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Written submission from Judith Fox Lee

Exposé oral

Mémoire de Judith Fox Lee

In the Matter of the

À l'égard des

Canadian Nuclear Laboratories (CNL)

Laboratoires Nucléaires Canadiens (LNC)

Application from the CNL to amend its Chalk River Laboratories site licence to authorize the construction of a near surface disposal facility

Demande des LNC visant à modifier le permis du site des Laboratoires de Chalk River pour autoriser la construction d'une installation de gestion des déchets près de la surface

Commission Public Hearing
Part 2

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Natural Rights in Canada for Environmental Protections:

Submission to the Public Commission Hearing on The Application from the Canadian Nuclear Laboratories to The Canadian Nuclear Safety Commission to Amend its Chalk River Laboratories Site License to Authorize the Construction of a Near Surface Disposal Facility

by Judith Fox Lee **April 11, 2022**

Introduction & Background – 77 Years of Unsolved Legacies of the Nuclear Age

I make this submission to highlight the need for the Canadian Nuclear Safety Commission (CNSC) to uphold its main mandate to regulate the development, production and use of nuclear energy in Canada to protect health, safety and the environment, by rejecting the license application from the Canadian Nuclear Laboratories to construct a (misleadingly named) Near Surface Disposal Facility (NSDF) at Chalk River, less than one kilometer away from the Ottawa River. The internationally accepted definition of "near surface disposal facility" is "a facility consisting of *engineered trenches or vaults constructed on the ground surface or up to a few tens of metres below ground level*." This misnamed NSDF would be totally above ground, and similar to a municipal landfill, except that this is proposed mound is 60 feet in height!

A **peer review** of Canada's framework for nuclear safety was conducted in 2019 by a team of **20 senior nuclear regulatory experts from 17 countries under the International Atomic Energy Agency (IAEA)**. The Review team found "**no evidence**", beyond the principles contained in the *Policy Framework*, **of a "governmental policy or strategy related to radioactive waste management**." It found that the *Policy Framework* "...does not encompass all the needed *policy elements* nor a *detailed strategy* or *corresponding arrangements* [emphasis added] … for radioactive waste management..." Specific aspects of this deficient management approach which bear directly on the proposed facility and its risk-prone outcomes will be further detailed in sections which follow.

It has been clear, in tracking our Canadian nuclear waste management attempts over its history since inception in 1957, that there is a significant protocol and strategy vacuum as measured against the highest-held industry standards from the IAEA. These notable gaps have allowed the promotion and realization of substandard radioactive waste methodologies and facilities in Canada. However, **the *other* overwhelming reason for these lax outcomes, has been, in all fairness and at the heart of the matter, the persistent, widely-documented, global dearth of viable and successful nuclear waste management solutions.** That is, Canada can no doubt greatly improve our own management of nuclear wastes by improved project design and planning, scheduled waste monitoring, tracking and recording of inventories, greater regulation of transportation of radioactive materials, and other improved protocols with stricter adherence to evidence-based strategies, ***but in essence, actual fixes for the 'big-picture' problems of waste remain globally elusive because the Issue has truly remained unsolvable.***

This July will mark the 77th anniversary of having no viable solution to the waste management problems of the nuclear age. Nuclear experts, trying their absolute best, with hugely-funded efforts throughout this entire

period, have still come up empty handed. There have been many different theories and propositions, funded into highly expensive projects, only to be generally followed by one failure after another. This must finally be recognized. No fault of anyone. Handling such incredibly poisonous, unimaginably long-lived toxins is simply beyond our limited human capacities for both engineering and the perfect execution and maintenance required. There have been so many promises, attempts, misses, failures and infamous accidents which consistently demonstrate dangerous, if by times well-hidden, results, such that it remains inexplicable that anyone can still conceive of this technology as safe, green or healthy. Indeed, the global industry's efforts on the waste problem have been characterized by many observers and even several top experts in the field itself (such as Sir Brian Flowers, Philip Pahner, Professor Emelyanov of the USSR, and Dr. John Gofman, to name a few) as a failed mixture of unrealistic hopes and misguided speculation.

To date, there are no schemes for successful long term safe storage or for transmuting these toxins into harmless substances. So the problem remains: how to keep radioactive waste of all types in as safe storage as possible until it decays after tens or hundreds of thousands of years or even much longer in some cases. The depository must be absolutely reliable as the quantities of poison are tremendous. We have simply had no practical experience with such a long-term project to date. (To put these vast time periods into some perspective, the appearance of the Neanderthals was a mere 75,000 years ago, by comparison.) The solution would also require societies with unprecedented stability and mutual cooperation. Recent events carried out by Russian troops holding Ukranian power plants hostage give evidence of how far we are from meeting that requirement. As do the entire nuclear weapons programs. So, again, but well worth repeating, Canadians will be burdened with storing and guarding the entire range of toxic waste products for huge geological time periods, and burdened simultaneously with preventing the wastes from contaminating our precious, irreplaceable biosphere and our biological populations of all types, human, fauna and flora.

Finally, the other huge, unsolved aspect of this waste management problem is the multiple and complex layers of transportation required for storage of these ultimately dangerous materials through our air and over our land and bodies of water, the challenges of which cannot be overestimated. Some nuclear physicists such as John W. Gofman have emphasized that this is the most intractable, hopeless part of the problem -- the extent of loss of radioactive waste into the environment during packaging and movement to 'final' storage locations, wherever and whatever they may be. Transportation of these various waste products has already taken place (usually unbeknownst to us, in our unsuspecting, everyday lives) through major population centres (--but all types of places are equally important, including our less spoiled and less developed, wild and rural places—) by specialized tanker trucks, railroads, ships and planes. All these means are prone to their own accidents and failures.

So, it is a great burden for Canadians on all these bases, whether due to technical failure, human error, or terrorism, to shoulder fears that atomic products will get out of control during our lives or the lives of our children, or grandchildren and also that the shadow of plutonium poisoning will remain hanging over our health and earth for the unimaginably long-term future.

This is growing more and more true, right now, when our energy needs are seeing real viable solutions with sustainable, clean and renewable sources and with minuscule costs, in comparison. *Why saddle ourselves any further with these unacceptable existential risks? These are not just energy decisions. They are decisions about the fate of our perceived as pristine home and native land, and of the people and wildlife that we hope will still live here in a thousand years and, maybe a thousand thousand years.*

To quote our top Canadian independent nuclear expert, Dr. Gordon Edwards on this subject, from his expert testimony to the Natural Resources Parliamentary Committee , speaking on *The Future of Canada's Oil, Gas, Mining and Nuclear Sectors,* December 2016: "The greatest challenge facing the nuclear industry today is the question of nuclear waste, including the dismantling of radioactive structures and the decontamination of radioactive sites. Going forward, parliamentarians need to play a much more active oversight role. The industry is making plans to abandon these dangerous wastes right beside major bodies of water, such as the Ottawa River, Lake Huron, Lake Ontario, and the Winnipeg River. Important matters of public policy are being decided by default, by the nuclear industry and its [captured] regulator, based on technical considerations buttressed with scientific extrapolations, but these decisions are not wholly technical in nature, as they will implicate society as a whole." He says our elected Parliamentarians must be more involved: "It would be beneficial to Canadians if the various agencies of the nuclear establishment, such as AECL, the CNSC, and the NWMO, were called upon to report regularly to a parliamentary committee at least once per session." This would greatly increase the transparency of what is being planned, and could establish a specified, bona fide, embedded role for government in the nuclear waste and other industry management issues. Similarly, with respect to the development and implementation of a more mature and integrated nuclear waste strategy, we should also enable independent scientists and related experts, Indigenous peoples or concerned civil society/community representatives, to have a right to access information, to engage in *on-going decision-making*, and to know the full risks of management and decommissioning— and *not just at the initial planning stages of these nuclear management policies*.

Major Problems with this *Above Ground* Dump Proposal (which is what it is, despite its name)

Unfortunately, the current proposal to build a **giant, uncovered (for 50-years or longer), above ground nuclear dump that would obviously not isolate radioactive wastes from the biosphere** (as required by IAEA), mirrors the same serious flaws. The greatest is that according to the IAEA, a "disposal facility at or near the surface makes it susceptible to processes and events that will degrade its containment and isolation capacity over much shorter periods of time." Such a facility is not suitable for long-lived radioactive materials according to the IAEA. The proposed facility would not be in compliance with international safety standards/practice for radioactive waste disposal because it would violate a key principle of radioactive waste management - that the radioactive inventory must decay to an internationally accepted level within the design life of the facility to allow release from regulatory oversight. If this sounds impossible, you are correct! The report contains no discussion of "end state"objectives. Long-lived radionuclides proposed for disposal in the mound - if present in packaged wastes at maximum permitted limits - would not decay to clearance levels for thousands to millions of years. CNSC's environmental assessment report is supposed to cover all licensing stages, including decommissioning and abandonment (removal from regulatory control). But it contains absolutely no mention of an end-state report. This is a fatal omission in the environmental assessment.

Other major problems of this proposal include a lack of mature planning, a lack of intelligent siting (It appears that proximity to contaminated structures awaiting demolition at AECL's Chalk River Laboratories—not environmental protection—was the priority in the siting for the NSDF. The proponent and CNSC staff failed to seriously consider *alternative sites* that would avoid rapid discharge of radioactive and hazardous substances to a major water body, and avoid placing wastes in an area with a high water table.), lack of sufficient time or consideration for genuine community consultation (note the recent request by the Algonquins of Barriere Lake

and others to halt the licensing proceedings, and note the more than 140 municipalities and the Assembly of First Nations which have already voiced loud objection by official resolutions due to the glaring unsuitability of the site) and lack of optimal design elements for protection of the environment – problems that we have seen fail under many different circumstances around the world to date. I will continue to examine the most objectionable elements of this particular proposal throughout the rest of this submission.

In a large area, 11 hectares, to a maximum height of 25 meters, (possibly the largest containment of its type in the world, accepting both low- and medium-level wastes) the plan is to lay down two non-leak-proof plastic liners as currently used in municipal dumps (??!!), and pile to an estimated amount of one million cubic meters of mixed nuclear wastes (about 40% of Canada's total current nuclear wastes!) over a 50+ year period. The proposed liner membranes are subject to physical and chemical deterioration, punctures, improper installation, among other problems, the greatest of which might be the fact that no plastic membrane currently invented can last even remotely near the longevity of the wastes themselves. Plastic membranes break down relatively quickly, within the years of a single human lifespan. With no cap to be installed until the closure date of the operation, all materials therein openly exposed during the operational period to rain, wind and snow, freeze and thaw cycles and increasing extreme weather events, and then locate the whole mess within a kilometer of the Ottawa River, with a steep downward hillside slope to a wetland and lake area below (which is already contaminated by the Chalk River facility effluents). Original site selection criteria announced by the proponent would have excluded any site with more than a 10% slope. The criterion was later changed to 25%, apparently to allow for the chosen site! Proposed leachate and water treatment systems could breakdown or fail, and either of these events could lead to the Ottawa River being rapidly contaminated. There is no way to remove any leaked tritium which would make the water radioactive.

This project, if completed, would put Canadians in this region at direct risk of adverse effects on their drinking water, (the Ottawa River flowing into the St. Lawrence provides a drinking water source to millions of Canadians, in many towns and cities including Ottawa and Montreal), their air (by wind), their land (through seepage, and through airborne isotopes falling to earth) and therefore on their food, all of which will contribute to the degradation of health, of much-prided biodiversity of animals, birds and fish among other creatures, and not least, of our beautiful environment (immediately destroying acres of trees, and potentially contaminating a much wider region), with the same risks and outcomes continuing for hundreds of thousands of years, and longer, for future generations of Canadians, due to the unrefuted longevity of the full range of radioisotopes which would be dumped. The proposed site lies on a major fault line in a seismically-active region as identified by Natural Resources Canada. The underlying bedrock has been identified as being porous and fractured, with high levels of groundwater flow, going directly into the Ottawa River. Finally, there is relatively little about human health risks in the document, beyond the *unsupported assertion* that radiation doses will be within "acceptable limits."

This proposal can simply not be considered a mature, sophisticated waste management design, nor, by extension, can it *be considered to regulate our nuclear waste management in a way which affords any protection whatsoever of Canadians and our environment by any reasonable definition,* the main mandate of the CNSC.

Therefore, at this time, the federal government and specifically, CNL which has complete responsibility for the management of this proposed radioactive waste site, and the CNSC which is tasked with the approval or cancelation decision for licensing this project, **need to be strongly reminded of the direct, potent risk mechanisms to human health and well-being, and of the simultaneous risks of damage to our living, natural environments, our flora and**

fauna, our irreplaceable Canadian biodiversity, our precious water, air, land (which produces our food supplies) and other invaluable natural resources.

So, here is a brief but critical outline of these potent risk mechanisms, for these stated purposes: To contribute to the improved understanding of everyone involved in this decision at the CNSC to be able to easily *carry out its own stated mandate to protect the environment and current and future generations of Canadians, by rejecting this license request.*

More targeted comments and objections to specific aspects of the NSDF – which will echo closely what many other concerned individuals, indigenous and otherwise, community organizations and scientific bodies have also officially expressed in current and earlier phases of this public engagement process—will immediately follow these important reminders. ***I submit this review of the potent, intrinsic health risks inherent in nuclear wastes and more specific objections to the proposal which follow, for the purpose of contributing to the best possible decision: a clear rejection of this hopeless and dangerous plan.***

Effects of Ionizing Radiation on Human, Animal, Fish, Avian and other Species' Health

Microphysics: In nature, energy is regularly cast off from unstable atomic structures. When these particles or energies leave their previous orbits or shells and radiate outward, they are capable of imparting an electrical charge to other matter they encounter, and so are called "ionizing radiation." Such radiation can be, and is, quite damaging to biological structures.[i] As atomic physicist John Gofman described it:

"With ionizing radiation, electrons are removed from their atoms, and endowed with energies huge compared to those in ordinary chemical reactions. Such electrons maraud for great distances (compared with atomic dimensions in angstroms) and have the chemical capability to break any kind of bond one might care to visualize. In living biochemical systems, reactions are carefully controlled, often by special geometric juxtaposition of the reactants. A marauding high-speed electron simply does not notice all this elegant juxtaposition. It can break anything, anywhere. And once it has ripped an electron out of an atom in a molecule, that molecule is itself at such a high-energy level that it can produce all kinds of chemical reactions that would never have been possible without the ionizing radiation." [ii] **Therefore, ionizing radiation such as that created by nuclear waste, causes by its very nature an accelerated entropy of biological systems.**

In the human cell, certain chemical bonds are crucial to the integrity of the genetic code and breaking just a few of these bonds may endow the code with a permanent alteration. **When a mutated gene is responsible for regulating normal cell growth, an uncontrolled proliferation of damaged cells, or cancer**, can develop. **When mutation occurs in the procreative cells or in the developing embryo, birth defects** can result. **When mutation occurs in the blood-forming tissue**, **impairment of the immune response system** can result, and this can **increase susceptibility to an entire spectrum of human diseases**.

Radiation is therefore said to be mutagenic (cell-mutating), carcinogenic (cancer-causing), teratogenic (birth-defect inducing), and immuno-suppressing (resistance-impairing).

All of these effects, which begin at a submicroscopic level, remain invisible for extended periods of time until they reach observable proportions. The latent period may be decades in the case of an incipient cancer, or it may be centuries in the case of a genetic effect. **Another aspect of nuclear waste, then, is contributing to the suffering, ill health, and death of humans and all other life forms, over extremely long periods of time,[iii] tens of thousands of years in some cases, or even more, as we all know.**

Declassified reports from the Manhattan Project show that senior health physicists knew or suspected that: "... the genetic effect [from radiation] **has no threshold and exposure is not only cumulative in the individual, but in succeeding generations.**[iv] As health physics, microbiology, and human radio-epidemiology developed, **our early optimism about the harmlessness of low-level radiation vanished. Repeated studies verified that radiation is a powerful bio-genetic poison, capable of causing irreversible health damage at the lowest measurable doses.**[v] Today it has become universally recognized that there is no proven threshold for potentially fatal injury from radiation -- that there is no "safe" low dose. It is now also widely recognized that all exposures to radiation are cumulative; both in individuals, and in the species as a whole. **Indeed, studies have shown that exposure of parents increases the susceptibility of their offspring to cancer.**[vi] **We are thus confronted with accumulating genetic susceptibility to an increasingly radioactive environment, a process which places the survival of our species and all life forms in jeopardy.**[vii]

Against this backdrop of the biological science of the effects of ionizing radiation on human, animal, fish, and avian species, and with the physics of the half-lives of the documented contaminants which create extremely long-lived hazards in some cases, leads me to hereby register my strong objections to the highly lax NSDF for storage of nuclear wastes now being proposed by CNL at Chalk River.

Achieving a More Mature Regulatory Environment

> **The disposal of radioactive substances in a manner that reasonably anticipates their eventual potential release into the human and natural environments imposes a health burden upon future generations that cannot be justified by any moral, economic or legal rationale.**

The CNL, the proponents of this proposal themselves, predict that the mound is fully expected to eventually disintegrate in a process they refer to as “normal evolution,” a phrase which inaccurately but conveniently makes it sound safe and risk-free. The many ways the mound would be ***expected to leak*** are described in the project’s environmental impact statement!

Such a facility for permanent disposal of nuclear waste has never before been licensed in Canada. Regulations to limit radiation levels in this proposed NSDF do not currently exist. Any Canadian nuclear wastes from mining, from operating power plants with post-fission radioactive waste materials, the irradiated nuclear fuels, any building structures and materials exposed to radioactivity, and indeed, radioactive waste from all sources, destined for this site, must be highly and independently regulated, tracked, monitored and reported on, within set schedules, according to established international standards. There is no provision for this level of requisite monitoring in this proposal. Indeed, these wastes must be much more highly regulated than they have ever been, before, in Canada. The IAEA says that all radioactive wastes (except the “Very Low Level” category) must be carefully stored out of the biosphere, ***not*** in an above-ground mound. This proposal reinforces the huge credibility gap that developed during Canada’s first 60 plus years of deficient waste management approach because of its many continuing flaws. It could also potentially fail to address Canada’s international obligations under the *Joint Convention on the Safety of Spent Fuel Management* and on the *Safety of Radioactive Waste Management*. The giant pile of leaking radioactive waste would be difficult to remediate. Remediation costs are expected by many to exceed those of managing the wastes had they not been put in the mound. See the final comments section for other specific objections.

Allowing the same companies along with government bodies both of which are vested in the promotion of nuclear technologies to be the **captured regulators** is an immoral and unacceptable strategy, and denies all Canadians and

our natural environments, the due diligence required to live up to the government's own stated core policy of utmost care for our collective health and wellbeing. Therefore, the structure and process for approving this proposal are flawed. Changes to the Canadian Environmental Act made by the Harper government in 2012 eliminated independent panel reviews for nuclear projects and excluded the Ministry of Environment (at the time) from the decision-making process. The proponent of this dump, CNL, has been managed since 2015 by a consortium of profit-making multinational corporations, although the Chalk River site and its wastes remain under public ownership. The Harper government's motives became quite clear, by directing the consortium to "take actions to increase revenues generated from [nuclear] commercial activities." They have since planned to dispose of "waste arising from [these] commercial activities" in the NSDF. Their current contract ends in 2025, when they could simply walk away from any responsibility if they so choose.

The CNSC, an unelected body, has sole responsibility for the CNL project approval, and it has demonstrated an apparent unwillingness to protect the environment and a preference to favour industry interests over public safety concerns. Again, on this proposal, we have the example of the CNSC having promoted in the past, the very same types of projects it was also tasked with regulating. This flaw is so clear and obvious that intentionally designing our government's nuclear management structure in this way, as our government has done since 2012 is a national embarrassment and shame, with no exaggeration. In 2017, the Trudeau government released the report of the Expert Panel [Gelinas Panel] that reviewed the environmental assessment process, and set out how the government should make decisions on proposals which affect the health of Canadians and our environment, recommending a major shift towards more inclusive, evidence-based, and sustainable decision making. Unfortunately, our nuclear sector has resisted many of these changes, and has not adopted the next generation of impact assessments with values of independence, sustainability, public participation, improved governance of assessments, indigenous rights and co-governance, and strategic and regional assessments. I will address the proposal's most egregious and flagrant contradictions of these government recommendations in my final list of specific objections, immediately below:

Specific Objections to the NSDF

- ☹ **The mound would contain hundreds of radioactive materials, dozens of hazardous chemicals and tonnes of heavy metals. In addition to the considerable wastes already accumulated there during more than 50 years of operation of the Chalk River Nuclear Labs, radioactive wastes are planned to be brought in from across Canada.** Radioactive materials destined for the dump include tritium, carbon-14, strontium-90, four types of plutonium (one of the most dangerous radioactive materials if inhaled or ingested), and up to 80 tonnes of uranium. Twenty-five out of the 30 radionuclides listed in the reference inventory for the mound are long-lived. This suggests the dump would remain dangerously radioactive for 100,000 years. A very large quantity of cobalt-60 in the dump would give off so much intense gamma radiation that workers must use lead shielding to avoid dangerous radiation exposures. The IAEA says high-activity cobalt-60 is "intermediate-level waste" and it, along with all the other wastes in this category, destined for this mound, **must be stored underground according to current best practices and conventions. Canada would therefore be shirking its international obligations as a member state of the IAEA and a signatory to an international nuclear waste treaty if it allowed this dump to be licensed**. Dioxin, PCBs, asbestos, mercury, and up to 13 tonnes of arsenic and hundreds of tonnes of lead are other non-radioactive poisons which would go into the dump.

☹ The proposed license for the NSDF includes no enforceable requirements for "waste characterization". Here is the weak stipulation contained: "The licensee shall perform waste characterization at appropriate steps in the management of radioactive waste. The characterization of radioactive waste shall include the ***principal*** radionuclides relevant to safety and assurance that the waste or waste package will meet the acceptance criteria for the appropriate steps in the management of radioactive waste. Waste characterization shall include assessing the physical, mechanical, chemical, biological, thermal and/or radiological properties of the waste, including ***dominant*** radionuclide content, ***as applicable***. The licensee shall maintain records of the ***relevant*** characteristics of the waste based on the characterization performed." [emphasis added] Assessing only "principal" or "dominant" radionuclides is subjective. This means that the licensee can choose to ignore most of the radionuclides in the waste, making it impossible to track them and adhere to limits in the Waste Acceptance Criteria. The phrase "as applicable" means that even tracking "dominant" radionuclides ***is optional***.

Their word choices highlighted above are important examples of slick language which benefits the licensee by giving them options about the degree to which, and when and exactly how the characterization, assessment and tracking are to be carried out, and appears to enable them to decrease potential liabilities. Additionally, Section 3 (1) (j) of the General Nuclear Safety and Control Regulations requires that an application for a license provide, "the name, quantity, form, origin and volume of any radioactive waste or hazardous waste" to be disposed of. The NSDF Environmental Impact Statement only provides a list of 31 radionuclides that would go in the mound without describing in what waste types they are found (contaminated soils, demolition wastes, commercial wastes, etc.). The radionuclide list is incomplete. Dozens of radionuclides including decay products are missing from the list. There is also no information on quantity, form, origin or volume.

☹ This type of above-ground, low and medium waste storage is an experimental, unproven technology, and therefore puts Canadians at further risk. This is not compatible with the government's stated core policy of protecting the *Safety of People and the Environment,* and specifically breaks a number of international agreements designed to protect world citizens from experimentation, that Canada has signed. The draft plan fails to do this. (See next point.)

☹ As a party to the following international human rights treaties, conventions and covenants, by potentially allowing the use of unproven storage of fuel wastes, and by other potentially insufficient, unproven and dangerous waste management and decommissioning processes, the government would not be carrying out its responsibility to protect its citizens (and environments) from becoming unknowing subjects in what would amount to experimentation – and which has the strong potential to expose them unduly to unnecessary releases of ionizing radiation into its water, air, and food supply: The United Nations Universal Declaration of Human Rights; The United Nations International Covenant on Civil and Political Rights; The United Nations International Covenant on Economic, Social, and Cultural Rights; The United Nations Convention on the Prevention and Punishment of the Crime of Genocide; The Nuremberg Principles; The United Nations Convention on the Rights of a Child; and The Helsinki Agreement. We challenge the authority of the federal government and the Canadian Nuclear Safety Commission (CNSC) to thereby cause unknown rates of current and future fatal and other cancers, genetic effects, numerous illnesses and damage to the overall human and fauna populations, and the flora of all potentially affected regions.

Conclusion

Why does it matter that Canada has one of the least robust systems of nuclear governance in the world? The nuclear business comes with risks of catastrophic accidents and produces dangerous and potentially deadly wastes, as just outlined. The potentially lethal effects of nuclear energy cannot be disguised, and the most stringent measures taken can only perhaps decrease, but never eliminate, the risks. There is no safe level of exposure to the radioactive waste substances produced in nuclear reactors, from mining, milling, and refining, and in transportation and storage. These materials remain hazardous for many, many millennia. Robust nuclear governance is needed to protect humans, other life forms, and the environment from these risks.

In light of all that, to license a huge, uncapped above-ground nuclear dump sited on a hillside over top of porous, fractured bedrock, within a kilometer of the Ottawa River with only 2 plastic liners separating a heavy, 7-story pile of some of the most toxic, long-lived substances on earth **is not a justifiable, safe enterprise which is founded on principles of protection of human health and the environment!** Great risks, and no demonstrable, true benefit to be gained. The IAEA requires that "For facilities and activities to be considered justified, the benefits that they yield must outweigh the radiation risks to which they give rise." The IAEA review of Canadian practices states that "Th*ere is* ***no systematic evaluation of justification*** *for the various practices involving radiation sources in the licensing process*." [emphasis added]. The IAEA has suggested that the CNSC should "establish a procedure to ensure the systematic implementation of justification in the authorization of all practices involving radiation sources."

In the current license application by CNL, *there is a distinct and dramatic disconnect between the nuclear industry's need to deal with dangerous wastes, and the public's right to be protected from radioactive pollutants, which are already created.* ***By not explicitly addressing "justification", Canada's nuclear safety framework allows industry needs to prevail and planned radiation exposures to increase without any assessment of whether or not there are benefits to society at large that justify these predictable increased exposures.***

Given the poor site, it even appears that the nuclear wastes already there will need to be moved to a safer, below-ground storage location, if a suitable one can ever be found. Until then, careful interim storage and continuous monitoring will be required.

These are my comments on the most important failures and weaknesses of the Chalk River NSDF licensing proposal. Thanks in advance for including my complete submission on the public record of all feedback received.

[i] Bates, Albert K. The Karma of Kerma: Nuclear Wastes and Natural Rights, Journal of Environmental Law and Litigation Univ. of Oregon School of Law Vol 9, page 3 February 1988 & 1995

[ii] Gofman, J.W., Radiation and Human Health (San Francisco: Sierra Club Books, 1981), 23.

[iii] Bates, Id., 1.

[iv] Parker, H.M. Instrumentation and Radiation Protection, Health Physics 38:957, 970, June 1980

[v] Honicker, Petition for Emergency and Remedial Action Before the Nuclear Regulatory Commission (Petition), pp. 8-9 (1978); Mancuso, TY., et al., Radiation exposures of Hanford workers dying from cancer and other causes, Health Physics 33:369 (1977); Kneale, G.W., et al. Re-analysis of data relating to the Hanford study of the cancer risks of radiation workers, Late Biological Effects of Ionizing Radiation, Vol.1 (International Atomic Energy Agency; Vienna, 1978); Kneale, et al. Hanford Radiation Study III: a cohort study of the cancer risks from radiation to workers at Hanford, Br.].Ind.Med. 38:156

(1981)7 Advisory Committee on the Biological Effects of Ionizing Radiation (BEIR 111), The Effects on Populations of Exposure to Low-Levels of Ionizing Radiation: 1980 (Academy Press; Washington, 1981); and Stewart, A.M., Delayed effects of A-bomb radiation: a review of recent mortality rates and risk estimates for five-year survivors, Br.].Epid. and Com.Health, 36:80 (1982).

[vi] Petition; ibidat 17; and see, Bross, I.D.J., and N. Natarajan, Cumulative genetic damage in children exposed to preconception and intrauterine radiation, Investig. Radiology 15:52 (1980).

[vii] Petition at 150; and see, Bertell, R., Radiation Exposure and Human Species Survival, Envir. Health Rev. (Canadian Inst. of Public Health Inspectors, June 1981), 43-52 (App. Br. at 12).