

The Age of Nuclear Waste is Upon Us:  
Are We Ready? Two Case Studies

“Nuclear waste is everybody’s business. Decisions can no longer be left to the discretion of the nuclear establishment and its regulatory bodies,” said Dr. Gordon Edwards of the Canadian Coalition for Nuclear Responsibility. “The Canadian Nuclear Safety Commission, appointed by the government, has little or no objectivity in dealing with nuclear waste issues”.

Dr. Ole Hendrickson, of the Concerned Citizens of Renfrew County, cited the case of SRB Technologies, a tritium light factory in Pembroke Ontario, northwest of Ottawa. “This company is in the business of marketing a nuclear reactor waste material, a radioactive form of hydrogen called tritium.”

“In commercializing tritium, this company has polluted the local environment, exacerbated nuclear weapons proliferation risks, and become a dumping ground for tritium wastes from other countries,” said Dr. Hendrickson. “This has all been done with the approval of the CNSC, whose primary legal obligation is supposedly to protect people and the environment.”

Another case, cited by John Bennett, National Program Director of Sierra Club Canada Foundation, is Ontario Power Generation’s proposal to bury and abandon nuclear waste just one kilometer from the shore of Lake Huron. Mr. Bennett pointed out that 154 municipalities representing some 20 million people have passed resolutions opposing the project, yet throughout the public hearings CNSC staff supported OPG’s proposal and dismissed public concerns.

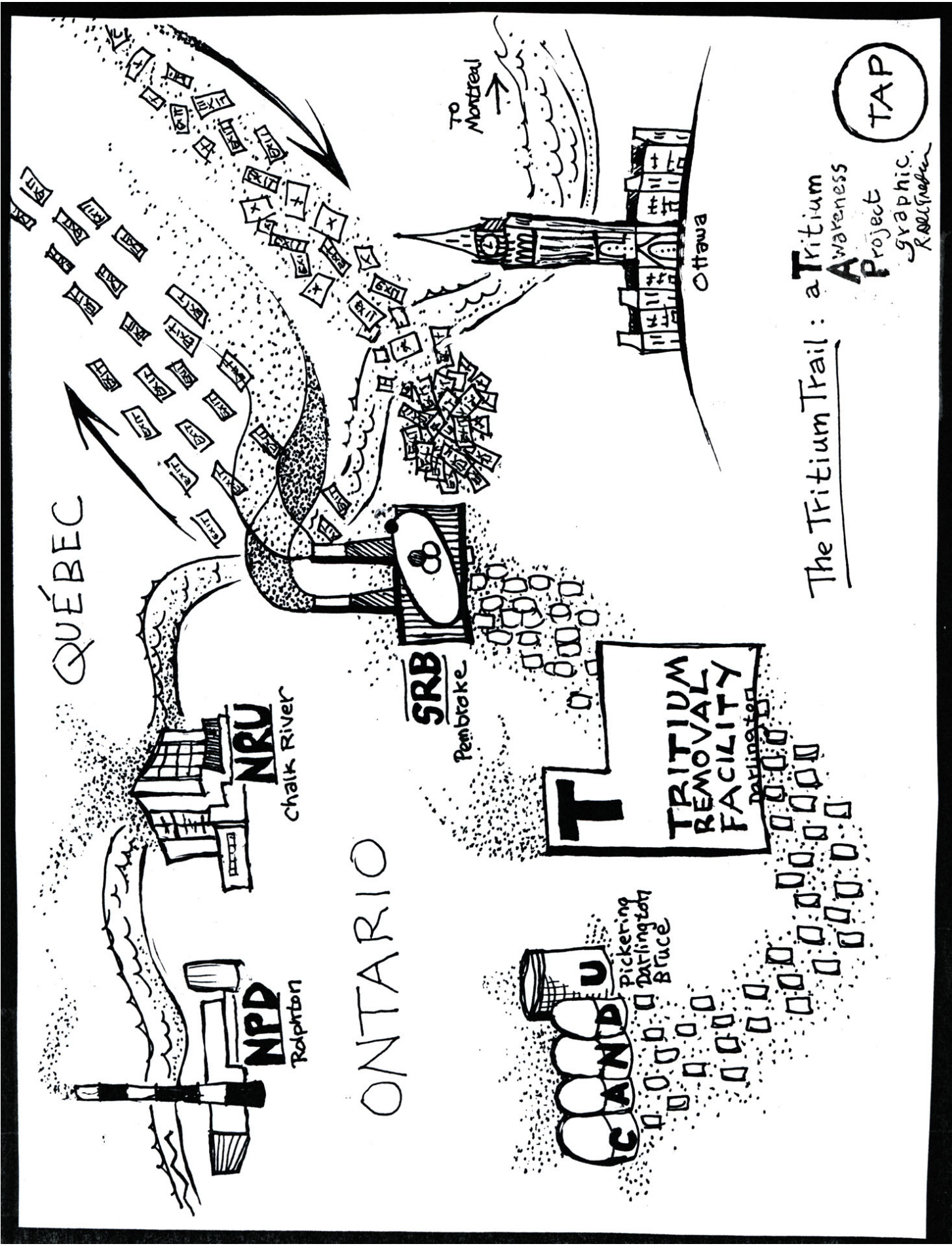
“When Linda Keen was fired from her position as head of the CNSC in 2008 for trying to enforce regulatory requirements, I believe that any chance for the CNSC to play an independent role was scuppered”, said Dr. Edwards.

In the 2012 Omnibus Budget Bill, Canada’s conservative government transferred responsibility for environmental assessment of nuclear projects to the CNSC. Hence the federal panel that last week recommended approval of OPG’s nuclear waste plan was appointed by CNSC President Michael Binder, supported by Minister of Environment Peter Kent. The three-year environmental assessment was housed in CNSC offices.

Doug Hunter of the Inverhuron Committee, representing residents living near the proposed DGR site, said “It’s just common sense that you don’t dump your waste where you draw your drinking water”.

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The Tritium Trail: a Tritium Awareness Project

graphic.  
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*Backgrounder:*

*May 12, 2015*

## “Nuclear Waste is Everybody’s Business”

Nuclear waste is everybody’s business, because the implications of mismanaging nuclear waste transcend science, extend beyond national borders, and involve time spans that dwarf the span of human history. The age of nuclear waste is just beginning, and we are all involved, like it or not. Decisions can no longer be left to the discretion of the nuclear establishment and its regulatory bodies. ]

In the Great Lakes region, a major battle of wills is looming. Canada’s nuclear industry seeks permission to abandon its most voluminous nuclear wastes just one kilometer from the shores of Lake Huron, while 154 municipalities representing over 20 million people – including such cities as Toronto, London and Chicago -- have passed resolutions opposing the project to abandon these radioactive wastes so close to the Great Lakes watershed, the source of drinking water for 40 million people. This project has no social licence to proceed. Abandonment is not a solution to the nuclear waste problem.

Last week a federal panel approved Ontario Power Generation’s plans for a nuclear waste dump at Kincardine, Ontario. OPG is proposing to construct a series of caverns 680 metres below-surface in a band of limestone, and to transfer into those caverns 200,000 cubic metres of nuclear waste. The waste will remain dangerous for more than 100,000 years. The Great Lakes came into existence only 10,000 years ago. The pyramids of Egypt are just 5,000 years old. Over the past 60 years, the USA has tried 8 times to locate a safe underground waste repository for its spent nuclear fuel, and it has failed all 8 times. OPG brags that it has studied the chosen geological formation by the shore of Lake Huron for 10 years.

The site is home to North America’s largest nuclear complex, with eight operating reactors. To run nuclear reactors you need lots of water; but to store nuclear waste safely you need the opposite. Thus the site seems convenient for the industry, but inappropriate for long-term nuclear waste management, particularly when there is no intention to monitor or retrieve the waste once it has been abandoned.

The Canadian Coalition for Nuclear Responsibility will be working in cooperation with hundreds of other organization representing civil society around the Great Lakes Basin to prevent the burial and abandonment of nuclear wastes at any such location. Ultimately the decision is a political decision, not solely a technical one.

## Points to ponder:

- the Bruce site is chosen for convenience rather than for environmental protection
- the characterization and the inventory of the nuclear wastes remains incomplete
- underground chemical reactions including gas generation are constant concerns
- the technology for sealing the vertical shaft is neither determined nor proven
- the cost, now estimated at over \$2 billion, is likely to be \$6 to \$10 billion or more
- the volume of decommissioning wastes is not known due to lack of experience
- geology is not a predictive science but a descriptive one
- the accuracy of predictions over such long time spans is impossible to verify
- two deep underground repositories for nuclear waste in Germany have failed
- the one deep geological repository for nuclear waste in N. America failed in 2014
- what language do we use to communicate the danger to future generations?

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*It would go downstream, and pollute the fresh water that people need to sustain themselves. There are enough problems with the lack of fresh water, and here we are basically creating a potential issue for the future*  
Chief Vernon Roote, Saugeen Ojibway Nation, May 2015

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See : <http://stopthegreatlakesnucleardump.com>

<https://knownuclearwaste.wordpress.com>

<http://ccnr.org/#tr> “Troubles with Tritium”

<http://ccnr.org/#HLW> “High Level Radioactive Waste”

<http://tapcanada.org> “Tritium Awareness Project”

## DGR BACKGROUNDER: FEDERAL PANEL SUBMITS REPORT ON NUCLEAR WASTE BURIAL PLAN

On May 6, 2015, a Joint Review Panel appointed by the federal Minister of the Environment and the Canadian Nuclear Safety Commission in 2012 provided the Minister with their final report on the review of Ontario Power Generation's proposed Deep Geologic Repository for Low and Intermediate Level Radioactive Wastes. The Joint Review Panel (JRP) recommended that the federal minister approve the proposed repository, despite the expert evidence they heard throughout the public hearings about numerous technical uncertainties, and in the face of large and growing public opposition.

### Background

Ontario Power Generation is proposing to construct a series of caverns 680 metres below-surface in a band of limestone, and to transfer into those caverns 200,000 cubic metres of nuclear waste. Some of these wastes – called “low level” radioactive wastes – do not require extra barriers to shield workers from radioactivity, although they are still hazardous. Other wastes, classified as “intermediate” wastes are highly radioactive. In fact, intermediate waste is almost as radioactive as “high level waste” and as recently as 2002 was identified as Type III waste, with similar radioactivity to used fuel or irradiated nuclear fuel waste. Elements of these wastes will remain dangerously radioactive for hundreds of thousands of years, and some for even far longer than that.

### Key Issues

- Ontario Power Generation's characterization and inventory of the wastes remains incomplete
- The rate at which gas will be generated by deteriorating metal waste containers is still unknown; this is important, because these gas pressures can cause fracturing that could speed the release of radionuclides out to the biosphere
- The chemical stability of some wastes, such as ion exchange resins, is uncertain over time
- Many of the “design” decisions have not yet been made, including important features like the seal for the vertical shafts that connect the underground repository to the environment
- The only example Ontario Power Generation offered of a similar deep geologic repository for radioactive wastes, the Waste Isolation Pilot Plant in New Mexico, is no longer operating after an underground fire and loss of containment resulted in radioactive releases to the surface in 2014
- Management of the wastes through placement in the proposed DGR will cost approximately four times more than above-ground options, with current cost estimates at over \$2 billion; OPG's pattern of persistently underestimating costs for nuclear projects over the last several decades suggests that real costs are more likely to be in the \$6 to \$10 billion range
- Ontario Power Generation's proposal (2011) is for 200,000 metres<sup>3</sup> but in August 2013 Ontario Power Generation acknowledged on the public record that they intend to double the amount of waste to be placed in the proposed DGR and will seek a licence amendment after they receive a project approval based on the original volume; the final use and size of the proposed DGR remain unknown
- 154 municipalities representing more than 20 million people have passed resolutions opposing OPG's proposed waste repository; the large and growing public opposition includes many elected representatives in the U.S.
- The Project is not supported by the Saugeen Ojibway Nation; Ontario Power Generation has previously stated that it will not proceed without the support of the Saugeen Ojibway Nation.
- This project is an unacceptable risk to the world's largest fresh water supply: the Great Lakes.

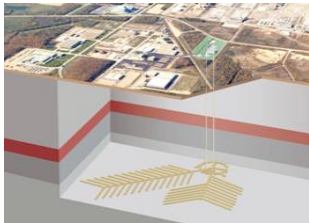
Public interest intervenors in the 2013-2014 hearings are reviewing the Joint Review Panel report and are expected to issue a joint statement in the near future. See [www.bruce-nuclear-waste-burial.ca](http://www.bruce-nuclear-waste-burial.ca).

## DGR BACKGROUNDER: THE OPG PROPOSAL

### Ontario Power Generation's Deep Geological Repository for Low and Intermediate Level Radioactive Waste

#### Overview

Ontario Power Generation (OPG) is proposing to construct and operate a deep geologic repository at the Bruce Nuclear site, within the Municipality of Kincardine, Ontario. Low and intermediate level radioactive wastes produced from the continued operations of the nuclear generating stations at Bruce, Pickering and Darlington would be placed in the Deep Geological Repository (DGR) at an estimated depth of 680 metres below the surface, approximately 650 metres from the eastern shore of Lake Huron. The estimated size of the surface facilities for the DGR is approximately 15 hectares while the footprint of the underground facilities is approximately 30 hectares.



The waste would consist of industrial items and used nuclear components (but not used fuel, according to statements to date by OPG) that are currently processed and stored at OPG's WWMF after being transported by truck from Pickering and Darlington to the WWMF, and by truck on-site from the 8 Bruce reactors. The DGR will receive the wastes currently in storage in the Bruce site interim facilities at the Western Waste Management Facility (WWMF) as well as that produced from the continued operation of generating stations at Bruce, Pickering and Darlington.

Low level waste consists of industrial items that have become contaminated with low levels of radioactivity during routine clean-up and maintenance activities at nuclear generating stations. Intermediate level radioactive waste consists primarily of used nuclear reactor components, ion-exchange resins and filters used in reactor water filtration systems. The wastes are generated during the operation of nuclear reactors in Ontario, and during refurbishment of the reactors (replacement of the reactor's innermost components). Shortly before a federal review hearing got underway in September 2013 OPG acknowledged that it also intended to place decommissioning wastes in the proposed DGR, a decision that would double the volume of the waste from 200,000 m<sup>3</sup> to 400,000m<sup>3</sup>. Ontario Power Generation has made a commitment to the host municipality of Kincardine that the Deep Geologic Repository will not be used to store high level nuclear fuel waste. Kincardine and other area municipalities have signed a "willing host" agreement with Ontario Power Generation which sets out a number of conditions, including multimillion dollar payments from OPG to the municipalities -- payments that are dependent on statements of support for the project from the municipalities.

#### Key Issues

Key issues related to this proposal to bury nuclear waste in a limestone rock formation on the shore of Lake Huron include the eventual failure of the waste containers, the questionable ability of the "host" limestone and shale rock formations to act as a barrier to radioactive wastes migrating from the repository, the effectiveness of the seals to be placed in the shafts at time of closure, the rate of gas generation in the repository, the volume and nature of the radioactive wastes, the close proximity to Lake Huron, and local opposition.

There are several additional issues that apply to this and to other proposals to bury nuclear waste, more generally, including the effectiveness of both the engineered and geological barriers, the reliability of the computer modeling on which predictions of safety are based, and a general lack of independent peer reviewed studies.

#### Review Process

A joint federal review began in 2006. A Joint Review Panel was appointed in January 2012 and a public hearing commenced in September 2013, was adjourned in October 2013 and reconvened in September 2014. Final comments were required by October 9 2014 and the public record closed in November 2014. The Joint Review Panel provided a report with their recommendation to the federal Minister of the Environment on May 6, 2015.

Learn more about the proposed repository by visiting [www.bruce-nuclear-waste-burial.ca](http://www.bruce-nuclear-waste-burial.ca)

#### Deep Geological Repositories

Internationally, the nuclear industry has been promoting the idea of burying nuclear waste for decades. The nuclear industry's argument in favour of burying nuclear waste relies on concept of "multiple barriers", and the theory that a combination of barriers – generally a combination of packaging, packing material and rock - will contain the radioactivity for long enough to allow the radioactivity of the waste to decrease considerably. Key issues relate to the ability of the various barriers – both engineered containers and the rock formation – to effectively contain the wastes and the reliability of the computer-based predictions that the nuclear industry will use to defend its proposal. Repairing containers or retrieving failed containers of radioactive material will be difficult after the containers are placed in the underground repository, and these difficulties will increase over time and will dramatically increase if and when the waste containers begin to fail. Even low levels of exposure to radioactivity – including from wastes - can be harmful.

## **SRBT BACKGROUNDER: CANADIAN NUCLEAR SAFETY COMMISSION IGNORES NUCLEAR WEAPONS CONNECTION, ENVIRONMENTAL CONTAMINATION, AND NUCLEAR WASTE IMPORTS IN RECOMMENDING RENEWAL OF TRITIUM LIGHT FACTORY LICENSE**

On May 14, 2015, the Canadian Nuclear Safety Commission (CNSC) will hold a hearing in Pembroke, Ontario on an application from SRB Technologies Canada Inc. (SRBT) to renew its nuclear substance processing license. SRBT, which rents space in a building it shares with other businesses, is considered to be a class 1b nuclear facility because of the large quantities of radioactive materials it handles. CNSC Staff recommends awarding SRBT a 10-year license despite continuing high radioactivity levels in the environment near the SRBT facility. CNSC Staff is silent on SRBT's expanding nuclear waste import business and associated accident risks. CNSC Staff also proposes to remove safeguards related to nuclear weapons proliferation from SRBT's license, even though tritium (used in glow-in-the-dark devices) is a controlled substance which in small (2-4 gram) quantities can increase the power of nuclear weapons several-fold.

### **Background**

SRB Technologies, Inc., with operations in the U.K., U.S. and Canada, claims to have been “the industry leading tritium sign manufacturer and a disposal service provider for close to 50 years.” It opened a branch plant in Pembroke, Ontario in 1990. In 1994 SRB Technologies (Canada) Inc. (SRBT) received approval to increase its radioactive gas emissions to enable “recycling” of tritium from expired products such as exit signs, supposedly those returned by its own customers. SRBT then obtained licenses from the CNSC's predecessor, the Atomic Energy Control Board (AECB), to import large quantities of waste military tritium devices from the U.K., U.S., and Russia. SRBT removed the tritium-filled glass tubes, crushed them, and recaptured a fraction of the tritium gas released in a “recycle rig” containing depleted uranium. According to internal AECB documents, this unit was inefficient and poorly designed: much of the radioactive waste gas went up SRBT's stacks and out into the local environment. AECB, and then CNSC, continued to issue nuclear waste import licenses and allowed SRBT to run its recycle rig for over ten years in the face of growing citizen protests about environmental contamination. CNSC suspended SRBT's tritium processing during 2007-2008, citing evidence of unacceptable groundwater contamination, and initiated a “Tritium Studies Project”. The synthesis report from this project, released in 2011, calls for a groundwater protection objective of 100 Becquerels per litre (a Becquerel, Bq, is the amount of a radioisotope that gives off one radioactive disintegration per second).

CNSC has only allowed SRBT to do tube-filling operations (not “recycling”) during its current 5-year license (2010-2015). Although SRBT's reported radioactive gas emissions have declined, tritium contamination of groundwater still exceeds the CNSC's 100 Bq/L objective in a large area around SRBT. CNSC staff provide no reasons for this persistent and widespread contamination, but a research study published in 2015 by CNSC scientists indicates that “organically-bound tritium” (OBT) is found in surprisingly large amounts in soil and vegetation even several kilometers away from the SRBT facility – a new and unexpected finding.

### **Key Issue 1: The Nuclear Weapons Connection**

The same tritium gas used by SRBT to make in glow-in-the-dark devices plays a very important role in nuclear weapons arsenals. When added to a fission weapon, tritium creates a nuclear fusion reaction that greatly enhances the power of the resulting blast. This allows the manufacture of much lighter and more portable nuclear weapons. As a Party to the *Treaty on the Non-Proliferation of Nuclear Weapons*, Canada has agreed “to accept safeguards... with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices.” Canada implements the *Treaty* through the *Nuclear Non-proliferation Import and Export Control Regulations*, in which tritium is listed as a controlled substance.

For reasons that are unclear, but may be associated with a desire to reduce administrative burden, CNSC staff now propose to remove the reference to the *Nuclear Non-proliferation Import and Export Control Regulations* and associated safeguards provisions from SRBT's license. As SRBT handles an amount of tritium sufficient to supply the needs of dozens of fission weapons each year, and engages in extensive import/export activities, deletion of safeguards provisions from SRBT's license seems contrary to the interests of Canada and its allies.

## **Key Issue 2: Persistent Radioactive Contamination and Health Risks**

Radioactive contamination of the Pembroke environment remains high. In 2014, radiation levels in the groundwater monitoring well at the base of SRBT's stacks averaged 43,000 Bq/L of tritium, far above the 100 Bq/L level recommended by CNSC "for the protection of a potential drinking water resource" – a level that "represents a balanced consideration of science, public health policy, achievability/practicality and societal expectations" (*Tritium Studies Project Synthesis Report*, January 2011, CNSC INFO-0800 Revision 1). Health risks to residents living near SRBT are increased by the absence of an "exclusion zone" around SRBT's premises -- unlike Canada's other class 1 nuclear facilities such as nuclear reactors.

A Pembroke-based group, *The First Six Years*, has hired Dr. Ian Fairlie, a scientist who has published many peer-reviewed journal articles on tritium, to assess SRBT's radioactive gas emissions and their potential health effects. Dr. Fairlie notes that tritium is "extremely mobile in the environment, contaminates all biota in nearby areas including humans to ambient levels and binds with organic matter to form organically bound tritium (OBT) with long residence times in the body making it more radiotoxic." He says "Annual tritium emissions to air from SRBT's light factory at Pembroke, Ontario are large compared to most nuclear power stations in the world, and are comparable to those from Canadian reactors which are prolific tritium sources." He states:

"Environmental measurements of soils, foodstuffs, wells and sewage near the SRBT facility indicate pervasive continuing tritium contamination. Tritium levels in most wells are higher than the CNSC's design guide for groundwater tritium, and much higher than the Ontario Government's recommended level for tritium in drinking water. It appears that neither CNSC nor SRBT understands the factors responsible for the continuing high groundwater contamination near SRBT."

Dr. Fairlie recommends that:

- Local residents should continue to avoid consuming locally-grown foods and water from local wells;
- Local women intending to have a family, and families with babies and young children should consider moving elsewhere;
- SRBT employees, especially the teenagers, should be informed about the hazards of tritium; and
- In the longer term... the SRBT facility [should] be relocated to a more remote area.

## **Key Issue 3: Nuclear Waste Imports and Accident Risks**

CNSC staff do not discuss SRBT's waste processing or import/export activities in documentation for the May 14<sup>th</sup> hearing. However, available evidence suggests that SRBT currently imports very large amounts of nuclear wastes. The U.S. Nuclear Regulatory Commission (NRC) has mounted an aggressive effort to recover waste tritium devices – unlike the CNSC, which allows them to be discarded in landfills. In 2014 the NRC gave SRBT's U.S. affiliate a license to export waste tritium devices to SRBT in Pembroke. Data in SRBT's "Annual Compliance Reports" suggest that these waste devices are disassembled and their components shipped intact to a waste facility at Chalk River – unlike the pre-2007 period, when they were crushed in the "recycle rig".

Shipping large quantities of nuclear wastes increases risks associated with incidents such as transport accidents, fires or tornadoes. When glass tubes break, their contents (pure tritium gas) can be converted to the tritium oxide form, which poses much greater radiation hazards to humans as it is largely retained in the body when inhaled or absorbed through the skin. In theory, a firefighter could receive a lethal radiation dose if the contents of a single exit sign were converted to tritium oxide and absorbed into the body. The failure to acknowledge SRBT's expanding nuclear waste import business and its associated risks is a major deficiency in the "Environmental Assessment Information Report" portion of the CNSC Staff document for the May 14<sup>th</sup> hearing.

*Backgrounder prepared by Concerned Citizens of Renfrew County. For more on tritium: [www.tapcanada.org](http://www.tapcanada.org).*