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Written submission from Stephen Lawrence

Mémoire de Stephen Lawrence

In the Matter of the

Ontario Power Generation Inc.

Application for a licence to construct one BWRX-300 reactor at the Darlington New Nuclear Project Site (DNNP)

Commission Public Hearing
Part-2

January 8, 2024

À l'égard d'

Ontario Power Generation Inc.

Demande visant à construire 1 réacteur BWRX-300 sur le site du projet de nouvelle centrale nucléaire de Darlington (PNCND)

Audience publique de la Commission
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Submission document by Steve Lawrence, 409 -3133 Tillicum Rd., Victoria, BC, for the hearing for OPG's application to construct a BWRX-300 at the Darlington site. November 4, 2024

The application by OPG to construct a BWRX-300 reactor has aspects that go beyond what CNSC is mandated for and needs action first by the federal government, who, in turn, needs to engage the international community. While OPG is submitting the application, the only other entity named is GE / Hitachi. There are many more interests involved in pushing this forward. It is getting to be a real mess of proponents and jurisdictions and economic wish lists. The Feasibility study conducted by the provinces is all about economic opportunities and makes no mention of handling of nuclear waste. So much for the environment. This is the Achilles heel of this industry - how can you sell nuclear technology to countries who may not even have a suitable site for permanent storage, or couldn't afford one?? While deep disposal is a best practices solution, which hasn't reached approval in Canada, I would question whether it is even a good solution? How can you even propose to build a new nuclear reactor, even in Canada, without an approved permanent storage site for the waste that will be created? In considering its responsibilities, if the CNSC approves this project they will be opening a floodgate not only across Canada, but globally. I am not sure it will be able to regulate/control the environment, health, safety, national security and maintain its reciprocal international obligations with this development. It looks like the beginning of a free-for-all where Canada's obligations should be to act as a watchdog instead of feeding the fire. In considering the ramifications of this approval, I don't feel the CNSC can even make a decision on this until the government of Canada has gone through a public process to decide a) what it wants to do with its own nuclear waste and, b) whether the public wants to be involved in a process whose end result will be the dissemination of nuclear technology to any jurisdiction in the world who wants it. It seems like the mother of all wishful thinking, that nothing can go wrong if everybody has access to radioactive materials and waste. There are obviously corporate interests who are lobbying and pushing for this application approval to the extent that they have already done the site prep and excavated for the reactor vessel, but that is not a proper reason for allowing it to go forward. I do not believe the CNSC mandate can allow it to move forward on this until the government of Canada has performed its duty to the public. There is no way the CNSC can give the green light on the dissemination of this technology on behalf of the Canadian public - there is just too much at risk. It is rapidly leading to a situation where CNSC will have little control and will not be able to fulfill its obligations towards national security and international obligations. The commercial sector will be everywhere. There are interests that will say, in the interests of taking climate action, who want to use nuclear energy to develop their oil reserves - this is just manipulation. As we speak there are theatres of war operating that include nuclear reactors and countries who may not hesitate to use nuclear threats. There can be no illusions here.

The OPG has applied to the Canadian Nuclear Safety Commission (CNSC) to construct a BWRX-300 at the Darlington site. My main focus is (b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. I consider this, in the light that it is a one of a kind project, that is a trial balloon for a whole fleet of these

SMRs in several provinces (Ontario, New Brunswick, Saskatchewan and oil and mining companies in Alberta and Saskatchewan. The BWRX-300 at Darlington is in partnership with Poland and the US. Poland plans to build a fleet of these SMR's, using Darlington as a test case. This seems to be a joint project with many interests including the Czech Republic, Estonia, Sweden, the UK, and GE/Hitachi probably has many more clients in mind. This is not a Canadian design reactor and the fuel bundles used in it will be manufactured in the US. Canada has signed Nuclear Cooperation Agreements (NCA) with 47 countries. Canada's non-proliferation policy stipulates that Canadian-supplied nuclear material, equipment and technology may only be transferred to countries with which Canada has concluded a bilateral NCA. NCAs establish reciprocated obligations to minimize risk associated with major nuclear items. These include assurances that exports are properly protected, safely handled and used for peaceful purposes, and that Canada maintains control over nuclear exports. The CNSC regulates the use of nuclear energy and materials to protect health, safety, national security and the environment. I can understand the pressure that is being applied to the CNSC by governments and lobby groups that can almost taste impending deals. Natural Resources Canada (NRCan) has been working with provincial, territorial and industry counterparts in order to advance SMRs as a clean energy option in Canada. The Canadian Roadmap for SMRs, led by NRCan, outlined several recommendations for advancing SMR projects within Canada and included a recommendation to develop Canada's SMR Action Plan which affirms the federal government's support, in principle. The governments of Ontario, New Brunswick and Saskatchewan signed an interprovincial SMR Memorandum of Understanding (MOU) in December 2019, with the addition of Alberta in April 2021. The Energy Ministries of New Brunswick, Ontario, Saskatchewan and Alberta developed a feasibility and strategic plan for deployment of SMRs, including market opportunities across Canada and globally.

This puts Canada in a global race with other major nuclear nations that are also seeking to capitalize on the SMR opportunity. Early-mover advantage is critical if Canada is to become a global SMR technology hub and capture a significant share of the supply chain opportunities, increased jobs and economic benefits. Successful demonstration and deployment of SMRs in the near-term is key to securing Canada's early-mover advantage. This will also contribute towards Canada's emissions reduction targets, help develop its strategic industrial sectors and provide opportunities for remote communities. The deployment of SMRs in Canada represents opportunities for fuel fabrication and other supporting capabilities to be developed across the country. In addition, as Canada gains a more varied nuclear fleet and research reactors, SMRs present many interesting opportunities for fuel recycling and minimizing nuclear waste in the future. SMR development is a regulatory process that is more safety goal-oriented, commensurate with the risks of a nuclear reactor design, rather than being rule-based. Once a reactor is licensed and operational, the licensing of subsequent units should be significantly more efficient provided there are no design changes. This will provide investors and operators the licensing confidence necessary to move forward with a"fleet" approach ('i.e., deploying the same technology in multiple jurisdictions), which can enhance the business case for SMRs. The growth of SMRs in Canada and around the world will drive an increased demand for uranium, providing new opportunities for uranium produced in Saskatchewan and potentially Alberta, and increased utilization of refinery and conversion facilities in Ontario. In the short-term, Saskatchewan has sufficient

uranium to supply planned Canadian SMRs, while increased mining activities are feasible depending on uranium pricing in the long term. This has big business all over it.

Apparently, there is international consensus that deep geological repositories (DGRs)represent the best practice for the long-term management of used nuclear fuels resulting from SMRs, fuel reprocessing and other types of advanced reactors. The deep geological repository (DGR) for nuclear waste was developed for managing Canada's used nuclear fuel. No foreign used fuel will be placed in the repository. Sweden and Finland will also not allow foreign waste. All three have spent decades selecting a sight. Just the three sites and nothing else is coming up in the foreseeable future - every country will be on its own! Through 2021, the federal government has been reviewing and modernizing Canada's Policy Framework for Radioactive Waste to ensure that Canada has strong radioactive waste policies in place that continue to meet international best practices, are based on the best available science, and reflect the values and principles of Canadians. I haven't seen much public discussion on this lately. There are reasons why they don't want foreign waste. The toxic and radioactive nature or the waste is very long lived, going way beyond any time frame we can guarantee integrity of a DGR. The waste is radioactively hot and will continue to produce heat for a very long time and this heat must be dissipated. The disposal concept makes a point that the bentonite clay is there to make sure the waste remains dry but there is water everywhere underground and the water is actually needed to carry the heat away. This also creates the possibility that this heated groundwater can take the waste back into the groundwater system, impacting life. What do we know about clay? When clay is dry, it acts like an insulator (containing the heat??). When it is wet it conducts heat? It also, when wet, swells up and can exert great pressure - could this damage the containers? How will the properties of the clay be affected by heat? Anyway, waste that might escape containment in the DGR over long time spans needs to be able to combine with minerals in the clay to create more stable, less mobile minerals - can the clay do this? ((background: Uranium deposits are sedimentary. The radioactive elements in the ore come from the erosion of a mountain range (the Canadian shield). These dissolved minerals are precipitated out and concentrated in fault zones through which groundwater from runoff percolates - the ore mineralogy is relatively stable. When we mine uranium and bring it to the surface, we then mill it into a fine powder and then treat it chemically so it no longer exists in a stable bond with the minerals in the ore. We extract a small amount of radioactive material we want and throw the rest into a surface pit where it is later covered with soil. This is not an effective way of dealing with this toxic and radioactive material as it is now in a more mobile state which can easily move into the environment. Saskatchewan is now starting to solution-mine uranium and leave unwanted, more mobile, residues in the water undrerground in the aquifers themselves - even worse.))

I have problems with the application. The proposal talks about lessons learned from the Fukushima disaster where 4 larger versions of BWR reactors were destroyed. there seemed to be a domino effect. A report from the Japanese government found that the worst case scenario, if the accident could not have been contained, was the evacuation of an area 250 km surrounding Fukushima. Since then the US has extended their exclusion zones from 1km to 4km from reactor and nuclear waste storage sites. The DNNP is within the Darlinton reactors and dry waste storage facilities canadian exclusion zone of 1km. Lessons have not been learned. OPG had applied for a wide range of

considerations for the reactor to be kept confidential for national security, technical and commercial reasons - this is a public facility where the public needs to know what it is getting. Even in Phase 1 of these hearings there was an in camera session after the public one. There were 57 items up for redaction including: program, construction, supply chain and execution management plans, project quality assurances, engineering oversight,, construction/owner interface agreements, hazard and safety analysis methodologies, excavation and backfill, containment evaluation, computer modeling, ALARA design criteria, systems/structure/component report/ and mechanical design reports, shutdown analysis, and wind/flood/and climate change impacts. In the redaction application documents they were all replaced with assurances that all material, components, procedures, etc. would comply with all appropriate standards, codes, procedures, etc. This whole process looks like a process where rich countries will again be able to invest in the dissemination of technology in which there could very well be a legacy of negative global impacts. The literature is full of claims that the technology is clean, emission free, and recycling will limit waste. These terms need to be defined clearly because as they stand they are not objective and represent disinformation to the public - not in the interests of the CNSC mandate. Uranium mining, concrete in the construction and transportation in particular are not fossil free. While an operating reactor may have few carbon emissions, there are routine and emergency radioactive emissions that come off operating reactors. The entire nuclear chain is full of waste from mine tailings to waste created by reprocessing that needs to be repackaged and cared for. There are claims that the SMR technologies are scalable but I have to wonder if the scaled down modules might end up in reducing backup systems that would be only available on larger models. The design process is iterative - I assume they are learning from their mistakes - not entirely comforting. ALARA and Best practice also seem to be fairly vague terms. The promotional literature talks about lifting, setting, aligning and fixing components. There is nothing in the application that really talks about the assembling of all the components and how integrity is maintained both in the construction and how resilient this assembly might be in the face of earth movements such as slumping. How well will passive systems continue to operate if the facility ended up being tilted. Exactly what guarantees have been given to indigenous peoples in regard to wild rice and gathering of wild foods and medicines? Because there are so many actors and suppliers in this proposal, what are the actual opportunities for Canadians? Are major components being manufactured in Canada? I believe procurement from suppliers are part of the confidential list. The reactor design is not Canadian so there will be no intellectual property there?? The fuel bundles will be manufactured in the US so security of fuel supply is not guaranteed. Is the fact that the fuel bundles were designed for a forced circulation system going to impact reactor core operation and cooling? There will be countries who have no nuclear experience who may want to purchase this technology. I think Canadians got lucky in the 1950s when 1500 military and Chalk River staff were brought in to prevent a meltdown. Chernobyl operators were not on top of their game. Mistakes were made at Three Mile Island. How many more incidents will these nubies bring to the table. All humans make mistakes - what are the operator overrides? How good are the training simulations - what are the assumptions? What measurable level of competency do they have to attain? What is to prevent system sabotage or mishandling?

Marcel LaCroix brought up several points of concern in Phase 1. It is a passive system so circulation

would be slower than in a forced circulation system. I got the sense that he thought it less predictable and less stable. Non condensable gases such as hydrogen might impact circulation. Fuel pressure in the chimney at startup. Issues of stability of the reactor core are complex depending on the operating states. Circulation can be rerouted from blockages through manipulation of valves - could this lead to an incident? Impacts of loss of containment (dry core)? Void distribution and potential boiling transition? Could the power coefficient of reactivity become +ve? Is it possible for there to be a large reactive insertion? Are voids a concern?

Will there be contamination of turbines from steam entering from the reactor core and is there an outgas stack system to handle this? The cooling pools for the used fuel are integrated with replacing coolant to reactor cores - what possible problems could this cause? The meltdown of the advanced BWX reactors 1, 2, and 3 at Fukushima was due to loss of coolant - what makes this reactor different that would prevent a meltdown? Will there be a linkage between the reactors - as there was to reactor 4, which was shut down for maintenance at the time that would result in hydrogen destroying the other reactors. The real threat at Fukushima was the loss of coolant water to the used fuel bundles which could have resulted in much more severe consequences. Are there safeguards for this? Why is the secondary control room contained in the Reactor Building itself - isn't it a backup that should be at least once removed from potential disaster scenarios? The cooling system is a once through system of lakewater - what is going to be the potentials for contamination of the lake.

This process is on a roll and seems unstoppable. Site prep is ready for the insertion of the reactor building and foundation work. The construction is two days of hearings away from being approved. I am sure major components have already been ordered as many are time sensitive to the construction process. It seems like a done deal to go right through to operation - is this, and everything else that will go along with it, something that the Canadian public really wants??

https://www.scientificamerican.com/article/nuclear-power-odyssey-of-naoto-kan-former-japan-prime-minister-during-fukushima/

https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-daiichi-accident#:~:text=The%20accident%20was%20rated%20level,the%20accident%20%E2%80%93%202719%20MWe%20net

Thanks for your consideration, steve.