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Editorial

Of Gophers and Railways

By Hugues W. Bonin, Associate Editor of the CNS Bulletin.

What do gophers and train buffs have in common? Nuclear Engineering, of course! Taking advantage of my beginnings on the CNS Council and as chairman of the Communications Committee, I would like to shed some light on the previous sentence. But, to maintain the suspense, let's first talk a bit about communication.

We frequently hear and read that the nuclear industry in Canada is dead, since the CANDU is not selling. Why? We all know that there is presently a great deal of activity beyond the design of new CANDU power plants: the completion of the 9 or 10 reactors under construction (plus RMC's SLOWPOKE of course), the operation of the reactors on line, the retubing of Pickering 1 and 2, the research on the small reactors (SLOWPOKE-3 and -4, Maple-X, the nuclear battery), just to name a few activities. I am afraid that clichés such as "CANDU is Canada's next Arrow" are being encrusted in the mind of Canadians, thanks to the efforts of several journalists always on the prowl for alarmist "news" items.

The problem is that man's behavior and beliefs can be conditioned. How many times a day commercials insist that the only good bacon comes from Canadian hogs, or that coffee beans are not worthy unless they have grown high in the mountains? Hogwash! What about these kids I often see at Kingston's passenger station merrily chuffing along and chanting "choo-choo"? This is

as far as one can get from the sights and sounds of VIA's and Canadian National's diesel growlers, but the cliché persists. Brainwash! And, according to a recent survey, there is still a majority of persons in the public who are convinced that a nuclear plant can undergo an atomic explosion with all of the shebang, including of course, the traditional mushroom cloud. (I can swear here that Editor David Mosey is about to add that the Flat Earth Research Society still has members...).

Since the repetition of clichés time after time is indeed a very powerful process to encrust ideas in people's mind, it appears logical that repetitious methods should be used to counteract the effects of the anti-nuclear clichés. Some key political figures such as Mr. Mulroney or some important ministers receiving dozens of letters from CNS members might, sometime, start wondering if that large number of informed people might be right, after all. But if pressure comes also from the general public, the effect might be even stronger, and I feel that what the nuclear industry needs is greater positive visibility to the general public.

This is where the railways argument comes into action, as a comparison with the railway industry is possible here. Have you ever wondered why CN Rail and CP Rail have TV commercials, notably at sports programs? The immediate cost-benefit advantage of running these commercials is not obvious, as the average person in the public is not likely to expedite full carloads of freight by himself. The aim is to create a

healthy business image to the public in order to, by the way of a chain of influences, make an administrator eventually choose the railway instead of the trucking company for the next shipment of goods. We all remember the trend of the sixties and seventies when city administrations chased the railways out of downtowns. Ottawa and Quebec City are immediate examples that come to my mind. Trains were then seen as useless and cumbersome dinosaurs, and the railways reacted to this by first replacing the steam-era paint schemes by "modern" eye-catching liveries and logos. With better acceptance from the public and the customers, not only could they reverse their downward business trend, but they could even maintain a level of profitability such that both major railways can invest billions of dollars into the network expansion and modernization in Western Canada, for example. And yet, they continue to advertize to the general public.

I think that the point here is public perception, and the example of the railway industry proves that it is important enough for them to spend large sums of money in advertizing. On the other hand, the results of many surveys and the attitude of several politicians show that, for the nuclear industry, there is much room for improvement. So far, the public relations people of the major components of the nuclear industry are doing an excellent job, but only a tiny fraction of Canadians is effectively reached. Action from the local branches of CNS is also very desirable, although they are located within the same areas of the country where nuclear activity is concentrated. What I have in mind is that some TV commercials "selling" nuclear energy would not only reach a vast majority of Canadians, but also would have a very positive impact if hard figures (economic, safety...) are clearly presented based on sound sources not easily refuted by the opposition groups. Such TV commercials, possibly financed jointly by CNS and CNA, repeated time after time, could imprint a positive message in the mind of viewers, (at the risk of becoming clichés, I admit), and offer an excellent platform to counter anti-nuclear arguments.

Like the gophers which could undermine the big earth levee at Darlington if Ontario Hydro does not keep an eye on them, poor image to the public could simply jeopardize the future of the Canadian nuclear in-

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Perspective

Brief to the Ontario Select Committee on Energy on the Future of Nuclear Power in Canada

Presented by the Canadian Nuclear Society
September 17 in Toronto.

"As they have been successful in inducing belief, so have they been effective in quenching and stopping inquiry."

Sir Francis Bacon, 1620

Introduction

The Canadian Nuclear Society/Société Nucléaire Canadienne is a voluntary organization of men and women interested in the advancement of nuclear science and engineering for peaceful and beneficial purposes. The society was formed five years ago and now has a membership of five hundred men and women.

The CNS/SNC attracts largely professionals to its membership, however, the CNS/SNC is not itself a professional association with a government-issued mandate to regulate professional practice. Moreover, while the CNS/SNC provides services to its members — largely in relation to professional preparedness — the CNS/SNC is not a social or economic self-interest organization. Rather, the CNS/SNC is patterned in the tradition of learned or scientific societies which has been sustained since the Renaissance.

Following in this tradition, the CNS/SNC sponsors numerous conferences and edits published proceedings containing scientific papers on subjects of technical and social significance in the nuclear field.

The professional backgrounds of CNS/SNC members comprise scientific disciplines such as physics, chemistry, biology, most of the engineering branches and various technological specialties. The unifying force that brings them together in the CNS/SNC is their common involvement in varied ways in the development of nuclear science and its application to the betterment of mankind.

Very important to CNS/SNC members is the fact that CANDU is a unique Canadian reactor development. Canada is the only country beside the U.S.A., U.S.S.R. and the U.K. which has taken a reactor system from an idea to widespread commercial implementation. Along the way, many of the Canadian developed features such as triplicated safety systems, computer control, fuel design, safety analysis, etc. have been adopted in the light water reactors of other countries. These achievements have required considerable Canadian ingenuity, and very hard work by a large number of people as well as federal research and development funds, and utility investment.

A source of pride to the members of the industry is that the cost of these developments to the federal government and the utilities has been only a fraction of the funds spent by the other countries who developed

their own systems. The cost was also significantly less than that of many countries which adopted the designs of others.

This brief focuses on three issues from the point of view of individuals, such as CNS/SNC members, who have been and are intimately involved in the science, engineering, manufacturing, construction and operation of Canada's nuclear facilities. These three issues are:

- The development of the manufactured controversy surrounding the CANDU reactor system,
- The immediate concerns, and
- The possibilities for the future of nuclear power.

The "Manufactured" Controversy

The term "manufactured" controversy is used to indicate that the large number of the public who are biased against the applications of nuclear technology have developed their bias largely on the basis of misunderstandings. There is no denying that some criticism is and has been valid, but what human endeavour of this size (30,000 employees and \$3.6 B GNP) does not make some error? It was our thought that you might be interested in the development of the current public opinion on nuclear matters.

Canada got its head-start on the nuclear program as a result of the Combined Policy Committee decision to build a heavy water reactor in Canada during World War II. Canada assembled the small team of scientists and engineers in the mid-1940's that built and operated the first nuclear reactor to go critical outside the U.S.A. At that time, the supply of oil based energy was known to be limited, and the conversion of the awesome power of the atom to the service of mankind was a major multi-disciplinary scientific and engineering challenge with a highly ethical objective.

The very rapid economic growth enjoyed during the 50's and 60's enhanced the arguments for the adoption of this new source of electrical energy. In fact nuclear power was regarded in many quarters as the only possible long term answer to the world's energy needs.

Until the late 1960's most Canadians shared the pride of the Canadian team in their achievements. There were critics, most of whom took the traditional view that Canada could not compete with the major nations and should adopt one of the designs being pursued by the U.K. or the U.S.A.

There was also scepticism particularly in government circles that the CANDU reactor could be as good as its developers said it was. During this decade two demonstration

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reactors started-up in Ontario. India and Pakistan also adopted the CANDU system. The decade of the 70's provided some answers to these critics. The construction and early operation of the Pickering reactors demonstrated the economics, feasibility and safety of the CANDU system. CANDU reactors were also purchased by Argentina and S. Korea.

Hughes Bonin

As a result of the oil crisis, severe inflation and high interest rates in the late 70's and early 80's, a worldwide economic depression occurred. The demand for electricity was decreased and the optimism in the world's nuclear industry was severely curtailed.

Starting in the early 70's, a new type of critic emerged. These critics believed that the nuclear industry in all its branches posed an unacceptable threat to the future of mankind. The objective of such critics seemed to be to turn the clock back to simpler times and eliminate all of the potential for evil and for good arising from the scientific investigations of the atomic nucleus.

This type of criticism dismayed those of us with a knowledge of the industry, particularly as these beliefs caught the attention

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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, (\$5.00 to students).

La SNC procure aux Canadiens intéressés à l'énergie nucléaire un forum où ils peuvent participer à des discussions de nature technique. Pour tous renseignements concernant les inscriptions, veuillez bien entrer en contact avec le bureau de la SNC, les membres du Conseil ou les responsables locaux. La cotisation annuelle est de \$30.00 (\$5.00 pour les étudiants).

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of the media and were widely spread. From the point of view of the nuclear professional, much of this early criticism consisted of out of context quotations from pioneering work on hypothetical accident analysis for the safety of the reactors. Such accident analysis was done so that the safety systems (which have since proven to be very effective) could be designed and incorporated into the plants. The industry was criticised for being secretive at the same time as the extensive technical information available was being misused. The public were also advised not to believe anything that the experts said.

The fear of cancer and genetic defects from manmade low level radiation exposure was, and is, a major theme of anti-nuclear crusaders. Mention is rarely made of the very much greater natural low level radiation in which all life on earth exists. Despite their stated fears, such critics do not act in ways to reduce their exposure to natural radiation. They do not avoid living and working in areas of higher natural radiation levels. They do not avoid flying, brick houses, cohabitation, leafy vegetables, etc., all of which increase natural radiation exposures.

Another significant manufactured criticism is on the safe disposal of nuclear waste. Our members know that the small quantity of wastes (some of which will still exist even if the industry is abandoned) can and will be disposed of safely. This view has been endorsed by experts from twenty countries in the Organisation of Economic Cooperation and Development (OECD). Over the next few years, the methods of disposal developed and the proofs of their safety will be presented to the Canadian public. However, most critics decry the research into, or implementation of, disposal methods.

These and other manufactured issues have received wide publicity, however, their rebuttal by groups such as your predecessor the Ontario Legislative Committee on Ontario Hydro Affairs, the Bayda Commission, the Porter Commission, the Interfaith Program for Public Awareness of Nuclear Issues, the Kemeny Report on Three Mile Island in the U.S., the Windscale and Sizewell Inquiries in U.K., have not gained equivalent publicity. In fact, polls indicate that many of the public do not know that when a switch is thrown the power used has to be manufactured and many still believe that nuclear power reactors will blow up with the characteristics of an atomic bomb. These kind of views seem to have coalesced into an anti-nuclear dogma which is subscribed to by a significant portion of the population. The educational efforts of the informed community have made very limited impact on such beliefs.

The Immediate Issues

The Darlington nuclear power plant has become the lightning rod attracting most of the criticism of Ontario Hydro's nuclear power program. The CNS/SNC suggest



Joe Howieson, CNS President (right) with Past President Phil Ross-Ross, at the presentation of the CNS brief to the Ontario Select Committee on Energy on September 17 at the Ontario Legislative Building, Toronto.

that the Select Committee eschew the issues of the manufactured controversy and concentrate on the major issues of

- The need for an increasing supply of electrical power in the province,
- The timing of the Darlington reactors, and
- The cost of the power supplied from Darlington.

These three issues are interrelated by economic factors. Growth rates of electricity supply and gross provincial product have maintained their historical one to one correlation even over the last few years. Electricity is not immune to the "increased cost: decreased sales" relationship, and the cost of power from a nuclear plant increases very rapidly as construction time is lengthened. Presentations from Ontario Hydro have no doubt made these relationships clear to you and the CNS would just like to make the following points.

The determination of the need for a new power plant, when it should be constructed and what type of plant should be built (for the minimum long term cost of electricity) are problems which Ontario Hydro and its regulatory body have had to grapple with on an annual basis since the utility was founded. The methods used for such forecasting are not and can never be completely accurate. They depend on many uncontrollable variables. The methods used have however become much more sophisticated over the years as the planners take more variables into account and make their major assumptions more explicit.

Decisions on new plant construction made on the basis of forecasts are among the most significant decisions made by Ontario Hydro management. They commit the utility to a course of action for up to 15 years. The annual reviews, and the review by your Committee, can cause modification or even reversal of these decisions on occasion. The cumulative proof that the decisions have been right lies in the delivered cost of electricity to Ontario consumers.

We can compare the cost of a kilowatt hour either with the average number of minutes historically worked to buy one, or with the cost charged by other utilities in Canada or in other countries. By either comparison we are forced to the conclusion that Ontario's electricity consumers have been better served by their utility management than consumers of most other commodities.

Ontario Hydro's critics, until 20 years ago, tended to push the utility for more power and wider distribution. Such critics knew from their own experience what shortages of electricity or no electricity at all meant. Today, many critics have never done without electric power and do not realise what an engine for economic development electricity has been and still is.

Most of our members believe that Ontario Hydro management continues to carry out its given mandate very well. With the legislature controlling the mandate of the utility and the government appointing its top management and advising them on priorities, the current controls encourage the spirit of enterprise amongst its employees rather than the sterile bureaucracy seen in many government controlled operations.

The Future of Nuclear Power

Most people are aware of the limited nature of the world's oil-based fuel supplies and the need for their conservation. Also recognised is the renewable nature of our hydraulic resources. Fewer people however are aware of the nearly renewable nature of the CANDU reactor system. The following points are made to clarify the long term potential of the CANDU reactor.

- **Obsolescence** The major factor which has enabled utilities to reduce the real cost of electricity since the turn of the century was the increased size and efficiency of the generating plant. While some seventy year old hydraulic plants of 10 MWe capacity are still being operated by remote control in Ontario, their electricity would be very expensive today if operators were required. No forty year

old coal plants of up to 60 MWe capacity are still in service. The sum of their maintenance, operation and fuel cost are too high.

The 500 to 900 MWe plants now in use however are not going to suffer the same rapid size obsolescence. This statement is made on the basis of three points:

- The design and construction of the larger turbines and generators are pushing against technical and material limits in many areas.
- Construction costs and lead times for these plants are already approaching the limits for prudent management.
- The economic gains promised by larger plants are no longer being realised because of decreased reliability.

There is with the existing size of plants still a great deal of scope for engineering improvement. Cost reduction and simplification present continuing challenges with no loss of safety.

- **Plant Life** If it is accepted that in future, size will increase much more slowly than in the last fifty years, then the current CANDU reactors will be much more economic after the mortgage is paid off than they are today. Approximately fifty per cent of the electricity cost is currently going to pay for the capital cost. In about forty years time the utility will get the power for only fuel, operating and maintenance costs — bargain priced power. Such reactors would only be replaced if a new plant could be built to produce power at less than the cost for maintenance of the old one. The design of the CANDU reactors makes maintenance easier than for the alternative light water reactors. Replacement of the guts of the reactor — the calandria and pressure tubes — has already been demonstrated and is now almost routine. We anticipate that the existing CANDU plants will operate for as long as Ontario Hydro's large hydraulic plants.

To achieve this longevity will require continuing engineering and scientific efforts of a very high level to provide better inspection and maintenance methods, as well as longer-lasting, higher quality and higher technology components.

- **Fuel Supply** The CANDU reactor's main technical advantage over all other thermal fission reactors lies in the efficient use of its neutrons. With the existing system CANDU consumes less natural uranium than any other commercial design. Yet the reactor offers greater scope for improvements in neutron economy than do its competitors.

All countries which have adopted the light water reactor will need to provide a second generation reactor (normally the fast neutron breeder reactor) to extend the power production potential of the uranium resource. The breeder reactor is as close to a perpetual motion machine as has yet been achieved. As fuel is burned in one area, new fuel is produced in another. By this means the power

available in natural uranium can be increased about 100 times that from current reactors.

CANDU reactors can achieve similar breeding without the need for a new and more difficult technology. They can be used to extend the power available in natural uranium by about fifty times and they can also "burn" the much larger world supply of thorium.

The introduction of such advanced fuel cycles makes the power cost from CANDU higher than with the natural uranium cycle because of the additional infrastructure which must be provided. It is however expected that the power costs will still be less than that from the fast reactors.

There is presently an oversupply situation in natural uranium in the world. Shortages and consequent price increases are not anticipated for many years. Real price increases to approximately three times the current price of uranium will be needed to economically justify the introduction of the thorium cycle. With so many alternative energy sources now under development, and so many other uncertainties, it seems unlikely that such advanced cycles could be introduced economically for many decades. However, they do offer an almost unlimited life for the CANDU reactor design.

Some continuing scientific and engineering work in this area is necessary so that implementation of the new cycles can proceed when the time is ripe.

Conclusion

In this brief, the CNS/SNC has presented the views of some of the professional scientists and engineers in the nuclear power field in Canada. We are proud of our association with this world class technical achievement and we believe strongly that this effort has significantly increased both the economic standing and the technical reputation of Canada and Ontario.

More than one third of Ontario's electricity is now supplied by nuclear plants — built largely by Ontario industry — saving \$500 M annually and markedly reducing the costs from acid rain production. Ontario also is a leader in the lifesaving uses of radiation in industry and medicine.

The current surplus of generating capacity in Ontario (including Darlington) will become a shortage within the next ten to twenty years unless new generating plants are ordered. The CNS/SNC is convinced that its members will soon be called on to help supply new nuclear generating plant and it foresees a long and illustrious future for this technology.

Nuclear technology has contributed greatly to Ontario's economy and to the health of its population. Wider application of this technology, in which Canada has already demonstrated its world class capability, contributes to Canada's transition to a manufacturing based economy. Rejecting the nuclear industry by stopping Darlington on the basis of manufactured issues would signal Ontario's unwillingness to build industries based on its plentiful resources.

Address to the CNS Officers' Seminar

Following are comments made by Thomas Claridge of the Toronto Globe and Mail to the CNS Officers' Seminar of September 11.

I guess that if there's anything all of us in this room share, it's a healthy dose of skepticism. The only difference is that you tend to be skeptical about the fairness of some of today's journalists, and I tend to be skeptical about the candor professed by some of today's spokesmen for the nuclear industry. At least some of us who profess to be professional communicators see our ultimate task as that of ferreting out developments that we deem to be newsworthy, finding a way of describing them in terms that are meaningful to the general public, and conveying the information in what a bureaucrat might describe as a "prioritized fashion." Ideally, such a process is carried out at arm's length from the news source, whom the journalist ought to regard as neither friend nor foe. Of course, in the real world it doesn't take all that long for anyone to become a bit friendlier to some news sources than to others particularly if some of the sources have been less than candid in the past.

In my experience, the nuclear industry over

the years has presented a considerable challenge to the Fourth Estate.

For one thing, the subject matter is a little more difficult to describe to the general public than baseball games, murders or even political speeches. I would be the first to agree with anyone who suggested that much of the reporting on nuclear power has been full of inaccuracies that stemmed from the simple fact that the reporter didn't know what he or she was talking (or writing) about.

Adding to the challenge is the existence of a rather wide variety of viewpoints represented by the industry, its regulators and its critics. As a small instance, the subject of spent fuel can produce everything from doomsdayers who see the problem as insoluble and everlastingly threatening to optimists who still talk confidently of someday reprocessing the fuel for the next generation of reactors. When what to some people is a deadly threat is seen by others as a golden opportunity, the truth surely lies somewhere in between.

But far more of a challenge is presented by the industry's penchant for secrecy which undoubtedly could be traced to the original, legislated requirement for total secrecy on

the subject of atomic fission.

Even today, agencies like Atomic Energy of Canada Limited are really paranoid in their dealings with the press, to the point where it's almost impossible for a reporter to get the truth about what's going on inside that organization "through channels." Some senior AECL officials have told their public relations people that they simply won't agree to an interview with any journalist, period.

A classic current instance of the problem that this confronts us with is found in the quiet battle raging between AECL and Ontario Hydro over the concept of "negative nuclear paybacks." The dispute first came to light during testimony before last year's Ontario Energy Board hearings on a Hydro rate proposal. At the time, Hydro witnesses were loathe to describe the points at issue, purely and simply because AECL's position had never been made public. And when I tried to make inquiries I got absolutely nowhere.

People in the federal agency, meanwhile, keep carping about the "bad press" it's routinely getting, and the disinclination of people like myself to report on AECL's "good news" (presuming it occasionally has some).

Such habits exist to some extent throughout the industry and there was even a time about a year ago when even Ontario Hydro was getting a bit paranoid on the subject, in the aftermath of the Pickering G-16 incident.

Perhaps the classic example the industry cites of the negative impact of bad journalism is the coverage of Three Mile Island. To the industry the episode is no doubt a glaring example of media "overkill." I've heard some of your colleagues suggest it was a disaster only in the minds of the media — an opinion which I don't think is shared by the shareholders of General Public Utilities, the plant's owner.

True, the commercial nuclear power industry's worst accident to date killed no one and involved release of relatively tiny amounts of radiation to the general environment. But it was a disaster beyond the limited score of the boardrooms; in my view it was a disaster in communications at almost every level, and that disaster started to unfold months before the LOCA at TMI. Probably everyone here knows full well that the reactor core wouldn't have been uncovered if the TMI operators had understood what was happening. And just about everyone is likely aware of the fact that a few months before the March, 1979 accident the operators at the Davis-Besse plant near Toledo, Ohio, faced the same series of events that transpired at TMI.

But I'll bet there's no one here who ever heard of the Davis-Besse near-miss until after TMI.

Just, for a moment, imagine how different things might have been if Toledo Edison had departed from the industry norm and "gone public" with their little problem, perhaps by encouraging one of their know-

ledgeable people to talk about it with the science editor at the Toledo Blade (if it has one). The story probably wouldn't have made page one, but the wire services might have picked it up if there was a full disclosure that it was the sort of thing that might happen in another B&W reactor; that could have led to a core melt if it hadn't been caught, and would have been more serious had the reactor been at full power.

And if the near miss did get national attention, there might well have been a chat among the TMI operators, a chat which led to an awareness of what they might have to deal with some day.

In my jaundiced view, there's far less risk than the industry frets about in "levelling" with the Fourth Estate, so long as the journalist you're dealing with has a reputation for fairness. Even if the news is "bad," letting it get out can be good for everyone.

FYI

Control Board Withholds Operating Licence

(Staff)

The Atomic Energy Control Board has not renewed the operating licence for Ontario Hydro's Pickering Unit 8. A desire for more information about damage to pressure tubes during the Unit's hot conditioning in March this year is said to be behind the Control Board's decision.

In an effort to prevent garter spring migration during hot conditioning, Ontario Hydro loaded Unit 8 with "dummy" fuel bundles — cast iron cylinders with similar overall dimensions and weight and comparable flow geometry to conventional fuel bundles. After completion of hot conditioning in March this year, pressure tube inspection revealed fret marks in some tubes, probably as a result of bundle vibration. After removal and inspection of some 29 tubes, additional ("secondary") marks were discovered. These marks were most likely caused by debris trapped between the dummy bundle and the pressure tube.

Ontario Hydro sources note that the board has requested more information on these marks, and their implications for pressure tube performance, pending the renewal of the Unit 8 operating licence.

Ontario Select Committee on Energy Hearings Underway

(Staff)

Public hearings by the Ontario Select Committee on Energy began on September 10. The committee Chairman, Philip Andrewes, PC MPP is a former Minister of Energy and the committee is charged with inquiring into Ontario Hydro affairs. The first hearings concern the completion of Darlington Nuclear Generating Station and the committee must report on this, with recommendations, this fall.

Ontario Hydro representatives gave the first

presentation to the committee, during the first three days, with background on Ontario Hydro's nuclear power program and a strong case for completion of Darlington. Presentations were then made by representatives of the Darlington area community, which were mainly supportive of the project due to its favourable economic impact on the region. Other supporters giving presentations included the Canadian Nuclear Association, Atomic Energy of Canada Ltd., the Society of AECL Professional Employees, Chalk River Technicians and Technologists, the Allied Construction Trades Council, the Ontario Hydro Employees Union, the Ontario Municipal Electric Association, the Joint Industry Task Force, the Ministry of Energy, the Ministry of Treasury and Economics and the Federation of Engineering and Scientific Associations.

Critics of the project that appeared included Energy Probe, Toronto Nuclear Awareness, Paul McKay, and from the US, Ralph Nader, Amory Lovins and Charles Komanoff. Criticisms of the Darlington project dealt with the overall cost, nuclear safety, and whether Darlington would be needed at all.

Representatives of US utilities also appeared before the committee.

Ontario Hydro and an antinuclear representative were each allowed rebuttals of their opposite positions at the end of the Darlington hearings.

IPPANI Report Issued (CNA)

Reports on the hearings of the Interfaith Program for Public Awareness of Nuclear Issues (IPPANI) have been issued, nearly one year after the hearings took place. The report of the hearings consists of a single document covering separate hearings on "Canada's Domestic Nuclear Issues," "Canada's International Nuclear Trade," and "Canada's Involvement in Nuclear Arms."

A main conclusion of the report dealing with domestic aspects of nuclear energy is that more thought must be given to finding methods for constructive dialogue in decision-making. This can provide for both public involvement and better decision-making in the light of what the panel observed as widespread dissatisfaction with government decision-making not only in nuclear matters but in other areas as well. While recognizing there will be a cost involved in developing such processes, the cost in public unease and alienation is likely to be a much greater cost in the long term.

Other findings were:

- Nuclear energy is not qualitatively different from a moral and ethical viewpoint from all other energy sources.
- It is unreasonable to ask for absolute certainty in decision-making and irresponsible to promise it.
- Where decisions are made concerning licensing and regulations for the nuclear industry, access by the public and those

opposed to nuclear energy is limited to having views heard on a sporadic basis.

- As to whether centralized technologies like CANDU stations are consistent with a participatory society the panel observed that they interconnect as much as they centralize.
- Calculations concerning the overall financial and societal costs of nuclear technology cannot be made. Cost-benefit analyses as a means of analyzing questions concerning nuclear energy are very important but as a formula for resolving the entire issue they are fruitless.

Conclusions of the panel which considered Canada's involvement in international nuclear trade noted that the degree of concern and caution to be exercised in nuclear trade must be far higher than any other type of trade. It noted that the nuclear bridge between energy and weapons may be a very long one but it does indeed exist. However, if a country's sole objective is weapons, there are faster and easier ways to acquire them then through a CANDU reactor. The panel noted that it had entered the hearings with high hopes of unravelling some of the threads of a "very complicated ball of yarn" but that it soon became evident that presenters were not as interested in reaching compromise positions as they were in staking out their own territory. "In the adversarial presentations we witnessed, each side chose such facts and presented those facts in a way that would support their bias. Morally, is this telling the truth and nothing but the truth?"

The third week of the hearings dealing with Canada's involvement in the arms race contained no presentations which made connections between Canada's peaceful nuclear industry and nuclear arms production. The report, by far the largest of the three, drew no substantive conclusions on the basis of submissions it heard.

Common discussions within the five faith groups which organized the hearings relate to ongoing use of the material as part of an educational process.

Oil Consumption Falls due to Nuclear Power (AIF)

Rising nuclear electricity generation around the world is contributing to the continuing decline in oil consumption, government and industry data show.

Since 1980, petroleum consumption among the 26 member nations of the Organization for Economic Cooperation and Development has been on a five-year decline, according to the International Energy Agency, which was established in Paris after the 1973-74 embargo to track oil supply/demand patterns.

IEA data show that petroleum consumption in OECD nations dropped to 34.5-million barrels daily in 1984, from 41.6-million b/d in 1980. The IEA expects consumption to fall again in 1985.

"A major factor in the decline in oil use

has been the substitution of other fuels, particularly coal and nuclear power," said IEA spokesman Phil Garon.

OECD nuclear electricity generation (which accounts for about four-fifths of the world's total) has risen sharply — up 80 percent from 1980 to 1984. Last year, it passed oil-fired generation for the first time and nuclear plants now provide 18 percent of electricity used in the OECD, which comprises most of the industrialized west including the U.S., Canada, Western Europe, Japan, Australia and New Zealand.

Worldwide, nuclear capacity rose 17 percent in 1984, according to the International Atomic Energy Agency in Vienna. This was the largest year-to-year rise since the introduction of large-scale nuclear power programs in the early 1970s, the agency said.

A June 1985 report by British Petroleum calculates that the worldwide increase in nuclear-generated electricity in 1984 "displaced over 40 million tons (oil equivalent) of fossil fuels and helped to reduce fuel oil demand."

CNS Division Update

Call for Nominations for the 1986 NSED Executive

Five members are to be elected to the 1986 Nuclear Science and Engineering Division Executive. Members are elected for a two year term commencing with the first NSED Executive meeting in 1986, and expiring with the first NSED Executive meeting in 1988. The two year terms of three current Executive members (W.J. Garland, G.M. Frescura, and A.L. Wight) will expire in 1987. They are not subject to reelection this year.

The NSED Executive consists of up to eight elected members. Officers (Chairman, Vice-Chairman, and Secretary-Treasurer) are chosen by the Executive from among their number.

Nominations are requested for members of the NSE Division Executive. A nomination requires the signature of one CNS member, and the signature of the nominee indicating willingness to serve if elected. The candidate must be a CNS member.

Nominations should be sent to the NSED Returning Officer:

A.L. Wight
Ontario Hydro, H9 E10
700 University Ave.
Toronto, Ontario, M5G 1X6

Conferences & Meetings

Joint Meeting of the ANS and AIF

To be held **November 10-14, 1985** in San Francisco, California. For information contact: **American Nuclear Society, 555 N. Kensington Ave., La Grange Park, IL 60525.**

International Conference and Exhibition on Fatigue, Corrosion Cracking, Fracture Mechanics and Failure Analysis

Sponsored by ASM and ANS, to be held **Dec. 2-6, 1985** in Salt Lake City, Utah. For information contact: **V.S. Goel, 8381 W. Portland, Littleton, CO 80123.**

International ANS/ENS Topical Meeting on Thermal Reactor Safety

Sponsored by ANS, cosponsored by CNS, ENS et al., to be held **Feb. 2-6, 1986** in San Diego, California. For information contact: **J. Webb, AECL CANDU Operations, Mississauga, Ontario, L5K 1B2.**

Topical Meeting on Advances in Fuel Management

Sponsored by CNS, ANS and EPRI, to be held **March 2-5, 1986** in Pinehurst, North Carolina. For information Contact: **Dr. G.M. Frescura, Ontario Hydro, Nuclear Studies and Safety Dept., 700 University Ave., Toronto, ON M5G 1X6.**

International Symposium on Siting, Design and Construction of Underground Repositories for Radioactive Wastes

Sponsored by IAEA, to be held **March 3-7, 1986** in Hanover, West Germany. For information contact: **Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.**

CNA Seminar on Opportunities in Small and Medium Power Reactors

Sponsored by CNA, to be held **March 4-6, 1986** in Toronto, Ontario. For information contact: **CNA, 111 Elizabeth St., 11th Floor, Toronto, ON M5G 1P7, or call Herb Rosinger at (204) 753-2311.**

Topical Meeting on Nuclear Power Plant Maintenance

Sponsored by ANS, cosponsored by CNS,

ENS et al., to be held **March 23-27, 1986** in Salt Lake City, Utah. For information contact: **Ken Talbot, Ontario Hydro — Pickering NGS, P.O. Box 160, Pickering, ON L1V 2R5, (416) 839-1151.**

Seventh Annual Conference of the CNS — Call For Papers

To be held in Toronto in parallel with the Canadian Nuclear Association's 26th Annual International Conference, **June 8-11, 1986**. The CNS Conference provides a forum for presentation of contributed papers, subject to peer review by a panel of CNS members and acceptance by the Program Committee. Papers are invited on all subjects relating to applications of nuclear technology, both technical and socio-economic, including Thermal hydraulics, Reactor Physics, Fuel Cycles, Risk Assessment, Safety Analysis, Regulatory Aspects, Nuclear Plant Design and Operation, Radiation Protection and Health Physics, Isotopes and Radiation, Food Preservation, and Other Applications of Nuclear Technology. A special invitation is extended for authors to present research and development results in new and innovative nuclear applications of technology. Sessions are also being planned on regulatory issues, plant operations and pressure tube integrity.

Persons wishing to present a paper are requested to submit a summary to the Conference Chairman for review, postmarked no later than **January 6, 1986**. Summaries should include an introductory statement indicating the purpose of the work and a

closing statement summarizing the significant new results. All summaries will be reviewed by the Technical Review Committee and the principal author will be notified of the status of the summary on or about **February 24, 1986**.

Summaries will be distributed at the meeting, and full papers published later in the CNS Conference Proceedings. Papers are to be presented orally at the meeting and are normally allotted 20 minutes for presentation and 5 minutes for questions. Summaries and full papers will be published in the language of the author (English or French only). Authors whose summaries have been accepted will be required to submit a full paper (in prescribed format on mats to be provided, not to exceed 7 mats in length) no later than **June 10, 1986**, for publication in the Conference Proceedings. All accepted summaries and full papers become the property of the Canadian Nuclear Society.

A summary must not exceed 900 words with figures or tables each counting as 150 words and with at least 450 words of narrative. References are not included in the word count but must be limited to an absolute minimum. Each line of equation counts as 10 words.

Summaries should be typed, single-spaced on only one side of 8 1/2 x 11 inch paper and with 3 cm margins on every side. The order on the first page should be as follows: title of paper, in capitals, centered; names of authors, upper and lower case, centered; affiliation of the authors and the mailing address of the principal author, upper and lower case, centered; text of summary.

References are listed at the end of the summary and indicated numerically in the text by superscript numbers.

The figures for the original copy of the paper must be high quality glossy photographs or reproducible black-on-white drawings, each on a separate page.

Each copy of the submitted summary must include a Summary Cover Sheet listing the title of the summary, the authors and their corresponding affiliation (employers). For each author, include the complete mailing address and telephone number. Indicate the author to whom correspondence should be sent.

Summaries must be postmarked no later than **January 6, 1986**. Four sets (original plus three copies of each summary, and a Summary Cover Sheet) must be submitted to the Conference Chairman: **J. Boulton, 1986 CNS Annual Conference, c/o Atomic Energy of Canada Ltd., Sheridan Park Research Community, Mississauga, Ontario, L5K 1B2, (416) 823-9040, telex 06-982372.**

4th International Conference on Emerging Nuclear Energy Systems (ICENES 4)

— Call for Papers

Sponsored by the Spanish Nuclear Society, the American Nuclear Society, the Canadian Nuclear Society, the European Nuclear Society, the Atomic Energy Society of Japan, the International Atomic Energy Agency, the USSR Academy of Sciences, and the Junta de Energia Nuclear, to be held **June 30-July 4, 1986** in Madrid, Spain. Papers are solicited on the following topics: reactor cavity analysis; hybrid and symbiotic fission-fusion reactors; accelerator breeding; small fusion reactors (< 100 MW); new breeder concepts; inertial confinement fusion; catalyzed fusion; polarized fuel fusion; impact and explosive driven fusion; nonconventional fusion systems; new concepts in nuclear energy; nuclear energy prospects; role and implications of emerging nuclear energy systems; and the impact of new nuclear technologies. Deadline for submission of 150-200-word abstract: **December 31, 1985**. Author notification: **February 15, 1986**. Full-paper deadline: **May 10, 1986**. For further information, or to submit an abstract, contact **Guillermo Velarde, Director, Dept. of Nuclear Energy, ETS Ingenieros Industriales, Universidad Politécnica de Madrid, P. de la Castellana No. 80, 28046 Madrid, Spain; phone (91) 411 41 48; Telex 46854 (LCOEE).**

Second International Conference on Radioactive Waste Management — Call For Papers

Sponsored by the Canadian Nuclear Society; cosponsored by the American Nuclear Society, to be held **September 7-12, 1986** in the Winnipeg Convention Centre, Manitoba. Being held in conjunction with the 1986 Annual Information Meeting of the Canadian Nuclear Fuel Waste Management Program. Meeting theme: "Demonstration Results Providing Direction for the Future." Papers are solicited on the following topics: geotechnical research for waste storage and disposal; environmental and safety issues and assessment; performance assessment and modeling of disposal and storage facilities; regulatory plans and implications; public attitudes; waste form—performance; engineered barriers; design of disposal facilities; interim storage and handling; used fuel and waste transportation; low-level and reactor waste management; and uranium mining and milling waste management. Summary deadline: **February 28, 1986**. Author notification: **April 15, 1986**. Paper deadline: at meeting. Inquiries and summaries should be directed to **Thomas S Drolet, Program Manager, CFFPT, 2700 Lakeshore Rd. West, Mississauga, Ontario, L5J 1K3; (416) 823-6654; Telex 06-982333.**

International Topical Meeting on Waste Management and Decontamination and Decommissioning — Call For

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Papers

Sponsored by the American Nuclear Society Fuel Cycle and Waste Management Division and Niagara Finger Lakes section of the ANS; cosponsored by the US Department of Energy, New York State Energy Research and Development Authority, ANS Remote Systems Technology Division, Canadian Nuclear Society, Atomic Energy Society of Japan and European Nuclear Society and in cooperation with the International Atomic Energy Agency, to be held **September 14-**

18, 1986 in Niagara Falls, New York.

The purpose of the meeting is to present a variety of state of the art Waste Management and D/D data. Papers are invited on the following aspects of Low, Intermediate, and High-level waste: characterization, handling and treatment of waste, risk assessment, regulatory aspects, liquid waste treatment, solidification, solid waste treatment, TRU waste, National Waste Management Programs, Melters, High Level Waste support systems, Glass composition, Modeling, Construction, Operation/maintenance, Economics, Government regulation, and Environmental issues/impacts, and the following aspects of D/D: techniques, use of remote equipment and, Robotics for D/D and Waste Management, Equipment Design, Facility Design, and System Design. Deadline for submission of 500 word summaries, **February 1, 1986**, author notification, **April 1, 1986**, camera ready paper due **July 15, 1986**. Submit summaries to **Spectrum '86 Technical Program, Box 191, West Valley, New York 14171, USA**. For information contact Eva Rosinger, (204) 753-2311.

Topical Conference on CANDU Fuel

Sponsored by CNS, to be held **October 6-8, 1986** in Toronto. For information contact: **A.D. Lane, AECL CRNL, Chalk River, Ontario K0J 1J0**, (613) 687-5581.

2nd CNS International Conference on Simulation Methods in Nuclear Engineering

Sponsored by CNS, to be held **October 14-16, 1986** in Montreal. For information contact: **D. Rozon, Directeur, Groupe d'Analyse Nucléaire, École Polytechnique, 6600 Côte-des-Neiges, Suite 215, Montréal, Québec, H3S 2A9**, (514) 340-4201.

Water Chemistry & Materials Performance Conference

Sponsored by CNS, to be held **Oct. 20-21, 1986** in Toronto, Ontario. For information contact: **N.A. Graham, Westinghouse Canada Inc., Dorset St. E., Port Hope, ON L1A 3V4**, (416) 885-4537, ext 297.

The Unfashionable Side

Weighty Matters

A classic problem for an electric utility is the ephemeral nature of the product. While electrical energy can be stored, currently available chemical storage systems (batteries) do not appear to be economic for

large scale application. This has had the result that a utility must have available considerably more generating capacity than is, on average, demanded.

Because generating stations are expensive there has been considerable economic incentive to develop energy storage systems — one example is pumped storage systems where water is pumped into an upper level reservoir using off-peak electrical power and allowed to flow into a lower level reservoir via turbines to help meet peak electrical energy demand.

Hydraulic pumped storage, however, is not the only potential energy storage arrangement available. In a paper presented at the recent International Conference of the Society of Joint Societies, Aphasia University's FPS Professor of Plausible Energy Studies, Dr. Dennis Molestrangler, FMA, points to the old-fashioned weight-driven clock as a classic example of storage of potential energy and outlines a conceptual design for a large-scale energy storage system to be used at a fossil or nuclear thermal generating plant.

Using the traditional weight-driven cuckoo clock as an illustration of the principle involved, Dr. Molestrangler notes that energy input to that storage system — pulling up the weight — is rapid compared to its rate of release (over many hours). In Dr. Molestrangler's projected Gravity Assisted Mechanical Energy System (GAMES), energy input and output rates would be similar, for reasons that will become clear. The GAMES concept calls for a tall lattice-work tower within which a large mass (a very large block of concrete, for example) would be constrained to move vertically. At the top of the tower would be an electric motor which, via suitable reduction gearing, cables and pulleys, would be connected to the large block of concrete. At off-peak times, the generating station would provide power to the electric motor which would hoist the concrete block up the tower. To provide peaking power the block would be allowed to descend, driving the motor which, in this situation, would become a dynamo. Provision for arresting the uncontrolled descent of the concrete block in the event of cable failure or loss of electrical load would be required and, as Dr. Molestrangler points out, such technology is well developed and readily available from the elevator industry.

Preliminary calculations suggest that an 18 foot cube of concrete (of about 400 tons in weight) descending from the top of a 300 ft tower would generate about 100 kWh, hence an array of such energy storage towers would be required. Dr. Molestrangler is currently investigating the relative economic benefits and engineering demands related to increasing tower height, storage mass or number of storage units. Another, longer term, option being considered is selective, time-dependent modifications to the law of gravity.

Ernest Worthing