

## ATTACHMENT A

Safe And Green Energy  
46 McGuire Drive  
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April 2, 2012

Louise Levert  
Secretariat  
Canadian Nuclear Safety Commission  
280 Slater St., P.O. Box 1046  
Ottawa, Ontario K1P 5S9

### **Re: Shield Source Inc. Ref. 2012-H-01**

Dear Ms Levert:

I am writing on behalf of Safe And Green Energy (SAGE), a Peterborough area citizens group concerned about tritium, Shield Source Inc., and CNSC licencing of this facility.

This correspondence is our substantive written submission regarding public notice Ref. 2012-H-01. I would also like to make an oral presentation at the public hearing in Ottawa on May 2<sup>nd</sup>.

Shield Source Inc. uses tritium to manufacture self-luminescent 'glow in the dark' lighting devices, which the company refers to as gaseous tritium light sources or GTLS. The company is located in a rented unit at the Peterborough Airport. Shield Source Inc. has been in business at this location since 1986.

Radioactive tritium concentrations for several kilometers around the Peterborough Airport have been dramatically elevated as the result of routine accidental releases of tritium from Shield Source Inc. [Shield Source Inc. Environmental Monitoring Program (EMP) Annual Compliance Reports 2000 – 2010].

The normal background concentration of tritium in water in the Peterborough area is about 6 to 7 Bq/L. [Correspondence received from Patsy Thompson, CNSC, May 11, 2009].

The provincial average for tritium concentrations in air is 0.08 Bq/m<sup>3</sup>. [Tritium Releases and Dose Consequences in Canada 2006, CNSC INFO-0793, p.23]

Normal background concentrations of tritium in vegetation have been reported by the

CNSC as in the range of 1-5 Bq/L. [Tritium Activity in Garden Produce from Pembroke in 2007 and Dose to the Public, INFO-0798, p.4]

## TRITIUM

Tritium is radioactive hydrogen. Naturally occurring tritium is formed at a steady rate in the upper atmosphere and falls to Earth in precipitation. It also decays at a steady rate with a half-life of 12.3 years. This steady rate of natural tritium production and decay causes tritium concentrations in fresh water to be balanced at about 1 Becquerel per liter (Bq/l). A Becquerel is defined as one radioactive disintegration per second.

In many areas natural concentrations of tritium in the environment have been elevated by releases of man made tritium from nuclear power stations. [Tritium Hazard Report: Pollution and Radiation Risk from Canadian Nuclear Facilities (2007) Ian Fairlie. p.20].As a result, the 'new normal' for tritium concentrations in water in the Peterborough area is about 6 to 7 Bq/l.

“Near SSI, public information posted by the Ontario Ministry of the Environment indicates that levels of tritium in the Peterborough drinking water plant are essentially at background (~6- 7 Bq/L)”. [Correspondence received from the CNSC’s Patsy Thompson, May 11, 2009].

At Ontario’s CANDU nuclear stations, tritium is a significant occupational health issue.[Darlington New Build Project Joint Review Panel, Undertaking Number 20, CNSC, File: 2.01 e-Doc: 3699184,p.3]Tritium is also a concern at water treatment plants near CANDU nuclear stations.[Rationale Document for the Development of an Interim Ontario Drinking Water Objective for Tritium, Ontario Ministry of Environment and Energy, p.1]

In response to these concerns Ontario Power Generation constructed the Darlington Tritium Removal Facility where it removes tritium from contaminated heavy water. This helps to minimize both worker exposures and tritium concentrations at nearby water treatment plants. The outcome is also that OPG produces tritium that it then sells in the marketplace where it is used for such things as the manufacture of self-luminescent signs and devices.

In the course of manufacturing these products, Shield Source Inc. also must address tritium as an occupational health issue. Tritium is very difficult to control and contain. Shield Source has experienced accidental discharges and chronic emissions. According to the ‘Optimization Study of Tritium Handling and Ventilation Processes’, Shield Source Incorporated, April 2007, p.6,

To identify all emission sources, an evaluation of the manufacturing processes at SSI is necessary. Tritium releases from a facility fall into one of two categories; accidental discharges or chronic emissions. Accidental discharges occur infrequently and arise from equipment failure or operator error. Modifying operating protocols and procedures and/or implementing several equipment modifications can help reduce the frequency and magnitude of these releases. Chronic emissions arise from various sources throughout the processing system such as vacuum discharges and permeation through tritium pyros. Chronic emissions also arise from various sources indirectly linked to the processing system, such as long term out gassing from metals that were

exposed to tritium gas, decontamination, waste and tritium loss from leaking sources due to improper seals or stress cracks. Mitigating chronic emissions involves minimizing activity accumulation, minimizing occupational exposures and reducing the decontamination efforts to maintain an acceptable work environment within the plant.

To reduce tritium concentrations inside the facility Shield Source Inc. emits tritium out of the workplace and into the air by means of an exhaust stack. To a lesser extent they also discharge tritium into the municipal sewer system. [CMD 12-H3, P.28]

When tritium gas is released to the atmosphere it can rapidly interact and become radioactive water, commonly called tritiated water. Our bodies use tritiated water the same as regular water, as a building block of life.

Our bodies can't differentiate between normal water and tritiated water. If we ingest, inhale or absorb tritiated water we are subjected to ionizing beta radiation from within. Tritium decays by emitting a beta particle. Inside a living cell that beta particle decay can damage or break cellular components including genetic material. . [Darlington New Build Project Joint Review Panel, Undertaking Number 20, CNSC, File: 2.01 e-Doc: 3699184,p.1]

According to the International Institute of Concern for Public Health,

*“Tritium is a carcinogen, mutagen, teratogen and developmental toxin which is easily absorbed into the body. Tritium exchanges easily with H atoms, and binds with organic compounds to form Organic Bound Tritium (OBT). It becomes incorporated into DNA. It disrupts the genetic code of women's reproductive cells. The cells most at risk from tritium would be those dividing at the time of exposure (precursor cells for the ovum), the embryo and nerve cells.*

*Tritium easily crosses the placenta, which raises concern for spontaneous abortions, stillbirths, congenital malformations and diseases.*

*Since tritium spontaneously disintegrates into a helium atom, the resulting recoil excitation can disrupt chemical bonds. These disruptions when reproduced cause chronic diseases such as allergies or hormonal dysfunction”.*

<http://iicph.org/comments-on-cnsc-tritium-studies-project>

The Biological Effects of Ionizing Radiation or BEIR VII Report published by the National Academy of Science states that there is linear dose-response relationship and no threshold for the induction of cancers by radionuclides. SAGE supports a position that the maximum safe dose of any ionizing radiation is zero. Every exposure to tritium increases the risk of health impacts.

## **MORE PROTECTIVE STANDARDS**

Over recent decades there has been an on-going tightening of standards for exposures to tritium in drinking water. This results from on-going re-evaluation of tritium.

For many years the guideline for the allowable concentration of tritium in drinking water in Ontario was 40,000 Bq/l.

In 1994 Ontario revisited the issue and reset the drinking water guideline at 7000 Bq/l, where it currently remains.

In 2009 tritium risk underwent another review. The result was that the Province of Ontario's Drinking Water Advisory Council (ODWAC) recommended a new guideline of just 20 Bq/l on a rolling annual average. [Report and Advice on the Ontario Drinking Water Quality Standard for Tritium, *Prepared for the Honourable John Gerretsen Ontario Minister of the Environment, By the Ontario Drinking Water Advisory Council* May 21, 2009] [http://www.odwac.gov.on.ca/reports/052109\\_ODWAC\\_Tritium\\_Report.pdf](http://www.odwac.gov.on.ca/reports/052109_ODWAC_Tritium_Report.pdf)

In 2009 SAGE made a written and oral presentation to the CNSC regarding the operating licence for Shield Source Inc. At that time the ODWAC recommendation was hot off the presses, having been released to the public less than 24 hours earlier. I advised CNSC at that time to take the proactive initiative by applying the ODWAC recommendation in the SSI licensing decision. I also pointed out that the Canadian Nuclear Association representing CANDU operators had supported the ODWAC recommendation.

There was uncertainty at that time about how the ODWAC recommendation would impact operations at Shield Source Inc. Tritium concentrations in tap water at the airport had been measured in excess of 20 Bq/l. In 2008 samples from W2 (Water from washroom at airport) averaged 54.53 Bq/l with a maximum of 70.33 Bq/l. Similarly, samples from W19 (Airtech, 200 meters west) averaged 61.25 Bq/l with a maximum of 106.00 Bq/l. [2008 EMP Report p.21]

The Province of Ontario has not, to date, adopted the ODWAC recommendation. Nor has ODWAC rescinded its recommendation. In any case, Shield Source Inc. appears to anticipate the province adopting the ODWAC recommendation because it has assessed its capability to comply with it. SSI reports the following in CMD 12-H3.1, p.27.

“Following the 2009 Ontario Drinking Water Advisory Council report regarding release limits for tritium in drinking water<sup>1</sup>, SSI found a laboratory capable of testing water samples for tritium contamination to a level of 8 Bq/L or lower in an effort to verify that drinking water levels and drinking water tested are well below the proposed annual average of 20 Bq/L. These locations include W2, WW5, W17 and W19 from the Ambient Water results, and all results were well below the proposed levels in 2010 and 2011.”

Another indication of support for the ODWAC recommendation comes from the Darlington Joint Review Panel, which in its recent Environmental Assessment into the proposal to build new nuclear reactors at Darlington made the following recommendation:

Recommendation # 54 (Section 7.1):

*"The Panel recommends that during operation, the Canadian Nuclear Safety Commission require OPG to implement measures to manage releases from the Project to avoid tritium in drinking water levels exceeding a running annual*

*average of 20 Becquerels per litre at drinking water supply plants in the regional study area". (Joint Review Panel, Environmental Assessment Report SUMMARY. Darlington New Nuclear Power Plant Project, August 2011, p. vi)*

### **RECOMMENDATION # 1:**

**While SAGE does not recommend that the CNSC grant Shield Source a licence renewal, should CNSC grant such a renewal, the company should be required to implement measures to manage releases from the facility to avoid tritium in drinking water levels exceeding a running annual average of 20 Bq/l, and furthermore, and to protect pets and livestock, this standard should also apply to environmental sources of drinking water.**

### **ENVIRONMENTAL MONITORING**

Environmental tritium concentrations resulting from emissions at SSI are monitored and reported in the Shield Source Inc. Environmental Monitoring Program Annual Compliance Reports (EMP Reports). These reports document tritium concentrations from tens, to hundreds, to hundreds of thousands of times above normal at various locations in water, soil, vegetation and air samples.

Here are examples of data contained in the 2010 Shield Source Inc. Environmental Monitoring Program Annual Compliance Report:

Water samples taken 170 meters from the stack indicated an average tritium concentration of 1,419 Bq/l with a maximum of 3,740 Bq/l. (2010 EMP Report, p.24).

Water samples taken in 2008 at site W17 (16 km NE of the stack) were reported as having an average tritium concentration of 65 Bq/l with a maximum of 112 Bq/l. (2010 EMP Report, p.25)

Apples collected for analysis 4450 meters north of the stack at sampling location V1 showed tritium concentrations to be up to 878 Bq/l in 2009. (2010 EMP Report, p.27).

In 2010 tritium concentrations in air were an average of 1.05 Bq/m<sup>3</sup> across all sampling location with a maximum of 20.54 Bq/m<sup>3</sup>. (2010 EMP Report, p.52)

To our knowledge tritium concentrations above normal background in the Peterborough area are attributable to emissions from Shield Source Inc. To our knowledge the closest alternative source for elevated tritium concentrations would be the Darlington Nuclear Generating Station and the Darlington Tritium Removal Facility. [Ontario Power Generation also maintains an Environmental Monitoring Program. To further understand the environmental sampling for releases from the Darlington and Pickering nuclear facilities see OPG Document Number N-REP-03481-10007, 2008 Results of Radiological Environmental Monitoring Programs].

SAGE remains concerned about soil contamination at the base of the stack and the CNSC response to this.

Where normal tritium concentrations in soil near the base of the stack would be about 6 to 7 Bq/l, in the years 2006 to 2008 soil samples from near the base of the Shield Source stack were found to have tritium concentrations averaging several hundred

thousand Bq/l with a maximum concentration of 1.5 million Bq/l in 2007(2008 EMP Report, p.25).

These extreme concentrations were discovered by the CNSC and SSI in 2006 but were not reported publicly until the April 2009 release of CMD 09-H6 and CMD 09-H6.1. SAGE is not aware of any explanation for the 2-3 year delay in reporting this information, and at this late date we would still be interested to know why this information was not included in the 2006 EMP report.

To this day the area at the base of the stack is completely open, unsigned, and accessible to the public. The area is immediately next to an area used to park private airplanes. A recent visit to the airport revealed that there is a picnic table at the base of the stack. There are no markings anywhere to indicate any sort of caution regarding tritium. It is not beyond the realm of possibility that on a nice summer day a family could come out to take their private plane for a flight and while the plane is being readied just steps away, an unsuspecting family could wait for take-off at that picnic table.

The 2008 Environmental Monitoring Program Annual Compliance Report is the *only* EMP Report that reports soil sample data. Shield Source did not report publicly on soil data until spring of 2009 and has made no further public reports regarding soil sample concentrations.

However, Shield Source Inc. continues to make public statements indicating that they routinely monitor soil. [see March 22, 2012, SSI correspondence to Township of Cavan Monaghan, pp.3, "In compliance with our Environmental Monitoring Program, we collect and test samples monthly of drinking water, ground water, surface water, **soil**, air and vegetation"]. If Shield Source is monitoring soil concentrations then SAGE requests the data be made public.

In response to the 2006-2008 contaminated soil data, Shield Source has installed test wells to determine the movement of radioactive groundwater as it migrates from this area.

## **ACCIDENTS**

In addition to routine emissions, accidental releases are a concern. Over the years there have been a number of tritium missteps, incidents and accidents. Here is a non-exhaustive summary.

In 1991 the public learned of the very presence of SSI following the discovery of radioactive garbage left at the Cavan Waste Transfer Station that was part of the clean up of an accident at Shield Source. <http://www.klimaatkeuze.nl/wise/monitor/356/3529>

In October 1999 an incident occurred at the facility, resulting in a dose to an employee which was close to the regulatory limit (30 mSv in a quarter, according to the Regulations in place in 1999) [CMD 00-H10]

Also in 1999, the licensee reported two incidents which resulted in increased releases. The incidents occurred following oil changes on the filling rig pumps. [CMD 00 H10]

In August of 2000, stack emissions exceeded that Action Level when human error caused excessive HTO readings while changing the oil in the fill machines.[2000

Environmental Monitoring Program Annual Compliance (EMP) Report, p. 13].HTO is tritium oxide, or tritiated water.

In 2003, HTO emissions for the week of Sept. 16th exceeded the weekly Action Level when during a routine oil change of one of the fill rigs it was determined that a storage can containing spent oil was not properly sealed. Between August 19 and Sept. 23<sup>rd</sup> 4TBq of HTO were released. [2003 EMP Report, p.4 and p.23]A TBq is one trillion Becquerels.

In April of 2005 an incident caused uptake of tritium by an employee.[2005 EMP Report, p.25]

In 2006 soil contamination near the base of the stack was discovered. [2008 EMP Report]

On Oct. 2<sup>nd</sup> of 2007 the Administrative Limit for emissions of 1.0X10 Trillion Bq was exceeded by 2%. [2007 EMP Report, p.9]

In 2008 Administrative Levels for HTO and HT emissions were exceeded due to maintenance on Tritium Gas Fill Machines. [2008 EMP Report, p.39]

In 2009 the weekly Administrative Level for HT emissions were exceeded during the EMP sampling period of August 25th to September 1st, 2009 and December 1st to December 8<sup>th</sup>. It was determined that the exceedance of administrative levels resulted from maintenance on the Tritium Gas Fill Machines. [2009 EMP Report, p.38]

The most alarming accident reported to date happened on Feb. 1, 2010. At approximately 3pm that afternoon the proverbial flood gates opened and Shield Source lost 147.25 Trillion Bq of tritium up the stack. This uncontrolled accidental release totalled 29.45% of the company's annual release limit in just five minutes (2010 EMP Report, p.51)

It is difficult to find comparisons to put the Feb. 2010 release at SSI into perspective.

## **CONTAINMENT**

SSI has determined that the possibility of a re-occurrence of a similar accidental release from the vacuum manifold could be prevented by installing electronic gate valves on the tritium fill machines.

Besides the obvious environmental and public health reasons for reducing tritium emissions, there is also a financial incentive. Tritium is reported to be an extremely valuable commodity. According to a 2004 presentation entitled Tritium Supply Considerations – UCLA (available as a PPT by web search), we know that tritium costs in Canada in 2004 were about \$30,000 per gram. Routine emissions and accidental releases of tritium by Shield Source have a cost to the company and to our communities.

## **RECOMMENDATION # 2:**

**To prevent worker exposures and to reduce emissions to the environment, Shield Source Inc. should install containment technology to respond to tritium accidents and to virtually eliminate routine tritium releases to air.**

## RELOCATION AND RECLAMATION

Shield Source has made it known that they are interested in leaving the present facility and constructing a new building 200 meters across the runway.

According to Shield Source:

“The construction of a new building would allow us to better incorporate best practices in our tritium processing which, in turn, we would expect could reduce our environmental footprint. While we have been able to make modifications to our existing leased facility, these modifications have in many cases been less than ideal. There’s no doubt that a new and separate building would greatly enhance fire safety, air make-up and exhaust, work safety and contribute to reducing our tritium emissions”. (CMD 12-H3.1, P.4)

According to CNSC Licence Renewal Application, NSPFOL-12.00/2012 – October 31, 2011, the site to be licensed extends only to the perimeter of the leased building area and does not have any additional structures within the licensed zone (p.2). This document also states that the decommissioning of the facility will ensure that there is minimal impact to the surrounding environment (p.16).

### RECOMMENDATION # 3:

**The CNSC should require that should Shield Source choose to relocate to a new building that they will be required to decommission the current location and take remedial action to decontaminate the property.**

### EMERGENCY PLANNING

The accidental release of 147.25 TBq in a five minute period on February 1<sup>st</sup>, 2010 clearly demonstrates that it would be prudent to adopt the precautionary principle and to have a tritium emergency plan in place at the SSI facility. Major nuclear facilities such as CANDU nuclear stations have a 1 km exclusion zone intended in part to provide for dispersion of radioactive releases.

In contrast Shield Source Inc. is located immediately next to a number of other businesses and is close to a local residence. Following the incident of Feb.1, 2010 it was reported that tritium concentrations in air at location A5(tree at house opposite SSI, 220 meters NE) rose to 20.54 Becquerels per cubic meter (Bq/m<sup>3</sup>). (2010 EMP. p.52)

The prudent thing to do immediately following this accident would be to notify people potentially in the path of the tritium plume so that they could take precautionary measures. Did SSI directly notify it’s neighbours after the Feb.1<sup>st</sup>,2010 incident and, if so, how long after the accident was this done?

CNSC staff have reported that 12(1)(c) of the *General Nuclear Safety and Control Regulations* states that every licensee shall “take all reasonable precautions to protect the environment and the health and safety of persons and to maintain security”. [CMD 12-H3



p.52]

A tritium emergency plan must be developed and implemented that includes a method to notify people of emergencies. Such a plan would notify and advise people regarding the protective steps of taking sheltering, using bottled water, avoiding contaminated foods, and doing such simple things as avoiding local swimming pools.

Areas such as Sarnia have horn systems and people are fully aware of emergency planning. The same is true around CANDU nuclear stations. With the small number of people in what might be called the SSI contiguous zone this would be a relatively simple thing to design and implement.

#### **RECOMMENDATION # 4:**

**As part of the CNSC Emergency Management and Fire Protection requirements and as part of the Public Information Program, Shield Source Inc. should be required to have a tritium emergency plan in place to notify and provide guidance to the general public and authorities.**

#### **PUBLIC INFORMATION PROGRAM**

As part of its operating license Shield Source is required to have a Public Information Program. The PIP should contain information on the Shield Source Inc. facility to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed.

Up until 2009 the CNSC approved public information program applied only to those persons within 1 km of Shield Source.

In 2009 CNSC staff noted that they had asked Shield Source to broaden the target audience to the community of Peterborough.

Three years later, the public information program is focused on those persons within 2 km of Shield Source Inc. This is not in keeping with the intent of the 2009 CNSC decision.

Over recent weeks I have talked to a man living very close to Shield Source Inc. that had no knowledge of the facility and he had never heard of tritium. I found this also to be the case during a recent visit to the airport when we met two gentlemen preparing their plane for a flight. The plane was parked very close to the stack. They had no knowledge of SSI or of tritium. The Shield Source pamphlets are not effective in informing the public.

The section of the SSI brochure entitled 'About Tritium' downplays tritium and is, in our view, not responsive to the requirements that a public information program should inform persons living in the vicinity of SSI to the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from SSI activities.

According to the Shield Source Inc. public information pamphlet...

“Tritium’s beta emissions are very weak. No other primary radiation is emitted. In fact, tritium emits the lowest level of beta radiation energy of all isotopes. The beta particles are easily stopped by a thin layer of any solid material and are unable to penetrate our body’s skin. Humans can only be exposed to radiation from tritium after it has somehow entered the body. It can do this readily only when the tritium gas is chemically in the oxide form. If inhaled as gas, tritium is almost immediately expelled from the lungs because the body cannot absorb it”.

This description minimizes the risks that might be associated with SSI’s tritium emissions. Shield Source does release tritium in the oxide form to the environment, and tritium gas releases do convert to the oxide form. The public should be informed of tritium risks in a more balanced manner. At a minimum the pamphlet should include a link to CNSC web page “Tritium in Drinking Water”[http://www.nuclearsafety.gc.ca/eng/readingroom/tritium/tritium\\_drinking\\_water\\_aug\\_2009.cfm](http://www.nuclearsafety.gc.ca/eng/readingroom/tritium/tritium_drinking_water_aug_2009.cfm)

SAGE continues to urge the CNSC to extend the focus of the SSI public information program to include all communities within the SSI tritium fallout zone to a radius that includes all areas where the EMP reports show the possibility of elevated tritium concentrations.

In this matter we draw your attention to the water sampling conducted at location W17, 16 km NE of the stack. Shield Source Inc. refers to this location as a ‘background’ sample. Remembering that normal background in our part of Ontario is about 6 to 7 Bq/l, it concerns us that in 2008 tritium concentrations in water at W17 averaged ten times normal background (64.77 Bq/l) with a maximum concentration of 112.07 Bq/l.

SAGE raised concerns about these elevated concentrations at location W17 at the 2009 SSI licence hearing. SSI has recently informed us that they must consider the W17 data for 2008 as irrelevant due to high concentrations in a travel blank [e-mail from Lisa McMurray, March 28, 2012] There is no text in the 2008 EMP indicating that the data is suspect. As well the W17 data first reported in the 2008 EMP Report is reported without correction in the 2009 and 2010 EMP Reports. This would indicate to us that the data is reliable for public review.

Also with regard to the geographic range of the PIP, the CNSC plays a role in notifying the public about SSI in that it places advertisements giving notice of the public hearing. Publishing the notice in only one newspaper (the Peterborough Examiner) on one day is not an effective way to inform the public.

#### **RECOMMENDATION # 5:**

**The range and content of the PIP needs to be improved so that all people potentially exposed to tritium released from Shield Source Inc. are aware and can make informed decisions regarding tritium exposures.**

#### **RECOMMENDATION # 6:**

**Shield Source Inc. monitors tritium emissions in real time. As part of the Public Information Program this data should be available to the public in real time via the internet.**

**RECOMMENDATION # 7:**

**Shield Source Inc. monitors tritium in the environment and reports this information annually in the Environmental Monitoring Program Annual Compliance Report. These reports are typically not available until after March 31st of the following year. Environmental monitoring data should be made available to the public on a monthly basis.**

**SUMMING UP**

In conclusion, there is an environmental awareness in our community that is summed up beautifully in the refrain that "It's all about water". We know that our health and our quality of life depend on that almost magical combination of hydrogen and oxygen, H<sub>2</sub>O. We believe that safe clean water is a human right.

The presence of tritium in our environment alters the water molecule at its core. Tritium can't be filtered from water... it is the water.

It is unfortunate that tritium moves so easily in our environment. Tritium released to air at Shield Source is carried wherever the wind blows, the water flows and the rain falls.

As a representative of SAGE and as a grandfather, I am very concerned about the tritium samples collected at V1, 4,450 meters north of the exhaust stack on Brealey Drive, just below Lansdowne. There is an apple tree on the boulevard there that I have come to call the tritium tree.

In August of 2009 apples from V1, the tritium tree, had tritium concentrations up to 878 Bq/l. Concentrations of tritium in these apples varies over the years and recent reports show lower concentrations, but as Shield Source Inc. reminds us, wind direction, precipitation and emission levels all influence tritium concentrations. Where tritium falls during one sampling period, it may not fall the next. These apples are most likely not from an isolated hot spot but rather a representative grab sample of tritium concentrations that are possible in vegetation, farms and backyard gardens downwind of the airport. This tree is in a residential area of Peterborough.

These radioactive apples demonstrate for us how, in the living world, tritium goes anywhere that water goes, becoming part of our food and potentially part of us. As the crow flies, the V1 tritium tree is closer to my grandchildren than it is to the stack where that tritium contamination comes from.

It is not acceptable for an unsuspecting population to be exposed to a toxin that can cause mutation, birth defects and cancer. People are careful not to expose their children to second hand cigarette smoke, and I am concerned that my grand children and others can be unwittingly exposed to 'second hand' tritium.

People living downwind and downstream of Shield Source are counting on the Canadian Nuclear Safety Commission to protect our interests by not permitting us to be subjected to uninvited and unwarranted tritium exposure, just so that a company can manufacture glow in the dark self-luminescent signs.

There are many topics which remain in question and untouched by this submission, and there are many unsettling trends and uncertainties and ongoing questions...

HTO emission values increased significantly in 2010 and 2011.

SSI reports that “The timing of these increased emission levels coincided with the modifications that we made to our exhaust stack system. When these increases first appeared, we began an investigation process to determine the cause. As there had been no quantifiable change in our production levels or processing procedures, we were unable to immediately identify the cause for these increases. As an initial step, we replaced the gas flow meter based on our belief that we were getting incorrect gas flow values which would influence our HTO calculations. Due to problems with the supplier, it took six months to implement this corrective action. When the new meter was installed, our gas flow readings returned to our normal range, but the HTO emissions remained higher than we expected. We then performed a maintenance overhaul of the impinger system replacing hoses, lines and fittings. When this failed to correct the problem, we hired a third party to run a sampling system in parallel with ours to compare results. Initial third party sampling data was consistent with our data thereby forcing us to re-evaluate the problem.

Based on our efforts to date, we have recently identified that the increased HTO emissions may be the result of less than adequate air flow through our system. It was suggested by an outside consultant that low air flow levels could cause gas to convert to HTO while in the copper tubing in our tritium fill machine. We have subsequently introduced outside air into the system to improve air flow and have started to see a drop in our HTO emissions. As there is insufficient data to draw any conclusions, we will continue to monitor results and take appropriate action”.[CMD 12-H3.1 p.25-26]

The 2009-2011 trend is further outlined by the following table from CMD 12-H3.1 p.26.

**Table TCMD03: Air Emissions released from the facility**

	<b>Release Limits (TBq/year)</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
HTO EMISSIONS	70	9%	38%	53%
Total Tritium (HT + HTO)	500	18%	55%	28%

Shield Source Inc. has a long history and yet they are still discovering issues that give rise to previously unanticipated and unexplained tritium issues. What will be next?

In this day and age, greater and greater precautions are being taken to protect the public from unnecessary exposures to ionizing radiation. Recently, with regard to the prospect of building new state of the art nuclear reactors at Darlington, the Joint Review Panel made the startling recommendation that the Municipality of Clarington should prevent, for the lifetime of the nuclear facility, the establishment of sensitive public facilities such as school, hospitals and residences for vulnerable clientele within the three kilometre zone around the site boundary.[Recommendation #45, Joint Review Panel, Environmental Assessment Report SUMMARY. Darlington New Nuclear Power Plant Project, August 2011]. The site boundary is already 1 km from the reactors.

Also in this day and age, it is hard to imagine that with tritium losses and control issues of the magnitude of those experienced by Shield Source Inc. a similar facility would ever

be permitted to set up operation at the Peterborough Airport, in a public location adjacent to other businesses, next to a restaurant and next to residential homes.

**RECOMMENDATION #8:**

**Safe And Green Energy recommends to the CNSC that it not grant an operating licence to Shield Source Inc.**

We thank the Commission for considering our written submission and look forward to meeting with you in Ottawa on May 2<sup>nd</sup>.

on behalf of Safe And green Energy

“Jeff Brackett”

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