procedures were needed to accommodate the current differences. These procedures will be eliminated as OHN Site Organizations become identical and as the new Work Management software is rolled out.
- Organizational Effectiveness and Staffing Centralized planning and scheduling and decentralized assessing was the underlying philosophy for how the organization should be structured, based on best industry practice. Thus, the creation of a centralized planning organization called Work Control. More pre-planning and preparation is needed to maximize field effectiveness necessary. In the nuclear industry, the efficiency gained by field staff has been proven to far out weigh the increase in front end staffing. Ratios of Assessors and Planners to field staff were bench marked and used as initial targets to implement the new processes, requiring a considerable amount of hiring and creating a backlog of training in those areas.
- Managing Transition Considerable work is required to manage and prepare staff through the transition and implementation of the new Work Management process. A comprehensive communication strategy was developed and carried out by communications staff experienced in change management. The strategy uses a cascade format of communicating, starting at the top and working its way down to the shop floor employees. It focuses on four basic principles:
- Face to face communications is most effective.
- Communication received from an employee's supervisor is most effective.
- What is being communicated should be consistent.
- There can never be enough communication.
- Training is needed with any new process. Lack of it often proves to be the downfall of most new systems. Comprehensive training programs are developed to prepare staff in key roles of the new Work Management process.



Aerial view of Pickering NGS.

Role of the Work Control Department

The Work Control Department at PND will centralize Planning to ensure :

- One set of Station Priorities
- One Plan for the Site
- All Work is Planned

Specifically the Work Control Department is responsible for the following main functions.

- Prioritize all work to a common Risk Based prioritization process.
- Schedule all On-Line (and eventually Planned Outages) work.
- Work Management Process Ownership
- Functional Leadership for the Planning Technician job family. This includes Training and hiring.
- Implementing the new Work Management processes
- Integration of all site work and production of the Daily Leadership Plan

By centralizing our Planning Organization we have paved the way to expedite site convergence on our new process. This has allowed ourselves to combine the collective strengths across PND to help implement this change.

Effective Planning will Mean Success!

Planning is an "integral" part of PND today and will continue to be in the future. Implementation of these new processes will increase the emphasis on planning which is key to our future success. The recognition and implementation of these proven processes is a statement of the importance proper planning plays in keeping us in business. This will help everyone work more efficiently and effectively.

We are working hard to ensure that both Pickering A and B are using these new work management processes. With the creation of the Work Control Department, we now have the focus and support required to implement improvements in our work management processes to support PND's drive to nuclear excellence.

We have a lot of work ahead of us, and must proceed in a timely fashion to ensure "our" future. Not all the changes will run smoothly the first time, but with a strong commitment to change we will be successful.

Lessons Learned to date.

- Change in a Collective Bargaining Environment

  The specific challenges here surround job documents, pay rates and past practices which all need to be addressed as part of the change management. These were recognized and corporate support made available.
- Complications of Multi-site Implementation

  Making change to processes in a multi-site organization adds the challenge of having multiple starting points with a common end point. The route to the end varies and the challenges are often different. This requires the recognition that the convergence paths will be slightly different from site to site.
- Managing transition from old to new process

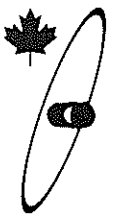
  Do not underestimate the amount of communication required to change peoples work habits and attitudes. What is obvious to the implementation team is not always obvious to the person in the field. Continual reinforcement of the goals and new processes is required.
- Know when to use the 80/20 rule

  Don't expect perfection in the first pass. There will be process adjustments required no matter how well planned the project is. You must strive to understand when good is good enough in order to allow the implementation to keep it's momentum.
- Effective project planning is essential

  The path to change needs to be well understood in order to keep your focus when bumps in the road are hit. This is also essential to maximize the use of your project staff.
- Get the training organization involved early

  The training requirements are large. New processes have to be taught at the worker level. This has been clearly evident to us particularly at the Planning Technician level
- Celebrate success!

  Do not be afraid to celebrate early successes in order to build confidence that the direction taken is beginning to show the desired results.



Lifetime Management of CANDU

by Basma Shalaby[1]

Ed. Note: *Following is the text used by Dr. Shalaby in a talk to the CNS Sheridan ark Branch Introduction CANDU Pressurized Heavy Water Reactors (PHWR) continue to play a insignificant role in electricity supply both in Canada and some offshore countries. This coupled with an increasingœnumber of CANDU NPPs reaching mid to end of their nominal design life (30 years) made plantœlife management an increasingly important program to utilities in order to protect the investmentœand the continued success of plants operation. Table 1 lists all CANDU reactors and their age.*

Plant life management activities have been ongoing on a component basis for sometime. Mostœutilities, for example, have a strategic plan for fuel channel life management, and are following theœresulting inspection and maintenance activities such as the spacer repositioning program. Similarœprograms are being developed for steam generator life maintenance.

The CANDU 6 utilities have also initiated pilot studies to assess the state of some of the criticalœsystems, structures and components (SSCs), identify plausible degradation mechanisms and defineœinspection, monitoring and mitigating programs to effectively assure safe and reliable performanceœof such SSCs.

These assessments will form the basis of an integrated aging management program covering allœelements of PLIM. With a successful PLIM program, the information provided will assist theœstations in maintaining the capacity factors required while achieving assurance of the plants continued safe, reliable and cost-effective operation for their whole design life and beyond.

Overall Approach/Strategy

An NPP has a large variety of systems, structures and components (SSCs), many of which are %` essential for overall plant safety and reliability. To enable components to be selected for detailedœaging assessments an overall approach and a systematic methodology is required.

For CANDU plant components have been classified into one of the following classifications:

1. Critical Non-Replaceable; such as Reactor Structures and Civil Containment Structures
2. Critical Replaceable; such as Pressure Tubes and Steam Generators
3. Non Critical SCCs are plant systems, structures or components that do not directly impact safety or plant reliability and hence can be replaced or maintained during the plant regular outages and maintenance call ups.

Critical Components are defined as those who rank high in the following attributes:

a) Consequence of failure on Plant Safety
b) Consequence of failure on Plant Operation
c) Cost and/or duration to refurbish or replace
d) Impact on plant availability (while on Refurbishment or Replacement)
e) Radiation dose to repair or replace
f) Regulatory Importance

Based on this approach the PLIM strategy adopted is to:

a) Identify critical components.
b) Undertake Aging assessments studies of such critical components.
c) Implement Life Management Programs; to maximize component life, ensure good performance and monitor plant condition.
d) Plan, scope and implement required programs to assure the original design life.
e) Prepare economic cases for rehabilitation and life extension.
f) Implement rehabilitation and operate beyond the nominal design life.

Multiphase Approach

Along with the strategy adopted, planning and implementation of the life management programs isœbeing defined.

Detailed Aging Assessment Studies of Critical SSCs:

A screening methodology is required to identify and prioritize critical SSCs and is driven by safetyœand economic considerations.

Screening of plant SSCs to identify the critical ones is done based on the plant Probabilistic Safety Assessments (PSA), Final Safety Analysis Reports (FSARs), Operating Principles and Procedures (OP&P) and power production requirements. A multi attribute system is also used to prioritize them.

During this phase, and in addition to this screening methodology, detailed Aging AssessmentœStudies are performed to identify all applicable aging degradation mechanisms and theirœplausibility, given the years of ser-

1. Acting Chief Engineer, AECL, Sheridan Park

TABLE 1

Name	Location	Capacity Mwe	In-Service Date	Age (Years)
Pickering 1	Canada	515	1971	26
Pickering 2	Canada	515	1971	26
Pickering 3	Canada	515	1972	25
Pickering 4	Canada	515	1973	24
Bruce 1	Canada	848*	1977	20
Bruce 2	Canada	848*	1977	20
Bruce 3	Canada	848*	1978	19
Bruce 4	Canada	848*	1979	19
Point Lepreau	Canada	633	1983	14
Gentilly-2	Canada	638	1983	14
Wolsong 1	Korea	638	1983	14
Embalse	Argentina	600	1984	13
Pickering 5	Canada	516	1983	14
Pickering 6	Canada	516	1984	13
Pickering 7	Canada	516	1984	13
Pickering 8	Canada	516	1986	11
Bruce 5	Canada	516	1985	12
Bruce 6	Canada	860	1984	13
Bruce 7	Canada	860	1984	13
Bruce 8	Canada	860	1987	10
Darlington 1	Canada	881	1990	7
Darlington 2	Canada	881	1989	8
Darlington 3	Canada	881	1991	6
Darlington 4	Canada	88	1992	5
Cernavoda 1-3	Romania	665 x 3	1996 / 2003**	1
Wolsong 2, 3 & 4	Korea	665 x 3	1997 / 1999	-

* Electrical equivalent (electricity plus process steam)

** Forecast date for Unit #3

vice and in reactor environments. Ensuing conclusions andœrecommendations are then formulated and implemented under an overall aging management program.

Formulation and Planning of the Detailed Aging Management Programs:

During detailed planning, inspection, evaluations, engineering assessments and developments areœundertaken for input into the utility's economic evaluation and planning programs. In parallelœwith such activities, engineering developments and supporting R&D programs will continue to support safety and regulatory requirements, mitigation of plant aging, and assure the plant design life and to enable its extension to the optimum life.

Refurbish, Replacement and Maintenance:

This will be influenced by the regulatory and economic environments. It is the implementationœphase and will be formulated based on the results of previous work. These results will be mainly knowledge gained from inspections, Condition Based Monitoring programs and other plant surveillance and diagnostics.

Fuel Channel Life Assurance Program

A detailed Fuel Channel Life, Assurance Program has been put in place for each plant. The most recent one was prepared for G-2 NPP and prescribes inspection, monitoring and mitigation techniques required to effectively manage pressure tube life over the life of the plant.

Summary

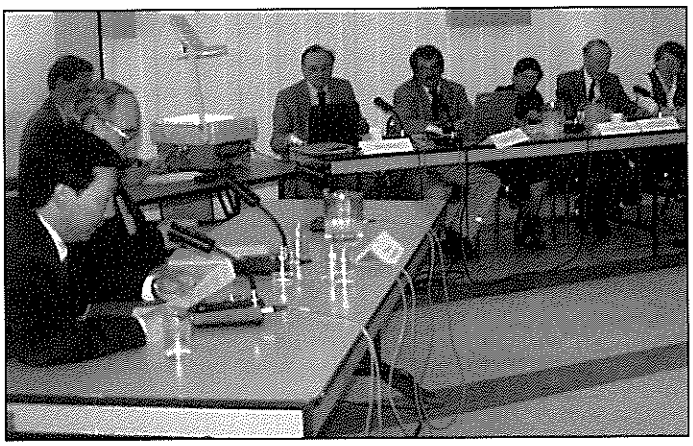
A wide range of life management programs have been in existence in CANDU NPPs from the start of plant operation; In-service Inspections (ISI), Periodic Inspection Program (PIP), Environmental Qualification (EQ), Preventive Maintenance (PM) etc. However, with many plants reaching their mid to end of their original design life, the need for optimizing and integrating such programs is increasing. In response to this need many nuclear plants initiated a program to optimize maintenance.

PLIM will continue to evolve over the next few years to address aging issues and plan and implement remedial programs. Given the robustness of the design and optimum and timely aging management actions CANDU plant, should have no impediments to a prolonged life beyond its original design life.

GENERAL news

Waste Panel issues report – technically adequate, socially not acceptable

Ed. Note: After eight years of hearings and deliberations the final report of the Nuclear Fuel Waste Environmental Assessment Panel was made public on Friday, March 13, 1998, by Christine Stewart, Minister of the Environment and Ralph Goodale, Minister of Natural Resources. The Panel decided that broad public support is necessary to ensure acceptability, and that safety is only one part of acceptability. On that basis the Panel concluded that the safety of the AECL concept [for deep geologic disposal] was adequately demonstrated from a technical perspective but not from a social perspective.



Then CNS president, Hong Huynh, at left, makes a presentation to the Environmental Assessment on Nuclear Fuel Waste on its final day of hearings in Ottawa, March 1997. (Not all of Panel is shown, chairman Blair Seaborn is second from right.)

The government must now consider the report and its recommendations. In releasing the report Goodale said, "This [the report] will set the stage for the next steps regarding the long-term disposal of nuclear fuel waste in Canada".

For the edification of readers of the CNS Bulletin, the Executive Summary of the Panel's report is reprinted below. The full report is available on the Web at WWW.CEAA.GC.CA

Report from the Environmental Assessment Panel on Nuclear Fuel Waste Management and Disposal Concept

EXECUTIVE SUMMARY

In a 1978 joint statement, the governments of Canada and Ontario directed Atomic Energy of Canada Limited (AECL) to develop the concept of deep geological disposal of nuclear fuel wastes. A subsequent joint statement in 1981 established that disposal site selection would not begin until after a full federal public hearing and approval of the concept by both governments.

In September 1988, the federal Minister of Energy, Mines and Resources referred the concept, along with a broad range of nuclear fuel waste management issues, for public review. He made this referral under the federal Environmental Assessment and Review Process Guide-lines Order. On October 4, 1989, the federal Minister of the Environment appointed an independent environmental assessment panel to conduct the review. A copy of the Terms of Reference for the review is included in Appendix A, and biographies of the eight panel members are included in Appendix B.

The panel's mandate was unusual compared to that of any other federal environmental assessment panel in that it was asked

- to review a concept rather than a specific project at a specific site;
- to review a proposal for which the implementing agency was not identified;
- to establish a scientific review group of distinguished independent experts to examine the safety and scientific acceptability of the proposal;
- to review a broad range of policy issues; and
- to conduct the review in five provinces.

AECL describes its concept as a method for geological disposal of nuclear fuel wastes in which

- the waste form is either used Canada Deuterium Uranium

(CANDU) fuel or the solidified high-level wastes from reprocessing;
- the waste form is sealed in a container designed to last at least 500 years and possibly much longer;
- the containers of waste are emplaced in rooms in a disposal vault or in boreholes drilled from the rooms;
- the disposal rooms are between 500 and 1000 metres below the surface;
- the geological medium is plutonic rock of the Canadian Shield;
- each container of waste is surrounded by a buffer;
- each room is sealed with backfill and other vault seals; and
- all tunnels, shafts and exploration boreholes are ultimately sealed in such a way that a disposal facility would be passively safe—that is, long-term safety would not depend on institutional controls.

Such a facility would cost an estimated $8.7 billion to $13.3 billion in 1991 dollars, depending on the amount of waste to be disposed of.

The Panel conducted its review in Saskatchewan, Manitoba, Ontario, Quebec an New Brunswick. To develop guidelines to help AECL prepare an environmental impact statement (EIS), the Panel held scoping meetings in autumn 1990 in 14 communities. It also held a workshop on Aboriginal issues and met with members of Canadian Student Pugwash. The Panel then prepared draft guidelines, released them for public comment in June 1991, and issued them in final form on March 18, 1992. On October 26, 1994, AECL submitted an EIS, supported by nine primary reference documents. The period for public review of the EIS began on November 8, 1994, and ended on August 8, 1995.

Public hearings were held in 16 communities over three phases beginning March 11, 1996 and ending March 27, 1997. Phase I focused on broad societal issues related to managing nuclear fuel wastes; Phase II focused on the safety of the AECL concept from a technical viewpoint; and Phase III focused on the public's opinions of the safety and acceptability of the concept. During all three phases, the Panel heard from a total of 531 registered speakers and received 536 written submissions, as listed in Appendix F. Participants were also allowed to submit brief closing statements in writing by April 18, 1997. The Panel considered all written and oral information received in the period from its appointment to the end of the hearings, as well as the closing statements, in preparing this report.

A detailed chronology of the panel's activities can be found in Appendix E.

Among other activities, the Terms of Reference directed the Panel
- to examine the criteria by which the safety and acceptability of a concept for long-term waste management and disposal should be evaluated; and
- to prepare a final report addressing whether AECL's concept is safe and acceptable or should be modified, and the future steps to be taken in managing nuclear fuel wastes in Canada.

CRITERIA FOR SAFETY AND ACCEPTABILITY

The Panel examined the criteria by which the safety and acceptability of any concept for long-term waste management should be evaluated (Chapter 4 of this report). In doing so, it came to the following key conclusions.

Key Panel Conclusions

- Broad public support is necessary in Canada to ensure the acceptability of a concept for managing nuclear fuel wastes.
- Safety is a key part, but only one part, of acceptability. Safety must be viewed from two complementary perspectives: technical and social.

On this basis, the Panel defined the safety and acceptability criteria as follows:

To be considered acceptable, a concept for managing nuclear fuel wastes must

a) have broad public support;
b) be safe from both a technical and a social perspective;
c) have been developed within a sound ethical and social assessment framework;
d) have the support of Aboriginal people;
e) be selected after comparison with the risks, costs and benefits of other options; and
f) be advanced by a stable and trustworthy proponent and overseen by a trustworthy regulator.

To be considered safe, a concept for managing nuclear fuel wastes must be judged, on balance, to

a) demonstrate robustness in meeting appropriate regulatory requirements;
b) be based on thorough and participatory scenario analyses;
c) use realistic data, modelling and natural analogues;
d) incorporate sound science and good practices;
e) demonstrate flexibility;
f) demonstrate that implementation is feasible; and
g) integrate peer review and international expertise.

SAFETY AND ACCEPTABILITY OF THE AECL CONCEPT

After applying these criteria to the AECL disposal concept, the Panel arrived at the key conclusions listed below. The rationale for them, and an elaboration on the technical and social perspectives of safety, are documented in Chapter 5.

Key Panel Conclusions

- From a technical perspective, safety of the AECL concept has been on balance adequately demonstrated for a conceptual stage of development, but from a social perspective, it has not.
- As it stands, the AECL concept for deep geological disposal has not been demonstrated to have broad public support. The

concept in its current form does not have the required level of accept-ability to be adopted as Canada's approach for managing nuclear fuel wastes.

FUTURE STEPS

The Panel considered the steps that must be taken to ensure the safe and acceptable long-term management of nuclear fuel wastes in Canada (in Chapter 6 of this report). It arrived at the following key recommendations.

Key Panel Recommendations

A number of additional steps are required to develop an approach for managing nuclear fuel wastes in a way that could achieve broad public support. These include

- issuing a policy statement on managing nuclear fuel wastes;
- initiating an Aboriginal participation process;
- creating a nuclear fuel waste management agency (NFWMA);
- conducting a public review of AECB regulatory documents using a more effective consultation process;
- developing a comprehensive public participation plan;
- developing an ethical and social assessment framework; and
- developing and comparing options for managing nuclear fuel wastes.

Taking into account the views of participants in our public hearings and our own analysis, we have developed the following basic recommendations to governments with respect to a management agency:

- that an NFWMA as described in Chapter 6 be established quickly, at arm's length from the utilities and AECL, with the sole purpose of managing and co-ordinating the full range of activities relating to the long-term management of nuclear fuel wastes;
- that it be fully funded in all its operations from a segregated fund to which only the producers and owners of nuclear fuel wastes would contribute;
- that its board of directors, appointed by the federal government, be representative of key stakeholders;
- that it have a strong and active advisory council representative of a wide variety of interested parties;
- that its purposes, responsibilities and accountability, particularly in relation to the ownership of the wastes, be clearly and explicitly spelled out, preferably in legislation or in its charter of incorporation; and
- that it be subject to multiple oversight mechanisms, including federal regulatory control with respect to its scientific–technical work and the adequacy of its financial guarantees; to policy direction from the federal government; and to regular public review, preferably by Parliament.

Until the foregoing steps have been completed and broad public acceptance of a nuclear fuel waste management approach has been achieved, the search for a specific site should not proceed.

If the AECL concept is chosen as the most acceptable option after implementation of the steps recommended above, governments should direct the NFWMA, together with Natural Resources Canada and the AECB or its successor, to undertake the following: review all the social and technical shortcomings identified by the Scientific Review Group and other review participants; establish their priority; and generate a plan to address them. The NFWMA should make this plan publicly available, invite public input, then implement the plan.

Additional and detailed recommendations on future steps are outlined in Chapter 6. Other aspects of the panel's mandate are dealt with in chapters 2 and 3 and in the appendices.

AECB Certifies CAIRS Laboratory

On March 11, 1998, the Atomic Energy Control Board issued a certification to the Canadian Institute for Radiation Safety (CAIRS) for their laboratory service which measures the exposure of workers to radon and radioactive dust. The service, is called "personal alpha dosimetry", is provided by CAIRS National Laboratories in Saskatoon, Saskatchewan. This is the first such certification to be awarded by the AECB.

The dosimetry system was originally developed in France by COGEMA and the CEA and redesigned by CAIRS for use in Canadian uranium mines. The dosimeters involve a small battery operated pump which draws air through a special filter and detector. The filters and detectors and sent monthly to CAIRS laboratories for counting. Over 500 miners in Saskatchewan are monitored by the service. CAIRS will now offer the service for workers exposed to radon and radioactive dust throughout North America, Asia and Australia.

Nuclear Book

The need for more and better communication with the public on nuclear matters has been expressed by many, including Minister of Natural Resources, Ralph Goodale, at the CNA/CNS Winter Seminar, Reid Morden, president of AECL, Hugh Segal, and others. The recent decision of the Environmental Panel on Nuclear Fuel Waste highlights the lack of understanding by the public of nuclear energy and radiation.

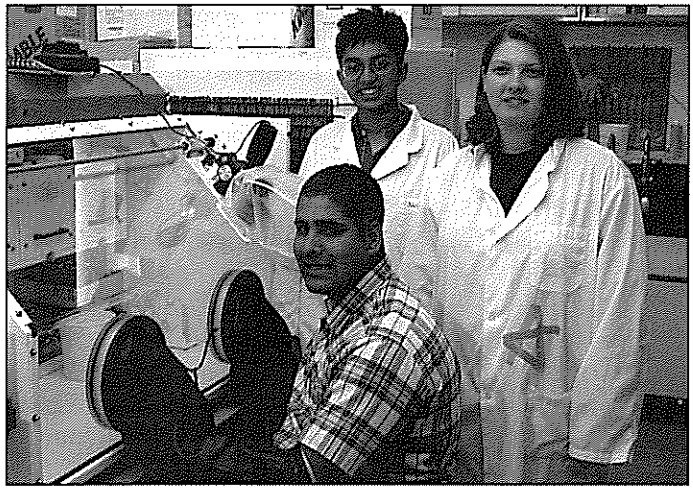
The Canadian Nuclear Society, along with MDS Nordion, and Zircatec are sponsoring a popular book proposed by Dr. Hans Tammemagi, an experienced writer with several books published and a former researcher in the nuclear industry. To make the project truly successful further support is needed by interested organizations in the nuclear community. Contact Hans for more information at (tel) 905-641-2732, or by e-mail: at oakhill@vaxxine.com

Deep River Science Academy offers Science in the Summer

Do you know someone who would benefit from a fun-filled summer at the Deep River Science Academy?

The Deep River Science Academy, a nonprofit private school, provides scientifically inclined high-school students with a unique opportunity to experience an enriched, hands-on science program in an R&D environment. Students are part of a national program and work with professional scientists and engineers on front-line projects at our three campuses in Ontario, Manitoba and British Columbia. Many of these projects are in the environmental sciences and energy production areas and are conducted at some of Canada's leading laboratories. Upon successful completion of the six-week program, including the presentation of written and oral scientific reports, students receive high-school and in some cases post-secondary credits. It's not all work and no play! For the entire six weeks, under adult supervision, eighty like-minded students from across Canada live in residence and enjoy a jam-packed recreational program that includes tennis, rowing, waterskiing, site-seeing and movie and barbeque nights.

For more information on a summer of a lifetime, call 1-800-760-DRSA.



At the Deep River Science Academy campus at the Whiteshell Laboratories in the summer of 1997, students Sammy Vaidyanathan from Gloucester, Ontario and Swati Rana from Oakville, Ontario, pose with their tutor Kim Mills, at a glove box they used in studying the size of naturally occurring microbial populations in granitic groundwater.

CANDU 6 performance

The March 1998 issue of the Canadian nuclear monthly newsletter, UNECAN News, provides performance figures of all CANDU units. The composite figure for all CANDU 6 units for 1996 and 1997 were respectable values of 87.6% and 85.7%. In 1997, the two Korean units, Wolsong 1 and 2, led the ranks, with capacity factors of 102.1% and 97.1% respectively. Embalse (Argentina) and Cernavoda (Romania), the other overseas units, also had good ratings, at 89.1% and 87.3%. The two Canadian plants, Point Lepreau and Gentilly 2 were lower because of outages. Their ratings for 1997 were 76.2% and 62.5%.

These figures attest to the soundness of the CANDU 6 design, as well as to the capability of the operating organizations.

(Information regarding UNECAN News can be obtained from the publisher, Ken Smith, tel. 905-828-8216; fax: 905-828-5987; e-mail: unecan@echo-on.net)

CRPA 98 ACRP

Ottawa, Ontario

May 24 - 28, 1998

The theme of this year's Annual Conference of the Canadian Radiation Protection Association is: communication and Training. The program includes invited papers by USNRC commissioner Greta Dicus and Dr. Mark Hart from the Lawrence Livermore National Laboratory, and a half day session by the Atomic energy control Board on the Nuclear Safety and Control Act and supporting regulations.

To register or for information contact: Hannah Goedhard
Tel. 613-258-3628 Fax: 613-258-1390
E-mail: goedhard@symaptico.ca

People

Moves:

Paul Lefrenière moved to the position of General Manager, Facilities and Nuclear Operations, at the Chalk River Laboratories of Atomic Energy of Canada Limited, at the beginning of 1998. Paul was formerly Technical Superintendent at the Gentilly 2 station of Hydro Québec.

Retirements:

Dr. Ernest Letourneau, retired in February 1998 after 20 years as Director, Radiation Protection Bureau of Health Canada. Dr. Letourneau had spent over 30 years with the department. He was a long time member of the Advisory Committee on Radiological Protection of the Atomic Energy Control Board and represented Canada at international organizations such ss United Nations Scientific committee on the Effects of Atomic Radiation (UNSCEAR) and the International Atomic Energy Agency (IAEA).

Hugh Spence retired as head of the Office of Public Information at the Atomic Energy Control Board at the end of 1997. Hugh was often seen on TV, heard on radio and quoted in the print media as the spokesperson for the AECB. He had been with the AECB for 21 years. Robert Potvin has been appointed acting director of the newly created Communications Division, which will take over the functions of the OPI, at the AECB

Deaths:

Another early pioneer of the Canadian nuclear program, although an "ex-patriot" for many years, **Dr. Leslie G. Cook,** died February 13 at his home in Delaware, USA. Dr. Cook was a member of the Montreal Laboratory and moved with that group to the newly created Chalk River Laboratories in 1945. He was head of the research chemistry branch and later became Director of the Chemistry and Metallurgical Division. He was very involved in the development of processes for the separation of plutonium and for the production of thorium fuel. He moved to the USA in the late 1950s. For most of his later years he was as a senior adviser with the research laboratories of Exxon Corporation.

AECB Publications:

Guide on ALARA

As one of the first formal Guides under its new regulatory document policy, the Atomic Energy Control Board has issued its document G-129, Guidelines on How to Meet the Requirement to Keep All Exposures As Low As Reasonably Achievable. The guide is an update of a consultative document issue in 1994. It provides advice on the types of actions required to ensure that exposures to ionizing radiation are effectively controlled and minimized.

AECB Review of IIPA

Available from the AECB is the report: Consolidated Results of the AECB Staff's Detailed Review of Ontario Hydro Nuclear's Integrated Independent Performance Assessment and Safety System Functional Inspection Findings. It is identified as document number INFO 0682.

Copies are of both reports are available from the AECB's Communications Division, Ottawa, tel. 1-800-668-5284; e-mail: info@atomcon.gc.ca.

IAEA Conference Report

The International Atomic Energy Agency has announced the publication of the proceedings of a symposium held in June 1997 on Nuclear Fuel Cycle and Reactor Strategies: Adjusting to New Realities. The purpose of the forum was to discuss the new realities facing the nuclear fuel cycle and to consider options on how these could be addressed. Dan Meneley was chairman of a working group that prepared one of the five "issue" papers. Terry Rogers was the lead author of an invited paper on Development Potential for Thermal Reactors and Their Fuel Cycles. Colin Allan and Stan Frost were co-authors of another invited paper on Radioactive Material Releases in the Nuclear fuel cycle - Experience and Improvements. The Proceedings are available from agents of the IAEA or from the Agency directly; e-mail: sales.publications@iaea.org.

IAEA Booklet

A booklet issued by the IAEA for the participants at the Kyoto Conference on Climate Change titled "Sustainable Development and Nuclear Energy" is now available from the Agency.

CNS news

CNS / CRPA communicating

Despite being involved in the same or related fields, the Canadian Nuclear Society and the Canadian Radiation Protection Association have tended to each go there own way over the almost two decades the two organizations have been in existence. Now, largely thanks to overtures from CNS director Parviz Gulshani and warm responses from CRPA executive members, communication is flowing between the organizations and some collaborative efforts are underway.

A presentation on the CNS will be given at the CRPA Annual Conference in Ottawa in May, and the CRPA is organizing a session at the 1998 CNS Annual Conference, which will be held in October in Toronto.

It has already been identified that public information is a major area of common concern. Both organizations recognize that the public's fear or distrust of radiation is a serious detriment to achieving the full and beneficial use of nuclear medicine, irradiation technology and nuclear energy.

Readers are urged to consider attending the CRPA Annual Meeting and possibly joining the Association.

The **CRPA Annual Conference** is being held in Ottawa, **May 24-28, 1998.** To register or for information, contact: Hannah Goedhard, tel. 613-258-3628; Fax: 613-258-1390; e-mail: goedhard@sympatico.ca

NEWS OF MEMBERS

Helen Griffiths is on attachment to Natural Resources Canada from AECL Chalk River Laboratories. Helen had been very active in the CNS Chalk River Branch.

Bob Morrison, former director general, nuclear energy at Natural Resources Canada, was the Canadian representative on a High Level Advisory Group formed by the Organization for Economic Cooperation and Development (OECD) to review the role and future of the OECD's Nuclear Energy Agency. Dr. Morrison had chaired the OECD-NEA's steering committee for a number of years. The report of the group, entitled Nuclear energy in the OECD: towards and Integrated Approach was issued in January 1998. Among the major conclusions of the group were:

- A more thorough discussion of nuclear energy in a sustainability context is required within the OECD.
- There is a continuing need in the OECD for a strong, technically based body whose main task is to provide a sound understanding of the scientific and technical basis for the safety, environmental and economic aspects of nuclear energy. The NEA is such a body.

New Web Page

After many months of planning and work by a dedicated new committee of the CNS, the Society now has its own Web page, with the simple and straight forward address:

www.cns-snc.ca

The Internet committee, which is now a standing committee of the Society is headed by Peter Laughton, of AECL-CRL. Other members are: Simon Day, Morgan D'Antonio, Gary Dyke, Adam McLean, with Jeremy Whitlock and Morgan Brown (of CRL and WL respectively) as active contributors.

The new Web page provides information about the Society and links to other sources of nuclear information. Branches and divisions will be able to add pages of their own, although they are warned that maintenance and upkeep of their pages are their own responsibility.

All members of the Society are encouraged to make use of the new Web site and to mention it to others. If any reader has questions they should contact Peter Laughton, e-mail: laughtonp@aecl.ca.

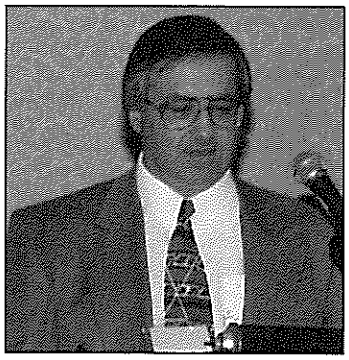
New Agreements

In February the Canadian Nuclear Society signed two agreements of cooperation; one with the Malaysian Nuclear Society, the other with the Atomic Energy Society of Japan

Also in February, the CNS joined ITER Canada, the organization set up to work towards having the next large thermonuclear machine, ITER, sited in Canada.

An Active Society
- President reviews CNS in 1997 at Winter Seminar

Ed. Note: *Following is most of the text of CNS President Ben Rouben's opening address to the CNA/CNS Nuclear Energy Winter Seminar in Ottawa, February 10, 1998*



Ben Rouben

Good morning ladies and gentlemen! The Canadian Nuclear Society would like to welcome each and every one of you to the Nuclear Energy Winter Seminar.

I would like to take just a few minutes to inform you about the latest developments in the CNS.

Branch Activities

Since last year's Winter Seminar, the Canadian Nuclear Society has continued to be very active. Our various local Branches have organized all manner of interesting seminars for members in their geographical regions. I believe that active CNS Branches provide an excellent service to their local membership.

Conferences and Courses

It has also been a banner year for CNS conferences and courses, an area in which the CNS has done very well for its members. In the past twelve months, the CNS has organized, sponsored, or co-sponsored, the following conferences and courses.

CNS Conferences and Courses in the Past 12 Months

Title	Date	Venue
22nd Annual CNA/CNS Student Conference	97 March 14-15	University of New Brunswick, Fredericton, NB
CANDU Reactor Safety Course	97 May 12-14	Mississauga, ON
1997 CNA/CNS Annual Conference	97 June 8-11	Toronto, ON
20th Nuclear Simulation Symposium	97 September 7-9	Niagara-on-the-Lake, ON
CNS 5th International CANDU Fuel Conference	97 September 22-24	Toronto, ON
CNS 4th CANDU Maintenance Conference	97 November 16-18	Toronto, ON

You can see the breadth of disciplines that these activities covered. All these events were very successful, from both the technical and the attendance points of view. I am very proud of our many volunteer organizers, in the Branches and the Divisions. I hope you will allow me to pat them collectively on the back; there are too many to mention individually.

Following are the conferences and courses planned for 1998.

Title	Date	Venue
23rd Annual CNA/CNS Student Conference	98 March 27-28	Royal Military College, Kingston, ON
11th Pacific Basin Nuclear Conference (PBNC '98)	98 May 3-8	Banff, Alberta
CANDU Reactor Safety Course	?	?
CNS 3rd International Steam-Generator & Heat-Exchanger Conference	98 June 21-24	Toronto, ON
19th Annual CNS Conference	98 October 18-21	Toronto, ON
Science of Nuclear and Radiation Course	98 June 22-25	McMaster University Hamilton, ON
Other CNS Nuclear Science and Engineering Division Course	?	?

PBNC'98, being organized on behalf of the Pacific Nuclear Council, is a major and exciting event for both the CNA and the CNS,. We certainly hope to see you there. It will give you an opportunity to mingle with senior representatives of companies and governments from many of the Pacific Rim countries, and to meet colleagues.

This year, for the first time, the CNS is holding its Annual Conference separately from the CNA, and I invite you all to Toronto in October for that occasion.

The "Science of Nuclear Energy and Radiation Course" shown above is a pilot project being launched by the Canadian Nuclear Society. This course is targeted at High School teachers, and is intended to provide factual information to these educators on nuclear science and technology. The CNS believes that it is very important to provide our youth with reliable information about nuclear technology and nuclear power. We think that there is a great need among teachers for this type of course. With increased knowledge of nuclear science and of the various uses of nuclear technology, educators will be better able and more inclined to provide a positive message to their students on the nuclear industry. This pilot project is co-sponsored by the CNA, and while it is initially planned as a course at McMaster University, if it is successful the CNS hopes to turn it into an initiative in many provinces, serving the local teacher communities.

The CNS is also sharing in the sponsorship of a book on nuclear energy for general readers, being prepared by Hans Tammemagi.

Membership

As a means of recognizing our growing numbers, the CNS has designed and distributed to its members an attractive personalized and framed certificate of membership.

CNS Incorporation

CNS Council is recommending incorporation of the Society as a legally separate organization and will be polling the membership on this question in the coming weeks.

The CNS was founded in 1979 as "the technical Society of the Canadian Nuclear Association)". That legal structure has continued to the present time. Over the years the CNS has grown in numbers and in financial strength. The Society now has close to 1,000 members. It has been administered independently, by its volunteer Council, since the beginning, and has taken good care of its own financial affairs.

The relationship of the Society with the CNA has always been, and continues, to be, excellent. Nevertheless, we believe that this is a good time for the CNS to incorporate. Incorporation will recognize, legally, the maturity of the Society and allow it to join its sister societies throughout the world as an independent technical society. It will allow the CNS to stand "on its own two feet", and be truly in charge of its own destiny. In addition, it will enhance the credibility of the Society as a technical association in its dealings with the "outside" world. If you are a member of the CNS, you will receive the voting ballot very soon.

Web Page

The CNS has just launched its own Web page. Again this was all done by volunteers. The page will provide information on the CNS and will have links to other sources of information on the nuclear industry and nuclear science and technology.

Summary

The CNS continues to grow and continues to provide an excellent service to the nuclear industry in Canada. The CNS is proud of Canada's nuclear heritage and will continue to work for the continued strength of that heritage.

Nominations for Council

The term for the current officers and Council of the Canadian Nuclear Society ends at the Annual General Meeting to be held this year on June 21, 1998, at the Marriott Hotel in Toronto.

The following persons have been nominated by the Nominating Committee for the 1998-99 term.

Nominated by Nominating Committee

President	Mr. P. D. (Paul) Thompson NB Power
1st Vice-President / president elect	Dr. V. S. (Krish) Krishnan AECL-SP
2nd Vice-President	Mr. K. L. (Ken) Smith UNECAN
Secretary	Mr. D. L. (David) Freeman Canatom
Treasurer	Dr. S. Y. (Andrew) Lee Ontario Hydro

Members at Large (12 positions)

Dr. P. (Parviz) Gulshan	AECL - SP
Dr. G. D. (Glen) Harvel	AECL - SP
Mr. H. M. (Hong) Huynh	Hydro Quebec
Dr. P. J. (Peter) Laughton	AECL - CRL
Mr. V. J. (Vincent) Langman	AECL - SP
Mr. R (Raymond) Leung	Ontario Hydro
Mr. K (Kris) Mohan	AECL - SP
Ms. J. (Jad) Popovic	AECL - SP
Mr. E. G. (Ed) Price	AECL - SP
Mr. A. W. L. (Duke) Segel	retired
Dr. H. J. (Harold) Smith	AECL - SP
Ms. J. A. (Judy) Tamm	AECL - WL

Further nominations are invited for any of the officer positions except President and Past President and for Members at Large of the Council.

Nominations require the signature of three members in good standing and the written agreement of the nominee.

Send your nominations to:

Nominating Committee
Canadian Nuclear Society
144 Front Street West, Suite 475
Toronto, Ontario
M5J 2L7

Deadline for receipt of nominations is Thursday, May 7, 1998.

Student Conference

The 23rd annual Student Conference was held successfully at the Royal Military College in Kingston, Ontario, March 27 and 28, 1998, just as this issue of the CNS Bulletin was going to press.

This Conference, sponsored by the Canadian Nuclear Society and the Canadian Nuclear Association, provides an opportunity for students at the undergraduate, masters and doctorate level to gain the experience of presenting papers to their peers. Papers were accepted and presented in either official language.

This year there were 24 papers with 29 authors. The winners were:

- Undergraduate — M. Pérusse et M. D. F. Boivin, RMC / CMR
  Armements Nucléaires

- Masters (tie) — M. Di Marco, Univ. de Mont.
  Thermoluminescence Dosimetry
  L. Lang, Univ. of N. B.
  A Model for Corrosion and Mass Transport in CANDU Reactor Coolants

- Doctorate — F. Taghipour, Univ. of Toronto
  The Impacts of Organics on Radioiodine Behaviour under Reactor Accident Conditions

(Honourable Mention) — D. Novog, McMaster Univ.
Subcooled Flow Boiling Hysteresis Characteristics of Freon 134a in a Tubular Channel

Abstracts of the winning papers will be published in the next issue of the CNS Bulletin.

Cadet LCdr. Christopher Tingle was overall Conference chair, while Professor Hugues Bonin chaired the organizing committee.

An aerial view of the Bruce Nuclear Department. The units of the Bruce "A" plant, in the foreground, have been "laid up" as part of Ontario Hydro's "nuclear asset optimization plan".

Chalk River

Chairman: Jeremy Whitlock

The Chalk River Branch continues to hold public seminars roughly once per month, in the evening in the Town of Deep River.

On January 29 the Branch held a "get-acquainted" seminar by Dr. Romney Duffey, AECL's new Principal Scientist at which there was an attendance of over 80 people. Dr. Duffey introduced himself by outlining his interests and career to date and explained the role of the Principal Scientist.

On February 26, Dr. Bill Buyers spoke on "Neutrons for the Next Fifty Years", giving an overview of the important applications of neutron scattering and the need for a new neutron source (the proposed IRF) to succeed NRU. Dr. Buyers represents the NRC's "Neutron Program for Materials Research" the hub of Canada's neutron scattering program which was operated until August 1997 by AECL at the Chalk River Laboratories.

The Branch's program coordinator (and part-chair), Helen Griffiths, left us this month for a new job in Ottawa. Before leaving, Helen set up the groundwork for the remaining seminars, taking us up to the summer. Program responsibilities will be taken over by branch chair Jeremy Whitlock for the remainder of the year.

On the education front, the Branch will be donating a prize to the Renfrew County Science Fair (April 4). It will also be exhibiting at AECL's annual Science for Educators workshop (April 16-18), and running the very popular Hands-On Radiation Workshop.

The executive is considering allocating some Education Fund money to the Deep River Science Academy, which is suffering from loss of government grants.

Bruce

Chairman: Eric Williams

The Bruce Branch resumes operation in April after obtaining permissin to use Ontario Hydro facilities for meetings.

The following presentations have been arranged:

April 28	Dr. Gary Kugler, V.P. Commercial Operations, AECL, who will speak on "AECL's Challenges at Home and Abroad"
June 2	Mr. Jim Ryder, VP Bruce Nuclear, on "The Bruce Nuclear Organization"
September 24	Beth McGillivray, Ottawa General Hospital, on "Nuclear Medicine"

Ms. McGillivray will also be making presentation to local high school students.

The Branch is encouraging teachers to attend the one-week course on "Science of Nuclear energy and Radiation" being presented at McMaster University with the co-sponsorship of the CNS. The Branch is offering to subsidize one teacher from each of the four high schools in the area.

Manitoba

Chairman: Morgan Brown

The Manitoba Branch is actively pursuing several potential speakers. Beth MacGillivray, of the Ottawa General Hospital, visited Manitoba from March 4 to 6. She spoke at a University of Manitoba Physics Department Colloquium on March 4, and to a Winnipeg high school on the 5th. Also on the 5th, she addressed the CNS Manitoba Branch in Pinawa. On the 6th, she spoke at Pinawa High School, to students gathered from neighbouring high schools. Later that morning Beth gave presentations to teachers at Whiteshell laboratories, and joined them for a tour of the Underground Research Laboratory.

New Brunswick

Chairman: Dave Reeves

Dr. Trevor Collins, of British Energy, spoke to an evening meeting in Saint John on March 12 about privatization of the electrical utilities in Great Britain and the challenges of generating electricity in a de-regulated market. He also spoke about some of the technical issues facing the Torness Power Station where he was reactor physicist before being assigned to British energy's office in Toronto. The talk was so popular that he was asked to speak again the next day at the Point Lepreau station.

The next meeting is on April 16 when Patrick Reid of ALARA will talk about the new CANFLEX fuel. Point Lepreau will be testing CANFLEX fuel in the near future.

A dinner meeting in May is being planned with Murray Stewart, president of the CNA, as the guest speaker. In June Sid Turner of NB Power will discuss the Hagler Bailly study of the future of the Point Lepreau plant.

(Report by Mark McIntyre)

Ottawa Branch

Chairman: Mohamed Lamari

In January the Ottawa Branch held a very successful evening meeting with Brian Debs, vice-president of regulatory affairs at Ontario Hydro Nuclear, speaking on the IIPA and NAOP. His talk elicited an animated discussion period

which was only terminated by his need to return to Toronto.

On February 22, Dr. Joe Borsa provided an up-beat message about Food Irradiation. *(See article in this issue prompted by Dr. Borsa's talk.)*

Several Ottawa area members of the Branch planned to attend the dinner of the CNA/CNS Student Conference being held at the Royal Military College in Kingston on March 27.. The several members of the CNS at RMC are attached to the Ottawa Branch.

The CNS Ottawa Branch is supporting the Ottawa Regional Science Fair and is offering a prize for the best project explaining a beneficial use of nuclear science or technology.

Pickering

Chairman: Marc Paiment

The Branch is planning another Annual Dinner Evening with the Darlington Branch.. Other than that, Branch members are, reportedly, trying to keep their heads above water with an ever-increasing workload.

Sheridan Park

The 1998 executives for the Sheridan Park Branch are:

Kwok Tsang	Chair
Parvis Gulshani	Vice-Chair
Mukesh Tayal	Past-Chair
Dinshaw Burjorjee	Secretary
Rick Ricciuti	Treasurer

On February 11th, Basma Shalaby, AECL acting Chief Engineer, gave an interesting seminar on "CANDU Plant Life Management".(Dr. Shalaby's notes for her talk are reprinted in this issue of the CNS Bulletin.).

AECL's new Principal Scientist, Romney Duffey, gave a seminar to the Branch on March 11.

A Correction

When the Proceedings of the Symposium on Radiological Impacts from Nuclear Facilities on Non-Human Species were published, an important acknowledgment was unfortunately omitted. The Canadian Nuclear Society and the Canadian Radiological Protection Association express their regret that the generous contribution of The Montreal Foundation was not mentioned in the Proceedings. The donation from the Foundation enabled the abstracts contained in the Proceedings to be translated.

NEWS MEMBERS

We welcome the following new members to the growing family of the Canadian Nuclear Society

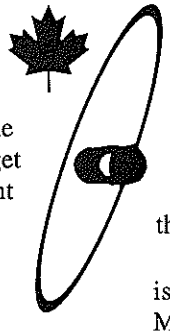
G. Carl Andognini
Thomas Bernacki
Gregory Cecchi
Andrew Celovsky
Hank Chow
David J. Cislo
Romney Beecher Duffey
M. Ellison
Neville D. Fairclough
Jaro Franta
Luke T. Frawley
Jim G. Georgas
Kenji Hirashima
May T. Heinrich
Mark D. Ho
Kazuhisa Hosokawa
Walter Hui
John M. Jevec
Thomas Johnson
Daniel D.J. Kane
Hatem Khouaja
Alex Kurasz
R. Peter Lindsay
Glen Michael MacGillivray
David Mader
Sirawat Maleevan
Kevin Maynard
Grant H. McClellan
Jim McLaughlin
Susan Helen Miller
Hannes Mueller
Sheldon Myhre
Agnes H. Park
Denis Pelletier
John Perrin
Kam Philipose
Tim Qian
William A. Ribich
Theodore Rockwell
Sergio Russomanno
Koushi Sakata
Sherry L. Secord
Pam Simons
David John Sims
Dan Snyder

Dieter Arn Bergman Toews
Heather Van Drunen
Nigel Vanzeller
Edward D. Wessman
Bill Yoh
Roderick Alan Young
Maung Zeya

CNA president Murray Stewart (L) and CNS president Ben Rouben sign the first formal agreement between the CNS and CNA for office services, while CNS president-elect Paul Thompson looks on, 9 February 1998.

The Tale of the CNS Logo

by Jeremy Whitlock



A scientist is always questioning. Weary of too many questions one day, I pushed back from my computer, coddled my cold coffee, and let my gaze wander around the office. Of course, the questions flooded in: "Why can't I get better shelving than this?" "How much does it cost to print that glossy internal newsletter?" "Is that a bullet hole?"

Then my eyes beheld my brand new CNS Membership Certificate hanging on the wall, and suddenly, an age old nagging question loomed before me: "What on earth is that CNS logo supposed to be anyway?". Don't get me wrong – I've always liked the CNS logo: that sharp-looking atom thingy with its blue elliptical orbit canted to the right, offset by a bold red maple leaf. It says "I am Canadian. And I am nuclear." It is rarely spared a second thought, and yet is known to all – the essence of good corporate art.

But wait. What exactly IS it trying to say? Surely that atom thingy is more than just a ... thingy.

It's not the only question I've had about the logo design. I used to wonder why its creators put space between the maple leaf and the ellipse, making life tough for the lapel pin designers. In more contemplative moments, I've marveled at how the logo makes for an inherently unstable lapel pin, with the maple leaf in its highest energy state, gravitationally speaking. How many of us have strutted around conference receptions sporting a tiny upside-down maple leaf, like some microscopic distress signal?

However, this isn't to impugn the foresight of the logo's creators. Originality, impression, recognition-factor, identity, patriotism – these were the criteria by which our symbol was forged, and no doubt under a deadline. Equally so, the artists of the late 70's cannot be faulted for building into the design an inherent sensitivity to digital reproduction. The CNS logo, with its pixel-width lines of graded thickness, slanted well away from the vertical, has become an unwitting standard by which the resolution of laser printers and computer monitors can be benchmarked. In the digital-only world of the new CNS website, for instance, we can look quite tattered at the receiving end, and it's beyond our control.

But that's splitting hairs. I'll take our elegant emblem any day over the uninspired, post-war industrialism of the ANS trademark. Sure, you can stamp the American logo into mashed potatoes and it would still be legible. Sure, it's a one-piece, symmetric design unhindered by gravitational caprice. Sure, the letters of the organization are emblazoned across the image like the "USA" on a Saturn V rocket. The fact is, our CNS logo is distinct, and distinctly Canadian.

Take that maple leaf, for example. As unmistakable as the maple leaf they slip around the GM logo, to make GM Canada. Or the maple leaves that Americans paste onto their luggage when they wish to be treated courteously abroad.

It's understated, but bold. Small, but effective. Well intentioned, but sometimes it hangs upside down.

Most importantly, our logo, like our CANDU reactor, is based on science, not expediency. The focus, after all, is a representation of atomic structure. I don't mean the generic whirligig atom found everywhere else, including the ANS logo – but a specific, albeit figurative, atom.

This brings me back to my original query. What exactly is the atomic species staring back at me from that Membership Certificate, or from the front cover of the Bulletin, or (inverted) from my left lapel? Clearly, three particles lie within the listing ellipse, of which two appear identical. I mentally draw up a short list consisting of: a tritium atom, a positive He-3 ion (which would explain the lapel pin's unstable energy state), and a water molecule with a highly figurative electron orbit. Perhaps the latter is heavy water – but deadline or no deadline, I really think they would have bent the polar molecule, wouldn't they?

Convinced that, by enshrining tritium as our trademark, the logo's creators had perpetrated the greatest tongue-in-cheek prank of our time, I sought out Mr. George Howey, the CNS' founding president from almost twenty years ago. This wasn't hard, since he's my next-door neighbour, but as it happens I cornered him at a CNS seminar. George, retired from managing Ontario Hydro's technical training program, instantly recognized the nobility of my quest, and pointed the finger at Dan Meneley, the CNS' founding Secretary/Treasurer. Confronting Dan was more difficult since he's currently one of AECL's main men in the Far East (Asia, not Point Lepreau). However, through the magic of internet, Dan responded shortly from the Red River Valley of Vietnam, and pointed the finger soundly (if virtually) at R. Allan Brown, currently of R.A. Brown & Associates Ltd. in Toronto. Allan in turn pointed right back at Dan.

A flurry of emails ensued, but the combatants generally behaved like gentlemen, and in the end a semi-coherent picture emerged. It seems that twenty years ago, the nascent Canadian Nuclear Society, formed as an offshoot of the CNA, needed its own identity. The call to create a logo was answered by Dan Meneley, who drew two nucleons within an electron orbit, and declared it D-2, heavy hydrogen. Simple, logical, and based on the science behind the product.

Shortly thereafter, Allan Brown and the late John Hewitt (the CNS' first Vice President) met over lunch at the U of T's Hart House to finalize the design. The maple leaf was added, along with that third "circle", which, logically enough, is the "electron". Close inspection reveals that the ellipse does indeed intersect the "electron". A satisfying answer indeed, regardless of the fact that electrons are not the same size as nucleons, nor are they likely to be lined up in space so neatly with the nucleons.

At some point the top-secret concept made its way to

George Howey, who sized it up through a cloud of cigar smoke, declared it acceptable, and the rest, as they say, is history.

The original colour scheme, it also emerged, was a baby blue atom and a red maple leaf. Over the years the atom's colour has not only changed (sometimes dark blue, sometimes red nucleons/blue orbit), but the incline of the ellipse seems to have varied as well. The consensus points to the current CNS letterhead as the closest to the original vision. Oddly, this slipshod QA is also satisfyingly consistent – where else but in Canada would we mismanage a symbol over such a short period of time?

So there you have it. Leaving no rock unturned, no corner of the Earth untouched, I've marched steadfastly through the mists of time to seek my answer: D-2. Hopefully the facts are close to what I report here; possibly they suffer from twenty years' moss-growth. Regardless, I can now return my cold coffee to its rightful place (the mouse pad), push back to my computer, and seek other unearthly riddles more closely related to what they pay me for.

Late News

Ed. Note: Following are some items of possible interest to our readers that arrived just as we were going "to press".

CNS Incorporation - Yes !

The closing date for the vote by members of the Canadian Nuclear Society on incorporation was March 27, 1998. Blosser and Associates, the Society's accountants, counted the ballots shortly thereafter and have reported that the answer was 97% Yes.

About one half of the eligible (paid-up) members cast their vote. Unfortunately about 9 % were spoiled, primarily from lack of signature on the mailing envelope.

With this outcome, the next step in the process towards incorporation of the CNS as a separate, federally incorporated, organization is for the Canadian Nuclear Association (currently the Society's parent body) to pass the necessary changes to their constitution and by-laws at their Annual General Meeting which will be held during the PBNC 98 conference in Banff in early May.

Once the CNA has passed those motions, the CNS executive will formally apply for incorporation as a federal, non-profit, organization. The By-Laws distributed with the incorporation ballot have already received preliminary approval by Industry Canada, the regulatory agency.

AECB Decisions

Following its public meeting held in Oshawa, Ontario, on March 24, 1998, the five-member Atomic Energy Control Board announced two major licensing decisions.

Pickering NGS

The Board approved the renewal of the Operating Licences for the Pickering A and B nuclear generating stations for a one-year term, to March 31, 1999. The Pickering A licence will require that all four units remain in an approved shutdown state until further AECB approval.

Ontario Hydro is to report back to the Board in six months on its progress in bringing about the required improvements. Also, Ontario Hydro must provide, by April 30, information to show that the shutdown of Pickering A does not impair the reliability of the power supply for the emergency coolant injection system at Pickering B.

In addition, Ontario Hydro must submit, by June 30, 1998, a summary of existing environmental protection programs related to the Pickering stations and the results of these programs.

Cluff Lake uranium mine

The Board approved a nine-month extension to the Operating Licence for the Cluff Lake mine.

Cogema, the mine's owner, must report to the AECB by June 30, 1998, on the cause and impact of the recently detected increase in radium levels in Snake Lake, next to the tailings management area, and submit a plan for mitigative measures.

The Board imposed a number of other conditions, including the requirement to submit, by June 30, 1998, information to demonstrate that the ALARA principle is being applied to the radiation protection program for underground miners. If this condition is not met underground mining will be forbidden.

Cogema officials must appear before the Board at its October 1, 1998 meeting to report on the progress on improving radiation protection, tailings management and general project management.

CALENDAR

1998

May 3 - 7

11th Pacific Basin Nuclear Conference
Banff, Alberta
contact: Ed Price
AECL Sheridan
Tel: 905-823-9060 ext. 3066
Tel: 613-584-3311
Fax: 613-584-1849
e-mail: pricee@candu.aecl.ca

May 10 - 15

ICONE-6 6th International Conference on Nuclear Engineering
San Diego, California
contact: B. Bigalke
ASME
New York, NY, USA
Fax: 212-705-7056
e-mail: bigalkeb@asme.org

May 24 -28

CRPA Annual Conference
Ottawa, Ontario
Contact: Ms. Cait Maloney
c/o Atomic Energy
Control Board
Ottawa, Ontario
Tel: 613-943-8948
Fax: 613-996-2049
e-mail: maloney.c@atomcon.gc.ca

June 7 - 11

ANS Annual Meeting
Nashville, Tennessee
contact: American Nuclear Society
La Grange Park, Illinois
Tel: 708-352-6611
Fax: 708-352-6464

June 14 - 18

12th International Symposium Zirconium in the Nuclear Industry
Toronto, Ontario
contact: G.D. Moan
AECL
Mississauga, ON
Tel: 905-823-9060 ext. 3232

June 21

CNS Annual General Meeting
Toronto, Ontario (to be held in conjunction with Steam Generator and Heat Exchanger Conference)
contact: David Freeman,
CNS Secretary
c/o AECL-SP
Tel: 905-823-9060 ext. 6405
e-mail: freemand@aecl.ca

June 21 - 24

3rd CNS International Steam Generator and Heat Exchanger Conference
Toronto, Ontario
contact: R. Tapping
AECL-CRL
Chalk River, ON
Tel: 613-584-8811 ext. 3219

June 22-23

World Uranium Mining Congress
Toronto, Ontario
contact: Evan Hurwitz
AIC Worldwide
Sydney, Australia
Fax: 61-2-9223-8216
e-mail: ehurwitz@aicconf.com.au

June 22 - 25

Science of Nuclear Energy and Radiation Course for Science Teachers
McMaster University
Hamilton, Ontario
contact: Bill Garland
McMaster University
Tel: 905-525-9140 ext. 24910
Fax: 905-577-9090
e-mail: garlandw@mcmaster.ca

June 28 - July 2

ICENES '98 – 9th International Conference on Emerging Nuclear Energy Systems
Tel Aviv, Israel
contact: Dr. Dan Knassim
POB 1931 Ramat Gan 52118
Tel: 972-3-613-3340
Fax: 972-3-613-3341

October 5 - 8

International Conference on the Physics of Nuclear Science and Technology
Long Island, H.Y., USA
contact: Dr. David Diamond
Brookhaven National Laboratory
Tel: 516-344-2604
Fax: 516-344-5730
Fax: 416-979-8356
e-mail: diamond@bnl.gov

October 11 - 14

International Topical Meeting on Safety of Operating Reactors
San Francisco, California, USA
contact: Dr. Garth Cummings
Danville, California
Tel: 510-422-1264
Fax: 510-423-2224
e-mail: cummingsg@ilni.gov

October 18 - 20

CNS Annual Conference
Toronto, Ontario
contact: Sylvie Caron
CNS Office
Toronto, ON
Tel: 416-977-7620 ext. 18
Fax: 416-979-8356
e-mail: carons@cna.ca

October 25 - 28

ENC '98 International Nuclear Congress and World Exhibition
Nice, France
contact: ENC '98 Secretariat
European Nuclear Society
Berne, Switzerland
Tel: 41-31-320-6111
Fax: 41-31-382-4466
e-mail: carons@cna.ca

Nov. 15 - 19

ANS Winter Meeting
Washington, DC
contact: ANS Office
La Grange Park, Illinois
Tel: 708-579-8258

Nov. 15 - 19

Meeting of the Americas: Nuclear Science, Technologies, Applications
Washington, DC (held in conjunction with ANS Winter meeting)
contact: Fred Boyd
Kanata, ON
Tel./Fax: 613-592-2256
e-mail: fboyd96@aol.com

Nov. 30 - Dec. 4

Trends in Design and Development of Evolutionary Water-Cooled Reactors
Seoul, Korea
contact: J. Cleveland
IAEA
Vienna, Austria
Fax: 43-1-2060-20607
e-mail: official.mail@iaea.org

1999

January 24 - 27

Health Physics Society Symposium
Albuquerque, New Mexico
contact: J.M. Hylko
Fax: 505-837-6870
e-mail: jhylko@msm.com

February ??

CNA/CNS Winter Seminar
Ottawa, Ontario
contact: Sylvie Caron
CNA/CNS Office
Toronto, ON
Tel: 416-977-6152 ext. 18
Fax: 416-979-8356
e-mail: carons@cna.ca

March 26 - 27

CNS / CNA Student Conference
Trent University
Peterborough, Ontario
contact: Dr. Jim Jury
Trent University

June 6 - 10

ANS Summer Meeting
Boston, MA
contact: ANS Office
La Grange Park, Illinois
Tel: 708-579-8258

June 13 - 17

CNA/CNS Annual Conference
Montreal, Quebec
contact: Sylvie Caron
CNA/CNS Office
Tel: 416-977-6152 ext. 18
Tel: 416-979-8356
e-mail: carons@cna.ca

September ??

International Symposium on the Radiological Effects from Nuclear Facilities on Non-Human Biota
contact: R. Maloney
AECB, Ottawa
Tel: 613-995-5116
e-mail: maloney.r@atomcon.go.ca

October 1999

3rd International Conference on Containment Design and Operation
Toronto, Ontario
contact: K. Weaver
Ontario Hydro
Toronto, ON
Tel: 416-592-4050

October 3 - 8

NURETH-9 - 9th International Meeting on Nuclear Reactor Thermalhydraulics
San Francisco, California, USA
contact: Dr. S. Levy
Levy & Associates
3880 South Beacon Avenue
Suite 112
San Jose, California
USA 95124

Nov. 14 - 18

ANS Winter Meeting
Long Beach, California
contact: ANS Office
La Grange Park, Illinois
Tel: 708-579-8258

?? 1999

International Conference on Effects of Radiation on In-Reactor Corrosion
contact: V. Urbanice
AECL-CRL
Tel: 613-584-4676

?? 1999

6th International CANDU Fuel Conference
TBD
contact: Joseph Lau
AECL - SP
Tel: 905-823-9040
e-mail: lauj@aecl.ca

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1997-1998
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1997

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(New) CNS WEB Page

For information on CNS activities and other links

http://www.cns-snc.ca

PBNC 98

11th Pacific Basin Nuclear Conference

How will nuclear power energize the Pacific Rim in the 21st century ?

Find out in Banff, Canada, in the spectacular Rocky Mountains, amid lakes and waterfalls, the Columbia Ice Fields, a natural spa, ski hills and golf courses.

Make a note on your calendar May 3-7, 1998 – PBNC 98. The theme of the conference is International Co-operation in the Pacific Rim in the 21st Century.

Session Highlights

Financing and Economics

Safety Practices and Regulation

Environmental and Resource Sustainability

Operations and Maintenance

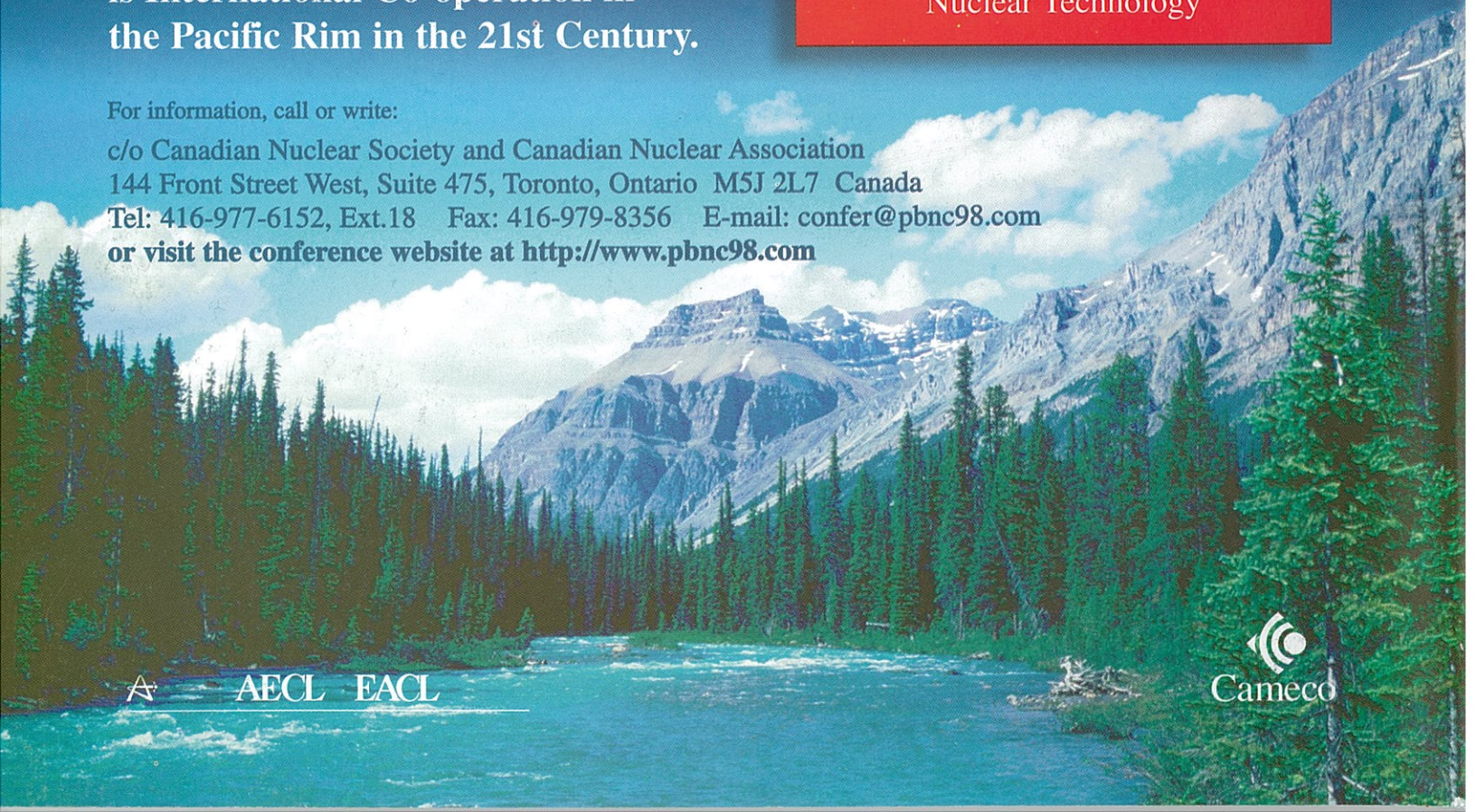
Industry Infrastructure

Public Information and Understanding

Nuclear Technology

For information, call or write:

c/o Canadian Nuclear Society and Canadian Nuclear Association
144 Front Street West, Suite 475, Toronto, Ontario M5J 2L7 Canada
Tel: 416-977-6152, Ext.18 Fax: 416-979-8356 E-mail: confer@pbnc98.com
or visit the conference website at http://www.pbnc98.com



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