

The Honourable Chrystia Freeland
Deputy Prime Minister and Minister of Finance
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February 13, 2021

Subject: Public Suggestions for the 2021 Federal Budget

Dear Minister Freeland:

For Canada's future prosperity we need to develop a dependable and sustainable clean energy technology that will provide good jobs for Canadians, that will meet both our heating and electricity generation needs and that will ensure we meet our CO₂ emission reduction goals. We recommend the Minister of Finance with the support of the Minister of Natural Resources, Minister of Environment and Climate Change and Minister of Innovation, Science and Industry incorporate a meaningful funding allotment in the 2021 and future budgets specifically reserved for (1) the development of commercial-scale recycling of used Canadian Deuterium Uranium (CANDU) reactor fuel to produce fuel for fast-spectrum nuclear reactors (FNRs) and (2) the development and deployment of a Canadian pool-type sodium cooled FNR that is safe for siting in urban areas.

Canada's annual fossil-fuelled thermal energy requirement is approximately twice Canada's total annual electricity consumption. The only proven sources of additional large scale sustainable and dependable non-CO₂-emitting energy are liquid sodium cooled FNRs. Renewable energy is not sufficiently dependable and CANDU reactors are not fuel sustainable on the scale required for total fossil fuel displacement.

Unlike our existing CANDU reactors, pool-type liquid sodium cooled FNRs can be made passively safe, i.e. they shut down under adverse conditions without operator or automated intervention. This feature allows the reactors to be safely located within city boundaries for provision of commercial steam heat, district building heat and electricity. We have had pool-type water cooled nuclear reactors operating safely on Canadian university campuses for many decades. The major difference between a water pool and a sodium pool is that the sodium pool operates at a higher temperature which enables electricity and commercial steam heat production. The electricity generation process produces lower temperature heat for district building heating.

The safety of sodium cooled FNRs has been demonstrated for many years. Russia has had many models of sodium-cooled power reactors in operation since 1973, with two currently comparable in size to a CANDU power reactor, and a larger version is under construction. The USA developed a small passively safe FNR which operated flawlessly during its 30-year life.

FNR fuel can be made by electrolytic recycling of used CANDU reactor fuel, of which Canada presently has over 60,000 tonnes in storage at reactor sites. Electrolytic used CANDU fuel recycling will address public concerns with respect to both nuclear fuel waste disposal and nuclear weapons proliferation.

Why do we need FNRs at this time? Four reasons: climate change mitigation, reduced nuclear fuel waste, superior fuel efficiency/sustainability and improved public safety. As compared to existing CANDU reactors, pool-type sodium cooled FNRs are passively safe, are 100x more efficient in use of natural uranium and produce 1000x less long-lived nuclear waste per unit of energy output. Recycled CANDU used fuel contains the isotope Pu-240 which makes the resulting FNR fuel unsuitable for military purposes.

The North American utility and nuclear sectors have been reluctant to undertake serious work to commercialize pool-type sodium cooled FNRs and associated fuel recycling technology because they have not been required to improve their fuel utilization or reduce their nuclear waste. These sectors currently plan

to discard Canada's used CANDU fuel in a deep geologic repository even though only 1% of its contained energy has been consumed. They have created a multi-billion-dollar trust fund for that purpose. However, that waste disposal plan is not consistent with our need for complete fossil fuel displacement to meet our climate change mitigation goals. The FNRs' superior fuel efficiency can completely displace fossil fuels for centuries using existing used fuel stockpiles and proven uranium reserves.

Our ASK. We believe there is a much better option for Canada that is likely to be received more favourably by the public. It requires long-term investments by the federal government and federal policy changes with respect to management of used nuclear fuel and allocation of used nuclear fuel trust funds.

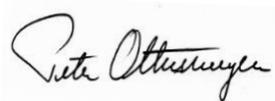
Electrolytic nuclear fuel recycling presently operates in a U.S. laboratory at the several kg per day level. This fuel recycling process has the distinct advantage of no spurious waste streams and has a very high resistance to nuclear weapons proliferation. Patent protection has run out. This process needs to be commercially scaled up about 1000x to support a Canadian fleet of FNRs. Fuel recycling can be done within the framework of the federal 2002 Nuclear Fuel Waste Act in relation to articles 20(2) referring to a "new approach".

Due to the federal government's new policy on carbon pricing, energy produced from electrolytic nuclear fuel recycling and FNRs will become competitive with natural gas in Canada by 2030. With your support the development of commercial scale electrolytic nuclear fuel recycling can be ready by that date. The utilities are governed under provincial laws and policies and are unlikely to undertake that development work on their own. However, recycling of used nuclear fuel into FNR fuel will eliminate the need for deep geological repositories, not just in Canada, but elsewhere as well. The current trust fund balances for used fuel waste management should be repurposed for electrolytic fuel recycling and FNR development and deployment. The residual trust funds can be returned to the used fuel utility owners.

A crucial benefit of recycling used CANDU fuel would be elimination of the need for foreign and expensive enriched uranium fuel to start new FNRs or any other type of SMRs (small modular reactors) in Canada. Canada does not have uranium enrichment facilities. Recycling CANDU used fuel would allow Canada to remain independent of other countries for the supply of FNR start fuel.

In summary we recommend the Minister of Finance include funding in Canada's 2021 and future budgets to develop commercial-scale recycling of used CANDU fuel to produce fuel for FNRs and to develop and deploy safe pool-type sodium-cooled FNRs to displace fossil fuels in both heating and electricity generation applications.

Sincerely,



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