

BUILDING CONFIDENCE IN NUCLEAR ENERGY

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ABSTRACT

The anti-nuclear groups have been very active in public communication and are advocating nuclear phase-out. The Canadian Nuclear Society has launched a course for science teachers to help them address the lack of understanding of an advanced technology, by teaching good science in plain language.

INTRODUCTION

In his address at the recent CANDU Maintenance Conference, Hugh Segal (Segal, 1997) pointed out that the marketplace of ideas is like many others. "Vacuums are filled when they are created, and they will be filled by other agendas when the main agenda is left by the side of the road." Is he correct in stating that the present construed anxiety about nuclear energy is the direct result of the vacuum created by our inadequate public communication, advocacy and public education?

While we have been very active in communicating and reacting strongly to the damaging rumours and myths being disseminated about nuclear energy and radiation, it is difficult to match the formidable resources of anti-nuclear groups who are waging a tireless campaign to phase out nuclear technology. They receive sympathetic treatment from the media who carry their messages without verifying their factual basis. Although most people realize that the media need to create a sense of crisis, to garner attention to their broadcasts and publications, it seems that the concerns about nuclear are really politically and socially driven.

There is scarcely a subject that has been more closely studied than nuclear energy and the effects of radiation on living things. Yet most people, even well educated people, know very little, if anything at all, about it. Whatever the public seems to know about nuclear technology is mostly negative: - atomic bombs, weapons proliferation, accidents, radiation that might cause cancers and genetic changes, "toxic" wastes, leaks, etc. Is there any wonder that there is apprehension?

The Government of Ontario is planning to restructure Ontario Hydro and introduce a competitive electricity market in Ontario in the year 2000. "All generators, including those outside Ontario, would be able to participate in the market by offering supply." "Small businesses and households would all have ... the choice of staying with their current utility, having an electricity broker arrange supply on their behalf or even buying directly themselves." (Ontario, 1997) How will the apprehension about nuclear affect its success in this new commercial environment?

Should the Canadian Nuclear Society (CNS) do anything to change these perceptions in Canada? What can it do?

The CNS is a volunteer organization of ~1000 individuals which fosters the development of nuclear science and technology primarily by providing forums for information exchange and opportunities for the personal

development of its members. The Society realizes that public concerns about nuclear technologies are rooted in the lack of understanding of an advanced technology and that part of the solution is education, using plain language and simple concepts of good science.

The CNS has demonstrated a desire to share its understanding of this high-tech area with the public, in order to help safeguard Canada's valuable investment in nuclear technology. Many members of the Society have the necessary skills to explain the technology. Since its inception in 1979, the CNS has been involved in a variety of educational activities, such as presentations on nuclear energy to classrooms of students or two-hour workshops on selected radiation experiments to groups of science teachers at the annual CNS conferences. While these have been beneficial to the individual participants, clearly a systematic, comprehensive and cost-effective approach is needed to help change public attitudes on a large scale, within the very limited financial resources of the CNS.

Many countries know how to get energy from the nucleus. It is an enormous resource that is environmentally superior to burning fossil fuels. We certainly believe that it will become more competitive again in North America. Nuclear energy is here to stay, no matter what the anti-nuclear groups do. The use of nuclear energy will become so widespread in the twenty-first century that it is important for more people to understand it better, especially the young people now in schools. It is important to introduce them to the science of nuclear energy and radiation.

A COURSE FOR SCIENCE TEACHERS

To do its part to change "what is" to "what should be," the Canadian Nuclear Society has developed a four-day course on the science of nuclear energy and radiation for elementary and high school science teachers. By enabling the teachers themselves to provide factual information (and explain how to use facts) to all their students, the CNS is able to achieve a tremendous leverage in its ability to communicate to a very large population, over the long term. The teachers taking this course also share their knowledge, experience and impressions with colleagues in their schools, and outside, at many teachers' events. They and their students also interact with many friends and acquaintances, as they comment on the alarming myths and rumours being spread by the media and anti-nuclear groups.

There is great controversy today about global warming and the energy strategies that are being advocated to limit CO₂ production. People are aware that nuclear energy could make a very important contribution, and educators are thirsting for credible information on all the nuclear issues. The CNS has already received many expressions of interest in this course.

The course is modeled on the successful course developed by Professor Albert Reynolds at the University of Virginia, and is based on his book, "Bluebells and Nuclear Energy" (Reynolds, 1996). For the past 14 years, he and his colleagues have given it in Virginia each summer to a new group of ~30 teachers. One thing he discovered quite early is that most science teachers are aware that they do not know enough about the subject to do it justice. A second thing he discovered is that the teachers who take the course are extremely eager to learn about nuclear energy and radiation. And learn they do. Their understanding and enthusiasm go a long way toward dispelling fear of the unknown among their students. Reynolds states, "There is no better way to appreciate our public school science teachers than to observe them learning new material and sense their eagerness to introduce it into their curricula."

Science teachers attempting to teach these topics have a problem. They can devote only a few weeks of their course to nuclear energy and there is a limit to the amount of time they can spend learning about and preparing the material. This problem has guided the design of the textbook. It covers the most pertinent material that is needed for the various levels and branches of science offered in middle and high schools. Since students are informed through TV and newspapers and ask questions about nuclear topics, the book covers controversial issues related to nuclear energy and radiation in addition to basic technical

information. A teacher will not know all of the answers after reading this book. Science teachers who take this course are aware of this, however, they gain confidence. The course is intended to be the beginning of a rewarding on-going relationship for everyone. Teachers will have contacts to get answers to new questions and to guide interested students towards future careers in science and engineering.

IMPLEMENTING THE COURSE IN CANADA

To ensure that this course is not perceived as an effort by the nuclear industry to influence public opinion with pro-nuclear ideology, it has been designed as a science course to be given in a university, and a tuition fee is charged that helps to cover the expenses. The lecturers are highly qualified and experienced scientists, engineers and educators. Many are CNS members who have volunteered their time to give this course. Anti-nuclear speakers are not included in the program. One does not hear science from the antis; one hears emotional, political rhetoric, and this is not consistent with a science course. One could argue that the course is biased toward nuclear energy. This is correct in the sense that it simply presents the facts about nuclear energy. The course explains how nuclear energy really works.

The first course (contents in Table 1) will be presented next month by McMaster University and the Canadian Nuclear Society, in cooperation with AECL, Ontario Hydro and Oakville Trafalgar High School. McMaster University has a 5 MW pool-type reactor, and is located near AECL and several nuclear power stations. It has been giving courses in nuclear science and engineering for more than 50 years. It also has a nuclear medicine department in its hospital and medical sciences centre. The course is timed (late June) to minimize disruption of the teaching and vacation periods.

The course material avoids technical jargon and mathematics, so as not to be a burden. The concepts are simple, practical, interesting and relevant to current issues in Canadian society. Teaching aids and materials will be provided that can be readily used in the classroom. The lecturers have excellent credentials and will provide rational presentations on the science and technology. The teachers will have heard and will hear different messages from the anti-nuclear groups, and the course will help them make informed decisions.

The teachers will be encouraged and given opportunities to ask critical questions - to challenge the lecturers with information and ideas that they have acquired from other sources.

The tuition fee is \$200 and includes a copy of the textbook: *Bluebells and Nuclear Energy* by Albert B. Reynolds. On-campus accommodation at the university student residence and a daily breakfast are included in the registration fee. Enrollment in the course is limited to 30 teachers.

At the conclusion of this pilot project, the course will be evaluated and adjusted to increase its effectiveness. Then it will be repeated at McMaster University in the following year and introduced at other universities across Canada that are interested in participating in this initiative. Likely candidates for the second round are: Dalhousie University in Nova Scotia, University of New Brunswick, École Polytechnique in Quebec, University of Ottawa, Royal Military College, University of Toronto, University of Manitoba and University of Saskatchewan. If the interest is really strong at a particular location, the CNS may organize two or more courses during the same summer. The ultimate goal is to enable all young Canadians to be educated by teachers who have taken this course.

This paper represents the view of the authors and not necessarily those of AECL, McMaster University or the University of Virginia.

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Table 1 List of Contents of the Course

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| - Introduction to the Course | - Laboratory: Startup of McMaster Reactor |
| - Introduction to Development of Teaching Unit | - Laboratory: Neutron Activation Analysis |
| - Nuclear Energy Concepts | - Workshop: Development of Teaching Unit |
| - Introduction to Radiation | - Nuclear Reactor Safety |
| - Health Physics Orientation | - Risk Analysis and Relative Risks |
| - Security Orientation | - Nuclear Energy and the Environment |
| - Tour of McMaster Reactor | - Introduction to Nuclear Medicine |
| - Laboratory: Radiation Detection | - Tour of the Nuclear Medicine Facilities |
| - Biological Effects of Radiation | - Course Evaluation and Wrap Up |
| - Nuclear Reactor Concepts | - Day trip to AECL and to Pickering NGS |
| - Nuclear Fuel Cycle | |