



Canadian Nuclear Society
Société Nucléaire Canadienne

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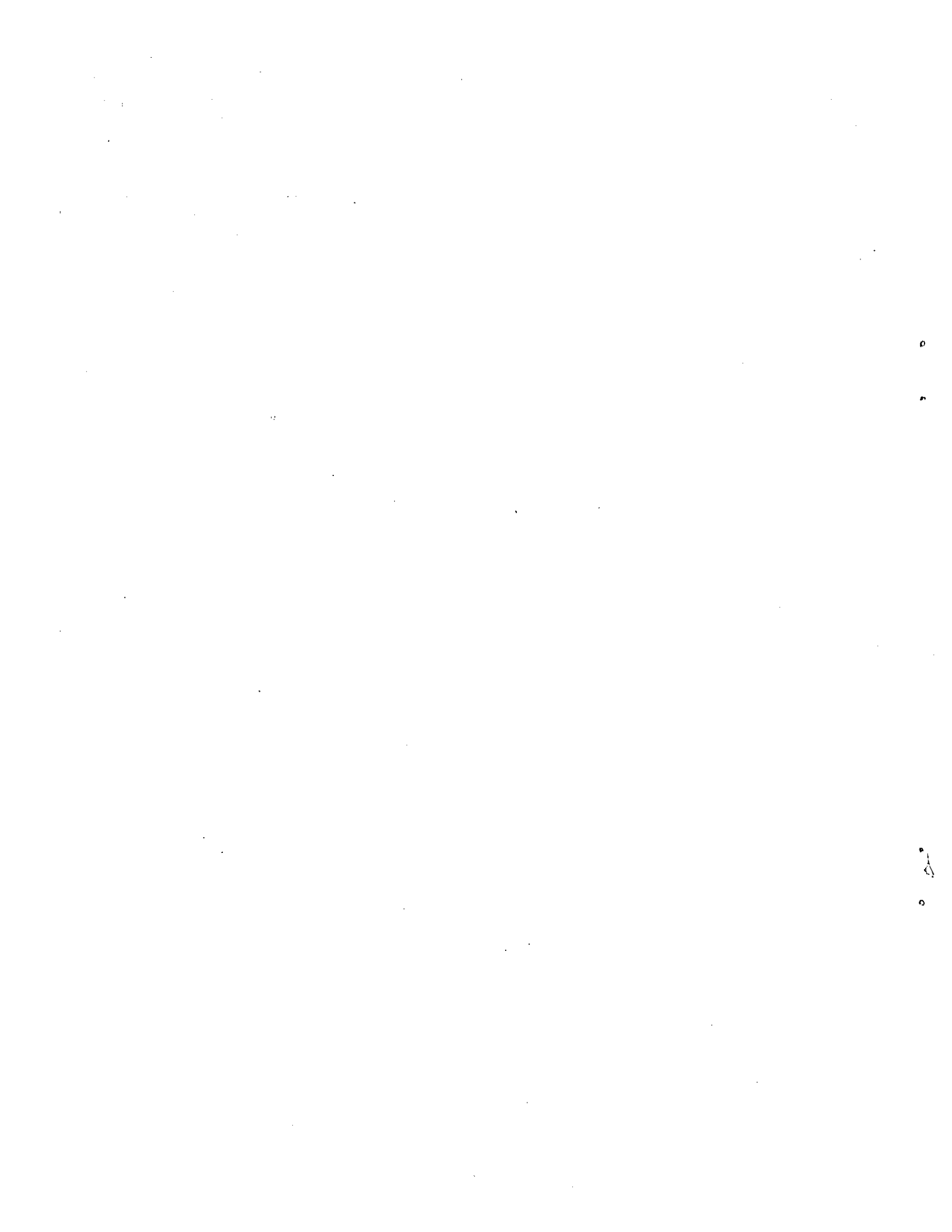
August-October / Août - Octobre 1982

**PRESIDENT'S MESSAGE -
CNS MEMBERSHIP DRIVE**

FUSION IN CANADA

**NUCLEAR ENGINEERING
AT RMC**

THE CNS VS. THE CNA



The CNS Bulletin is the membership newsletter of the Canadian Nuclear Society.

Le Bulletin SNC est l'organe d'information de la Société Nucléaire Canadienne.

CNS provides Canadians interested in nuclear energy with a forum for technical discussion. For membership information, contact the CNS office, a member of the Council, or local branch executive. Membership fee is \$30.00 annually.

La SNC procure aux Canadiens intéressés à l'énergie nucléaire un forum où ils peuvent participer à des discussions de nature technique. Pour tous renseignements concernant les inscriptions, contacter le bureau de la SNC, les membres du Conseil ou les responsables locaux. La cotisation annuelle est de \$30.00.

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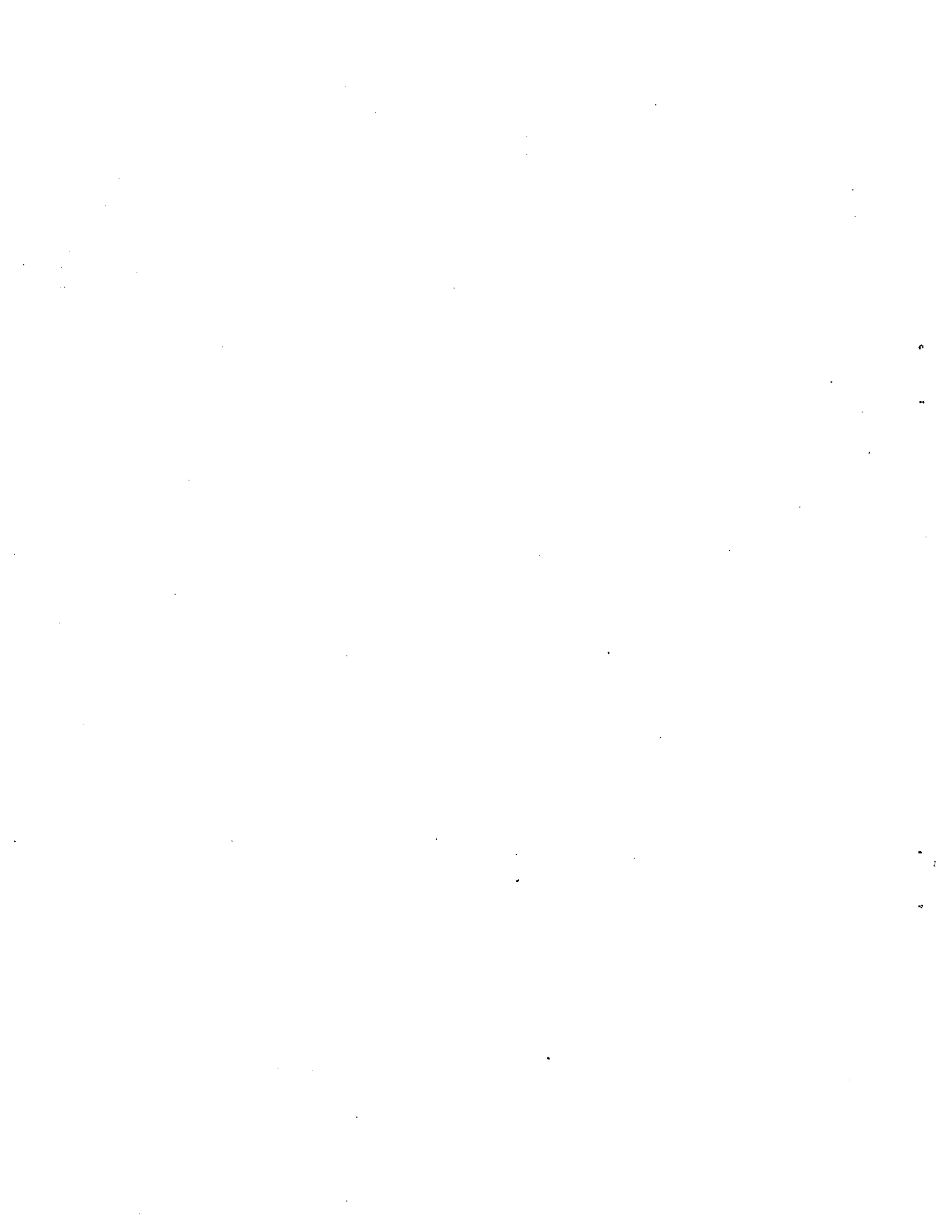
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EDITORIAL

An Introductory Offer

Everybody in the nuclear business in Canada could be permitted a certain amount of euphoria over the last month or so. A milestone was passed with the twentieth anniversary of the first CANDU on October 2. And one of Ontario Hydro's Bruce reactors achieved what seems to be a world record of 494 days on uninterrupted full power operation. Two Canadian utilities joined the nuclear operating club with the start up of 600MW CANDUs at Point Lepreau and Trois Rivieres (Gentilly-2). These events are bright spots in a rather gloomy environment.

Its rather ironic to reflect that the severest problem the Canadian nuclear community may ever have to deal with is not technical or scientific, but political and economic. The immediate future does not look promising -- people are not beating down doors to order CANDUs, and the industry's biggest single customer, Ontario Hydro, has no more nuclear stations committed after Darlington.

Against this rather gloomy background the CNS -- the society of individuals professionally involved in the nuclear business -- has to consider its future rather carefully. The first question might be that of membership. To survive and flourish, the CNS needs a larger membership than it currently has. The question is often asked: what can we offer prospective members? The most honest answer is "a lot of hard work." The plain fact of the matter is that at the present time entry to the CNS does not offer much in the way of obvious rewards. While a journal is under consideration, and a number of very successful conferences have been held, membership in the CNS does not provide free toasters, guarantee a successful career or entitle one to discounts at the supermarket. Membership in the CNS gives one the opportunity to contribute. At a time when most of the organizations we work for are less able to afford staff time spent on professional society activities, the contribution CNS members make must come from their own rather limited supply of free time. So that's the firmest offer we can make to any prospective members: CNS gives you the opportunity to do some hard, unpaid work for your profession. While at first glance this might not seem the most attractive offer one can make we can't help remembering someone a few years back who got a pretty good response to his offer of blood, toil, tears and sweat...

PRESIDENT'S MESSAGE

CNS Membership Drive

The Canadian Nuclear Society ~~is~~ the technical society of the Canadian Nuclear Association. The CNS is a society of individuals. How quickly the CNS can assume its full role as a learned society now primarily depends on how those in all aspects of the Canadian nuclear community can be encouraged to join and contribute to the programs of the society. Our programs are aimed at serving both the needs of our members and the needs of Canada.

As a technical society, we are a counterpart to the American Nuclear Society and the European Nuclear Society in much the same sense as the counterparts of the CNA are the Atomic Industrial Forum and Foratum. Before the CNS existed, the CNA played the dual role of a learned society and industrial forum. As a society born out of the the CNA, the CNS is slowly taking responsibility for many of the activities of a learned society, yet at the same time we enjoy the benefits of CNA experience, services and close cooperation.

During the past 2 years much progress has been made; we have evolved from a pro-tem council or steering group into a learned society with over 600 members. The society has active branches in Quebec, Chalk River, Ottawa, Toronto and Winnipeg, 4 technical divisions, standing committees, a means of communication with its members, a conference program and plans for publications are well in hand. Over 60 members are now serving on the various technical and branch committees. Of most importance, we know where we are going and we know how we are going to get there. We believe we can now effectively give guidance to those who wish to participate in society affairs.

On the international scene, the CNS is being recognized by the world and other nuclear societies. As President of CNS, I am one of 12 delegates on the committee looking into the role and mode of operation of the newly formed 'International Nuclear Societies Group'. The CNS now has representation on the ANS program committee, and CNS is and has been co-sponsor of many Canadian and international conferences. The International Conference on Radioactive Waste Management in Winnipeg on September 12-15 was the first totally CNS international affair. It was both a technical and financial success.

At the 'CNS Officers Seminar' on September 23, all agreed that the CNS should proceed with a membership campaign; the CNS does have something to offer. This campaign, beginning now and running through November, will include a concentrated effort by the technical divisions and branches. Personal contact between each

member and his co-workers and acquaintances is expected to be the most effective means of canvassing for new members.

Information on CNS, membership brochures, posters and other material to help individuals will be distributed via branches, divisions etc. in early October.

Persons joining CNS will receive membership through 1983. The membership fee for 1983 will be based on the budget now in preparation and will be announced October 13. The 1982 fee of \$25. may be increased a small amount in step with inflation and the broader technical programs being offered by the society.

The nuclear industry and nuclear societies face tough times, please help the CNS and the Canadian program by encouraging others to join and participate in the society.

P.A. Ross-Ross
President, CNS

Message du Président

Recrutement de Nouveaux Membres de la SNC

La Société Nucléaire Canadienne est la société technique de l'Association Nucléaire Canadienne. La SNC est une société de personnes. La rapidité avec laquelle la SNC peut assumer son plein rôle de société savante dépend surtout en ce moment de la manière dont on peut inciter les membres de la communauté nucléaire canadienne à rejoindre la Société et à participer à ses programmes. Ceux-ci ont pour but de servir tant les besoins de nos membres que ceux du Canada.

En tant que société technique, nous sommes une contre-partie de l'American Nuclear Society et de l'European Nuclear Society, au même sens que les contre-parties de l'ANC sont l'Atomic Industrial Forum et Foratom. Avant la formation de la SNC, l'ANC jouait le double rôle d'une société savante et d'un forum industriel. Issue de l'ANC, la SNC assume graduellement les activités propres à une société savante, tout en jouissant en même temps des bénéfices de l'expérience, des services et d'une étroite collaboration de l'Association Nucléaire Canadienne.

Durant les deux dernières années, il y a eu beaucoup de progrès: nous avons évolué d'un comité pro-terme à une société savante de plus de 600 membres. La Société maintient des sections actives au Québec, à Chalk River, à Ottawa, à Toronto et à Winnipeg, en plus de quatre divisions techniques, des comités, un organe de communication avec ses membres et d'un programme de conférences,

et les plans pour la création de publications sont déjà bien avancés. Plus de 60 membres servent présentement aux divers comités techniques et aux sections locales. Encore plus important est le fait que nous savons où nous allons et comment nous allons nous y rendre. Nous croyons que nous pouvons présentement guider ceux qui désirent participer aux affaires de la société.

Sur la scène internationale, la SNC est reconnue dans le monde et par les autres sociétés nucléaires. Comme Président de la SNC, je suis l'un de 12 délégués d'un comité d'étude sur le rôle et le mode d'opération du "Groupe International des Sociétés Nucléaires" récemment formé. La SNC est maintenant représentée au comité du programme de l'ANS, et notre société est et a été co-responsable de l'organisation de plusieurs conférences canadiennes et internationales. La Conférence Internationale sur la Gestion des Déchets Radioactifs de Winnipeg, qui a eu lieu du 12 au 15 septembre dernier était la première manifestation internationale entièrement organisée par la SNC. Elle fut un succès tant technique que financier.

A la "Conférence des Officiers de la SNC" le 23 septembre dernier, tous étaient d'accord pour le lancement d'une campagne de recrutement de nouveaux membres de la SNC; notre Société a certes beaucoup à offrir. Cette campagne, qui débute maintenant et qui se poursuivra tout au long de novembre, comprendra un effort concentré de la part des divisions techniques et des sections locales. On s'attend à ce que le contact personnel entre chacun des membres et ses collaborateurs et connaissances sera le moyen le plus efficace de recruter de nouveaux membres.

On distribuera, au début d'octobre, de l'information sur la SNC, incluant entre autres des brochures et des affiches, et ceci sera fait par l'intermédiaire des sections locales et des divisions, notamment.

Les personnes se joignant à la SNC auront leur cotisation valide pour toute l'année 1983. Le montant des cotisations pour 1983 sera déterminé d'après le budget maintenant en cours de préparation, et sera annoncé le 13 octobre prochain. La cotisation pour 1982, qui est de \$25.00 pourrait être augmentée quelque peu pour pallier à l'inflation et à l'expansion des programmes techniques offerts par la Société.

L'industrie et les sociétés nucléaires font présentement face à des temps difficiles. S'il vous plaît, aidez la SNC et le programme nucléaire canadien en incitant les autres à rejoindre la Société et à y participer activement.

P.A. Ross-Ross
Président, Société Nucléaire Canadienne

(Traduit par H.W. Bonin)

PERSPECTIVE

FUSION EFFORTS IN CANADA

Every second, an estimated 585 million Mg of hydrogen in the sun fuse to form 581 million Mg of helium. The missing four million Mg is converted to energy in the form of heat, light and radiation--the energy that sustains life on earth.

The challenge for science is to create a miniature sun in an earthly fusion system--a fusion reactor that will mimic the cosmic inferno.

Achieving these conditions of fusion has already involved 30 years of scientific effort and the investment of billions of dollars by the United States, the Soviet Union, Britain and the Western European countries and Japan. Information is freely exchanged between nations, partly because no single country can afford to go it alone.

Earthly materials to cope with mindboggling temperatures of up to 100 million C involved in fusion simply don't exist. Research to date in confining the fusion reaction and reaching the temperatures involved has centred on forces of magnetism and bombardment with laser beams.

Canadian and Ontario Hydro expertise in producing heavy water and tritium could give our industries a toehold in developing special components and systems for fusion research and development on an international scale. The physics involved are adequately taken care of elsewhere, but we have specialized knowledge and experience that no one else has.

The Canadian fusion program is a three-pronged approach based on the country's unique resources:

A \$37 million research facility at Varennes, Que., financed by Hydro-Quebec and the federal government, will contribute to the program of magnetic confinement of fusion reaction.

To achieve fusion (in a large reactor, the Quebec one is not intended to achieve fusion), the plasma has to be hot enough for a long enough time to become self-sustaining. The goal is to keep the plasma heated to 100-million C for up to 30 seconds. No material can hold up to direct contact with such a fireball, so scientists are designing various types of "bottles" that hold the plasma within powerful magnetic fields so that the ionized gases never actually touch any surface.

Technical difficulties with keeping plasmas together in the shapes of straight lines or spheres seem to give the edge to the torus, a closed doughnut-shaped reaction vessel known by the Russian name Tokamak. The Varennes Tokamak has a reaction vessel about two metres (six feet) in diameter. Surrounding this are rings of strong electromagnets called toroidal field coils, which work with the poloidal coils to shape the plasma and keep the fuel densely packed.

The Varennes Tokamak's most important experiment will be to develop what is called a multiple pulse train for the magnets that confine the plasma. Instead of trying to keep a single magnetic field intact for several seconds, fast switching will create a series of alternating magnetic pulses. The series of pulses, which individually may be only 1,000th of a second long, could create a powerful magnetic field that is practical to sustain for up to 30 seconds. The pulse configuration will be unique among international experiments on confinement and the work will be closely followed by other groups.

The Varennes machine will use only hydrogen rather than deuterium and tritium and the magnets will only be powerful enough to test the pulse technology. Full-scale fusion reactors must use magnets called super-conductors that are cooled to near absolute zero (-273 C, about -460 F) to reduce their resistance to the flow of electricity, reducing the amount of power needed to create a strong magnetic field.

Temperatures in the hydrogen tests will only reach 5 million C, but will be sufficient to test the confinement. Begun in 1981, the Varennes Tokamak is scheduled for completion in 1984.

Basic and applied laser research work, for which Canada is internationally acclaimed, is highly relevant to laser fusion. Basic work is being carried out by researchers at the University of Saskatchewan.

In inertial (laser) systems, brief but intense pulses of laser light or of atomic particles are used to irradiate a succession of fuel targets, or pellets (which can be as small as 1/500 the size of a grain of rice), that contain fusion fuel. This irradiation compresses and heats the fuel to the density and temperature required for fusion ignition. The resultant rapid burning of the fuel yields a microexplosive energy release.

There are currently problems in achieving a complete burn due to hot electrons impeding the implosion process. Saskatchewan researchers are tackling this basic problem using optical lasers to examine surface coupling.

The third prong of the Canadian program is the Canadian Fusion Fuels Technology Project.

The project focuses on the use of tritium as fuel for fusion reactors and on the technology required to handle it. This focus is a natural one for Canada since we have learned to deal with tritium in the day to day operation of our nuclear plants.

Tritium is produced in the heavy water moderator of CANDU reactors by the capture of a neutron by a deuterium atom to produce tritium. Up until now this tritium has slowly collected in the moderator system of our stations.

In 1985, tritium removal systems will be commissioned at Ontario Hydro's Pickering A Nuclear Generating Station to extract the tritium from the reactor systems and safely store it as a chemically stable compound of titanium or zirconium. In this form the tritium can be packed in stainless steel containers and shipped or stored. The tritium removal system will be large by international standards and the quantity of tritium extracted will be sufficient to satisfy the tritium fuel requirements for all of the world's several developmental fusion reactors that are foreseen before the start of the 21st century.

It has been the accumulation of tritium and the development of technology required for the Canadian fission program to handle tritium that is the basis for the emphasis of the Canadian Fusion Fuels Technology Project.

Fusion development will require both tritium as fuel for the early reactors and the tritium handling technology for the fueling systems.

It is planned to build on existing technology by conducting research and development in the areas of fusion fuels, fuel system development, materials technology and health and environment.

Canadian industry, universities and research institutions will be involved to produce information, processes, systems and components for use by the international fusion community. The development of these goods and services will also provide commercial opportunities for Canadian industry.

These activities will develop the level of capability in areas critical to fusion power so that Canada is recognized as an important contributor to the development of fusion energy and can successfully and economically adapt to fusion as an energy source when it is a commercial and technical reality.

There are potential export markets for hardware and engineering expertise with a high Canadian content. The opportunity exists for Canadians to design complete sub-systems for large fusion facilities in other countries. For example, the U.S. alone may need tritium systems worth as much as \$50 million a year in the next decade, including handling systems, hardware and remote maintenance equipment.

Industrial capability in any new high technology must be established fast. It is vital to involve industry as soon as possible in a meaningful way.

The country must make a creditable contribution toward fusion research and development or, sooner or later, it will have to buy its way into the field and likely at high cost. To gain entry to the fusion club we are focusing on the things that Canadians do well.

By doing so, we could well be taking the first major strides toward energy independence in the 21st century.

D.P. Dautovich
J.W. Richman

NUCLEAR ENGINEERING AT ROYAL MILITARY COLLEGE

Hugues Bonin is Associate Editor of the Bulletin and in this issue he presents us with an encouraging account of nuclear engineering programs at RMC. Born in Noranda, Quebec, Canada, in 1947, Hugues is a French-Canadian who spent most of his life in Montreal, Quebec, Canada. After obtaining a B.A. degree at College de Saint-Laurent, he went to the Sciences Faculty of Universite de Montreal, where he obtained a B.Sc. degree in Physics in 1971 and graduated from Ecole Polytechnique in Physics Engineering in 1973. Two years later, he obtained the M. Ing. degree at Ecole Polytechnique, in nuclear engineering, the subject of his thesis being the in-core fuel management of an uranium-fueled CANDU nuclear reactor. In August 1975, he started a Ph.D. program at the School of Nuclear Engineering at Purdue University, with a thesis on thorium-fueled CANDU nuclear reactor fuel management. In 1979, he joined the teaching staff of the Royal Military College of Canada at Kingston, Ontario, as Lecturer in Nuclear Engineering. In 1982, he was promoted Assistant Professor, and he teaches courses in simulation and optimization, and in electrochemistry, besides nuclear science and engineering.

LE GÉNIE NUCLÉAIRE AU ROYAL MILITARY COLLEGE

Le génie nucléaire est au programme de génie chimique depuis 1968 au Royal Military College de Kingston, Ontario. Initialement offert à titre d'option aux élèves-officiers de quatrième année, il est devenu obligatoire depuis 1981 dans le cadre du nouveau programme de "Génie des Combustibles et Matériaux". Aussi, les cours de génie nucléaire sont offerts tant en français qu'en anglais, et ce depuis 1979.

Les élèves-officiers inscrits à ce nouveau programme, durant leur quatrième année de leur baccalauréat en génie, deux cours majeurs de science et de génie nucléaire. Ces cours incluent un programme d'expériences de laboratoire, plusieurs visites à des centres nucléaires tels que les laboratoires de Chalk River, et, en fin d'année, un stage d'une semaine à l'Université McMaster de Hamilton, Ontario.

Le cours "Science et Technologie Nucléaires" est une introduction aux phénomènes de radioactivité et de réactions nucléaires. On y explique les mécanismes d'interaction radiation-matière, ce qui permet de déterminer les principes de la détection des particules et des rayonnements. Le chapitre suivant traite de la radioprotection: effets des radiations sur les tissus vivants,

conséquences médicales, dosimétrie, normes, etc. Enfin, le cours conclut avec les applications des radioisotopes, les applications militaires et l'implication des forces armées dans ce qui touche à l'utilisation de l'énergie atomique.

Le cours de génie nucléaire, intitulé "Sources d'Energie Nucléaire" est plus porté sur l'aspect design des réacteurs et autres sources, et sélection des matériaux. Une bonne partie du semestre d'hiver est consacrée à la physique du réacteur (statique et cinétique), et permet aux étudiants de comprendre le comportement des réacteurs. Les cycles du combustible sont décrits en détail, en soulignant les problèmes de sûreté et de protection de l'environnement pertinents à chacune des étapes des cycles, ainsi que les solutions proposées.

Un long chapitre traite des matériaux nucléaires, et le cours couvre brièvement des sujets tels que la fusion thermonucléaire, les applications militaires, les générateurs radioisotopiques et les petits réacteurs pour propulsion navale et pour usages militaires dans les bases éloignées. Les cours sont complétés par des projets de recherche bibliographiques ou pratiques. Les étudiants peuvent donc écrire des essais sur des sujets du génie nucléaire, ou encore choisir d'effectuer une recherche telle que la simulation d'un réacteur sur machine analogique ou digitale, ou encore des expériences de laboratoire plus poussées. Les étudiants sont de plus invités à présenter leurs résultats à des conférences telles que le colloque étudiant de l'Association Nucléaire Canadienne. Enfin, le Département de Chimie et de Génie Chimique organise une série de séminars, ce qui permet d'inviter au moins deux conférenciers de l'industrie et de la recherche nucléaires.

La semaine qui suit la fin des examens du semestre d'hiver est passée à l'Université McMaster. Après une visite des installations nucléaires de l'université (réacteur, accélérateur et laboratoires connexes), les étudiants effectuent plusieurs expériences telles que la radiographie neutronique, l'analyse par activation, la mesure de la réactivité des barres absorbantes du réacteur, en plus de participer au démarrage du réacteur. Le stage est complété par la visite d'un centre nucléaire (Bruce ou Pickering) et par une expérience au réacteur SLOWPOKE de l'Université de Toronto.

Le génie nucléaire au Royal Military College dépasse le cadre du programme régulier de Génie des Combustibles et Matériaux. En effet, les étudiants de quatrième année inscrits en Génie Physique se joignent à ceux du département pour suivre le cours "Sources d'Energie Nucléaire", et, dans le cadre du programme de projets de fin d'études des départements de Chimie et Génie Chimique et de Génie Physique, les étudiants peuvent choisir d'effectuer leur

travail de recherche sous la direction des professeurs de génie nucléaire. Enfin, cette année, une expérience d'analyse par activation neutronique est prévue au programme pour les étudiants de troisième année inscrits en Sciences Appliquées.

Les professeurs du département présentent, au mois de juin, une semaine de cours avancés en sûreté nucléaire et en radioprotection pour les officiers et les employés civils du Département de la Défense Nationale. Ces cours sont donnés par des experts de l'industrie nucléaire et des Forces Armées, ainsi que par les professeurs du Collège.

L'enseignement du génie nucléaire se donne aussi au niveau de la maîtrise. Les candidats à ce diplôme sont des officiers, qui, dans un programme de deux années, suivent une série de cours avancés et effectuent les travaux de recherche nécessaires à la rédaction d'une thèse, sur des sujets pertinents aux intérêts des Forces Armées.

Si l'on considère la taille modeste du Royal Military College, les laboratoires de génie nucléaire peuvent être considérés comme bien équipés. Plusieurs sources de neutrons (Américium-Béryllium et Californium-252) permettent les expériences de laboratoire et la recherche. De nombreuses sources gamma de calibration sont aussi disponibles, et le Collège vient de faire l'acquisition d'importantes sources au cobalt et au césium, qui pourront éventuellement servir en gammagraphie, en chimie sous radiation, ainsi que pour des expériences d'irradiation. Cet équipement se complète par de nombreux détecteurs accompagnés de toute l'électronique nécessaire.

Le Collège jouit d'une réputation respectable dans les milieux nucléaires. Déjà, il a eu l'honneur d'être l'hôte de trois colloques étudiants: celui de l'American Nuclear Society de 1972, le premier et le sixième Colloque Etudiant de l'Association Nucléaire Canadienne qui ont eu lieu en 1976 et 1981 respectivement. Les professeurs sont membres de plusieurs sociétés nucléaires, tant canadiennes qu'étrangères, et participent à de nombreux comités sur l'énergie nucléaire ou des sujets connexes.

Bien que la recherche en génie nucléaire s'effectue présentement sur une base modeste, l'avenir semble cependant prometteur dans ce domaine.

L'arrivée récente d'un nouveau professeur adjoint permettra une intensification de la recherche certaine. Ceux qui ont visité le laboratoire de génie nucléaire du Collège ont pu contempler l'emplacement prévu pour l'installation éventuelle d'un réacteur de recherche SLOWPOKE. Le travail de planification pour cette acquisition de taille est présentement en cours.

En conclusion, le Royal Military Collège offre à ses officiers-cadets des programmes qui incluent des cours de génie nucléaire. Bien que le but de ces cours ne soit pas de former spécifiquement des ingénieurs nucléaires, mais plutôt de compléter des programmes plus généraux, il est un fait que plusieurs diplômés ont choisi cette carrière et travaillent en ce moment dans l'industrie nucléaire, ou sont à poursuivre des études graduées dans ce domaine.

Lorsque comparé avec les programmes de génie nucléaire des autres universités, celui du Royal Military College paraît modeste. En revanche, ceci semble n'affecter en rien la popularité de ce programme auprès des étudiants, ni le soutien de la Défense Nationale, et certainement pas l'enthousiasme des professeurs.

Nuclear Engineering is offered at Royal Military College by the Department of Chemistry and Chemical Engineering in its new Fuels and Materials Engineering (FAME) program. Two main courses are given to fourth year officer-cadets, along with laboratory experiments. They are complemented by field trips, seminars, and a field studies week at McMaster University, where the students perform a series of experiments on the nuclear reactor. Term engineering design projects in nuclear engineering are offered to students of the FAME and Physics Engineering programs. Regular officers of the Canadian Armed Forces can obtain a masters degree in nuclear engineering, and a special one week course entitled "Advanced Radiation Safety Course" is given each year to groups of officers and civilians employed by the Department of National Defence.

The RMC nuclear laboratories are well equipped for a teaching establishment of this size. Numerous neutron and gamma sources are used for the lab experiments and the research projects. Analog machines are available for reactor simulation projects and the College digital computer permits the use of many reactor computation codes.

The activity of the College in the nuclear domain has been mostly in the hosting of three student conferences. The staff members are active in four nuclear societies, as they participate in many committees on nuclear matters. Research in nuclear engineering is carried out on a modest basis, but its future is bright as a new assistant professor of nuclear engineering had just been appointed.

Hugues W. Bonin

CNS NEWS

Membership Report

Membership has increased from 510 to 568 between July and September. This increase was largely in response to a letter campaign inviting attendees to the CNA/CNS annual conference to join at half price for the balance of 1982.

Branches:	T	Q	O	M	C	N	Total
July 6/82							510
July increase	27	5	3	-	3	2	40
Aug. increase	7	-	5	-	1	2	15
Sept. increase	1	1	-	-	-	1	3
							58
Sept. 23/82							568

T = Toronto, Q = Quebec, O = Ottawa, M = Manitoba, C = CRNL,
N = No Branch.

Non-CNS member attendees at the Winnipeg Waste Management Conference (Sept. 12-15) were offered CNS memberships to the end of 1983 for a \$20 difference in conference registration fees. It is expected that about 100 new CNS members will soon be enrolled.

A membership campaign, proposed to last from mid October to end November was finalized at the September 23, 1982 meeting. The society will rely heavily on all CNS officers to make this drive a success.

Tony Colenbrander

International Radioactive Waste Management Conference

This conference was the first international event sponsored totally by the Canadian Nuclear Society. Approximately 250 scientists and engineers gathered to hear a total of 115 papers on all aspects of radioactive waste management.

The banquet speaker was Mr. David Dingwall, Parliamentary Assistant to the Minister of Energy, Mines & Resources. In his talk he announced a new national program for the management of low level waste.

I believe that with this experience behind us that the young Canadian Nuclear Society can take its place beside other nuclear societies as being capable of sponsoring any international technical conference.

T.S. Drolet
Conference Chairman

Call For Copy

CNS members and officials are reminded that nuclear-related articles, letters to the editor and notices of upcoming events are welcome as input to the next CNS Bulletin. The text of addresses to groups or reports of your own research or involvement in the nuclear field would be of particular interest. Mail to: David Mosey, Editor, CNS Bulletin, c/o Ontario Hydro, 700 University Avenue, Toronto, Ontario, M5G 1X6.

Proceedings Available

The proceedings of the 3rd Annual Conference of the Canadian Nuclear Society, held June 9 in Toronto, are now available. The volume contains the complete text of 47 papers presented. Cost is \$30.00 to CNS/CNA members, \$40.00 to non-members.

Also available is the volume "International Conference on Radioactive Waste Management: Conference Summaries."

This 325 page volume contains summaries of papers presented at the CNS sponsored event, held in Winnipeg, September 12-15. Cost is \$15.00 to CNS members, \$20.00 to non-members.

Full proceedings of this conference will be published soon.

All volumes are available from the CNS office, 111 Elizabeth Street, Toronto, Ontario, M5G 1P7.

Twelve Questions About The Relationship Between CNA And CNS

- Q. Are the CNA and CNS separate organizations?
A. Not legally, but they are operationally.

Q. What does that mean?

A. Both the CNA and the CNS operate under the CNA Charter but elect their own officers, set their own fees, etc.

Q. How do the organizations differ?

A. The CNA is a corporate membership body. All its members are organizations. On the other hand the CNS, which is the Technical Society of the CNA, is an individual member body and all its members are people.

Q. Are the CNA and CNS services different?

A. The basic services provided by the CNA and the CNS are certainly different. For example, each organization has its own publications; Nuclear Canada and Nuclear Notes in the case of the CNA and the CNS Bulletin in the case of CNS. Also, the CNA exists chiefly as a forum for the consideration and resolution of broad matters relating to nuclear energy and the nuclear and uranium industries, largely through committee activity, whereas the CNS provides a forum for the presentation and discussion of technical and scientific papers, etc.

Q. How then do the committee structures differ?

A. The committee structure of the CNA is established to cover and coordinate such topics as economics, education, international affairs, legislative matters, public affairs, safety and environment, social issues, and technology, etc. whereas the CNS committee structure is on the basis of geographical location (branches) and members' technical interest (divisions) covering: nuclear science; design and materials; mining, manufacturing and operation; environment, health and public affairs.

Q. How do the fees differ?

A. The CNA has a graduated fee structure based on the size of the member organization and its degree of involvement in nuclear energy. In 1982 CNA fees varied between \$190.00 and \$30,900 per year. In the case of the CNS there was a uniform annual membership fee of \$25.00 in 1982.

Q. How are the officers of the CNA and CNS elected?

A. Officers of the CNA are elected by the 32-man CNA Board of Directors which, in turn, is elected by the membership as a whole. Officers of the CNS, on the other hand, are elected directly by the entire CNS membership.

Q. Do the organization structures differ?

A. Yes. As already mentioned the CNA operates largely through Standing Committees. Chairmen of these Standing Committees come together within the CNA Council which reports to the Board of Directors. In addition, the CNA has a full-time President.

The CNS is governed by its own Council which is made up of the representatives of the technical divisions and branches in addition to the elected officers. The CNS President is elected year by year.

Q. What coordination exists between the activities of the two organizations?

A. There is a great deal of coordination between the activities. For example, the CNS President is an ex-officio member of the CNA Board of Directors and also sits on the CNA Executive Committee. The CNA is represented on the CNS Council by the CNA General Manager, who also acts as Secretary to the CNA Board of Directors and the CNA Council. In addition, the CNA President is an ex-officio member of CNS Council. These linkages provide for close coordination between the two organizations.

Q. Do the CNA and CNS share the same headquarters?

A. Yes. The CNA headquarters at 111 Elizabeth Street, Toronto provides the headquarters for both organizations. CNA staff service both organizations thereby greatly reducing the overhead expenses that would occur if the organizations operated separately. Budgetary control systems largely separate the financial transactions of each organization although the CNS finances form part of the annual auditors' statement of the CNA.

Q. Are CNA members admitted to CNS events at member rate and vice versa?

A. This depends on the sponsorship of the event. Several events each year are jointly sponsored by the CNA and the CNS in which case the membership rate applies to delegates from both organizations. For separately sponsored CNA events all employees of CNA member organizations are admitted at member rates. For CNS-only sponsored events, only members of the CNS are admitted at member rates.

Q. Will there be changes in the future?

- A. For the foreseeable future the existing arrangements will continue although, as the CNS develops, there will be periodic reviews of the relationship between the CNA and CNS and the way in which their activities impact upon one another.

J.A. Weller
General Manager, CNA

CNS BRANCH PROGRAMS

Toronto Branch

November 9 at 19:00

Members will have an opportunity to tour the CGE Fuel Pelletizing Unit at 1025 Landsdown Avenue, Toronto. The tour will include a presentation on the health and safety aspects of fuel fabrication. Since numbers will be limited, those interested should contact David Jefford (592-2853) as soon as possible. Due to the proprietary nature of the plant facilities, employees of competitor organizations cannot be admitted.

November 30 at 19:30

Dr. Tom Drolet, Manager of Ontario's Fusion Energy Materials Program, will describe the Canadian Fusion Fuels Technology Project. This program has been established to pursue research and development into fusion energy, with special reference to the application of existing Canadian expertise in related fission energy areas (tritium and deuterium). Dr. Drolet will describe the program and discuss fusion energy with particular reference to environmental aspects and remote maintenance. The meeting will be held in Room 202 of the Galbraith Building, 35 St. George Street, Toronto.

**Arthur Guthrie
Chairman, Toronto Branch CNS**

Ottawa Branch

The Ottawa Branch Fall program for 1982 was launched September 22, with an account of the decommissioning of Eldorado Nuclear Ltd.'s Beaverlodge mine/mill operations. Eldorado's Director of Technology, Dr. A.W. Ashbrook, presented an interesting insight into the considerable work and expense that will be involved in returning the Beaverlodge site (including the townsite) to its original natural state.

Future meetings will include a discussion of Canada's fusion fuel technology program on October 20, by Dr. Tom Drolet, and a report on CANDU overseas construction projects on November 24 by CANATOM's Vice President, J.G. Russel.

CONFERENCES & MEETINGS

2nd International Conference on Nuclear Technology
Transfer (ICONTT-II)

Co-sponsored by the Argentine Association for Nuclear Technology, the American Nuclear Society and the European Nuclear Society, to be held November 1 to 5, 1982 in Buenos Aires, Argentina. Further information available from Mary Keenan, American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525.

Uranium and Nuclear Issues Seminar

Sponsored by the Canadian Nuclear Association, to be held November 2 to 3, 1982 in Toronto. Further information available from Canadian Nuclear Association, 111 Elizabeth Street, 11th Floor, Toronto, Ontario, M5G 1P7.

Seminar on Radiation Emergency Preparedness - Health Physics and
Medical Aspects

Sponsored by the International Atomic Energy Agency, to be held November 8 to 19, 1982 in Ljubljana, Yugoslavia. Further information available from Robert Najar, Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.

Joint Meeting of the American Nuclear Society and the Atomic
Industrial Forum

To be held November 14 to 19, 1982 in Washington, D.C. Further information available from Charles F. Jones, President, NUS Corporation, 910 Clopper Road, Gaithersburg, MD 20978.

International Symposium on Water Chemistry and Corrosion Problems
of Nuclear Reactor Systems and Components

Sponsored by the International Atomic Energy Agency, to be held November 22 to 26, 1982 in Vienna, Austria. Further information available from Robert Najar, Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.

Thermalhydraulics For CANDU Reactors

A course sponsored by AECL, Ontario Hydro, CNS and the McMaster Institute for Energy Studies, to be held at McMaster University, Hamilton, December 13 to 17, 1982. Further information from Dr. Jack Kirkaldy, McMaster Institute for Energy Studies, 1280 Main Street West, General Sciences Room 203, Hamilton, Ontario, L8S 4K1.

Commissioning Symposium

Co-sponsored by Canadian Nuclear Society and Canadian Nuclear Association, to be held May 3, 1983 at the Constellation Hotel, Toronto. Further information available from B. Harling, Ontario Hydro, 595 Bay Street, Toronto, Ontario, M5G 2C2 .

International Conference on Radioactive Waste Management

Sponsored by the International Atomic Energy Agency, to be held May 16 to 20, 1983 in Seattle, Washington. Further information available from Robert Najar, Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.

23rd Annual International Conference Of The CNA And 4th Annual Conference Of The CNS

Co-sponsored by CNS and CNA, to be held June 12 to 15, 1983 in Montreal. For information contact CNS.

International Conference on Numerical Methods in Nuclear Engineering

Co-sponsored by Canadian Nuclear Society et al., to be held September 6-9, 1983 in Montreal, Quebec. Further information available from R.A. Bonalumi, Ontario Hydro, 700 University Ave., Toronto, Ontario, M5G 1X6.

4th Pacific Basin Conference

Co-sponsored by CNS, CNA et al., to be held September 11 to 15, 1983 in Vancouver. For information contact CNS.

2nd Workshop on Analytical Chemistry in the Nuclear Industry

Co-sponsored by the Canadian Nuclear Society, Canadian Nuclear Association et al., to be held October 24-26, 1983 at Hecla Island, Manitoba. Further information available from P. Campbell, Analytical Science Branch, Whiteshell Nuclear Research Establishment, Pinawa, Manitoba, R0E 1L0.

THE UNFASHIONABLE SIDE

A Short Book Review

Energy Probe of Toronto has come out with a study, report or book (depending on which new announcement you read) called Breaking Up Ontario Hydro's Monopoly. According to a source at Ontario Hydro, the volume is authored by Energy Probe's Lawrence Solomon and advocates the handing over of conventional (thermal and hydraulic) generating stations to local authorities (Municipal utilities) while the provincial utility concentrates on transmission of power. Nuclear generating stations would be run by a wholly-owned subsidiary, Ontario Nuclear. My source added that the price of the publication is \$6 to an individual and \$30 to an organization. For further details I was told that the immortal Dorothy Parker's remarks could well apply: "The book is reasonably light and may be held in the hand without undue muscle fatigue. It is second only to a rubber duck for company in the bathtub, and may be propped behind the taps very conveniently. And if it slips down the plug-hole, well, it slips down the plug-hole."

Elastomer Energy Storage

I hear from Dr. Dennis Molestrangler (Aphasia University's Visiting Distinguished Reader in Energy Studies) that the elastomer energy storage project has reached the stage when work can begin on a laboratory-scale model of the system. The Molestrangler Elastomer Storage System (MESS) was originally conceived to be used in conjunction with nuclear generating stations. Nuclear stations are best suited for meeting base load -- so availability of a reliable energy storage system would be distinctly advantageous. A nuclear plant could be run at full throttle all the time, and during the period of the day when electrical demand is low the energy produced could be stored, to be released later during peak demand periods. Essentially the MESS conceptual design comprises an array of elastomers (informally know as "rubber bands") fixed at one end, with the other linked to the end of the generator rotor via a clutch and reduction gearing. As electrical load falls, direct mechanical energy is progressively transferred to the MESS for storage. There are several ways in which the stored energy can be released. Two of the most promising are (i) a second generator connected to the remote end of the MESS to be driven via a second clutch and step-up gearing, providing electrical output, and (ii) a very large propellor connected to the remote end, to provide a steady breeze for driving domestic wind generators.

The biggest challenge Dr. Molestrangler has identified at this stage in MESS development is increasing the elastomer energy storage capacity. At the present time calculations suggest that a parallel array of 20 elastomers 100 feet long is required per megawatt of energy. Applied to a 500MW(e) unit, this would give rise to a Direct Elastomer Torsion Energy Storage Tunnel 9.8 miles long. The MESS research group is giving energetic consideration to the capacity problem, ongoing investigations including non-elastomers (steel springs) as well as "folded" or "drum wound" elastomer arrays. More details will follow.

Ernest Worthing



Canadian Nuclear Society
Société Nucléaire Canadienne

111 Elizabeth St., 11th Floor,
 Toronto, Ont., Canada M5G 1P7

- Request For Further Information
 (Complete Only Name and Address)
 MEMBERSHIP APPLICATION

A. PERSONAL DATA:

Surname: _____ Given Names _____
 (underline name used)

Indicate desired mailing address in one of the check boxes:

Home
 Address: _____
 (Street) (City) (Province)

 (Postal Code) (Phone Number)

Business
 Address: _____
 (Street) (City) (Province)

 (Postal Code) (Phone Number)

B. MEMBERSHIP DATA:

Employer _____

Business Title (if applicable) _____

Please list any Technical or Scientific Societies, Institutes and Professional Associations of which you are a member.

EDUCATION

University, College Institute, etc.	Discipline	Degree/Diploma	Date of Degree or Diploma
_____	_____	_____	_____
_____	_____	_____	_____

Your Association with Nuclear technology

Please indicate the one or two CNS Technical Divisions most accurately reflecting your interests.

- A. Nuclear Science
- B. Design and Materials
- C. Mining, Manufacturing and Operation
- D. Environment, Health and Public Affairs

Are you interested in attending local Branch events? Yes No

Are you willing to serve as an executive on Canadian Nuclear Society Committees?

- Administration Yes No
- Technical Division Yes No
- Branch Yes No

Previous experience on Committees:

_____ Date (Signature of Applicant)

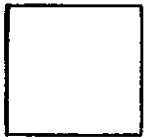
Language for correspondence _____

C. FEES:

MEMBER: \$30.00 for Calendar Year - January 1 to December 31.
STUDENT: \$ 5.00 for Calendar Year - January 1 to December 31.

FOLD AND STAPLE OR TAPE FOR MAILING

FROM: _____



CANADIAN NUCLEAR SOCIETY
111 ELIZABETH ST., 11TH FLOOR
TORONTO, ONTARIO
CANADA
M5G 1P7



Canadian Nuclear Society Soci t  Nucl aire Canadienne

111 Elizabeth St., 11th Floor,
Toronto, Ont., Canada M5G 1P7

- Request For Further Information
(Complete Only Name and Address)
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Business Title (if applicable) _____

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University, College Institute, etc.	Discipline	Degree/Diploma	Date of Degree or Diploma
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_____	_____	_____	_____

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Administration	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Technical Division	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Branch	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Previous experience on Committees:

Date (Signature of Applicant)

Language for correspondence _____

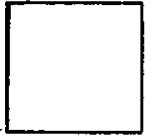
C. FEES:

MEMBER: \$30.00 for Calendar Year - January 1 to December 31.

STUDENT: \$ 5.00 for Calendar Year - January 1 to December 31.

FOLD AND STAPLE OR TAPE FOR MAILING

FROM: _____



CANADIAN NUCLEAR SOCIETY
111 ELIZABETH ST., 11TH FLOOR
TORONTO, ONTARIO
CANADA
M5G 1P7



Canadian Nuclear Society Société Nucléaire Canadienne

111 Elizabeth St., 11th Floor,
Toronto, Ont., Canada M5G 1P7

- Demande pour de plus amples renseignements
(Inscrire nom et adresse au complet)
- Demande d'adhésion

A. RENSEIGNEMENTS PERSONNELS:

Nom de famille: _____ Prénom: _____

Cochez la case appropriée pour l'adresse où vous désirez recevoir votre courrier:

Adresse au domicile: _____
(rue) _____ (ville) _____ (province) _____

(code postal) _____ (numéro de téléphone) _____

Adresse au bureau: _____
(rue) _____ (ville) _____ (province) _____

(code postal) _____ (numéro de téléphone) _____

B. RENSEIGNEMENTS PROFESSIONNELS:

Employeur: _____

Fonction (s'il y a lieu): _____

Veillez indiquer les sociétés ou associations à caractère technique ou scientifiques auxquelles vous êtes membre.

EDUCATION:

Université, collège, institut, etc.	Discipline	Diplôme	Année décerné
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Domaine d'activité ou d'intérêt relié à la technologie nucléaire

Veillez indiquer **un ou deux** groupes techniques de la SNC qui représentent le mieux vos intérêts.

- A. la science nucléaire
 B. la conception et les matériaux
 C. l'exploitation minière, la fabrication, l'exploitation des centrales
 D. l'environnement, la santé et les affaires publiques

Vous intéressez-vous à assister aux événements des chapitres régionaux? oui non

Désirez-vous participer aux comités de la Société nucléaire canadienne?

Conseil d'administration oui non

groupes techniques oui non

chapitres régionaux oui non

Expérience antérieure comme membres de comité:

(Signature du candidat)

Langue de correspondance _____

C. MONTANT DE LA COTISATION:

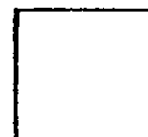
MEMBRE: \$30 par année civile - 1er janvier au 31 décembre

ETUDIANT: \$5 par année civile - 1er janvier au 31 décembre

(Remettre à la Société Nucléaire Canadienne)

PLIEZ ET BROCHEZ OU COLLEZ POUR POSTER

DE: _____



SOCIÉTÉ NUCLÉAIRE CANADIENNE
111 ELIZABETH ST., 11TH FLOOR
TORONTO, ONTARIO
CANADA
M5G 1P7

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