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Supplementary Information
Oral Presentation

Revised written submission from Adam Prinsen, Laura Anderson, Wei Wei Han and Brenna Steeles

In the Matter of the

BWXT Nuclear Energy Canada Inc., Toronto and Peterborough Facilities

Application for the renewal of the licence for Toronto and Peterborough facilities

Commission Public Hearing

March 2 to 6, 2020

Renseignements supplémentaires
Exposé oral

Mémoire révisé de Adam Prinsen, Laura Anderson, Wei Wei Han and Brenna Steeles

À l'égard de

BWXT Nuclear Energy Canada Inc., installations de Toronto et Peterborough

Demande de renouvellement du permis pour les installations de Toronto et Peterborough

Audience publique de la Commission

Du 2 au 6 mars 2020

Canada

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Revised version sent on February 18, 2020

Overview:

We request that the license for BWXT to pellet uranium dioxide in Peterborough not be granted. Uranium pelleting has potential health consequences to the community since uranium is a chemical and radioactive toxin. Airborne uranium particles can cause lung cancer when inhaled. It is not responsible to have a pelleting facility across the road from an elementary school. Uranium dust is heavy and tends to fall from the air close to the facility in which it is processed. Alpha particle radiation is a significant health concern that is not being accounted for in the risk assessments. Women and children are particularly sensitive to ionizing radiation.

Port Hope residents have chronic uranium toxicity markers in their urine from the nuclear industry, and are dealing with a 1.3 billion dollar clean-up as a result of the industry in their town. Regular activities over time, and also unforeseen accidents related to uranium pelleting could create similar problems in Peterborough. There are health effects related to continuous non-lethal exposure to uranium. Port Hope residents have more lung cancer than people in other areas in Canada, and this could be due to the toxicity from uranium processing. Health Canada and the CNSC have not investigated thoroughly the health effects related to continuous non-lethal exposure to uranium and are still allowing the same activities in other locations.

The regulations for radioactive pollution are unsafe. Should we be trusting our health to these standards and regulations? Will you be accountable for any health problems that arise in the people of Peterborough or for accidents that may occur? What kind of insurance does BWXT need for this type of activity? It is hard to imagine what insurance plan might realistically cover all the possible eventualities.

Discussion and Data:

Uranium is a toxic radioactive heavy metal. It can cause severe health problems when too much of this chemical is held in the body, and it can be very difficult to remove from the body like other heavy metals. It also releases alpha particles as it decays which can irradiate surrounding tissues when it is inside the body.

"Ionizing radiation is invisible, high frequency radiation that can damage the DNA or genes inside the body" – US Dept. of Health and Human Services …" There is no level below which we can say an exposure poses no risk…radiation is a carcinogen. It may also cause other adverse health effects, including genetic defects in children of exposed parents or mental retardation in the children of mothers exposed during pregnancy"-US Environmental Protection Agency.

From the WHO IARC:
"α-Particles emitted by radionuclides, **irrespective of their source,** produce the same pattern of secondary ionizations, and the same pattern of localized damage to biological molecules, including DNA. These effects, observed in vitro, include DNA double-strand breaks, chromosomal aberrations, gene mutations, and cell transformation.
•**All** radionuclides that emit α-particles and that have been adequately studied, including radon-222 and its decay products, have been shown to cause cancer in humans and in experimental animals.
• α-Particles emitted by radionuclides, **irrespective** of their source, have been shown to cause chromosomal aberrations in circulating lymphocytes and gene mutations in humans in vivo. The evidence from studies in humans and experimental animals suggests that similar doses to the same tissues — for example lung cells or bone surfaces — from α-particles emitted during the decay of different radionuclides produce the same types of non-neoplastic effects and cancers"

Uranium is an alpha emitting radionuclide. Therefor it is carcinogenic inside the body adjacent to tissues that are sensitive to alpha particle radiation.

We are concerned about uranium pelleting being done in the city of Peterborough, especially so close to an elementary school.

Uranium dioxide is an insoluble compound that when inhaled can be toxic to the lung (1). Because it is insoluble it can be held in the lungs for years (1).

Can Uranium cause Lung Cancer? Yes it can.

Studies:
Pulmonary adenomas or adenocarcinomas were observed in 4/13 Beagle dogs exposed to 5.1 mg U/m3 as uranium dioxide for 5 years (Leach et al. 1973). The neoplasms were observed 22–67 months after exposure termination. The lung dose was estimated as 600–700 rad (6–7 Gy). Spontaneous tumors are rarely found in dogs, and the incidence found in this study was 50–100 times higher than the expected rate of spontaneous tumors. (2)

One study was conducted with uranium ore dust in male Sprague-Dawley rats (Mitchel et al. 1999). The rats were exposed nose-only to uranium ore dust that was delivered to the rats as an aerosol under positive pressure. The ore was without significant radon content. The rats were exposed to 0, 8.4, or 22 mg U/m3 4.2 hours/day, 5 days/week for 65 weeks and were allowed to live for their natural lifetime. Exposure to uranium significantly increased the incidence of malignant and nonmalignant lung tumors. (2)

Another sudy:
Carcinogenic risks of internal exposures to alpha-emitters (except radon) are poorly understood. Since exposure to alpha particles—particularly through inhalation—occurs in a range of settings,

understanding consequent risks is a public health priority. We aimed to quantify dose–response relationships between lung dose from alpha-emitters and lung cancer in nuclear workers. (12)

We found strong evidence for associations between low doses from alpha-emitters and lung cancer risk. The excess OR/Gy was greater for plutonium than ***uranium***, though confidence intervals overlap. Risk estimates were similar to those estimated previously in plutonium workers, and in ***uranium*** miners exposed to radon and its progeny. Expressed as risk/equivalent dose in sieverts (Sv), our estimates are somewhat larger than but consistent with those for atomic bomb survivors.(12)

We found strong evidence that internal exposure to alpha-emitters in the lung increases lung cancer risk even at the low doses experienced by nuclear industry workers. A linear model proved adequate to describe the shape of dose–response for total alpha, plutonium, and ***uranium*** doses. (12)

Another Study:
Data from the Comprehensive Epidemiology Data Resource (CEDR) allowed me to study patterns of cancer mortality in a cohort of 4,014 ***uranium***-processing workers. Employing risk-set analysis for cohort data, I estimated the effects of external (gamma) and internal (alpha) radiation on cancer mortality. My results indicate that Fernald workers exposed to ionizing radiation experienced an increase in mortality from total cancer (per 100 mSv external dose rate ratio (RR) = 1.92; 95% confidence interval (CI) = 1.11–3.32), radiosensitive solid cancer (RR = 2.00; 95% CI = 1.02–3.94), and lung cancer (RR = 2.77; 95% CI = 1.29–5.95). (13)

Does the solubility of uranium affect its potential to cause lung cancer?
Yes it does. Uranium dioxide is not soluble and it is the worst. See the following study:
Two thousand seven hundred and nine male workers employed at the AREVA NC uranium processing plant between 1960 and 2005 in France were included in the cohort. Historical exposure to reprocessed uranium compounds classified by their solubility type was assessed on the basis of the plant's specific job-exposure matrix. Cox proportional hazard models adjusted for attained age, calendar period, and socioeconomic status were used to estimate relative risks in regards of each type of uranium compound. The relative risk of lung cancer tended to increase with decreasing solubility of reprocessed uranium compounds. The highest relative risk was observed among workers exposed to slowly soluble reprocessed uranium dioxide. This study is the first suggesting an increasing risk of lung cancer associated with exposure to reprocessed uranium. Our results are consistent with data from experimental studies of biokinetics and the action mechanism of slowly soluble uranium compounds, but need to be confirmed in larger studies with more detailed dose-response analyses. (3)

Yet another study concludes, ‘‘Our results suggest that uranium carcinogenicity may depend on isotopic composition and solubility of uranium compounds. This study is the first to show the carcinogenic effect of slowly soluble reprocessed uranium on two uranium target organs. (Lungs and lymphatic and hemopoetic tissues) This finding is consistent with data from epidemiological and experimental studies on similar compounds but need to be confirmed in the more powerful dose–

response analysis." (4)

Are there problems from continuous non-lethal exposures of Uranium?
Yes, of course there are. It is a toxic heavy metal that tends to reside in the bone and kidneys especially. These problems are already well-known, documented and undisputed so I will not go into detail, beyond the study posted below.

Study:
Uranium dioxide powder (0.125 gm/kg body weight) was implanted subcutaneously in rats. After 30 days, animals exposed to uranium weighed less than controls. Bone formation activity in endochondral ossification and bone growth were also lower in the experimental animals, as evidenced by histomorphometric and morphometric methods. This is the first study to report bone damage resulting from continuous, nonlethal exposure to an insoluble compound of uranium dioxide over a period of 30 days. (5)

Will CNSC-compliant quantities of Uranium dust fall nearby?
Yes. And children are playing across the road from BWXT. From the CNSC website "Since uranium dust is heavy, it does not travel very far in air. As a result, dust concentrations in the air always remain low and are entirely contained within mine and mill sites. "
http://nuclearsafety.gc.ca/eng/resources/mythbusters/index.cfm
Does this mean the uranium could fall close to the GE plant? Right on the elementary school playground?

We understand that BWXT will be emitting amounts of uranium into the air that comply with CNSC regulations, however, there is a real risk that the particles of uranium that enter the lungs of our community members will cause cancer. (9) The other unknown variable is how lower levels of chronic toxicity affect humans, who receive low levels of radiation over their lifetimes from particles of uranium in their lungs. Children are especially very susceptible to the effects of ionizing radiation and this facility is going to be next to an elementary school playground.

Study:
A study was done on residents of Port Hope Ontario by the Uranium Medical Research Center.
The conclusions are that Port Hope residents and uranium workers have chronic loads of various uranium compounds in their bodies (6).

Can we trust Heath Canada and CNSC to set reasonable limits for airborne uranium particles and alpha radiation? No, we cannot.
UMRC points out that the way the CNSC and Health Canada calculate radiation doses from

contaminants in the body is not sufficient. Alpha radiation from particles of uranium exposes the cells directly around the particle to high doses of radiation that damage those cells and the DNA. UMRC and Gordan Edwards have explained that these cells are getting 200 times the amount of radiation than the legal dose limit for the Canadian population. (6, 9) UMRC states; "Gamma is the only type of radiation monitored by Health Canada or any agency, in Port Hope. Alpha radiation, its public uptake and the human internal deposition of Alpha emitters is not monitored in Port Hope." (6)

Gordan Edwards PhD has a slide of alpha radiation being released from a tiny radioactive particle in lung tissue. Note that alpha particles do not penetrate very far but the effect that they have is very damaging to the cellular tissue *directly* around the particle. See pg 28 of this document: http://www.ccnr.org/Edwards_Workshop_2015.pdf

A letter to Canada's Minister of Health from UMRC about their findings and criticism is included below. For the references cited in the above letter, refer to the link below.
https://www.globalresearch.ca/alpha-particle-uranium-contamination-in-port-hope-ontario/8332

Uranium Medical Research Centre
March 1, 2008

Hon.Tony Clement
Minister of Health
Government of Canada

House of Commons
Ottawa, Ontario, K1A 0A6

Topic: Uranium contamination, Port Hope, Ontario
Dear Mr. Clement:

November 13, 2007, Uranium Medical Research Centre, Inc released laboratory results of assays of uranium measured in the 24-hour urine specimens of nine (9) representative residents and former nuclear workers in Port Hope, Ontario [1].
The Port Hope findings were peer reviewed at the European Association of Nuclear Medicine's Annual Congress, August 2007 [2]. The lab study was conducted at a world leading radioisotope laboratory, Institute of Petrology and Geochemistry, Johannes Goethe University of Frankfurt, Germany [3].
The urine analysis of the nine Port Hope residents and former nuclear workers revealed all study subjects' bodies to be contaminated by unnatural species of uranium. Neither Health Canada, nor the other responsible monitoring and regulating agencies (Canadian Nuclear Safety Commission, Natural Resources Canada, Ontario Public Health, and the Provincial or Federal Departments of Environment) list these uranium species as present in Port Hope. Nor do they identify them as potential

contaminants to the residents and workers there. We can find no environmental, biological or radiological study identifying these species of uranium in any jurisdiction in Canada [4].

What the Port Hope radiobiology study found

- Three former nuclear workers' urines contain the artificial uranium isotope, 236U. This isotope of uranium is a manmade component of recycled nuclear reactor, spent fuel. For example, measurable quantities of 236U were found in the urine of one worker 23 years since industry exposure.
- One worker's urine contains Depleted Uranium (DU), the "tails" of the uranium enrichment process. Canada does not enrich uranium although the record shows the Defense Research Establishment (DRE-DND), the Royal Military College (DND) and Cameco have imported DU for US/NATO weapons R&D and to produce components for US anti-amour DU munitions, respectively [5].
- All nine subject's (i.e. former workers, both male and female adults, and one child) urines contain elevated abundances of the uranium isotope, 234U. Elevated 234U is a forensic signature of "down-blended" or recycled, enriched uranium [7]. Dirty uranium is not identified in Natural Resources Canada's (NRCan) public documents associated with radioactive waste in Port Hope nor is it mentioned in CNSC's regulatory documents. Neither are there references to it in the NRCan/AECL Port Hope Environmental Assessments (EA) or the Municipality's Peer Review reports [8]. This constitutes serious omissions in the licensing reviews, the dose modeling, the EA's and the Peer Reviews.
- The findings demonstrate that emissions from the nuclear plants contain isotopes that are different in chemistry, form, radioactivity and biological effects than the species of uranium licensed for import and processing by Cameco and Zircatec.
- The contaminants found are substantially different from the species of uranium Health Canada and CNSC base the calculations of the allowable radiation doses in Port Hope. For example, the elevated uranium isotope 234U is 18,500 times more radioactive than primary isotope processed in Port Hope, 238U [9].

UMRC's laboratory mass spectrometry findings have been acknowledged in public forums by Cameco, Health Canada and the Canadian Nuclear Safety Commission. None have denied the accuracy of the laboratory results. At CNSC's Public Hearing, January 9, 2008, in Oshawa, Ontario, and at a Cameco public meeting in February 2008, Port Hope, CNSC staff and Cameco's Andrew Oliver, Vice President, Fuel Services Division, acknowledged the materials UMRC found in the biological samples have been processed in Port Hope [10].

Health Canada states an unambiguous falsehood to the people of Port Hope and Members of Parliament

Upon request from the Port Hope Town Council and members of Parliament for a reaction, Jack Cornett (Director, Radiation Protection Branch, Health Canada) made statements dismissing the medical significance of the Port Hope findings. By doing so, Jack Cornett and Health Canada stated an

unambiguous medical and scientific falsehood. His December 20, 2007 statement to the Port Hope Town Council and local press claims the industrial commercial uranium contaminants found by UMRC in the bodies of Port Hope's former nuclear workers and residents are "typical for Canadians" [11].
On January 21, 2008, correspondence under the Minister of Health's letter to the Mayor of Port Hope, repeats the same falsehood: "all the [uranium] levels are low and typical of the range in normal background values in individual Canadians"; and, "regardless of whether the uranium was natural or included artificial materials", the "highest reported uranium value … is only a fraction of the public dose limit [12]."
Director Cornett also misinformed the Municipality of Port Hope in writing by stating Health Canada contacted UMRC for detailed study information. No such contact was received. At the CNSC January 9, 2008 hearing, Chris Clement, Director of Radiation Protection Division, admitted to anonymously co-authoring with Jack Cornett, Health Canada's December 20, 2007 statement to the Port Hope Town Council and local press.

Health Canada, CNSC and Dr Finkelstein are in error

Your department, in cooperation with the CNSC, and recently joined by Port Hope's "peer reviewer", Dr. Murray Finkelstein, an Occupational Health consultant with the Ontario Ministry of Labour, proclaim a position which is scientifically and medically insupportable: you are on public record as telling Port Hope and members of Parliament the contaminants found in the bodies of the nine Port Hope subjects are not a health concern.

Dr Finkelstein's critique is based on his stated conclusion that the contaminants UMRC found in the lab are "soluble" uranium [13]. From this point forward, Dr Finkelstein's analysis is incorrect as he erroneously categorized the contaminants' physical-chemical form, its metabolic pathway through the body and likens the contamination to exposure to natural uranium. By misunderstanding the solubility class, Dr Finkelstein then bases his critique on inaccurate biological and radiological assumptions; discussing an entirely different form of uranium with a different biological half-life (i.e. residency time in the body) than the contaminants UMRC found in the bodies of the Port Hope subjects. A revealing point is Dr. Finkelstein's misuse of the word "species" to refer to "isotopes" of uranium, indicating he is not familiar with the basic vocabulary of radiation physics and uranium chemistry.
Health Canada, like Dr Finkelstein, also misunderstands the species (i.e. the physical-chemical form) of the contaminant found in Port Hope. This is revealed by Health Canada's statements about radiation dose. Apparently the Health Canada staff (Director Cornett) have led you, the Minister, to believe radiation dose can be calculated from the quantity of the uranium in the urine. This is a fundamental error.

Insoluble uranium, inhaled and incorporated into the body's tissues, bones and organs, takes years to decades to be released from tissues and is never fully cleared from the body. The quantities of the industrial contaminants measured in the Port Hope subjects are "tracers" of the presence of insoluble uranium; revealing much larger quantities of these materials remaining in the study subjects' bodies

[14]. The study information released publicly by UMRC did not contain the information needed by Health Canada to calculate the study subjects' radiation doses. Health Canada's statements about the doses cannot therefore be based on correct dose reconstruction methods [15].
Health Canada's statements to the Port Hope Council, the press and members of Parliament reveal the department does not understand the findings and their significance. Health Canada's conclusion that the Port Hope contaminants are typical, the dose is below the public dose limit, and that the findings are not medically significant is erroneous and irresponsible. You have ignored important radiological data about human contamination in Port Hope for which the only responsible position would be to undertake further study.

200 times the legal dose for civilians

Uranium is an "alpha particle" emitter. Alpha particles are the heaviest and most damaging of all forms of ionizing radiation. Uranium's radiation is 20 times more damaging (i.e. an RBE – "relative biological effectiveness" – of 20) than Gamma radiation [16]. Gamma is the only type of radiation monitored by Health Canada or any agency, in Port Hope. Alpha radiation, its public uptake and the human internal deposition of Alpha emitters is not monitored in Port Hope. There has been insufficient analysis of Port Hope's unusual patterns of coronary disease and cancers and their possible association with the daily emissions and chronic internal exposure to insoluble radiogenic toxins into the town's breathing zone.
Alpha radiation damages cellular function and can mutate the genetic code of the DNA. Alpha radiation damages the most vital of all repair and tissue building cells, the Stem cells [17]; and, it damages vital organ tissues in the heart, lungs, liver, lymphatic system, the kidneys and the central nervous system, all at a sub-microscopic scale. Alpha radiation is classified by the United Nation's International Agency for Research in Cancer, as a Group I, Carcinogenic to Humans compound [18].
When inhaled the microscopic fragments of uranium become deposited in internal organs and bones. Uranium is chemically referred to as a "bone seeker" for the reason that it has an affinity for bone tissue. The alpha radiation particles emitted by uranium travel very short distances and affect very small and discrete volumes of tissue. Each time a uranium atom decays, it delivers up to 4.9 MeV (million electron volts) of energy to surrounding cells and tissues.

An average sized, inhaled, 2.5 micron fragment of uranium delivers 340 REM of radiation per year to the tissue surrounding it. Using the International Commission on Radiation Protection standard RBE factor of 20 for Alpha particles, one 2.5 micron diameter uranium oxide fragment inhaled into the body emits 68 times the permitted annual dose for radiation workers and a dose 200 times higher than the legal dose limit for the Canadian population [19].

The life cycle of the species of contaminants UMRC identified in Port Hope bodies is years to decades. That means that the daily inhalational uptake of industrial fall-out of the most dangerous species of uranium in Port Hope accumulates in bodies faster than it can be eliminated. Health Canada's method of evaluating risks of the Alpha radiation does not account for this life cycle. Health Canada's method

of calculating radiation dose is to average the radiation over the body weight of the town's residents. Health Canada's method ignores ionization effects and the energy transfer at the organ tissue and cellular level.

UMRC rejects Health Canada's conclusions. Health Canada and the nuclear regulator, CNSC, demonstrate they do not understand the findings and the implications for Port Hope. If Health Canada understood the Port Hope results, it would be seeking more information, not dismissing what they reveal: chronic internal contamination; and, Health Canada would be praising the study as a significant scientific and medical accomplishment: measuring contamination by industrial radiotoxins at femtogram quantities (i.e. parts per quadrillion), decades after exposure.

UMRC welcomes any opportunity to bring its experts to face Health Canada's, CNSC's and the Port Hope peer review team's experts. UMRC is confident a repeat of the Port Hope study (using the same parameters and an equivalent class of lab) will reveal exactly the same pattern of contamination on the same or a new study group. We encourage the Minister of Health to implement his Director of Radiation Protection, Jack Cornett's statement to the Municipality of Port Hope that there is a need to independently repeat the research.

Sincerely:

Original signed by T Weyman

_____

Edward (Tedd) C. Weyman

Deputy Director

Uranium Medical Research Centre

Uranium Medical Research Center

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Charity BN/Registration #87943 – 3613 – RP – 0001

Cc Linda Thompson, Mayor, Municipality of Port Hope, Ontario

Michael Binder, President, Canada Nuclear Safety Commission

Hon Gary Lunn, Minister of Natural Resources Canada

For information: Hon. Sheila Frazer, Auditor General of Canada

One of the points to take from this letter is the effects of alpha radiation in the lungs, which are not accounted for in BWXT's risk assessment for their potential activities in Peterborough. We understand that statistically you can average this risk over the population and body mass of Peterborough and the risk becomes much lower. Would the risk not be lowered further still by keeping this industry outside of the city and away from the dense population of people (especially the children across the road)? As these researchers proclaim “The potential for adverse health effects related to releases of radionuclides is directly related to the population density near the mine or processing facility.” (10) These risks are not limited to alpha particle radiation either of course. There are chemical affects and other industrial risks as we write about later.

Dr Helen Caldicott has stated “there has never been a scientifically validated, peer reviewed, epidemiological study of the people (of Port Hope). Never. And the CNSC [Canadian Nuclear Safety Commission] claims they've got some studies that say the people in Port Hope are healthy. The studies they've done, which I feel are very partial and not very scientific, do indicate a high incidence of brain cancer in women and children, lung cancer in women, leukemia in children, very high incidence of arterio-vascular disease, which can be caused by radiation, and the like.”

Here is some information from one study we could find on the Port Hope population:
An ecological study of cancer incidence in Port Hope, Ontario from 1992 to 2007. (14)
This study did show a higher level of lung cancer in Port Hope (among women especially). There were 109 cases of lung cancer in women compared to the expected 77.5. There were 121 cases of men with lung cancer compared with the expected 105.1. Is this in part due to uranium dust in the air or to radon coming from the soil?
I realize you have found other areas that have similar rates of lung cancer as well, and there are many variables to consider such as smoking etc....but there is undoubtedly a possibility that the lungs of Port Hope women are being affected by the nuclear industry. Women are known to be more sensitive to the effects of radiation than men. (11)

Peterborough already has higher rates of lung cancer than expected for Ontario in both males and females. **Does it make sense to add another carcinogenic chemical to the environement of Peterborough?** “Males in Peterborough had significantly higher incidence of lung cancer than Ontario by 6.5% and melanoma by 24.4%. However, Peterborough males had significantly lower incidence of prostate cancer (5.6%) compared to Ontario males. Females in Peterborough have significantly higher incidence of lung cancer (21.9%), melanoma (21.5%), and uterine cancers (14.7%) compared to Ontario. The incidence of cancer increases with age, 66.0% of new cases in males and 58.5% of new cases in females were diagnosed in persons above 65 years old. December 2019 Environmental Protection Review Report Word e-Doc: 5930866 Page 39 PDF e-Doc: 6018621 Mortality rates for all cancers combined in both Peterborough and Ontario males have been declining since 1986. However,

female mortality rates for all cancers combined have remained fairly constant differing from the slowly declining rates in Ontario. Compared to Ontario, mortality from lung cancer was significantly higher in both Peterborough males (6.6%), and females (14.9%). Similar to cancer incidence, cancer mortality also increases with age, 75.3 % of deaths in males and 72.6% of deaths in females due to cancer, occurred in persons above 65 years old. When comparing Peterborough to Ontario, there were no significant differences in cancer mortality rates by age group for either sex." (BWXT license renewal application).

Do CNSC decisions and "safe levels" determined by the CNSC protect the public? Can the public trust the CNSC to keep us safe from risk of harm from BWXT? Historically that certainly does not seem to be the case. And what is different now?

Gordan Edwards, PhD, writes, "Since the town of Port Hope had been thoroughly contaminated with alpha- emitting radioactive substances, the Canadian nuclear authorities had to make a political decision back in 1975: What was an acceptable level for radioactive contamination in a private residence? And so a standard for an "acceptable level" of radon contamination in a private home was set at about 20 times the normal background levels of radon, to guide the cleanup operations at Port Hope. In testimony to the Elliot Lake Environmental Assessment Board in 1978, mortality figures published by the Ontario government were used to show that even the "acceptable" levels of radon contamination in homes would result in an extra 17 lung cancer deaths per thousand people chronically exposed to such levels. In other words, instead of 54 lung cancers per thousand, one would expect 71, a 31 per cent increase. In light of this evidence, the Board recommended that the radon standard for homes be reassessed. But no such reassessment has taken place. Since 1980 the B.C. Medical Association has published a slightly higher risk estimate and has condemned the radon standard for homes "as tantamount to allowing an industrially induced epidemic of cancer." A 1982 report published by the Atomic Energy Control Board concurs, estimating a 40 percent increase in lung cancer among those living in homes contaminated to the "acceptable" radon level. "

Are we going to have soil and air contamination in Peterborough from uranium pelleting operations?

In 2016, air at the perimeter of the BWXT Toronto factory was tested at 390 times the natural background uranium concentration. In 2017, soil around the Toronto factory was tested at 10 times natural background levels. In Peterborough, an air sample taken by the CNSC in 2014 at Prince of Wales school was at least 13 times background uranium concentrations. (Based on data from BWXT's Compliance reports)

Regular emissions from this facility will contaminate the watershed and ground in this area with uranium. Little Lake will become toxic over time as BWXT dumps contaminated waste water. Children and adults swim in Little Lake. If there is an accident our city could become very toxic with uranium

dioxide. This type of toxicity cannot be dealt with easily as Port Hope is now well aware of with the billion dollar clean up underway.

Will we be able to have safe backyard gardens in Peterborough after BWXT has conducted their business for 10 yrs? 20Yrs? 50Yrs?

If you moved the facilities away from the city would it be safer?

Many of these points will likely be refuted by your experts who have already prepared responses. *http://nuclearsafety.gc.ca/eng/resources/mythbusters/index.cfm*. The nuclear activities of BWXT will undoubtedly be deemed to be safe by the CNSC. Many people are beginning to doubt that the CNSC has the safety of the public in mind.

As stated in the letter UMRC wrote to health Canada "(The CNSC and Health Canada) have ignored important radiological data about human contamination in Port Hope for which the only responsible position would be to undertake further study." (6)

The contaminants found in the bodies of Port Hope civilians are not normal for the Canadian population, yet that is what they were being told. This does not give us confidence in the CNSC. Are you protecting people to the degree they should be protected? Normalizing the results of that study makes people suspicious.

For example: "**Members of the public have long been concerned over the independence, transparency, and accountability of the CNSC.** In 2008, the Commission's President Linda Keen was fired for refusing to permit a licensed nuclear facility to operate, on the grounds that it failed to comply with the safety conditions specified in its licence. Since then, strong evidence has come to light indicating that the incident was used as an excuse to fire Keen, who was intent on making CNSC regulations more stringent – against the interests and lobbying of the nuclear industry." For more detailed information see below.
http://voices-voix.ca/en/facts/profile/canadian-nuclear-safety-commission

Here is another excerpt from an article by Ian Fairlie that points out how the nuclear industry does not want to admit to the public that there are arising health consequences are arising from their business:

He writes, "The core issue is that, world-wide, over 60 epidemiological studies have examined cancer incidences in children near nuclear power plants (NPPs): most (>70%) indicate leukemia increases.
I can think of no other area of toxicology (eg asbestos, lead, smoking) with so many studies, and with

such clear associations as those between NPPs and child leukemias.

Yet many nuclear Governments and the nuclear industry refute these findings and continue to resist their implications. It's similar to the situations with cigarette smoking in the 1960s and with man-made global warming nowadays.

In early 2009, the debate was partly rekindled by the renowned KiKK study (Kaatsch et al, 2008) commissioned by the German Government which found a 60% increase in total cancers and 120% increase in leukemias among children under 5 yrs old living within 5 km of all German NPPs.

What is 'statistically significant'?

As a result of these surprising findings, governments in France, Switzerland and the UK hurriedly set up studies near their own NPPs. All found leukemia increases but because their numbers were small the increases lacked 'statistical significance'. That is, you couldn't be 95% sure the findings weren't chance ones.

This does not mean there were no increases, and indeed if less strict statistical tests had been applied, the results would have been 'statistically significant'.

But most people are easily bamboozled by statistics including scientists who should know better, and the strict 95% level tests were eagerly grasped by the governments wishing to avoid unwelcome findings. Indeed, many tests nowadays in this area use a 90% level.

In such situations, what you need to do is combine datasets in a meta-study to get larger numbers and thus reach higher levels of statistical significance.

Governments wouldn't do it - so we did

The four governments refrained from doing this because they knew what the answer would be, viz, statistically significant increases near almost all NPPs in the four countries.

So Korblein and Fairlie helped them out by doing it for them (Korblein and Fairlie, 2012), and sure enough there were statistically significant increases near all the NPPs. Here are their findings:

Table: Studies of observed (O) and expected (E) leukemia cases within 5 km of NPPs.

	O	E	SIR=O/E	90% CI	p-value
Germany	34	24.1	1.41	1.04-1.88	0.0328
Great Britain	20	15.4	1.30	0.86-1.89	0.1464
Switzerland	11	7.9 a	1.40	0.78-2.31	0.1711
France b	14	10.2	1.37	0.83-2.15	0.1506
Pooled data	**79**	**57.5**	**1.37**	**1.13 - 1.66**	**0.0042**

[a] derived from data in Spycher et al. (2011).

[b] acute leukemia cases

This table reveals a highly statistically significant 37% increase in childhood leukemias within 5 km of almost all NPPs in the UK, Germany, France and Switzerland.

It's perhaps not surprising that the latter 3 countries have announced nuclear phaseouts and

withdrawals. It is only the UK government that remains in denial.
So the matter is now beyond question, ie there's a very clear association between increased child leukemias and proximity to NPPs. The remaining question is its cause(s)."
https://theecologist.org/2014/aug/23/nuclear-power-stations-cause-childhood-leukemia-and-heres-proof

Can we trust you (the CNSC) to protect the health of Peterborough citizens?
BWXT is applying for a license that will allow them to have 700,000 kg of uranium powder on site at any time. They will also have a tank of highly explosive hydrogen gas sitting there. This is a potential disaster waiting to happen. **Why would you put this type of processing facility in a city and across the road from a school? If this type of accident were to happen in the city, what would be the consequences? How many people would die? What would the effects be of the chemical and radiological toxicity on people and the environment?** Obviously, the potential for health problems increases if the facility is in the middle of a city.(10) Then we would be dealing with radiation AND chemical toxicity from the uranium.

What kind of liability insurance does this facility need to operate?
Accidents happen all the time. BWXT does not meet the requirements to be insured under the nuclear liability and compensation act (NLCA) because they process natural and depleted uranium which are excluded from the definition of nuclear material. BWXT maintains industrial insurance but this information remains proprietary.(8) How can we be confident that they will be accountable for their actions, errors and accidents? Even if they are accountable, an accident that poisons the soil, water and the people cannot be completely reversed. Port Hope is suffering the consequences of that today.

Conclusion:

Is it really safe to have this operation in the city?
Pelleting is not a safe activity to conduct in this or any city. As Naturopathic Doctors, we practice preventative medicine and aim to treat the cause of disease.
We do not support this industrial activity.

- Alpha radiation is a risk factor you have not accounted for, especially as it relates to lung cancer.
- Accidents within the city limits have potentially devastating consequences.
- Putting a pelleting industry beside an elementary school is not responsible since children are more sensitive to the effects of ionizing radiation.
- Peterborough already has higher rates of lung cancer than the averages in Ontario.
- We do not feel confident that you have the best interests of Peterborough citizens at heart.

We request that you deny BWXT's request to pellet uranium in Peterborough.

Respectfully,

Adam Prinsen Bsc, ND

Laura Anderson Bsc, ND

Wei Wei Han Bsc, ND

Brenna Steels ND

John Millar Bsc ND

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