

We Will Not Compromise Safety

a written intervention by

The Canadian Coalition for Nuclear Responsibility

submitted to

The Canadian Nuclear Safety Commission

in the context of

Cameco's application for a 20-year licence

for the

The Port Hope Conversion Facility

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Cameco has applied to renew its operating licence for the Port Hope Conversion Facility (PHCF) for a term of 20 years. The present 10-year licence expires on February 28, 2027. The applicant is not asking for any changes in the current conditions of the licence, going forward, other than extending the term from 10 years to 20 years.

Uranium is a naturally occurring radioactive heavy metal. The Port Hope plant produces two specific chemical compounds of uranium: uranium hexafluoride (UF_6) for export and uranium dioxide (UO_2) for domestic use.

Canada is the world's second largest producer and exporter of uranium. Uranium ore is mined and milled in Northern Saskatchewan. From the mill, a solid uranium concentrate—commonly called “yellowcake”—is packed in drums as a fine powder and trucked to the Blind River refinery in Ontario. Yellowcake is a semi-processed mix of uranium oxides, mainly U_3O_8 . It does not react readily with air or with water, but it is easily inhaled if spilled. It is a powerful nephrotoxic heavy metal that can severely damage the kidneys if inhaled.

Uranium mining and milling leaves a long-lived radioactive footprint. Voluminous sand-like radioactive wastes called “uranium mill tailings” are left behind as an unwanted byproduct of the milling process. Canada has so far accumulated about 230 million tonnes of uranium tailings in Ontario, Saskatchewan and the Northwest Territories. These tailings contain over 70 percent of the total radioactivity present in the original ore. To be precise, the wastes contain most of the naturally-occurring radioactive byproducts of uranium such as radium-226, thorium-230, polonium-210, lead-210, and radon-222, all created spontaneously from the disintegration of uranium atoms over millions of years. Uranium mill tailings will remain radiotoxic for hundreds of thousands of years to come.

The Blind River facility, situated on the north shore of Georgian Bay, receives yellowcake from Canada, the United States and Australia for further processing. It is the largest uranium refinery in the western world. It removes impurities from the yellowcake and ships the refined uranium to Port Hope in the form of uranium trioxide powder (UO_3). The raffinate (refinery waste) remains behind at the refinery as radioactive waste.

Cameco's Port Hope facility (PHCF) converts 85 to 90 percent of the refined uranium trioxide from Blind River to a hazardous and highly reactive chemical compound called uranium hexafluoride (UF_6), while the other 10 to 15 percent is converted into a much more stable compound called uranium dioxide (UO_2). These two conversions are separate processes taking place within the Port Hope facility. Uranium hexafluoride is slated for export; it is solely intended for the purpose of uranium enrichment. Uranium dioxide is for domestic use; it is sent to an Ontario fuel fabrication plant prior to its use in CANDU nuclear reactors.

The export product, uranium hexafluoride – known in the industry as “hex” – is an extremely dangerous compound. It has to be handled very carefully. It reacts violently on contact with water or moist air, releasing toxic and corrosive chemicals. The rapid and energetic reaction creates a dense white cloud of corrosive gas, posing serious health hazards. The cloud is made of gaseous hydrogen fluoride (HF) and tiny particulates of solid uranyl fluoride (UO_2F_2).

On contact with skin or lungs, HF becomes liquid hydrofluoric acid. It causes deep caustic burns, severe respiratory damage, and pulmonary edema (whereby fluid builds up in the tiny air sacs of the lungs, making it very hard to breathe). It attacks eyes, destroys corneal tissue and can cause blindness. Acute high-dose exposure can be fatal, as in the 1986 Sequoyah Fuels incident discussed below. If uranyl fluoride is inhaled, serious cellular damage to the kidneys can occur within 24 to 48 hours. At the same time, radioactive material lodges in the lung, increasing the risk of cancer years later.

The Sequoyah Fuels plant, located in Gore, Oklahoma. was a uranium hexafluoride conversion facility also. It began operations in 1970. The Sequoyah plant suffered a serious accident in 1986 when an overfilled UF₆ cylinder was heated by workers (contrary to regulations) and internal gas pressure made it burst. Worker James Harrison (25) was killed; over 100 workers, travelers, and residents required medical evaluation and treatment for toxic gas exposure due to hydrofluoric acid and uranyl fluoride exposures as well. Twenty-one of them were hospitalized. Interstate highway 40 and several local areas faced temporary closures, as the toxic cloud travelled 29 kilometres in a 40 km/hr wind.

Bear in mind that the consequences described above resulted from the accidental release of the UF₆ in one transport cylinder only. Evidently a much more severe accident would have correspondingly more serious consequences. The Sequoyah plant was forced to shut down in 1992 for safety reasons, after another toxic release occurred.

The immediate chemical hazard from UF₆ is entirely due to hydrogen fluoride gas. Although UF is lighter than air, the dense cloud of white “smoke” of uranium fluoride stays close to the ground because of the heavy particles of uranyl fluoride. The plume drifts horizontally at a low elevation before dispersing. Inhalation of uranyl fluoride particulates can cause severe kidney damage a day or two later. The chemical hazard is vastly more significant than the radiation hazard. However, the radiation hazard is by no means insignificant, because uranium is an internal alpha-emitting radionuclide – a class 1 carcinogen.

See “Oklahoma Town Ponders Impact of Nuclear Fuel Plant’s Fatal Accident
by J. Michael Kennedy, Los Angeles Times, Jan. 8, 1986.
<https://www.latimes.com/archives/la-xpm-1986-01-08-mn-533-story.html>

After the Gore accident, a Nuclear Regulatory Commission (NRC) official admitted that uranium processing plants fell into a “regulatory crack” since they handle both radioactive and chemically toxic materials. Most plants handle either one or the other, but not both, and so are regulated by different federal agencies. Because of the Gore accident, NRC rules for these types of processing plants quickly changed to include chemical operations as well as

those involving radioactivity. In Canada the same is true for plants regulated by the Canadian Nuclear Safety Commission (CNSC). Accordingly, the PHCF falls under the terms of the Nuclear Liability and Compensation Act (NLCA), even though the chemical hazard following a severe accident far exceeds the radiological hazard.

The Nuclear Liability and Compensation Act (NLCA) was created by the Parliament of Canada because no private home insurance or business insurance policy will provide coverage for persons or property that become contaminated as a result of an accident at a nuclear facility. Every such insurance policy has an explicit “nuclear exclusion clause” that voids coverage in such an event. Injured parties seeking recompense for property damage or personal liability will have to seek recourse from the plant operator (in this case Cameco) or from the Government of Canada.

The Port Hope plant is one of only two uranium hexafluoride conversion facilities currently operating in North America, and one of only five in the entire world. The sole operating U.S. “hex plant” is the Metropolis Works in Illinois. It has been owned by Solstice Advanced Materials since October 2025; it was previously owned by Honeywell.

Let us compare the surrounding population density in both cases. According to US Nuclear Regulatory Commission (NRC) reports, only 212 people live within a mile of the Illinois plant; and just 13 homes are located within half a mile of the six-story uranium hexafluoride processing building.

By contrast, the entire concentrated urban core of Port Hope – housing about 13,000 people out of a total population of 17,000 – lies within a two-mile radius of the Cameco plant. Considering the possible consequences of a severe accident at PHCF releasing a large cloud of concentrated acid and toxic material, does the town have a well-thought-out and well-rehearsed evacuation plan that is familiar to the citizenry? How long would it take to evacuate the downtown area in case of an emergency?

Despite precautions, accidents do happen. In January of 2023, an equipment failure at the Illinois plant caused an accidental release of 800 pounds of hydrogen fluoride gas when a reboiler exploded, triggering a local "shelter-in-place" order for the surrounding Metropolis community and closing nearby highways. No serious injuries were reported, but the event reignited intense local anxiety regarding lack of adequate emergency communication and questionable plant safety due to decades of historical emissions and accidental leaks dating back to the 1950s. Given the much greater population density around the Port Hope plant, any comparable event there could be far more consequential, especially given the history of widespread radioactive and chemical contamination throughout the town and the ongoing multibillion dollar cleanup.

On October 21, 2021, a worker without adequate protective equipment was exposed to HF gas at the Illinois plant when a corroded gasket failed. He was rushed to hospital but soon died there. On June 7, 2024, a contract worker was seriously injured during maintenance work when residual HF gas was unexpectedly released from piping. He spent two days in hospital with serious injuries and second degree burns from exposure to HF.

In September 2026, Solstice Advanced Materials (the current owners of the Illinois plant) agreed to an \$80 million settlement to resolve long-standing class-action lawsuits alleging that the plant's radioactive and toxic discharges had contaminated local properties and caused a spike in cancers among town residents. Back in October 2014, a leak inside the plant had created a noticeable chemical cloud outside the plant. Honeywell (owners of the plant at that time) insisted publicly that the leak was confined to the operations area. However, Nuclear Regulatory Commission (NRC) logs reveal that members of the public reported seeing the toxic plume escape the building for five minutes before mitigation systems were activated.

See: "U.S. Chemical Safety Board Issues Final Report on Toxic Hydrogen Fluoride Incidents"
<https://www.csb.gov/us-chemical-safety-board-issues-final-report-on-toxic-hydrogen-fluoride-incidents>

And, of course, there have been unanticipated mishaps at the PHCF plant as well. An unplanned release of uranium hexafluoride occurred in September, 2025. A leak occurred in a hydrogen fluoride (HF) line due to over-pressurization in August 2025. A small release of UF₆ happened from a line on the third floor of the plant while the facility was not in operation in October 2024. A procedural non-compliance incident led to a small release of hydrogen fluoride fumes during routine maintenance in May 2017. In the latter case, the CNSC issued an administrative monetary penalty of \$17,830 to Cameco for failing to follow approved procedures. And so it goes.

The PHCF is already 44 years old. That's 22 years older than the Sequoyah plant was when it was permanently shut down. It's also 32 years older than the Port Hope precursor of the PHCF, known as "building 27". Building 27 was the first uranium hexafluoride conversion facility at Port Hope; it operated from 1970 to about 1982. If PHCF is granted a 20-year licence renewal, it will be 64 years old by the end of that term. That's pretty old! Aging facilities and aging equipment are generally not as reliable or as leak-tight as intended

As the Port Hope conversion facility grows older, a higher priority should be given to ensuring that the plant has a substantial exclusion zone of at least 2 kilometres that will act as a buffer to protect the surrounding population in the event of accidental releases of highly toxic chemicals such as uranium hexafluoride, hydrogen fluoride or uranyl fluoride. An exclusion zone provides extra insurance that people and their property will be protected even if a severe accidental release occurs. The people of Port Hope deserve this extra insurance, especially since the Nuclear Liability and Compensation Act has deprived them of the option of accessing private insurance to guarantee them compensation from an insurance company in the event of a major accident.

Of course, a severe accident at PHCF is unlikely. But so is a severe nuclear reactor accident. Nevertheless, nuclear reactors have safety systems – emergency core cooling

systems, vacuum buildings, and duplicated rapid shutdown systems – just in case such a highly improbable accident occurs. Everyone hopes they will never be needed, but there they are. These emergency measures are available to protect people in case of an emergency – especially an unforeseen emergency.

The Illinois UF₆ conversion facility has far fewer private residences and commercial establishments within two kilometres than PHCF has. The owners of the Illinois plant are considering buying all the properties within a mile of the plant in order to create such an exclusion zone free of residences. If Cameco finds that purchasing all relevant property within a two-kilometre radius of PHCF is prohibitively expensive, the plant should be relocated to a more suitable location that can more easily accommodate such a two-kilometre exclusion zone.

Recommendation 1. That CNSC require Cameco to establish and maintain an “exclusion zone” of at least 2 kilometres around the PHCF plant as a prudent margin of safety for the population in case of a large release of uranium hexafluoride or hydrogen fluoride.

Recommendation 2. That CNSC not grant a licence to Cameco for the PHCF for a period of more than two years, so that if recommendation 1 cannot be fulfilled for any reason, the PHCF shall be relocated to a site that will be able to accommodate such an exclusion zone.

In 1984, one year before the Sequoyah incident described above, there was a close call at the Metropolis Works in Illinois. The circumstances were eerily similar – an overfilled UF₆ shipping cylinder needed to be relieved of some of its loading. The workers, violating prescribed procedures, heated the cylinder, but fortunately it did not burst.

The workers knew that, when heated, solid UF₆ will turn into a liquid and can then be “poured out” to lighten the load. However, what the workers perhaps did not appreciate is that the UF₆ can also turn into a gas without warning, creating a sudden overpressure situation leading to a rupture of the cylinder.

See “How an Illinois Plant Dodged a Uranium Bullet”

Chicago Tribune, January 26, 1986 ; UPDATED: August 9, 2021

<https://www.chicagotribune.com/1986/01/26/how-an-illinois-plant-dodged-uranium-bullet/>

In fact, the only reason for making such a dangerous chemical compound as UF_6 in the first place, is to get uranium into a gaseous form at a relatively low temperature. It turns out that UF_6 is one of the only chemical compounds of uranium that can be easily turned into a gas.

Once the uranium is made into a gas, it becomes possible to separate the lighter atoms (uranium-235) from the heavier atoms (uranium-238) by using an array of “ultracentrifuges”. Each ultracentrifuge spins very fast, driving the heavier atoms outwards towards the perimeter while keeping the lighter atoms closer to the central axis. If this is done over and over and over again, higher and higher grades of enriched uranium can be obtained where the heavier atoms have been dramatically reduced and the concentration of lighter atoms is greatly increased. The uranium has been “enriched”.

Canada has no uranium enrichment plant, and most countries in the world do not have one – for very good reasons! Uranium-235 is the only material found in nature that can sustain a nuclear chain reaction, so it’s the only kind of uranium that you can use to make an atomic bomb or to fuel a nuclear reactor. The greater the concentration of uranium-235, the more “enriched” the uranium has become. Very highly enriched uranium can be used to make an atomic bomb (e.g. the highly enriched uranium bomb that destroyed Hiroshima on August 6, 1945). A much lower degree of enrichment is required to fuel many of the world’s nuclear reactors. The Canadian CANDU reactor design is unusual in that it does not require enriched uranium at all; it can operate on natural (unenriched) uranium perfectly well.

But in principle, any regime with a well-constituted uranium enrichment capability can choose to make weapons-grade uranium (>90 percent uranium-235). From there it is a short step to having a full-fledged nuclear weapons arsenal. That possibility – allegedly – is what led to Iran being attacked twice by the USA and Israel in the last couple of years.

The world has witnessed how Iran has responded to such devastating military attacks. “Unsymmetric warfare” has induced Iran to attack its neighbours in the Gulf area. Some commentators worry that the Iranian regime may also plot terrorist retaliations of various kinds. In Britain, a group of young men seemed to be planning an explosive attack on an American military air force base; was this directly linked to the Iranian regime? In Saudi Arabia, a plane bound for Tel Aviv made an emergency landing after the pilot was stabbed by the co-pilot; was this an Iranian plot? In both cases it is too early to say for certain, but the possibility exists. And, for that matter, it really doesn’t make much difference if it is a government plot or an act by a radicalized individual.

The ostensible rationale for why Iran was attacked twice in the last eighteen months was because of its enriched uranium. The first strike with bunker-buster bombs on June 13, 2025, destroyed 22,000 of Iran’s uranium hex centrifuges, it is thought, but not Iran’s stockpile of 440 kilograms of 60 percent enriched uranium that had already been produced prior to the attack. The subsequent war on Iran, launched on February 28, 2026, was supposed to bring about regime change so that the nuclear weapons threat from Iran based on highly enriched uranium could be put to rest. Instead, the war became mired in a struggle over the Strait of Hormuz and various attempts to limit the economic instability worldwide caused by the subsequent petroleum price surge.

If Iran (or an Iranian sympathizer) is searching for a way to retaliate on the nuclear front, what could be done? Well, one cannot have enriched uranium without first having uranium hexafluoride. Where is the most uranium hexafluoride in North America being produced? At the Port Hope Conversion Facility. Could that facility become an Iranian-inspired terrorism target?

It is not unreasonable to suppose that Iran (or an Iranian sympathizer) could plan, overtly or covertly, a terrorist attack on the PHCF. Such an attack could be launched by air, by water, or by land. It could cause devastating releases of toxic chemicals within the Port Hope

community and beyond. Most importantly, such an act would hinder other countries from ready access to enriched uranium by depriving them of sufficient quantities of uranium hexafluoride, thus exacting revenge for the attacks on enrichment facilities in Iran.

Recommendation 3: That CNSC not grant a licence to Cameco for the Port Hope Conversion Facility for a period exceeding two years, during which time Cameco be required to devise a detailed emergency measures plan based on the contingency of a terrorist attack on the plant, with a well-publicized evacuation plan for the entire downtown area of Port Hope including a full rehearsal of such an emergency evacuation plan.
