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Oral Presentation

Written submission from Jane Scott

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

Exposé oral

Mémoire de Jane Scott

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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Senior Tribunal Officer, Secretariat
Canadian Nuclear Safety Commission
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Sent by email cnsc.interventions.ccsn@canada.ca

Dear Sir or Madam:

RE: BWXT Nuclear Energy Canada's application to license FFOL-3620.1/2020

I am a member of CARN and am taking advantage of the one week extension.

I am writing this intervention regarding BWXT's 10 year license renewal and it's request for permission to start pelleting in Peterborough.

I also plan to give an oral intervention, focussing mostly on the lack of a precautionary approach given to protecting public health, especially in light of "new" scientific insights into radiation's effects, in general and uranium, specifically, and other uncertainties.

I am so apalled that there is no mention in BWXT's environmental risk assessment of Peterborough's ongoing problem of over 126 years of legacy waste, including tce's, lead and pcbs, on and off of the old GE lands, on which BWXT NEC is situated. This is well documented. The parking lots next to the school and across from BWXT, had to be be capped to try to prevent further runoff of contaminants, and there is an ongoing problem of pcb's and other contaminants going into Little Lake. And that is just part of it. The MECP is actively involved with GE trying to mitigate the damage, that over 100 years of bad practice and lack of proper oversight has inflicted upon the people, especially the workers of Peterborough. Why compound a historic mistake?

We already have a type one nuclear facility in our downtown core, which is allowed to have 1500 metric tons of uranium onsite and repair radioactive equipment. We're already exposed to conventional toxic emissions going into our air and water on an ongoing basis. Would the existing factory even be allowed to set up shop today if it weren't grandfathered in?

BWXT NEC does not exist in a vacuum!

The effects of pollution on health are cumulative throughout a person's life. That is not in question. So how can the CNSC, which claims to protect public health, not even take into consideration the environmental and health challenges our community already faces? If the CNSC doesn't have any jurisdiction over where facilities are located, as they recently claimed at a public event, then what good are they as a regulator?

BWXT Toronto emitted 3000 times more uranium into the air in 2018 and 94,000 times more in the sewers than the factory in Peterborough did. Alpha emitters such as

uranium are type 1 carcinogens according to the World Health Organization's International Agency for Research in Cancer. In 2016, an air sample at the perimeter of the Toronto facility tested at 390 times background uranium concentrations. (If background really is .0001µg U/m^3, according to the CCME) And there was no special "event" recorded that year. Uranium is quick to become airborne. Building 21, in Peterborough, is butt up against the sidewalk in the corner of the GE grounds, just meters away from the corner of the primary school's playground. They plan to put pelleting on the 2nd floor of the building that already does the fuel bundling. A beryllium stack is already right next to the sidewalk. Is this really the best place to start pelleting as well.? A place where children play, and their pregnant mothers walk by with toddlers in prams? Is this the true spirit of ALARA? Kids have no voice and no choice in this matter, but could carry an extra toxic burden for the rest of their lives. Kids are glossed over in the ERA, and aren't properly protected by the ICRP's guidelines, in the first place. (NIRS.org) There is no in depth analysis.

And what if there's an accident? We know that the weather is becoming more and more unpredictable with climate change, and that people make mistakes. Accidents happen! Safe doses can quickly go through the roof. If they do pelleting in building 21, as they've planned, there will be a beryllium brazier downstairs, a sintering furnace upstairs, and a hydrogen tank attached to the building.

In the IAEA's "Manual for Siting Nuclear Facilities"**,** it says: **Special attention shall be paid to vulnerable populations and residential institutions (e.g. schools, hospitals, nursing homes and prisons) when evaluating the potential impact of radioactive releases and considering the feasibility of implementing protective actions."**

The MOE says that uranium is 200 times more dangerous inhaled than ingested. Yet, when I wrote the CNSC and asked about various things, they went into a detailed analysis about ingested uranium, but made no mention about inhaled uranium. Only after I asked specifically about the dangers of inhaling uranium, did they mention alpha particles.

We know that estimating risk is not an exact science, especially when based on outdated approaches, but even in BWXT's very limited Environmental Risk Assessment Report, they mention that the estimated radiation dose to public would go from 0.00 to 10 µSv if pelleting comes to Peterborough. The estimated public dose at BWXT's Toronto facility was 17µSv in 2017. OPG's estimated publice dose for the Darlington Nuclear Power Plant was .7µSv in 2017 . Darlington has a 1 km exclusionary zone. Do you really think it's prudent or appropriate to allow a pelleting facility to set up shop right next door to our most vulnerable citizens in the heart of Peterborough's downtown?

From personal coorespondence with the Uranium Medical Research Centre's[1] Tedd Weymann:

> …inhaled uranium poses a life long threat due to the incorporation of very small particles of the alpha emitter in bone and the target tissues. In this exposure scenario (such as BWXT's facility in Peterborough), alpha radiation is the most dangerous of all radiation types due to its "biological effectiveness"….Emissions from nuclear facilities of radioactive source materials in the form of micron and submicron-sized particles, of no-to low-soluble ceramic uranium, present a direct threat to the health of anyone who inhales it.
>
> This health threat is stochastic and can materialize anytime throughout the life of contaminated individuals. They will be continually, internally irradiated by the incorporated uranium throughout their lifetime. There is no known medical, pharmaceutical nor dietary method of decontamination of a person with inhalation exposure to ceramic uranium. Neither is there any known prophylactic that can prevent cellular, genetic damage from ionizing radiation. Nuclear facilities that process uranium should, therefore, be sited at significant distances from human activity and communities….

Calculating risk is based on a variety of assumptions, and models. There are huge uncertainties about where in the body the particle will end up, how long it will stay, etc… The present ICRP model is out of date "because it was developed before the discovery of the DNA structure and the discovery that certain radionuclides have chemical affinities for DNA, so that the concept of absorbed dose…cannot account for the effects of exposure to these radionuclides."[2] (Lesvos Declaration signed by many radiobiologists—more good information if you follow the link)
The ICRP model is seriously flawed because internal emitters are especially damaging at a cellular level. Chris Busby (PhD in chemical physics) explains it like this:

> The existing radiation risk model is that of the International Commission on Radiological Protection, ICRP. It is the basis for all legislation in the area of radiation risk. For internal radioactive exposures it is seriously flawed.
> This is because:
> The units, absorbed dose, energy per unit mass are unable to adequately represent the key risk which is ionization density at the cell level. Thus absorbed dose does not distinguish between warming oneself in front of a fire and eating a hot coal.

Tedd Weyman, on umrc.net, writing specifically about the harm caused by a tiny spec of ceramic uranium dioxide dust from a pelleting factory in Port Hope :

> An average sized, inhaled 2.5 micron diameter, 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 µg diameter of uranium oxide fragment inhaled into the body emits 68 times the permitted annual dose for workers and a dose 200 times higher that the legal dose limit for the Canadian population.

When asked in a letter about the calculation, he said:

> UMRC's physicists' and radiologists' estimates are based on reality: ie — (1) an internal burden (internal contamination) (2) via inhalation of (3) ceramic uranium (a physicochemical form called "low soluble" to "insoluble") (4) incorporated into bone (where uranium replaces calcium) and organs, (5) where it emits its dose (alpha, beta and gamma dose) to cells directly in a radius of only a few microns of cells (not diluted over kilograms of flesh) (6) where there is potential DNA damage and subsequent outcomes of that on the patients health and inherited effects on off-spring.

(Dr. Asaf Durakovic is Executive Research Director of the Uranium Medical Research Centre, and the Uranium Medical Research Institute, MD, PhD, DSc, FACP professor of Nuclear Medicine and Radiology, "specialist in all aspects of nuclear and radiation medicine," over 35 years) He first described the "Gulf War Syndrome" in the military and civilians and has researched war zones suffering the tragedy of extensive uranium contamination.

In a peer reviewed study, Genetic Radiation Risks: a neglected topic in the low dose debate, [3] Chris Busby, Inge Schmitz-Feuerhake (professor of experimental physics and researcher into the biological effect of ionizing radiation), and Sebastian Pflugbeil (medical physicist) note:

> Internal exposure to uranium by inhalation…has been associated with significantly high genotoxicity resulting in anomalously high excess levels of chromosome damage and birth defects in a number of different groups….For internal exposure to substances like Sr-90 and uranium, which both have high affinity for DNA, the concept of dose is meaningless.

The CNSC, like many regulators in other countries, relies on the International Committee on Radiological Protection for their guidelines on how to protect people from radiation exposure. The ICRP's most recent report came out in 2007. What is very worrying is that in 2009, shortly after he resigned, Jack Valentin, former Scientific Secretary and editor of the ICRP is on video admitting that the uncertainties for certain internal exposures were too high (up to two orders of magnitudes) to properly predict the health effects of those exposures on human populations. (https://duckduckgo.com/?q=chris+busby+and+jack+valentin&t=h_&iar=videos&iax=videos&ia=videos&iai=k2JFxnAkTW4) Valentin also said that it was wrong for the ICRP and UNSCEAR to ignore Chernobyl and other data when coming up with their risk assessments.[4]

Ian Fairlie[5] (radiobiologist) (2018) warns that there is a "paradigm shift" happening in radiobiology that has not been taken into consideration when coming up with risk assessments by the ICRP, BEIR and until recently, UNSCEAR, despite these finding not being really new at all. These untargeted effects (because they don't rely on direct breaks of DNA) include "genomic instability where effects occur many generations

later, and bystander effects where adjacent cells not hit by radiation are damaged, and micro-satellite mutations " . He warns that "these effects occur at very low doses of radiation. In fact some effects occur after the passage of a single alpha particle through a cell" He adds that "most scientists now think that genomic instability is a precursor to cancer ". "When faced with the uncertainties posed by non-targeted effects, it would be wise to apply the precautionary principle."

Hindsight has shown the ICRP's risk assessments are sometimes wildly off base.

> Controversy has been raging for decades over the link between nuclear power stations and childhood leukaemia. But as with tobacco and lung cancer, it's all about hiding the truth, writes Ian Fairlie. Combining data from four countries shows, with high statistical significance, that radioactive releases from nuclear power plants are the cause of the excess leukaemia case.

(https://theecologist.org/2014/aug/23/nuclear-power-stations-cause-childhood-leukemia-and-heres-proof) In a peer reviewed article, Fairlie found a 10,000 fold discrepancy between official dose estimates and childhood leukaemia around nuclear power plants in their meta analysis.[6]

Another major source of uncertainty is that we don't know where in the body, or even in whose body, a radionuclide, especially one like uranium, which can combine to DNA, and take the place of calcium in the body, can end up. What about the people that are more radiosensitive than average? women? children? fetuses? So again we should take a precautionary and not an ALARA approach allowable risk, "allowable harm" to public health, when there are so many uncertainties.

BWXT and the CNSC imply that uranium is safe by calling it weakly radioactive. However there are many anomalies in the behavior of uranium in vivo and in vitro that cannot be accounted for by conventional risk models. Uranium is a radioactive heavy metal. Alexandra Miller, radiobiologist, from the American Armed Forces Radiobiology Research Institute (AFRRI) has a mountain of biological evidence showing that there is a synergistic effect between uranium's radiotoxicity and it chemotoxicity as a heavy metal. Even cells that are not immediately "hit" by the radiation, exhibit a bystander response and aredamaged. Miller:

> Published data from our laboratory have demonstrated that DU exposure in vitro to immortalized human osteoblast cells (HOS) is both neoplastically transforming and genotoxic. In vivo studies have also demonstrated that DU is leukemogenic and genotoxic. DU possesses both a radiological (alpha particle) and chemical (metal) component but is generally considered a chemical biohazard. Studies have shown that alpha particle radiation does play a role in DU's toxic effects. Evidence has accumulated that non-irradiated cells in the vicinity of irradiated cells can have a response to ionization events.

https://www.researchgate.net/publication/317496883_Radiation_exposure_from_depleted_uranium_The_radiation_bystander_effect
https://www.sciencedirect.com/science/article/pii/S0041008X17302600?via%3Dihub
“Miller points out that recommended safe radiation limits – promulgated by UN agencies and adopted by countries – are not based on these new findings and, thus, do not protect against low-dose radiation from DU, and by extention, natural uranium. ”*
https://climateandcapitalism.com/2015/02/08/pentagon-pollution-5-deadly-impact-depleted-uranium/

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https://doi.org/10.1016/j.taap.2017.06.004

Massimo ZUCCHETTI is a full Professor at Politecnico di Torino, Italy, where he graduated in 1986. He teaches Radiation Protection, Nuclear Power Plants.… He was in the short list of candidates for the 2015 Nobel Prize in Physics for his research on advanced fuel nuclear fusion:

> There is growing evidence in scientific literature, resulting **both from in vitro and in vivo analyses, that current models of the mechanisms of toxicity of uranium dust are not fully satisfactory. They should be refined in order to obtain more effective responses and predictions regarding health effects. Emerging data on the different hazards of enriched uranium and depleted uranium indicate that the radiological toxicity cannot be neglected: a synergy between chemical and radiological toxicity must be taken into account in the new model. ***

(https://www.researchgate.net/publication/293649172_Toxicity_of_Depleted_Uranium_Dust_Particles_Results_of_a_New_Model : by Massimo ZUCCHETTI

Uranium’s ability to bind to DNA, untargetted effects, such as the bystander effect, and the secondary photoelectron effect make it far more dangerous than than conventional assessments take into account. Chris Busby suggests that some of the anomalous effects of uranium can be explained by the secondary photoelectron effect. Because uranium is a substance with a high atomic number, when it absorbs natural background gamma radiation, and or it’s own photon radiation, it starts spilling out photoelectrons and auger electrons, which

"smash up" anything that the uranium is attached to—chromosomes, mitochondria... For a variety of reasons, Busby says, "it can be concluded that uranium exposure causes chromosome damage and micronuclei formation in human populations at levels of radiation exposure (conventionally assessed) which are 1000 times too low to explain these effects." http://euradcom.eu/wp-content/uploads/2016/04/ecrruraniumrept.pdf. However, even just as a heavy metal bound to DNA, uranium is genotoxic.

> Northern Arizona University biochemist Diane Stearns has established that when cells are exposed to uranium, the uranium binds to DNA and the cells acquire mutations, triggering a whole slew of protein replication errors, some of which can lead to various cancers. Stearns' research, published in the journals *Mutagenesis* and*Molecular Carcinogenesis*, confirms what many have suspected for some time – that uranium can damage DNA as a heavy metal, independently of its radioactive properties. "Essentially, if you get a heavy metal stuck on DNA, you can get a mutation," Stearns explained.[7]

Even depleted uranium emits enough alpha particles to cause serious problems as well. (Keep in mind that according to the CNSC website, DU is only 60 percent as radioactive as natural uranium, so these numbers would be higher for natural uranium.)

> Tiny as it is, the 2.5 micron depleted uranium oxide pellet (this is not to be concluded with a pellet in a nuclear fuel bundle) contains 210 billion atoms (2.1 x 10 to the power of 11) of U238. Each year, the pellet will emit an average 32.3 alpha particles. It also contains U234, 235, 236 which together yield an additional 5.3 alpha particles per year.
>
> Thus a single pellet of depleted UO2 will produce a total of 37.6 alpha particles per year….A calculation shows one single pellet delivers 1,000 times the annual (dose) limit…
>
> Another factor to consider is "permanence".
> Objects or particles less than 5 micron in diameter are considered respirable, meaning that it is small enough to enter into the lungs and become permanently trapped. If the body does not manage to somehow release it then the radiation is internalized and the dosage is permanent during the individual's lifetime and even remains in their physical remains after death.[8](Uranium Medical Research Institute)

After 3 months, the radiation given off a spec of uranium dioxide dust will apparently double because of the radioactive decay of the daughter products. (http://ataridogdaze.com/science/uranium-decay-rate.html) "Uranium compounds that are less soluble (e.g.UO_2) tend to be retained in the lungs and regional lymph nodes for many months or years, thereby creating an increased cancer risk from alpha particle exposure." https://www.ncbi.nlm.nih.gov/books/NBK201047/ Uranium is also a bone seeker. The Royal Society (2001) cite references to support the view that the half life of some types of uranium in the body is longer than 10 years and may be considered to be perhaps indefinite (euradcom.eu)

Even when the ICRP published their last guidelines in 2009, they were seriously criticized for ignoring new evidence showing that uranium, and other radionuclides were more genotoxic than previously thought. But surely it will be impossible for the ICRP and thus the CNSC to deny the science this time round. Hopefully, Peterborough won't be saddled with pelleting based on outdated science.
Annex C of the UNSCEAR 2009 report:

> It would seem prudent to consider the implications of non-targeted and delayed effects of radiation exposure when considering models of radiation carcinogenesis, particularly at low doses…models of radiation-induced carcinogenesis should incorporate both direct and indirect effects when evaluating risks.

And then there is of course the fact that the WHO's IARC states that "Internalized radionuclides that emit α-particles are carcinogenic to humans (Group 1)."
https://monographs.iarc.fr/wp-content/uploads/2018/06/mono100D-9.pdf :

> 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.

So why did the CNSC say in a letter to me that "uranium is not a human carcinogen. No genetic effects are observed" ? Is this really our safety regulator? I am confused. The gamma and beta radiation from having 1500 metric tons of uranium dioxide and contaminated equipment onsite also requires shielding to protect the public and workers from external radiation. Are their precautions adequate? The scientific consensus is that there is no safe dose of radiation. Yet, in the same letter to me:

> During the fabrication of fuel pellets, uranium dioxide dust participles may be produced. About a few micrometers in diameter, these dust particulates may be inhaled if they become airborne. Inhalation of uranium dust may result in internal dose to lung tissue from the alpha particles, as well as chemical toxicity if it is absorbed in the bloodstream and transported to sensitive tissues, notably the kidneys.

> Ionizing radiation: α-particles All internalized radionuclides that emit α-particles, including radon-222 decay products and plutonium-239, are classified as Group 1 carcinogens by IARC.23 Alpha-particles are somewhat unique among occupational and environmental carcinogens, because of their ability to produce a higher relative rate of double-strand DNA breaks compared with other types of ionizing radiation. Cells that have been hit by an α-particle, as well as nearby cells (ie, the so-called "bystander effect"),24 may undergo genetic changes that lead to cancer.25 Alpha-particles can also produce reactive oxygen intermediates that can produce oxidative damage to the DNA.25 A single bronchial epithelial cell that has sustained genetic damage can initiate lung cancer.25 Because cancer is thought to originate from a single cell (ie, monoclonal) that has completed the process of malignant transformation, it is unlikely a threshold exists for α-particle–induced lung cancer.2"." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3875302/#!po=72.9508

> "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," https://journals.lww.com/epidem/FullText/2017/09000/Risk_of_Lung_Cancer_Mortality_in_Nuclear_Workers.7.aspx

Unfortunately epidemiology is extremely hard to do because there are so many confounders…Did they smoke? Were they obese? Were they exposed to other carcinogens? Did they die of some other health condition caused by radiation, before they died of cancer? Were they alcoholics? Did they exercise? Were they in a war zone? Was the land they lived on already polluted? It's very difficult to determine how much an individual has inhaled. How much is in their bones? They might have some very small particles sitting as sediment in the lungs for years before it dissolves.

> A study found that 44% of GE nuclear workers (in Peterborough) had reduced monocyte counts that were abnormally low—15-20 times lower than expected in a sample of healthy men and women… It is proposed that reduced monocyte production is a measureable effect of radiation exposures (from inhaled uranium) as heavy metal uranium settles in the bone and emits alpha particles."
> (https://www.unifor.org/sites/default/files/documents/document ge_advisory_cmtt_report_may_15_final_for_web.pdf

Keep in mind that this was just in the fuel bundling area, where no uranium powder was actually handled. There was only "negligible" dust from the ceramicized uranium pellets.

Keith Baverstock is a radiobiologist, who was the regional advisor for Radiation and Public Heath for the WHO for many years until he wrote an article, eventually published in 2005, complaining that the ICRP and the IAEA underplayed the possible dangers of depleted uranium dust in war zones, and other biological and epidemiological evidence. "There will be a period, ranging perhaps from months to years, where a slowly dissolving particle in the deep lung is surrounded by cells containing uranyl ions." Periodically, these will let off an alpha particle and "thus there is the possibility of a synergistic effect between a chemical carcinogen and radiation." He notes the importance of the bystander effect, "where cells not actually irradiated, but located close to ones that are, exhibit radiation effects." He notes that the uranyl atom "binds avidly to DNA". He notes that, "The ICRP routinely uses essentially untested models to determine the risks from internal emitters." "We cannot therefore ignore the possibility that the IAEA, ICRP and WHO are responding to political pressure not to disclose the potential health consequences to either military or civilians in the use of depleted uranium." [9]

Since then we have had a mountain of biological evidence showing that uranium is much more dangerous than previously thought. (Alexandra Miller, et al)

What is most shocking to me is that even if there had been a detailed analysis into the increased possible effect of radiation from a pelleting factory on women, children and fetuses in BWXT's very limited environmental review assessment, it wouldn't have been protective enough. For example, even in the Biological Effects of Ionizing Radiation VII by the National Academy of Science, little girls, 0-5 are said to be twice as vulnerable to harm from radiation as little boys. The ICRP doesn't even have a separate category for fetuses despite the increased harm that can happen when uranium crosses the placental barrier. BWXT did not do a detailed receptor analysis anyway, so it's a moot point.

> Above-average tissue metabolism and high rates of mitosis increase the chance that mutations cause malignancies before they can be stopped by the body's self-regulatory mechanisms. As the children's immune systems and cell-repair mechanisms are not yet fully developed, these mechanisms cannot adequately prevent the development of cancer. A recent meta-analysis found that "qualitative and quantitative physiological and epidemiological evidence supports infants being more vulnerable to cancer" and estimated that infants have about 10 times higher radiation risks per unit dose when it comes to radioactive fallout than adults, while the more conservative International Commission on Radiological Protection (ICRP) assumes that the sensitivity to ionizing radiation in young children and fetuses is higher than in adults by only a factor of 3.166. *

(http://nuclearhotseat.com/wp-content/uploads/2016/03/NH-161-Alex-Rosen-UNSCEAR-source-info-Critical-Analysis-of-UNSCEAR-Report-US-letter.pdf)

The CNSC must take “new” scientific insights into consideration while coming up with its risk assessments and safe public doses in the future. It must take a precautionary approach when there are so many unknowns. The ALARA principle of allowable risk, allowable harm, is not sufficient when there are so many unknowns and small children right next door.

Again, is it fair and appropriate to put this nuclear factory across from a school in the heart of town? Again, what if there’s an accident or if someone has a bad day? In 2004, there was 2 inches of water on the floor of GE-h. There are always fugitive emissions that aren’t measured. In 2018, a large rainfall flooded the Toronto pelleting factory, resulting in a power outage and 50 drums of water needing to be dealt with. Whenever anyone—firemen, tradespeople, supervisors— goes into the plant, there will be fugitive emissions—on peoples’ clothing and equipment. It is impossible to perfectly contain this fine powder. What if the power goes out? What if we have further water restrictions in the future? What if there’s a fire and 126 years of toxic pollution is released into our biosphere? Should we be putting people at risk for the company’s convenience?

I have been shocked by how self-regulated BWXT is. For example, there have only been 11 air samples taken by the regulator, the CNSC, since the beginning of the last 10-year licensing period checking concentrations of uranium in the air around the Toronto facility. That hardly seems adequate. How did they choose those specific days? What was the weather like? Was the facility even producing pellets at the time? Did BWXT know the CNSC was coming? One discrepancy really stood out for me. In 2014, a numbered air sample taken at Campbell Park was reported as 0.049 $\mu g/m^3$ and was reported as that again in 2016. In 2019, on their website, that same numbered sample—GT07-A02— was reported as 0.000000034 $\mu g/m^3$, and now on the website, it is reported as 0.0000488$\mu g/m^3$. These reported measurements are really strange! For one thing, I thought the background level of uranium in Toronto was supposed to be 0.0001$\mu g/m^3$. For another, why do they keep recording this same numbered sample so differently from year to year?

They only took nine air samples of each beryllium and uranium concentrations in air during the last licensing period in Peterborough, as well. One uranium sample taken in the Prince of Wales schoolyard in 2014 was 0.0013$\mu g/m^3$—much higher than natural background, which I fine disturbing. My kids used to go to that school.

Some scientists at Trent University have noticed that beryllium concentrations in the soil have been increasing over the past years, even as BWXT has been insisting on virtually no emissions. Is the CNSC looking into this and finding out why it’s been increasing? It is supposed to be our watchdog. What concentrations in the air are needed to get that sort of increase in soil concentrations? Why haven’t they been taking more air samples to figure out what’s going on? Did BWXT use the wrong filters

in the stack as it did on the workers respirators? The thing is that accidents happen and that these dangerous materials shouldn't be handled next to a school in the first place.

Beryllium standards are continually being tightened because it is an extremely dangerous substance. It's also a type one carcinogen and some people have a hypersensitivity to it.

The MECP POI limit for Beryllium is 0.01 $\mu g/m^3$. The POI is the plant/public boundary. BWXT NEC has established an internal Control Level of 0.01$\mu g/m^3$ air at the stack exit. Dilution between the stack and the plant boundary will also reduce the concentrations at the POI to below legislated limits…
(pg. 2-16 of the ERA Report.)

However, the Be stack is right next to the sidewalk and extremely close to the schoolyard, which is elevated compared to the factory.

> In addition, there is increasing evidence that even limited exposure to low concentrations of beryllium may lead to CBD (Chronic Beryllium Disease) in some individuals with increased susceptibility. For example, research indicates that some employees who work outside of beryllium work zones, such as clerical staff, have developed CBD. There have also been reports of the disorder in family members who were exposed to beryllium dust from an employee's clothing and in individuals who reside in the vicinity of beryllium refineries.[10]

It seems absurd that while kids can't even eat peanut butter sandwiches at Prince of Wales School, the staff at the CNSC seem to think it's okay to add powdered uranium to an already problematic situation.

BWXT and the CNSC have also failed to take into consideration the huge differences between the Toronto watershed and the Peterborough watershed. There should have been a full investigation into this.

I haven't even gone into the socio-cultural, economic implications of this…

I feel that neither BWXT nor the CNSC has been transparent with me. Repeatedly, I have asked both of them at what capacity they were producing at under their present licences. BWXT said this was proprietary information and the CNSC wasn't forthcoming either until finally Julian, from the CNSC, said both facilities were operating at 50%. This information is really important in trying to understand what they could be polluting in the future. In the first license renewal I read, BWXT was seeking an early license renewal, with the amendment to produce fuel pellets, for Oct. 2019. I wonder how many people were informed about that.

In the 17 years of living in the neighbourhood surrounding BWXT, I have received exactly one newsletter in my mailbox.

In conclusion, it's a crazy place to put what amounts to a whole nother factory….especially one that emits a radioactive heavy metal. Increased emissions will mean more people breathing in or ingesting this toxic dust. BWXT doesn't even own the polluted land upon which it sits. One nuclear facility is more than enough for a downtown core in this day and age. It's unfair to add to the toxic burden of the children living in the neighbourhood and going to the school, especially given that accidents happen, and there are so many uncertainties about uranium's behaviour in the body. A precautionary approach must be taken.

Canada must also update its radiological protection guidelines to incorporate new scientific knowledge and better protect the public from harm at all stages of the nuclear fuel cycle.

(People would have much more confidence in a regulator that reported to the Minister of the Environment, rather than to the Minister of Natural Resources.)

Good neighbours don't make radioactive pellets.

Please deny BWXT the amendment to make uranium dioxide pellets. Existing operations should be shut down because of the sharp increase in beryllium soil deposition.

Thanks for your time,

Sincerely,

Jane Scott

Please note: Bibliography on the next page and embedded links in the text.

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3.

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4. The Lesvos Declaration (2009) signed by many radiobiologists. https://euradcom.eu More important information here about the inadequacy of the ICRP guidelines.

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