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Oral Presentation

Written submission from Philip Kienholz

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 Philip Kienholz

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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INTERVENTION: THE BWXT LICENCE RENEWAL (HEARING REF. 2020 -H - 01)

Background

I live 2.0 km from the BWXT Nuclear Energy Canada's (BWXT) Peterborough site.

I have previously submitted interventions to a Joint Federal/Saskatchewan Environmental Assessment Panel reviewing five uranium mines in northern Saskatchewan,[1] in Saskatoon, and to a public hearing to review a Shield Source Incorporated operating license application,[2] in Peterborough.

I have attempted to maintain a calm, rational approach so as to organize this intervention into a clear flow, but please do not mistake my intent. Below any appearance of tranquility in my discourse, **I am upset and angry about the absurd location of a nuclear hazardous industry within the downtown residential area of my city, about a regulatory regime that disrespects human rights, and about a regulator whose bias has been captured by the industries it regulates.**

As well, the Canadian Nuclear Safety Commission (CNSC) staff report's reliance on obfuscating language and excessive discursive detail deserves censure and correction.

Recommendations

I recommend that:

1) BWXT's application be denied in its entirety.
2) The Canadian nuclear licencing and regulating functions be assigned to two completely and fully separate and independent bodies.
3) Updated "Preliminary Decommissioning Plans"[3] be made available to public review.

How much of the already significantly contaminated entire General Electric (GE) Peterborough site(s) would decommissioning restore to safe conditions? Do updated decommissioning plans include a comprehensive, level 2, hazardous material abatement for entire GE site(s)? *Please answer this*.

Introduction

The business case for BWXT's license to manufacture uranium pellets, and the staff report of the CNSC, that have been discussed in the local press, are only part of the relevant discussion.

Significantly, the manufacturing process would increase from assembling nuclear fuel bundles to include making the uranium pellets for inside the bundles, a process now done in Toronto.

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[1] Kienholz 1993a, 1993b, 1993c. Submissions to Joint Assessment Panel.

[2] Kienholz 2012. Shield Source Intervention.

[3] Snopek 2019b, 9, *BWXT Licence Application.*

The BWXT Peterborough plant is not located "in a mixed industrial, commercial, and residential area," as the licence application[4] states. Having walked nearly all of the streets of the neighbourhood that surrounds the GE site on the north, east, south, and west, I can confidently state that it is predominantly a high density residential area primarily comprised of one-, two-, and three-storey houses and row houses situated close together on small lots, often more than one residence at each building. A few small businesses are present, eg. three cafes, several professional service offices: dentistry, massage therapy, and guitar repair; a small publisher, and rock climbing gym. West of the GE factory site, across Monaghan Road, are large parking lots and spaces, many with trees and shrubs.[5]

The junior playground of Prince of Wales elementary school is located at the northwest corner of the intersection of Monaghan Road and Wolfe Street, with a primary BWXT building that is currently being used for nuclear production located only metres away at the opposite corner of that intersection.

Reluctance, or inability, of CNSC to consider this crucial siting aspect of licencing safety is indicative of regulatory problems within the CNSC and surrounding legal arrangements; see discussion below at pages 10 -- 11, and recommendation no 2, above.

Legal Challenge to Uranium Environmental Distribution

My reading in nuclear safety has led me afield from Canada to the topic of depleted uranium (DU) weapons used, primarily by the militaries of the United States (US) and United Kingdom (UK) in Afghanistan, Iraq, and the Balkans. Along the way I have come across an interesting book[6] passage regarding legality of DU weapons use.

Of course, many have seen the wars in those areas as illegal from the start, so that DU weapons might possibly be considered a lesser legal issue, with the larger legal issue of the wars themselves left untouched by the International Criminal Court (ICC) due to the overwhelming geopolitical power of the US.

But given the extremely long period in which DU distributed into the environment will remain a health hazard, the challenge seems worth raising and bringing to the fore:

Uranium in Iraq: Sub-section 2.16.2, "Illegality Due to Radioactivity," quoted in its entirety:

As there has not been any specific treaty banning the dispersion of radioactive material, the question that arises is: what is the position of international law on this issue? In the absence of a convention or treaty one resorts to principles under conventional international law.

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[4] Snopek 2019b, 6. *BWXT Licence Application.*

[5] See photo in Appendix, and Figure 2, "Aerial view of the BWXT Peterborough facility," Tadros, 4.

[6] Al-Ani, *Uranium in Iraq* 73-74.

This was considered in depth by the International Court of Justice in its opinion, dated 8th July 1996, upon the request of the General Assembly of the UN on the Legality of the Threat or use of Nuclear Weapons. Although the opinion was on the use of nuclear weapons, most of the legal argument would apply to DU. In paragraph 35 the Court held:

> *"Ionizing radiation has the potential to damage the future environment, food and marine ecosystem, and to cause genetic defects and illness in future generations."*

As ionizing radiation is a characteristic of DU, it is clear that it falls within the consideration of the Court even though it was considering nuclear weapons as such.

The court upheld a fundamental principle in international law which is not immediately apparent. It has been argued by some politicians that the legal war, as they claim the attack on Iraq in 1991 to have been, enabled them to use radiological weapons in the form of DU. However, the Court stated in paragraph 39 that:

> "*A weapon that is already unlawful per se, whether by treaty or custom, does not become lawful by reason of its being used for a legitimate purpose under the Charter."*

It is suggested that as the Court finds that weapons that create ionizing radiation are unlawful, then their use becomes unlawful whether or not the war in which they are used is lawful.

The Court went on to confirm several principles before concluding that it is unlawful to use or threaten to use nuclear weapons. Among these principles is the subjection of conflict to humanitarian law. In paragraph 78 the Court confirmed that

> *"humanitarian law, at a very early stage, prohibited certain types of weapons, either because of their indiscriminate effect on combatants and civilians, or because of the unnecessary suffering cause to combatants.*

It is clear that, according to the Court's finding, DU's use is prohibited both because its effect does not discriminate between combatant and civilians and because its massive burning habit causes unnecessary suffering to combatants.
End quote.

Following from the Court's reasoning in a hypothetical parallel case:

a) Radioactive uranium dioxide powder is used to manufacture uranium pellets for nuclear reactors, considered by the State to be a legitimate operation.

b) Part of the uranium used in manufacture is regularly released into the environment during the manufacturing process, considered by the manufacturer and the regulator to be of amounts that are within acceptable limits.

c) Were uranium dioxide to be administered directly to an individual, it would be considered an illegal act of administering a noxious substance under the State's criminal code due to the poisonous toxicity and harmful radioactivity of the uranium to the individual.

d) An argument is made that humans in the environment, whose security of their person is guaranteed under international covenant to which the State subscribes, have their health threatened by their environment being polluted by uranium manufacturer's waste, to which they are exposed outside of their permission, and outside of their ability to avoid.

The complainants, referencing the above noted legal precedent, draw a parallel between DU as a weapon, and uranium oxide as a noxious substance. They claim their exposure to the noxious quality of uranium dioxide in the environment is illegal and not legitimized by its State-considered legitimacy in manufacture for use in nuclear power plants.

How does the CNSC respond to this argument. <u>Please answer this</u>.

Technology and Health

Data from the *2018 Annual Compliance Monitoring Report* for BWXT's actual uranium emissions from the Peterborough and Toronto facilities,[7], show major increases in Peterborough's annual emissions of uranium dioxide powder -- airborne: 3,140 times, from .002 to 6.28 grams, and waterborne: 93,500 times, from 0.01 to 935 grams. These increases, reflecting the total of the two separate facilities, were confirmed by a BWXT employee at one of their Peterborough information sessions.

As well the proposed licence continues the existing limit of uranium, in all forms, to be stored on the Peterborough site at any one time of 1,500 Mg (Tonnes), and the continuing limit of uranium processed per month of 150 Mg (Tonnes).

A single gram of the very fine uranium dioxide powder contains 7.8 trillion individual particles of 0.3 micron size,[8] each a potential cancer cause if inhaled, ingested, or entering a body through a wound. This hazard, in a residential neighbourhood and so close to an elementary school junior playground, emphasizes the significance of the problem facing Peterborough. The number of emitted particles would be astronomical -- airborne: 134.2 billion new particles wafting through the neighbourhood per day, and

[7] Snopek 2019a. *2018 Compliance Monitoring Report*, 54, 56, 59, 61.

[8] Edwards 2020a, slide 19. *Problems with Pelleting.*

waterborne: 20.2 trillion new particles per day heading through the sewer to the water treatment plant and into the Otonabee River. Winds will also distribute the tiny uranium particles outside the immediate neighbourhood.

A crucial technical point is important to touch on here -- the difference between external radiation dose, also called whole body dose, and internal radiation dose, created by radioactive material that has gotten inside the body. [9]

The international regulatory regime is primarily focussed on setting maximum limits of external radiation exposure, or whole body dose, that purport to limit the number of adverse health effects, averaged over a population, to an acceptable level. The primary public risk from BWXT's pelleting operation however, is the release of uranium particles from the industrial processes into the environment. These particles, when taken into the body, cause an internal radiation dose of alpha particles to adjacent cells. For this reason I have focussed on actual amounts of uranium documented to have been released in 2018, rather than on whole body radiation dose.

The High Efficiency Particulate Air (HEPA) filters that are used to catch airborne uranium particles cannot trap particles between 0.1 and 0.4 microns in diameter. Particles of sizes above and below this range are caught in the filters, but the particles between 0.1 and 0.4 microns from vented air pass through the HEPA filters into the environment around the factory.[10]

The allowable whole body dose per year differs, depending on the regulator, from 1 milliSievert public radiation dose used by the Canadian National Research Council/Canadian Nuclear Regulatory Commission (NRC/CNSC) to the 0.1 milliSievert airborne dose used by the United States Environmental Protection Agency (EPA).[11]

The table below[12] shows how doses of alpha radiation from a single uranium particle taken into the body vary as particle size varies from 0.1 to 0.3 micron in diameter and the distance from the particle to the adjacent cells varies from 11 to 12 microns.

Size of Particle	Range of Alpha Particle	Radiation Dose per Year
0.1 micron	12 microns	7 milliSieverts
0.1 micron	11 microns	9 milliSieverts
0.3 micron	12 microns	191 milliSieverts
0.3 micron	11 microns	248 milliSieverts

[9] The politics of regulatory recognition of uranium internal dose versus whole body dose is reviewed briefly in Busby, 1995 1-2, and extensively in Busby, 2010 *passim.*

[10] Edwards, 2020b, in Ruiter, *Say No to BWXT Uranium Pelleting,* video, 3:11, particle sizes.

[11] Edwards, 2020b, in Ruiter, *Say No to BWXT Uranium Pelleting,* video 6:12, "Exceeding Radiation Exposure Limits with One Single Particle Lodged in the Lung;" CNSC, 2018 6.

[12] Edwards, 2020a, from slide 40.,"Radiation Dose to a tiny volume of tissue with One Particle Lodged in the Lung."

Comparing:

the allowable annual whole body dose set by regulators of 0.1 or 1 milliSievert

to

the larger annual radiation dose, 7 to 248 milliSieverts, from single particles radiating to a small number of cells

emphasizes

the severity of the very large quantity of BWXT released airborne uranium particles: 134.2 billion per day.

BWXT's proposed licence would expose this hazard to the Prince of Wales Elementary School children, to the surrounding residents, and to wherever winds carry the uranium dioxide powder particles, which have been elsewhere documented as travelling at least 5.8 km from their emission source, and physically surviving a minimum of 25 years in the environment.[13]

Each internal uranium particle lodged in the body gives their radiation dose to small quantities of adjacent cells. A more likely occurrence however, is for multiple particles to be taken into the body.[14]

The general health effects of exposure to ionizing radiation are:[15]

- DNA damage (cancer, birth defects, miscarriage, stillbirth)
- Immune dysfunction
- Diabetes, heart disease
- Inheritable disease, reduced fertility
- Acute radiation sickness.

This extract from a report[16] by the European Committee on Radiation Risk, quoted in its entirety furthers understanding of the complex processes of uranium taken into the body:

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[13] Lloyd, et al 2007, "Uranium oxide particulate surrounding a former processing facility."

[14] Moore, in Ruiter, *Say No to BWXT Uranium Pelleting*, video 16:43.

[15] Vakil, in Ruiter, *Say No to BWXT Uranium Pelleting*, video 8:10; see also Busby, et al (2010) *passim;* Durakovic et al, "Uranium Isotopes Induced Alteration in the Human Genetic Pool;" and Miraki, *Afghanistan After "Democracy:"* for photographs of malformed stillbirths -- warning, not for viewing by children or the squeamish.

[16] Busby et al 2010, 19. *2010 Recommendations of the ECRR: The Health Effects of Exposure to Low Doses of Ionizing Radiation.*

> "The release of radioactive materials into the environment results in the contamination of living organisms. This internal radiation exposure and external radiation from the same radioactive materials in the environment cause damage to cells. Recent research into genomic instability and bystander signalling suggests that such exposure results in death or mutation in roughly a third of all somatic or genetic stem cells intercepted by a radiation track. One high-impact consequence of this is that a small proportion of the descendants of these irradiated cells may become cancerous and kill the individual. Other consequences are that the general loss of cells to the organism may result in both specific and general impairment of health. Third, these effects in germline cells are not restricted to the exposed individuals and may be passed on to the next generation."

Canadian Nuclear Regulation

Human rights philosophy holds that no one should be asked to give up security of their person, as when people are exposed to nuclear radiation without their consent. But the CNSC draws its operating principles from an international regulatory regime with an underlying philosophy of "utilitarianism."[17] This philosophy uses the greatest good for the greatest number of people to think through decisions. Decisions made in this way result in what these decision makers call "winners and losers." But those who receive the benefits are not the same as those who suffer the losses. This is unfair.

CNSC's implementation of the utilitarian philosophy uses the ALARA principle: As Low As Reasonably Achievable.[18] This presumes that whatever is being regulated has an unquestioned right to go forward, while the hazards are reduced to the extent "reasonable," or in other words, not costing too much money and not causing too much harm. But the ALARA principle ignores that there is no lower limit below which radioactive exposure does not pose a health risk.[19] The fundamental open-minded questioning ethic of science is warped by an imperative underlying the ALARA principle.

The losses in the BWXT case are the potentials for single particles of uranium oxide powder to cause cancer in the cells to which they become immediately adjacent. The benefits go to shareholders of a company based far away from Peterborough; the losses are felt here. Whether local jobs in the industry are a benefit or a loss, given the hazards, and the issues surrounding nuclear and uranium industry in general, is an open question.

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[17] Busby and Valentin. "Public Debate: Pr. Chris Busby, ECRR, versus Dr. Jack Valentin, ICRP," video 1(2) 49:58-52:20, and video 2(2) 0:00-01:10; Busby et al 2010, 22-25.

[18] Busby and Valentin. "Public Debate," video 1(2) 43:30 - 44:04; Minister of Public Works and Government Services, "Keeping Radiation Exposures and Doses as Low as Reasonably Achievable."

[19] Busby and Valentin. "Public Debate," video 1(2) 42:44; National Research Council.

Nuclear regulators around the world have accepted that any dose of ionizing radiation exposes a person to health risks.[20] Canada is a signatory to the Universal Declaration of Human Rights, Article 3[21] of which states, "Everyone has the right to life, liberty, and security of person." Why does CNSC continue to licence radiation releases into the environment? *Please answer this*.

A Peterborough example of CNSC's lax regulatory approach is the Shield Source Inc. (SSI) debacle. The history of this raises the question if the CNSC is trustworthy to protect the public.

SSI used radioactive tritium gas to manufacture illuminated building exit signs and airstrip lighting in Peterborough. Their annual reports to CNSC of levels of tritium emissions into the environment were ten times less than actual -- for eighteen years. Repeated public outcries over elevated radiation levels surrounding the plant did not raise CNSC's effective concern. Finally an SSI employee released a year's quota of tritium in one burst. CNSC required SSI to engage an anonymous, outside "root cause" consultant.[22] That investigator's report revealed that SSI had never understood the emission monitoring equipment. To address emission levels that didn't match their mistaken understanding, SSI had installed devices between the monitoring equipment and the recording equipment so as to adjust emission readings to conform to what they thought the levels ought to be. The plant closed down soon after the report's release.

Further evidence of CNSC's unreliability is the $1.28 billion environmental clean-up now needed in the Port Hope area due to nuclear industrial operations there.[23]

It would be foolhardy to trust our health and safety to the CNSC. It has demonstrated short shrift for human morality by an unfair utilitarian philosophy, and for human health effects by a jerry-rigged ALARA operating principle and the decisions that flow from it.

What, in particular concrete terms, has Canada done to remedy the shortcomings in nuclear regulation that have allowed the above noted situations in Peterborough and the Port Hope area to occur? *Please answer this*.

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[20] National Research Council, "Beir VII: Health Risks from Exposure to Low Levels of Ionizing Radiation."

[21] United Nations. *Universal Declaration of Human Rights.*

[22] This sequence of documents traces the process of investigation leading to the Root Cause Report: Kinectrics, Inc. anonymous employee 2012a, SSI 2012a, Lynch 2012a, Ravishankar 2012a, Lynch 2012b, Ravishankar 2012b, Kinectrics, Inc., anonymous employee 2012b, SSI 2012b, SSI 2012c, Ravishankar 2012c, Anonymous, possibly Garry Fowles, undated, likely 2012.

[23] Lee-Shanok, 2018. "$1.3 billion cleanup of Port Hope finally underway after decades of massive planning;" Canadian Nuclear Laboratories, "Port Hope Area Initiative."

In my view, constructive public participation in CNSC licensing hearings is compromised by CNSC's management. One piece of evidence in support of this contention, is that the submission date of the CNSC's staff review[24] is only one day after the submission date of BWXT's licence application.[25] This points to coordination and collaboration between the CNSC and BWXT, the regulator and the applicant, in a joint process prior to any review by the general public. BWXT had originally requested a ten-year licence renewal on 9 November 2018. Presumably the one year period between 9 November 2018 and 19 December 2019 was a period of interaction between the applicant and the regulator.

An interaction process beforehand between the CNSC and the applicant regarding non-prescriptive documents, practices, and standards is not transparent. Its closure to the general public limits intervener presentations. Documents that are deemed proprietary or security-sensitive are denied to interveners, while available to the applicant and CNSC staff.[26]

The public receives the impression that the Commission will presume both the validity of the applicant's evidence and the rigour of their Staff's review of it. The significance of public questioning, or public contradicting of applicant's evidence, is thus perceived to be diminished.[27]

The inquisitional manner of conducting the hearing, with no qualification of experts, and no cross examination under oath, reduces the ability of getting at the truth.[28] The executive director of the Canadian Environmental Law Association has stated, "In the hearings, we really do see a frustrating amount of apologetics for the industry going on by staff."[29]

The pre-hearing collaboration between the industry and the industrial regulator noted above, in its centralization of oversight through limited information dissemination and the reliance on the regulator's internal staff creates a precondition for regulatory capture.[30]

The close relationship between the CNSC and the industries it regulates was frequently cited as problematic by participants during the process that led to an Expert Review Panel's final report on environmental assessment processes. The Expert Review Panel noted expressed concerns that the CNSC also, as a Responsible Authority, promoted projects they were regulating,[31] that the CNSC conducted their own

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[24] Tadros i, submitted 20 December 2019. *CNSC Staff Report.*

[25] Snopek 2019b 2, submitted 19 December 2019. *BWXT Licence Application.*

[26] Blaise et al 239, 240. "Nuclear Law, Oversight and Regulation."

[27] Blaise et al 239. "Nuclear Law, Oversight and Regulation."

[28] Ibid.

[29] Theresa McClenaghan, in Galloway 2018, "Letter claims info on nuclear risks withheld from safety commissioners,."

[30] Blaise et al 240. "Nuclear Law, Oversight and Regulation."

[31] Gélinas 50. *Building Common Ground.*

assessments, and that they were co-opted by the industry they were charged with regulating.[32] The perception of bias or conflict of interest that naturally arises from the dual role clearly proscribed by the International Atomic Energy Agency (IAEA) below was the most often cited concern by participants in the Expert Review Panel.[33]

Why did Canada exclude the CNSC from the 2017 extensive review process of federal regulators that was intended to rebuild public trust? *Please answer this.*

The systematic approach to safety taken by the CNSC and its applicants is valuable, but alone is insufficient. Applicants and regulators must also consider "black swan" events -- less likely but significant, and as well learn to regularly think imaginatively in considering inadvertent *cross-subsystem and multi-system* interactions, or else the systems approach can devolve into simply checking off items on lists without actively intelligent consideration. The value of real-world common sense supplementing systems thinking is reinforced by the primary conclusion reached by Japanese investigators of the Fukushima nuclear disaster, that it was "a profoundly manmade disaster."[34] The involvement of a complicit regulator in the Fukushima tragedy,[35] taken into a Canadian context, emphatically cries out for correction of the flaws of the Canadian nuclear regulatory system documented by Blaise et al, and Gélinas, and reviewed above.

Canada's membership in the International Atomic Energy Agency requires it to:

> "…take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy,"[36]

and to

> "ensure that the regulatory body is effectively independent in its safety related decision making and that it has functional separation from entities

[32] Gélinas 49. *Building Common Ground.*

[33] Gélinas 49. *Building Common Ground;* see also Blaise, et al 242. "Nuclear Law, Oversight and Regulation."

[34] Kurukawa, 2012: Message from the Chairman.

[35] Kurukawa, 2012, *passim*.

[36] IAEA 2016. *Governmental, Legal and Regulatory Framework for Safety*; cited in Blaise et al, 240, "Nuclear Regulation in Canada."

having responsibility or interests that could unduly influence its decision making."[37]

The Canadian legislation requiring the regulator to meet its international obligations is the Nuclear Safety and Control Act[38] which states in the section, "Canadian Nuclear Safety Commission / Objects":

"**9** The objects of the Commission are

(a) to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information in order to

(i) prevent unreasonable risk, to the environment and to the health and safety of persons, associated with that development, production, possession or use,

(ii) prevent unreasonable risk to national security associated with that development, production, possession or use, and

(iii) *achieve conformity with measures of control and international obligations to which Canada has agreed*…." (emphasis added)

Canada has international obligations to ensure their nuclear regulator is completely separate from, and independent of influence by any other body concerned with the promotion or utilization of nuclear energy. Why does the CNSC continue to act as both a licensor and a regulator? *Please answer this*.

Non-CNSC Recommendations

Although outside the mandate of the CNSC I recommend that the entire former GE site(s) be condemned because of the many known, and unknown, instances of hazardous material contamination on the site(s).

I further recommend that the site(s) be barricaded against citizen contact and that a program of hazardous material assessment, abatement, and remediation begin, with financial contributions required from all business entities who have occupied the site(s).

I further recommend that the goal of the remediation be to restore the site(s) to a condition of safe human access, with appropriate signage and monuments dedicated to the workers who suffered illness and death from exposure to hazardous materials on the site and whose labours benefited the monetary acquisition of the business owners, senior managers, and executives, who did not suffer from hazardous exposure.

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[37] IAEA 1994. *Convention on Nuclear Safety*, cited in Blaise et al, ibid,

[38] Government of Canada 2017. *Nuclear Safety and Control Act.*

Conclusion

Emphasizing the significance of human endeavour outside the scientific , technological, and regulatory -- into the realms of social morality and the imagination, I conclude with a quotation from Robert Bates,[39] 1977 Chairman of Science Council Committee on Policies and Poisons, and a poem[40] of my own.

> "…I wish to stress the fact that chronic incapacity causes a heavy and immeasurable burden of misery. Some of us may be so far removed from any hazardous environment in our daily lives that we forget than even if the percentage incidence of these conditions is low, if you happen to be the individual involved, as far as you are concerned, it is 100 per cent. This is true of disablement from asbestos, or mercury, or silica, or for that matter, from many other hazards. The only proper goal for a society such as ours is to attempt to eliminate all such misery."

[39] Bates, 5. *Policies and Poisons.*

[40] Kienholz 2016 16, *Display: Poems.*

Stalk and Leaf

Afterword to the report, Environmental Consequences of Uranium Mining, submitted to a Joint Panel Reviewing Five Saskatchewan Uranium Mines

Feature, if you will
band of travellers, far into the future
find the two hundred metre broad boulder field,
glacier raked and broken, sparse trees:
roots probing to secret depth

How consider uranium waste buried under anomalous stone,
jagged haphazard horizon, patchy leaf-decayed soil,
trees radionuclide stunted birch and poplar,
fungal clues -- fabulous mushroom shapes and colors,
convoluted veil-like vulvas amid the yarrow,
in the sedges, beside white moss:
clusters of patterns -- sensed disorder of reason?

Small pond perched in hollow of tossed fractured rock
reflecting smooth the angles; cattails tower over water lilies,
brown seed heads drooped in gigantic mutation,
lines of stalk and leaf mirroring
rough panoply of rock

Nomads turn to say crazy
quilt scene, hodge-
podge weirdness,
millennial radiation, skewed
simulacrum of terrestrial nature, agonizing
yield of plutonic mine?

What danger to approach the pond,
cross the boulders not truly seen as minor sign:
great pit of mill tailings below

Will the fungi be pleasant to eat
travellers be but imaginary?

Glossary

ALARA: As Low As Reasonably Achievable.
BWXT: BWXT Nuclear Canada Inc.
CELA: Canadian Environmental Law Association.
CNSC: Canadian Nuclear Safety Commission.
DU: depleted uranium.
ECCR: European Committee on Radiation Risk.
GE: General Electric Canada.
IAEA: International Atomic Energy Agency.
ICC: International Criminal Court.
ICRP: International Commission on Radiological Protection.
EPA: Environmental Protection Agency, USA.
HEPA: High Efficiency Particulate Air.
NRC/CNSC: National Research Council/Canadian Nuclear Safety Commission.
UN: United Nations.
SSI: Shield Source Incorporated.

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Appendix

BWXT Facility on former GE site, Peterborough. Note: red lines showing BWXT portion are incorrect. Near corner of site is the northwest corner. Street extending from northwest corner to the right is Monaghan Road, north on the left, south on the right. Street extending from northwest corner to the left, east, is Wolfe Street. Two primary buildings leased by BWXT are along Monaghan Road. Note Prince of Wales Elementary School on Monaghan Road, with junior playground on opposite corner from BWXT building. Photo: http://nuclearsafety.gc.ca/eng/uranium/processing/nuclear-facilities/bwxt-nuclear-energy-canada-inc-peterborough/index.cfm.