

**PETERBOROUGH PUBLIC HEALTH
BOARD OF HEALTH – STAFF REPORT**

TITLE:	BWXT Nuclear Energy Canada: Application for Licence Renewal
DATE:	February 12, 2020
PREPARED BY:	Julie Ingram, Manager of Environmental Health
APPROVED BY:	Donna Churipuy, Director of Public Health Programs Dr. Rosana Salvaterra, Medical Officer of Health

PROPOSED RECOMMENDATIONS

That the Board of Health for Peterborough Public Health receive the staff report, *BWXT Nuclear Energy Canada: Application for Licence Renewal*, for information.

FINANCIAL IMPLICATIONS AND IMPACT

There are no financial implications arising from this report.

DECISION HISTORY

The Board of Health has not previously made a decision with regards to this matter.

BACKGROUND

Purpose of the Report

This report has been prepared to provide Board of Health members with an overview of Peterborough Public Health’s involvement and assessments in relation to BWXT’s licence renewal application to the Canadian Nuclear Safety Commission.

BWXT Nuclear Energy Canada

In December 2016, BWXT Canada (a subsidiary of BWX Technologies Inc.) acquired GE Hitachi Nuclear Energy Canada Inc. Currently, BWXT Nuclear Energy Canada (BWXT NEC) operates the Peterborough facility located on Monaghan Road at the former General Electric Peterborough complex.

This facility assembles CANDU® (Canada Deuterium Uranium) fuel bundles for CANDU® reactors, such as those located at the Pickering and Darlington nuclear generating stations. The facility is licenced by the Canadian Nuclear Safety Commission (CNSC), the federal regulator for the nuclear sector in Canada. On November 12, 2018, BWXT NEC submitted an application to the CNSC for the renewal of its operating license for a ten (10) year period. The current licence applies to both BWXT Peterborough and Toronto facilities, and expires on December 31, 2020.

The application submitted by BWXT NEC is seeking authorization from the CNSC to permit the production of natural uranium pellets at the Peterborough facility. Currently, pelleting operations are only conducted at the Toronto facility. The Peterborough facility is licenced to produce and test fuel bundles using the uranium dioxide pellets, which have been manufactured in Toronto. BWXT NEC's website states: *"While there is currently no plan to change the existing state of operations, including the flexibility to allow BWXT NEC's Peterborough facility to conduct pelleting will help to ensure that BWXT NEC has the ability to adapt as needed to changing business needs over the decade-long licence period."*

The CNSC will host public hearings for the proposed licence renewal application on March 2 and 3, 2020 in Toronto and on March 4, 5 and 6, 2020 in Peterborough.

Peterborough Public Health's Engagement in the Licence Renewal Application

Peterborough Public Health (PPH) has been involved with the activities surrounding the licence renewal application for BWXT Peterborough. A summary of these activities is provided below:

- meetings with BWXT Executives;
- meetings and consultation with CNSC staff;
- meetings and discussion with members of CARN – Citizens Against Radioactive Neighbourhoods;
- meeting with the Kawartha Pine Ridge District School Board;
- consultations with Public Health Ontario;
- consultations with Ministry of the Environment, Conservation and Parks;
- consultations with the City of Peterborough Environmental Protection Division;
- collaboration with Toronto Public Health;
- attendance at various information nights hosted by BWXT and the CNSC;
- review of the evidence surrounding the health-related impacts of the Peterborough operations;
- comprehensive review of the Commission Member Document (December, 2019);
- development of website content for public education and outreach;
- collaboration with an expert from Trent University; and
- response to public questions and inquires.

These activities have enabled PPH to enhance our understanding of the operations at BWXT Peterborough and complete risk assessments of the various potential public health hazards related to operations at BWXT Peterborough. On January 27, 2020, PPH provided a written submission, otherwise known as an intervention, to the CNSC with a request to present orally during the public hearings in Peterborough (see Appendix A). Our submission was accepted and our request to present was granted. Furthermore, it is our understanding that a request will come from the CNSC for PPH to be present at the public hearings to answer health-related questions from Commission members, pertaining to the licence renewal.

On February 11, 2020 PPH staff, management and executive will be touring the BWXT Toronto facility in order to better-understand pelleting operations and the potential risks in the event that pelleting operations are relocated to Peterborough.

Summary of Peterborough Public Health's Written Intervention to the CNSC

A complete copy of PPH's written submission to the CNSC is provided in Appendix A. In summary, PPH supported the conditions recommended by CNSC staff in the Commission Member Document, particularly those outlined in Licence Conditions 15.1: Environmental Monitoring and 15.2: Commissioning Report. However, PPH is urging commission members to consider the following additional recommendations:

- 1. That BWXT implement a comprehensive environmental monitoring program to provide sufficient data to assess the full extent of uranium and beryllium emissions in the surrounding area prior to any decision regarding renewal of the licence and the addition of pelleting at the Peterborough site.**
- 2. That the BWXT Peterborough facility retain the services of an independent, neutral third party for soil, water, and air testing for Uranium and Beryllium, as appropriate, and publicly share all reports and test results in their entirety; and**
- 3. That the BWXT Peterborough facility establish a Community Liaison Committee (CLC) in Peterborough, similar to that which has been established in Toronto.**

We are hopeful that these additional recommendations will be considered by the Commission and believe that these measures will help increase our community's confidence with sampling results and ensure that moving forward, our community's concerns are addressed.

PPH is aware of the many concerns from community members related to the location of the facility. Given that the Peterborough BWXT facility is located within a residential neighbourhood and adjacent to an elementary school, the concerns of the community are understandable. Accordingly, we have stated in our written submission that should the licence be renewed to allow BWXT to continue operating, it would be essential to ensure that the surrounding community has the information it requires, in a timely and transparent manner, to reassure residents that emissions into the environment are not posing a risk to health.

Generally, children can differ from adults in their susceptibility to hazardous chemicals, but whether there is a difference depends on the chemical itself. The physiology and behaviour of children may result in increased exposure. For example, if a chemical is found in high concentrations in the soil, children may be more likely to be exposed due to their tendency for increased hand-to-mouth contact. When it comes to chemical toxicity, children may be more vulnerable due to their longer remaining lifetime for the damage from chemicals to become evident, which is particularly relevant for cancer.

As part of our comprehensive risk assessment, PPH has considered the following potential hazards associated with current and proposed operations at the BWXT plant:

- Uranium Dioxide (currently present)
- Beryllium (currently present)
- Liquid Hydrogen (proposed for pelleting)

The BWXT Peterborough and Toronto facilities are licenced and regulated by the Canadian Nuclear Safety Commission (CNSC) whose role is to regulate the nuclear sector in Canada and protect health, safety, security and the environment. The CNSC also ensures that Canada complies with its international obligations on the peaceful use of nuclear materials and technology. Licences granted by the CNSC outline various requirements for operations including fire safety and emergency response plans, as well as establish action levels and release limits for radioactive or hazardous substances into the environment. An action level is set as a type of early warning system as it indicates when releases may be deviating from the norm. The licence issued by the CNSC sets facility-specific release limits, which are derived to protect the health and safety of the public and the environment. At the Peterborough BWXT facility, there are guidelines and limits for both uranium and beryllium.

Uranium

Uranium is a naturally occurring element that is present at low levels in various chemical forms in the environment. It is a heavy metal and is found in various rocks and ores, soils, water, air, plants, and at low concentrations in animal tissue. Uranium is present in drinking water and food and small amounts are ingested and inhaled by everyone every day. It has been estimated that the average person ingests 1.3 µg or micrograms (0.033 Bq or becquerel) of uranium per day, corresponding to an intake of 11.6 Bq per year. It has also been estimated that the average person inhales 0.6 µg (15 mBq or megabecquerels) annually.¹ On average, about 90 µg of uranium exist in the human body from daily intakes of water, food and air; approximately 66% is found in the skeleton, 16% in the liver, 8% in the kidneys and 10% in other tissues.² Radiation, including UV radiation from the sun, is a known carcinogen, but natural uranium is not. It has not been classified as a carcinogen by the International Agency for Research on Cancer (IARC).³

Most of the naturally occurring uranium is uranium 238, which is considered to be weakly radioactive. Its half-life is 4.5 billion years – which means it takes 4.5 billion years for it to lose half of its radioactive alpha particles, on its way to becoming Thorium 234. Most people are primarily exposed to uranium through the ingestion of food and water, however exposure can also be as a result of inhalation or dermal contact. The amount of uranium in air is generally very small. BWXT uses uranium dioxide, a naturally occurring oxide of uranium.

The biological and health effects of uranium are due to both its chemical and radiological toxicity. In general, this toxicity, as demonstrated in animal studies done since 1949, is caused by chemical rather than radiological components, although there is still some uncertainty about a possible cumulative effect. Exposure to uranium primarily results in damage to the kidneys, and the severity of health effects is partially dependent upon the level and duration of exposure.⁴ Occupational and epidemiologic studies in humans have failed to consistently demonstrate a higher risk of deaths from respiratory disease or cancers of any kind. Workers exposed to insoluble uranium compounds did not show renal toxicity.

Evidence reviews completed up to 2016 do not provide any information on whether or not children are more susceptible than adults to natural uranium.⁵ Although we believe that children would likely show the same health effects as adults, we do not know whether children are more susceptible than adults to uranium effects.

There are three exposure pathways for uranium: air, soil and water. The Radiation Protection Regulations established under the Nuclear Safety and Control Act sets a public dose limit for radiation at 1 mSv or millisievert/year.⁶ To put this limit into perspective, a typical chest CT scan provides a 7mSv dose of radiation, the average dose from natural background radiation in Canada is 1.8mSv per year and a typical cross-Canada flight results in 0.2 mSv.⁷ The Canadian regulations comply with the recommendations of the International Commission on Radiological Protection.

For air, Ontario maintains a list of Ambient Air Quality Criteria (AAQC), which is developed by the Ministry of Environment, Conservation and Parks. The limit for uranium and uranium compounds in coarse particulate matter (PM10) is 0.03 µg/m³. The limit for uranium and uranium compounds in total suspended solids, is 0.06 µg/m³. These limits are annual averages and are deemed to be health-protective.⁸ PPH staff is awaiting additional clarification on how these limits are derived.

Limits for uranium in soil are determined by the Canadian Council for Ministers of the Environment (CCME) as outlined in the Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. The limit for uranium in soil for residential and parkland areas is 23 mg/kg.⁹

Finally, the regulatory limit for the discharge of uranium into wastewater is based on the CCME Water Quality Guidelines for the Protection of Aquatic Life, which sets a limit of 15 µg/L.¹⁰ Additionally, the City of Peterborough has a sewer use by-law (number 15-075)¹¹ which allows the discharge of waste radioactive materials under a licence from the CNSC.

Beryllium

Beryllium is a naturally-occurring element present in a variety of materials including rocks and soil. Beryllium is an important metal used in a number of industries; it is known for being lightweight and for its exceptional strength, stability and heat-absorbing capability.¹² Beryllium is used at the BWXT Peterborough facility in the fuel bundle manufacturing process.

Human exposure to beryllium occurs primarily in the workplace and inhalation is the most common route of exposure with respiratory disease typically being the end result. Based on sufficient evidence for carcinogenicity in humans and animals, the International Agency for Research on Cancer (IARC) has classified beryllium in Group 1, carcinogenic to humans.¹³

While there is little evidence surrounding the effects of beryllium on children, it is likely that health effects of beryllium exposure on children would be similar to the effects seen in adults.

According to the Toxicological Profile for Beryllium¹⁴, no data were located that examined age-related differences in the toxicity of beryllium.

Most information regarding adverse health effects in humans after the inhalation of beryllium come from occupational exposure studies, where significant exposure has occurred. The respiratory tract is the primary target of beryllium toxicity. Inhalation of beryllium dust or fumes in an occupational setting can result in chronic beryllium disease, which is scarring of the lungs that is irreversible and potentially fatal. Lung cancer may also be a result of occupational beryllium exposure.¹⁵ It is important to be mindful that the health-related outcomes described above are observed only in occupational settings. Beryllium is not likely to cause any respiratory disease from exposure in the general environment because ambient air levels of beryllium are very low.

There are regulatory limits for beryllium based on the potential routes of exposure including air, soil and water. Ontario's AAQC for beryllium is 0.01 µg/m³ in a twenty-four hour period¹⁶, based on potential health effects. Like uranium, limits for beryllium in soil are determined by the CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. The limit for beryllium in soil for residential and parkland areas is 4 mg/kg.¹⁷ Finally, beryllium discharge to wastewater also falls under the City of Peterborough's sewer use by-law, which allows for the annual release limit determined by the CNSC licence for the facility. Release limits of beryllium into the wastewater stream from the Peterborough facility are based on the Ontario Provincial Water Quality Objectives, which is 11µg/L.¹⁸

For comparison, according to information received from Public Health Ontario, the occupational exposures that can lead to chronic beryllium disease or lung cancer occurred at levels 50 to 100 times the Ontario AAQC limit of 0.01µg/m³.¹⁹ Acute beryllium disease (berylliosis) has been documented in the past (1950s) where exposure to high levels of soluble beryllium compounds in some cases led to progressive upper and lower respiratory tract symptoms, and in a small number of severe cases, death. The concentrations of exposure in these cases were approximately 10,000 times greater than the Ontario AAQC.

Liquid Hydrogen

Liquid hydrogen is not currently stored on site at BWXT Peterborough but it is stored on site at the Toronto facility. In the event that pelleting is relocated to Peterborough, the storage of liquid hydrogen would likely be required as it is used in the manufacturing of uranium pellets. Liquid hydrogen is flammable and explosive when combined with air. Liquid hydrogen is also stored at an extremely low temperature, which poses an additional occupational hazard for handling.

According to the BWXT 2018 Annual Compliance and Monitoring Report,²⁰ there are fire safety and evacuation emergency response plans for the Peterborough and Toronto facilities. PPH staff consulted with City of Peterborough staff, who have indicated that fire services and emergency management staff meet annually with BWXT to discuss emergency response and review emergency response plans. City staff advised that in the event pelleting is relocated to

Peterborough and there is the need to store liquid hydrogen at the facility, protective measures will be required, developed and implemented.

For the following section of this report, data provided by CNSC and BWXT has been reviewed to determine whether or not emissions are posing a risk to the health to the general public. Occupational health concerns fall within the mandate of Ontario's Ministry of Labour and are outside the scope of this review.

RESULTS

PPH has reviewed data for current and historical emissions of beryllium and uranium from the BWXT Peterborough and Toronto facilities. In addition, we have reviewed the findings of Toronto Public Health in its 2018 report to its board of health.²¹ Overall, emissions are typically well below the release limits outlined in the operating licence for the BWXT facilities, which are set to achieve the environmental and health standards and guidelines previously described in this report.

Radiation Dose

Uranium exposures have both a radiological and a chemical component. Table 3.6 from the CNSC report provides data on the annual doses to the public from both the Toronto and the Peterborough site. Dosimeters were added in Peterborough in 2016.

BWXT is required to estimate the total radiation dose to members of the public resulting from its operations. These estimated radiation doses assume that a member of the public occupies the boundary of the facility continuously for 24 hours per day, 365 days per year. Recall that the regulatory effective public dose limit is 1mSv per year. At the Peterborough facility, the 2018 estimated radiation dose to a member of the public was 0.00mSv, contributing 0% to the public dose limit. This has been the case from 2014 to 2018, inclusive. At the Toronto facility, the 2018 estimated radiation dose to a member of the public was 0.0004 mSv, contributing 0.04% to the public dose limit.

Radiation from the Toronto site, where pelleting currently takes place, has resulted in annual doses since 2014 that range from 0.41 µSv or microSieverts to 17.49 µSv, well below the limit of 1000 µSv, or 1 mSv. In the event that pelleting operations relocate to Peterborough, we might expect higher emissions of uranium, and therefore expect a higher estimated radiation dose. From 2014 to 2018 inclusive, the highest estimated dose in Toronto was 0.0175 mSv, which contributed approximately 1.8% of the public dose limit.

Figure 1

Table 3.6: Estimated annual public doses from air emissions and environmental thermoluminescent dosimeter (TLD) for both Toronto and Peterborough facilities respectively [8-12]²²

Period	Toronto			Peterborough			Public dose limit [μSv]
	Gamma dose from TLD/Survey Meters [μSv]	Dose from air emissions [μSv]	Total [μSv]	Gamma dose from TLD [μSv]	Dose from air emissions [μSv]	Total [μSv]	
2014	4.8	0.41	5.2	N/A	0.00	0.00	1000
2015	9.4	0.41	9.8	N/A	0.00	0.00	
2016	0.00	0.7	0.7	0.00	0.00	0.00	
2017	17	0.49	17.49	0.00	0.00	0.00	
2018	0.00	0.41	0.41	0.00	0.00	0.00	

In addition to the radiation dose, data on chemical exposures for both uranium and beryllium will now be discussed.

Uranium

Air emissions of uranium at the Peterborough BWXT facility are from a single point. Emissions are exhausted through a High Efficiency Particulate Air (HEPA) filter and continuous in-stack monitoring is performed. In 2018, the highest recorded release of uranium was 0.006μg/m³ (recall that the standard is 0.03 μg/m³), and there was a total discharge of 0.002 grams of uranium for the year. This is thousands of times lower than the licence release limit of 550 grams. Over the last five years, total annual air emissions of uranium at the Peterborough plant have ranged from 0.002 to 0.004 grams.

Figure 2

Table 3.1: Uranium air emissions (kg/year) monitoring²³

Parameter	Uranium - Toronto	Uranium - Peterborough
Licence Limit (FLOLs)	0.76	0.55
2011	0.00928	0.000011
2012	0.01267	0.000005
2013	0.00579	0.000013
2014	0.01090	0.000003
2015	0.01080	0.000003
2016	0.01080	0.000004
2017	0.00744	0.000002
2018	0.00628	0.000002

If pelleting operations are relocated to Peterborough, the emission of uranium might be expected to increase to similar amounts observed at the Toronto facility. A review of the data from the Toronto facility over the last five years shows that uranium emissions in the air have ranged from 6.3 to 10.9 grams per year. Although this is many times higher than the current air emissions of uranium at the Peterborough facility, it is still well below the licence release limits.

Additional air monitoring is conducted at the boundary of the Toronto facility and over the last three years, the highest average concentration was $0.001\mu\text{g}/\text{m}^3$, which is thirty times lower than Ontario's AAQC limit of $0.03\mu\text{g}/\text{m}^3$.

Boundary monitoring is not currently conducted at the Peterborough facility, but CNSC's recommended licence renewal conditions requires that it be implemented prior to pelleting being relocated to Peterborough. Ambient air samples were collected as part of the CNSC's Independent Environmental Monitoring Program (IEMP) in 2014, 2018 and 2019. According to the CNSC, results were $0.0013\mu\text{g}/\text{m}^3$ (2014), $<0.003\mu\text{g}/\text{m}^3$ (2018) and $<0.00009\mu\text{g}/\text{m}^3$ (2019)²⁴, all well below the requirements of Ontario Regulation 419/05 *Air Pollution – Local Air Quality Regulation*²⁵, which sets the release limit as $0.03\mu\text{g}/\text{m}^3$ on an annual basis.

At the Peterborough facility, uranium may be discharged with the wastewater stream as a result of routine activities such as washing floors, walls and equipment. Prior to release, all wastewater that is potentially contaminated with uranium is held for the determination of the quantity and concentration of uranium. The water is filtered prior to sampling and once the results of batch samples are verified to be below control levels (6 parts per million (ppm) per batch and 3ppm annual average) the water is filtered again during discharge to the sanitary sewer system. From 2016 to 2018, no samples exceeded action levels and in 2018, 0.01 grams of uranium was discharged with the wastewater stream. From 2014 to 2018 inclusive, annual releases ranged from 0.01 to 0.14 grams, and the licence release limit is 760 kilograms. A similar process is followed at the Toronto facility. From 2014 to 2018 inclusive, annual releases ranged from 0.39 to 0.94 kilograms. This is significantly higher than the releases from the Peterborough facility, however, the amounts remain well below the licence limit. PPH staff have consulted with the City of Peterborough Environmental Protection Division to discuss the release of uranium through wastewater from the BWXT facility and no concerns were identified by City staff.

Figure 3

Table 3.3: Uranium liquid effluent (kg/year) monitoring results and licence limits for BWXT Toronto and Peterborough (2011-2018) [4-12]²⁶

Parameter	Uranium - Toronto	Uranium - Peterborough
Licence Limit (FLOL)	9,000	760
2011	1.05	0.00010
2012	0.90	0.00010
2013	0.83	0.00020
2014	0.72	0.00014
2015	0.39	0.00006
2016	0.65	0.00013
2017	0.94	0.00003
2018	0.94	0.00001

Air emissions are the primary pathway for potential release from the BWXT facilities into the natural environment by impingement on the surface of the ground. Available data indicate that air emissions of uranium from the Peterborough facility are extremely low therefore, soil sampling is not required or conducted in Peterborough as part of the facility’s licence conditions. However, soil sampling is conducted in Toronto on an annual basis and samples are collected at 49 locations in accordance with a documented plan. In 2018, without exception, all samples fell below the acceptable standard for residential and park land (23mg/kg = 23µg/g) and ranged from <1.0 to 11.9µg U/g soil. Some soil sampling has been done in Peterborough as part of CNSC’s IEMP. The results of soil samples collected and tested for uranium concentrations were all below the regulatory limits as determined by the CCME Soil Quality guidelines, described in the background section of this report.

Beryllium

As stated in the background, inhalation is the most common route of exposure for beryllium. There are three stacks that act as air emission points for beryllium at the Peterborough facility. The CNSC requires BWXT to monitor beryllium concentrations in each stack. This is achieved with continuous in-stack monitoring which involves drawing a sample of air across a filter capable of trapping beryllium. The filter is analyzed and the result is related to the air volume passed through the filter. According to the 2018 Annual Compliance Monitoring Report, the highest value recorded for beryllium air emissions was 0.001µg/m³, which is ten times less than the internal control level, which is 0.01µg/m³, the same as Ontario’s AAQC guidelines for beryllium in a twenty-four hour period.

Beryllium emissions were reviewed back as far as 2013 and all were below the licence action level.

Air monitoring at the Point of Impingement (the plant/public boundary) for beryllium is not currently required as part of BWXT’s licence conditions for the Peterborough facility. However,

ambient air samples were collected and tested as part of CNSC’s IEMP in 2014, 2018 and 2019. According to the CNSC, results were 0.000077µg/m³ (2014), <0.003 µg/m³ (2018) and <0.0003 µg/m³ (2018), all below the requirements of Ontario Regulation 419/05 *Air Pollution – Local Air Quality Regulation*, which sets the release limit as 0.01µg/m³ at the point of impingement.²⁷

Beryllium may also be released from BWXT Peterborough with wastewater that is generated from equipment use and washing. Potentially contaminated water passes through a settling weir system (a weir tank or frac tank is used to hold water for up to twenty-four hours to allow solids to settle out), prior to release to the sanitary sewer. There are release limits outlined in BWXT’s operating licence and internal control levels are set to provide additional protection. Upon reviewing beryllium releases with wastewater, they are below the established release limits. The limits are set using the Ontario Provincial Water Quality Objectives, which for beryllium is 11µg/L.

Figure 4

Table 3.2: Average Beryllium concentrations in liquid effluent (µg/L) for BWXT Peterborough (2011-2018) [4-12]²⁸

Parameter	Beryllium - Peterborough
BWXT’s Internal Control Level¹	4.0
2011	N/A ²
2012	N/A ²
2013	0.38
2014	1.34
2015	4.5
2016	0.4
2017	1.0
2018	0.6

¹ United States Environment Protection Agency maximum contaminant level for drinking water [42]
² Beryllium liquid effluent monitoring results were not reported until 2013

PPH staff consulted with the City of Peterborough Environmental Protection Division to discuss the release of beryllium through wastewater from the BWXT facility. No concerns were identified and City staff indicated that beryllium will start being monitored as part of routine sampling procedures. Over the last three years, the maximum beryllium concentration measured in the wastewater from the facility ranged from 2.5 to 5.4 µg/L.

Just prior to this board report, concerns have emerged regarding the concentrations of beryllium in the soil close to the Peterborough facility. Soil monitoring in Peterborough is not required as part of BWXT’s operating licence, however, it too is conducted as part of CNSC’s IEMP. The upper limit has been steadily increasing: 1.1 mg/kg (2014) 1.34mg/kg (2018) and 2.34 mg/kg (2019). Although the results continue to be below the CCME Soil Quality Guidelines (4.0 mg/kg), the results are approaching the guideline and require further study to determine if there are fugitive beryllium emissions from the facility. Increasing concentrations in soil, if

validated, are a concern, given the proximity of the facility to the elementary school across Monaghan Road, which includes a playground for the youngest and potentially the most vulnerable children. Although data on susceptibility in children is not available, children are considered to be at risk for increased exposure through ingestion and dermal contact.

As described above, the air effluent monitoring results at the beryllium emission points for the BWXT Peterborough facility have been reported since 2013 and appear to be below the action levels in the licence conditions. Therefore, it is not clear whether or not the increase in beryllium in the soil sampling is attributable to the BWXT Peterborough facility and for this reason, PPH has recommended to the CNSC that a more comprehensive environmental monitoring program be completed prior to the decision regarding the renewal of the licence and/or moving the pelleting process to the Peterborough facility.

Liquid Hydrogen

In an effort to further understand the risks, PPH staff consulted with Public Health Ontario (PHO) as to the potential health hazards associated with the storage of liquid hydrogen. PHO suggests that the hazards would occur from the low temperature and/or high pressure under which the liquid hydrogen is stored, and is likely more of a workplace health and safety concern. PHO indicated that an engineering assessment may be beneficial to assess the potential for offsite impacts and ensure that appropriate protective measures are implemented. PPH will be visiting the BWXT Toronto facility on February 11, 2020 at which time we intend to ask questions and gather additional information about the storage, use and safety of the liquid hydrogen at that facility. An oral update will be provided to the Board of Health on February 12, 2020.

CONCLUSION

Based on our review of the available data associated from the storage and use of uranium dioxide at the Peterborough site, we believe that the additional radiation dose to the general public is negligible. At the Toronto site, levels well below the limits are documented.

For nonradiologic health effects, results of current and historic emissions of uranium and beryllium from the Peterborough facility suggest that the emissions are below regulatory requirements and well within facility licence release limits for BWXT. For Peterborough, there is more limited data upon which to base this assessment, and we have noted a concerning trend in the levels of beryllium in soil samples located near the facility. It would be prudent to determine whether or not the increases in beryllium found in the soil are attributable to fugitive emissions from BWXT Peterborough prior to making a decision about licensing.

Review of the data from the Toronto facility indicates that if pelleting operations are relocated to Peterborough, uranium emissions will be expected to increase however, they will still fall within regulatory guidelines and the licence limits for the Peterborough facility. There is no evidence to support any exceedances, even if pelleting operations come to Peterborough and the evidence indicates that the health of community and the environment will be protected.

Additional monitoring and sampling, including for soil and ambient air, should be in place prior to the implementation of pelleting in Peterborough. One of the best ways to ensure that there are no risks or threats to public health is to ensure the presence of a robust sampling program and full communication of sampling results in their entirety with the local community. It is for these reasons PPH is recommending the implementation of a comprehensive monitoring program to fully assess current uranium and beryllium emissions prior to any decision regarding the licence renewal and the addition of pelleting.

Additionally, in order to increase public confidence with sampling, we recommend that an independent, third party be retained and that a Community Liaison Committee be established in Peterborough.

STRATEGIC DIRECTION

This report applies to the following strategic direction(s):

- Community-Centred Focus
- Determinants of Health and Health Equity

APPENDICES

[Appendix A – PPH Written Intervention Submission to the CNSC \(January 27, 2020\)](#)

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Source for Figures 1 – 4: A Licence Renewal BWXT Nuclear Energy Canada Inc.: Application to renew licence for the Toronto and Peterborough Facilities. Canadian Nuclear Safety Commission. <http://www.nuclearsafety.gc.ca/eng/the-commission/hearings/cmd/pdf/CMD18/CMD20-H2.pdf>

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January 27, 2020

Canadian Nuclear Safety Commission
280 Slater Street, P.O. Box 1046, Station B
Ottawa, ON K1P 5S9

Dear Canadian Nuclear Safety Commission Members,

RE: Application for Renewal of the BWXT Nuclear Energy Canada Inc. Class 1B Fuel Facility Operating Licence for the facilities in Toronto and Peterborough, Ontario

Please accept this written submission with respect to the above-mentioned licence renewal for BWXT Nuclear Energy Canada Inc. (BWXT NEC). The comments made in this submission pertain to the Peterborough BWXT facility, which falls within the geographical jurisdiction served by the Board of Health for the Peterborough County-City Health Unit (operating name, Peterborough Public Health (PPH)).

According to Ontario's Health Protection and Promotion Act (HPPA), a medical officer of health shall investigate complaints regarding potential hazards related to occupational or environmental health in the health unit.¹ In addition, the HPPA requires medical officers of health to stay informed on matters related to occupational and public health.² As such, PPH has been engaged with community members, CNSC staff, the Ministry of Environment, Conservation and Parks, the City of Peterborough, and Public Health Ontario, as well as directly with BWXT in relation to the license renewal.

When considering whether or not the licence renewal should be approved, PPH urges commission members to consider the location of the BWXT NEC Peterborough facility. It is located within a residential neighbourhood and adjacent to an elementary school. The playground for the youngest children in the school is across the road from the facility. Should the licence be renewed to allow BWXT to continue operating, it would be essential to ensure that the surrounding community has the information it requires, in a timely and transparent manner, to reassure residents that environmental emissions are not posing a risk to health. In our opinion, strengthening the relationship with, and accountability to, the surrounding residential neighbourhood presents a challenging but worthwhile endeavour for any long term operation of BWXT in Peterborough.

PPH has reviewed the Commission Member Document (CMD) submitted by CNSC staff, dated December 20, 2019³ regarding the *BWXT Nuclear Energy Canada Inc. Application to renew licence for the Toronto and Peterborough Facilities*. Upon review of this document, PPH believes that the recommendations proposed by CNSC staff in the CMD will help to ensure that if the uranium dioxide pelleting operations are relocated to Peterborough, emissions from the Peterborough BWXT facility can be controlled and maintained at levels that are protective for the community's health. However, we believe the implementation of recommendations and licence conditions proposed by CNSC staff, including those outlined in Licence Conditions 15.1: Environmental Monitoring and 15.2: Commissioning Report⁴, are critical prior, and not subsequent, to the approval of any changes in operations at the Peterborough BWXT facility, including the initiation of pelleting operations.

Current data for emissions of uranium in water and air at the Peterborough facility is published in the facility's annual compliance reports. Additionally, the Independent Environmental Monitoring Program (IEMP) provides additional sample results. Although reassuring, these snapshots do not provide PPH with enough data upon which to base, with confidence, a recommendation regarding the safety of the facility. It appears that the uranium emissions into air and water are far below the level that would impact human health, but we would appreciate a much more robust data set to support our assertions. It would be beneficial for this purpose for the IEMP to expand the number and location of samples collected and include additional air monitoring for uranium and beryllium.

In addition, we note what appears to be an upward trend of beryllium present in the results of the soil monitoring conducted as part of the IEMP.⁵ The samples show an upward trend in the presence of beryllium in soil testing conducted in 2014, 2018 and 2019. The latest results did not become available until after the CMD had been posted. The upper limit has been steadily increasing: 1.1 mg/kg (2014) 1.34mg/kg (2018) and 2.34 mg/kg (2019). Although the results continue to be below the CCME Soil Quality Guidelines (4.0 mg/kg), the results are approaching the guideline and require further study to determine if there are fugitive beryllium emissions from the facility.

A comprehensive and robust monitoring program is quintessential to prevent exposure and protect public health. According to the current licence, monitoring for beryllium is not required at or outside of the fence line. The facility does conduct continuous in-stack monitoring. Given the trends in the soil samples collected as part of the IEMP, additional environmental monitoring outside of the fence of the facility should be considered, including air monitoring in areas where soil samples have been collected as part of the IEMP.

As the beryllium results have recently come to light, it would be most prudent to investigate with the establishment of a more comprehensive environmental monitoring program to be done first, prior to the decision regarding the renewal of the licence and/or the moving of the pelleting process to the Peterborough site. It would be our recommendation that this monitoring should be undertaken with the full participation of representatives of the local community.

Further to the licence conditions outlined by CNSC staff in the CMD, Peterborough Public Health encourages commission members to consider these additional recommendations:

- 1. That BWXT implement a comprehensive environmental monitoring program to provide sufficient data to assess the full extent of uranium and beryllium emissions in the surrounding area prior to any decision regarding renewal of the licence and the addition of pelleting at the Peterborough site.**
- 2. That the BWXT Peterborough facility retain the services of an independent, neutral third party for soil, water, and air testing for Uranium and Beryllium, as appropriate, and publicly share all reports and test results in their entirety; and**
- 3. That the BWXT Peterborough facility establish a Community Liaison Committee (CLC) in Peterborough, similar to that which has been established in Toronto.**

We believe that these additional measures will help to increase the level of confidence that our community has in sampling results and will help to ensure that, moving forward, community concerns will be heard and addressed.

Peterborough Public Health plans to attend the public hearings in Peterborough on March 5 and 6, 2020 in order to address any public health-related questions from commission members.

Thank you in advance for considering this submission.

Sincerely,

Original signed by

Rosana Salvaterra, MD, CCFP, MSC, FRCPC
Medical Officer of Health

¹ Health Protection and Promotion Act, R.S.O. 1990, c. H.7, s. 11(1) <https://www.ontario.ca/laws/statute/90h07#BK12>
(January 14, 2020)

² Ibid. s. 12(1)

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