

**Submission to Industry and Trade Committee
Study on the Development and Support of the Electronics, Metals and Plastics Recycling Industry.**

April 19, 2023

Title: Concerns respecting reprocessing of nuclear fuel waste in Canada.

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Introduction:

There is a policy vacuum in Canada relating to reprocessing nuclear fuel waste to extract plutonium. This is of urgent concern since present risks relating to proliferation are being raised by recent government funding of research into nuclear waste reprocessing. This submission will detail the reasons for our concern, and call on the Committee, as part of its study on the circular economy, to recommend that Canada explicitly ban reprocessing of nuclear waste.

Summary:

Canada should not consider reprocessing nuclear fuel to extract plutonium as part of its plans for a low carbon circular economy. Canada has a longstanding commitment to discourage and, where possible, prevent the proliferation of nuclear weapons capabilities. Reprocessing nuclear waste results in the separation of plutonium. Although the stated intent of doing so may be for additional nuclear fuel power generation, this raises serious security concerns. Since plutonium is one of the most widely used primary nuclear explosive material in the world's nuclear arsenals, non-proliferation experts are agreed that ready access to plutonium must be discouraged, and prevented where possible.

Once nuclear explosive materials become readily available, it is simply a matter of political choice whether a nation state will use such material for civilian or for military purposes. Moreover, if such material is stolen or diverted, subnational groups (including criminals and terrorists) can make their own nuclear explosive devices. Accordingly, Canada should ban any reprocessing of used nuclear fuel for the purpose of extracting plutonium regardless of its alleged intended use.

Recommendation:

The government of Canada should explicitly ban plutonium reprocessing from nuclear fuel waste in Canada.

Supporting Information:

Canada on March 31, 2023 finalized a new national policy on radioactive waste: Canada's long overdue new Policy on Radioactive Waste and Decommissioning <https://natural-resources.canada.ca/our-natural-resources/energy-sources-distribution/nuclear-energy-uranium/radioactive-waste/canadas-policy-for-radioactive-waste-management-and-decommissioning/24987> .

In consultations leading to this finalized policy, Canadian Environmental Law Association submitted that the government should ban any reprocessing of used nuclear fuel within Canada. CELA also sent communications to all Canadian Parliamentarians calling for their support for such a ban on nuclear security grounds.

The new federal radioactive waste policy did not do so; rather the new policy states that the issue of reprocessing nuclear fuel waste is outside of its scope. The government of Canada, in its recently released radioactive waste policy, stated that

“Reprocessing, the purpose of which would be to extract fissile material from nuclear fuel waste for further use, is not presently employed in Canada, and so is outside the scope of this Policy; if ever brought forward, the radioactive waste from such a project would fall within the scope of this Policy.”

Accordingly, the risks of proliferation that ensue from allowing for reprocessing of nuclear fuel in Canada were not addressed in the federal radioactive waste and decommissioning policy. CELA submits to this Committee, that as part of its study on the circular economy, it should recommend to the government that this issue should not be deferred to the future; rather an outright clear ban on reprocessing must be expressed as current policy of the Government of Canada. In light of current projects and research which are proceeding with federal funding support regarding small modular reactors, some of which would conduct reprocessing and utilize reprocessed nuclear waste, we urge that the time is now for Canada to explicitly express a policy to ban reprocessing of nuclear waste in Canada, and to reconfirm the decades-long informal ban on nuclear waste processing that has existed in Canada since the mid 1970's.

Waste Considerations

Extracting plutonium from used nuclear fuel does not eliminate the need for a permanent nuclear fuel waste management program. Many of the radioactive constituents of the post-reprocessing waste are extremely long-lived, on the scale of millions of years. Numerous studies have concluded that reprocessing produces several waste streams that are more challenging to manage than the existing solid fuel assemblies.

Nuclear Explosive Materials

A socially acceptable policy on nuclear waste reprocessing must be in conformity with Canada's longstanding commitment to discourage and, where possible, prevent the proliferation of nuclear weapons capabilities. This objective is in line with parallel ongoing efforts to discourage the use of, and prevent access to, highly enriched uranium (HEU), the other primary nuclear explosive material in existing nuclear arsenals. (A primary nuclear explosive is any material that can undergo a nuclear explosion without the need for any additional nuclear explosive material.)

Reprocessing and Plutonium Extraction

Unlike uranium, plutonium is not a naturally-occurring material (except in trace amounts). Plutonium is a human-made uranium derivative. It is created as a by-product in every nuclear reactor that is fueled with uranium. All reactor-produced plutonium is weapons-usable once it has been extracted from the intensely radioactive used nuclear fuel. Thus, by being irradiated in a nuclear reactor, non-weapons usable uranium creates weapons-usable plutonium.

Any technology that is capable of extracting plutonium from used nuclear fuel is called “reprocessing”. Without reprocessing, the plutonium remains inaccessible and unusable for weapons or for any other use. Used nuclear fuel is so intensely radioactive that, immediately after discharge, any unprotected human standing within one metre of a used nuclear fuel assembly would receive a lethal dose of gamma radiation in less than a minute. The radiation barrier makes plutonium inaccessible without a robotically-run reprocessing plant of some kind.

Once it has been separated from the other radioactive waste materials by reprocessing, plutonium poses a weapons-proliferation risk. Plutonium gives off relatively little penetrating radiation and so it can be safely transported without heavy shielding and even smuggled across some borders with relative ease. It can be clandestinely incorporated into a nuclear explosive device.

For this reason, President Carter, who was trained as a naval nuclear engineer, banned commercial reprocessing in the USA in 1977. That same year, in Canada, Atomic Energy of Canada Limited (AECL) urged the federal government to support its plan for building two demonstration reprocessing plants in Canada – one to extract plutonium from used uranium fuel, the other to extract an artificial fissile material called uranium-233 from irradiated thorium rods.

The Canadian government, under Prime Minister P. E. Trudeau, did not give its approval to AECL’s proposal to launch commercial reprocessing in Canada. Since all existing nuclear weapons require either highly enriched uranium (HEU) or plutonium as a primary nuclear explosive, Prime Minister Pierre Elliot Trudeau portrayed these two nuclear explosive materials as “the vital oxygen on which the nuclear arms race feeds” in a speech to the United Nations General Assembly in 1978. The then Prime Minister advocated a “strategy of suffocation” as a preliminary but necessary step if the world wants to achieve a nuclear weapons free world. He told the General Assembly that we must choke off the vital oxygen on which the nuclear arms race feeds, by ending the production of weapons-grade uranium and plutonium.

We urge the present government, to rearticulate the federal policy to ban plutonium reprocessing in Canada on non-proliferation grounds.

Nine eminent non-proliferation experts from the USA have recently written three open letters to the Prime Minister in 2021 urging the Canadian government to conduct an independent proliferation review of a current reprocessing proposal in Canada at Point Lepreau. The authors state:

“Our main concern is that, by backing spent-fuel reprocessing and plutonium extraction, the government of Canada will undermine the global nuclear weapons non-proliferation regime that Canada has done so much to strengthen.”

Proliferation Vulnerability

There is a fundamental difference between uranium and plutonium.

From a non-proliferation perspective, uranium falls into two categories: weapons-usable uranium, and non-weapons-usable uranium. These categories are defined by the relative percentage of the only naturally-occurring chain-reacting isotope of uranium, called uranium-235. Weapons-usable uranium contains 20% uranium-235 or more. Uranium with less than 20% uranium-235 is not weapons-usable.

In contrast to uranium, all reactor-produced plutonium is weapons-usable. There is no known way to render such plutonium unusable for nuclear weapons purposes. Reprocessing is the key technology that makes plutonium available for use as a reactor fuel or as a nuclear explosive.

Some nuclear power advocates argue that the reprocessing technologies they have adopted are “proliferation resistant” because of the presence of other radioactive elements and the lack of “purity” of plutonium in the reprocessed fuel. However, a major study of proliferation vulnerabilities associated with civilian plutonium use, involving seven eminent nuclear research labs in the USA, concluded in July 2009 that a mixture of plutonium and minor actinides is not truly proliferation-resistant because it is relatively easy for a would-be proliferator to complete the separation process and obtain chemically pure weapons-usable plutonium. Most of the separation work has already been done by the reprocessing operation. A more recent study by the US National Academy of Sciences published in 2022 reached the same conclusion.

International Ramifications

The first reactors built in the US, Canada, the UK, France, Russia and China, were in part intended to produce plutonium for bombs. Reprocessing technology was developed and deployed in each of these countries.

Japan is the only non-nuclear weapons state that practices commercial reprocessing of used nuclear fuel. There is considerable economic and political pressure for Japan to stop doing so, particularly in light of the collapse of Japan’s “breeder reactor” program. If Canada supports reprocessing and engages in reprocessing, we will be only the second non-nuclear-weapon state to do so. The potential for multiplying the number of nuclear weapons capable states is obvious and alarming.

Conclusion

Failure to ban reprocessing of nuclear fuel in Canada will not solve nuclear waste issues; it will make them worse. It will increase the level of threat of diversion of plutonium from Canada for adverse purposes. It will decrease the world-wide commitment to reducing stocks of materials useable in atomic weapons. No “fuel chain” should be created whereby nuclear fuel is “recycled” or “reprocessed” due to the exponential increase in global security hazard from atomic weapons or misuse of the separated plutonium. Just as Canada has been participating in ending programs utilizing highly enriched uranium on non-proliferation grounds, Canada must also ban reprocessing plutonium from used nuclear fuel on the same grounds.

Submitted by the Canadian Environmental Law Association

Acknowledgements:

This briefing to the Committee on Industry, Trade and Commerce on its study of a circular economy was prepared based on research and submissions from the Nuclear Waste Watch Radioactive Waste Policy Steering Committee, consisting of members of civil society from across Canada.

ABOUT the Canadian Environmental Law Association:

Canadian Environmental Law Association (“CELA”) is a public interest law clinic dedicated to environmental equity, justice, and health. Founded in 1970, CELA is one of the oldest environmental advocates for environmental protection in the country. With funding from Legal Aid Ontario (LAO), CELA provides free legal services relating to environmental justice in Ontario, including representing qualifying low-income and vulnerable or disadvantaged communities in litigation. CELA also works on environmental legal education and reform initiatives.

Resources:

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