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The NUCLEAR *Advantage*

CANADA EDITION



Serving in so many ways...

To many people, the word “nuclear” is often related to the nuclear power industry which, in a few decades, has grown to produce 17% of the world’s electrical energy and continues to offer significant benefits to our global environment.



Nuclear science and technology extends to many fields. Nuclear applications in the medical, pharmaceutical and health fields beneficially affect millions of people every year. In other ways, nuclear technologies help to produce better-quality goods and services that improve our day-to-day living.

This pamphlet is intended to provide the reader with a better understanding of the uses and benefits of nuclear technology.

RADIOACTIVE COBALT TREATMENT SAVES HALF A MILLION LIVES PER YEAR

Almost fifty years ago Canadian cancer researcher, Dr. Harold Johns, developed a machine for treating cancer. It used radiation from a radioactive cobalt isotope produced at the Chalk River Laboratories in Ontario, Canada. This treatment proved so effective that it has been adopted throughout the world and today is credited by health authorities with saving an estimated 500,000 lives per year.

The treatment is based on the fact that cancer cells are more active than adjoining normal cells. By exposing the cancer cells to controlled doses of radiation from the cobalt isotope, these more active cells are killed while normal cells are less affected and able to survive the treatment.

RADIOACTIVE IODINE ISOTOPES DIAGNOSE CANCER

McMaster University, one of Canada’s top science universities, recently developed a process to conveniently and safely produce very high quality radioactive iodine isotopes at its nuclear research reactor. Radioactive iodine isotopes are used to diagnose and treat thyroid and prostate cancers. Today, McMaster University produces a substantial quantity of all the radioactive iodine isotopes used in the world.

FACT:

Medical applications

– Over 40,000 medical procedures using radioactive isotopes are performed each day in North American hospitals and clinics to diagnose and treat various diseases. One Canadian company, MDS Nordion Inc., supplies most of the major diagnostic isotopes used in the world. These isotopes are produced at Canada’s Chalk River Laboratories in Ontario.



100 YEARS OF X-RAYS

Few scientific discoveries have had as great an impact on medicine as the application of x-ray techniques. During the twentieth century, the X-ray has become the primary diagnostic tool in modern medical practice, allowing physicians to improve their understanding of a patient’s condition and avoid invasive surgery.

World Health Organization statistics show that millions of lives each year have been positively affected by this technology. X-rays are a nuclear technology.

Safety & environmental benefits of nuclear technology



NEUTRONS IMPROVE FLIGHT SAFETY

All high-temperature jet engine turbine blades manufactured in Canada are inspected for manufacturing flaws through a process called, "neutron radiography". It uses neutrons produced in a nuclear reactor to produce images of the internal structure of the turbine fan blades. This process ensures that there are no hidden flaws in the blades and reduces the potential for these blades to break in flight and damage the engine, the wing or even the aircraft fuselage.

RADIATION USED TO STERILIZE INSECTS

When traditional chemical treatments failed to control insect infestation, Canada's Okanagan Valley fruit growers looked to the nuclear industry for assistance. The concept is simple: By exposing adult insects to a dose of radiation, they become sterile. When released in nature, they mate with fertile females but the sterile eggs never hatch and insect populations diminish.



The project employs about 100 people and sterilizes two million insects a day.

FACT:

Helping the Environment

– Over the last 30 years, use of the 22 CANDU nuclear power reactors in Canada has avoided putting a billion tonnes of carbon dioxide into the atmosphere.



FACT:

Nuclear Technology helps find Land Mines

– One approach to land mine detection involves the application of nuclear technologies. Both X-rays and gamma rays have been used successfully in detecting land mines that kill or injure an estimated 23,000 people annually.



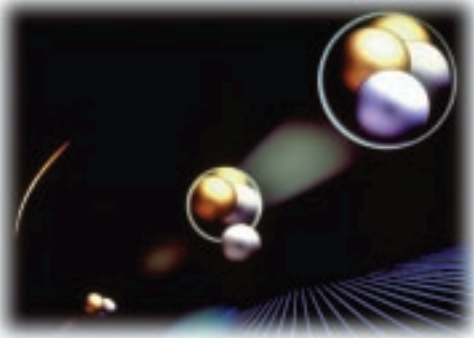
CANADIAN ENVIRONMENTALISTS SUPPORT NUCLEAR RESEARCH



Canadian environmentalists are seeing the advantage of applying nuclear technologies to environmental problems. For example, waste discharges from industrial and domestic sources are often laden with chemicals and organisms which are harmful to the natural environment. Nuclear research techniques have helped develop improved strains of enzymes that can significantly reduce or even eliminate some forms of these pollutants.

"Nuclear, naturally!" may yet become a slogan for environmentalists!

Nuclear electricity production



CANADA CELEBRATES 53 YEARS OF NUCLEAR FISSION

Canada was the second nation in the world to achieve sustained nuclear fission. It took place at Chalk River Laboratories in 1945. By 1962, Canada's first nuclear reactor to generate electricity went into service for Ontario Hydro, Canada's largest electric utility company. The Canadian-designed CANDU® power reactor has proven to be a reliable design and today contributes significantly to the electricity produced in Ontario, Canada's most industrialized province, as well as in Québec and New Brunswick. In addition to the CANDU power reactor, the SLOWPOKE and MAPLE research reactors are unique Canadian developments.

CHINA AND KOREA CHOOSE CANADIAN REACTORS

The first Canadian nuclear reactor in Korea began producing electricity in 1983. Since that time, Korea has ordered another three Canadian power reactors. Korea has also chosen the Canadian MAPLE research reactor design as the basis for its new HANARO research reactor. China has also decided to purchase two Canadian CANDU power reactors which are now under construction. China anticipates high rates of electric-energy growth and plans to develop up to 50 new nuclear power stations during the next several decades. China and Korea's choice of Canadian reactors is a vote of confidence for Canadian nuclear technology.



FACT: The CANDU nuclear power reactor was chosen by the Engineering Institute of Canada as one of the ten most significant Canadian engineering achievements of the twentieth century.



CANDU REACTORS ON FOUR CONTINENTS

Canada has a relatively small population of 30 million people. However, due to its high level of industrialization and high standard of living, it is the fifth largest electricity-producing nation in the world. Canadian energy production expertise is well represented in the nuclear power field, with the Canadian-designed CANDU nuclear power reactor operating or under construction on four continents. CANDUs are producing power in Canada, Korea, Argentina, Romania, Pakistan and India. Two more are presently under construction in China. CANDUs are contenders for future nuclear power requirements in Turkey and Hungary, as well as in many Asian nations considering the clean and efficient nuclear power option.

FACT: Canada's long experience in international peacekeeping operations was recognized when a former Canadian Prime Minister, Lester Pearson, was awarded a Nobel Prize for Peace. Canada has a reputation as a major trading nation, a trusted member of the international community and a strong supporter of nuclear non-proliferation and sustainable development.



Nuclear research and regulation

TAKING RESPONSIBILITY

A Canadian solution to the safe and permanent storage of used nuclear fuel has been researched and engineered for almost two decades. It involves burying this material deep underground in undisturbed granite formations. Geologic research has shown that these formations have remained undisturbed for 1.5 billion years or more. A seven-year scientific and public review of this approach has just been completed – an independent panel found the concept technically acceptable. The priority now is to ensure public understanding and acceptance of this approach.

FACT:

Canadian Nuclear Technology Assists US Space Program

– The cause of the explosion of the US Challenger Space Shuttle was determined to be faulty seals. The engine manufacturer, Morton Thiokol, turned to scientists at the Chalk River Laboratories to assist in the engineering and design of new seals that are now used.



programs now pursued by scientists all over the world. Chalk River research findings, first reported in 1979 by Dr. H. C. Birnboim, now at the Ottawa Regional Cancer Clinic, have been cited nearly 10,000 times in work done by other cancer researchers.

ASSURING PERFORMANCE

The development of nuclear technologies carries risks that require good technical judgement and careful monitoring. Canadian nuclear licensing standards are set by an independent agency of the Government of Canada. Canada's approach to nuclear regulation is similar to its aircraft and flight safety regulation, with high standards of industry self-regulation. Such measures, when combined with the regulator's own inspections and reviews, ensure high levels of public confidence in the handling of nuclear technologies.



RECOMBINANT DNA - ARE THE ANSWERS IN OUR GENES?

Although Recombinant DNA sounds esoteric, research into human cell genetics at the Chalk River Laboratories in the 1970's significantly advanced genetic research and laid the foundation for medical research

FACT:

Canadian Awarded Nobel Prize in Nuclear Physics

Dr. Bertram Brockhouse was awarded the 1994 Nobel Prize in Physics. Dr. Brockhouse received his Nobel award for work undertaken at the Chalk River Laboratories of Atomic Energy of Canada Limited (AECL).





PICKERING NUCLEAR POWER STATION

In Canada, nuclear power plants are often located in close proximity to large population centers. The Pickering Nuclear Generating Station is located right in the city of Pickering (population: 75,000) and is 40 kilometers from the city of Toronto (population 3.5 million).

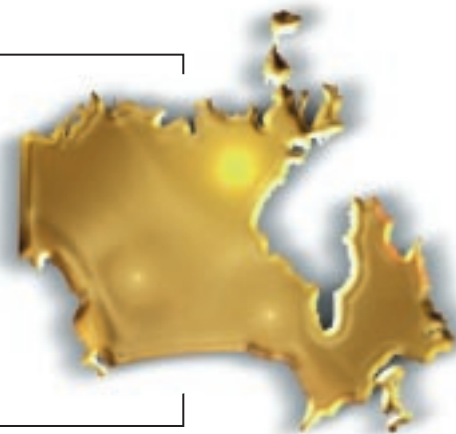
THE CANADIAN NUCLEAR WORKERS COUNCIL

Concerned that the public was not getting the most accurate information about the significant medical, environmental and economic benefits of their industry, several Canadian labor unions with members in the nuclear industry agreed a few years ago to support the creation of a Nuclear Workers Council. The Council's mandate is to promote factual information on the benefits of nuclear energy to Canadian workers and the Canadian people.

Although the main membership in the Council is unionized workers at Ontario Hydro's nuclear power stations, some Council members are involved with uranium mining as well as other aspects of the nuclear industry, including research.

CANADA'S NUCLEAR LEADERSHIP – A DISTINGUISHED HISTORY

For almost half a century, the Canadian Government has stood behind the Canadian nuclear industry. That commitment goes right to the top. "It is no secret that I am personally a strong supporter of the CANDU nuclear power system," notes Canada's Prime Minister Jean Chretien. "I believe that the technology is safe and unmatched for performance, and that CANDU is a product in which Canada can take immense pride."



FOR MORE INFORMATION ON NUCLEAR ISSUES CONTACT

- Frequently Asked Questions.....<http://www.ncf.carleton.ca/~cz7251/>
- IAEA - United Nations Agency<http://www.iaea.or.at>
- Nuclear Energy Institute.....<http://www.nei.org/>
- Greenpeace.....<http://www.greenpeace.org/index.shtml>
- Medical<http://nuc-med-read.uthscsa.edu/williams/wmstoc.htm>
- CANDU Nuclear Reactors<http://www.aec.ca>
- Isotopes - MDS Nordion<http://www.mds.nordion.com/home.html>
- Canadian Nuclear Assoc.....<http://www.cna.ca>



FEEDBACK

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