



**Written submission from
Michael Phillips**

**Mémoire de
Michael Phillips**

In the Matter of the

À l'égard de

**BWXT Nuclear Energy Canada Inc.,
Toronto and Peterborough Facilities**

**BWXT Nuclear Energy Canada Inc.,
installations de Toronto et Peterborough**

Application for the renewal of the licence for
Toronto and Peterborough facilities

Demande de renouvellement du permis pour les
installations de Toronto et Peterborough

Commission Public Hearing

Audience publique de la Commission

March 2 to 6, 2020

Du 2 au 6 mars 2020

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BWXT Peterborough Licensing Renewal Intervention

Saturday, January 25, 2020

Senior Tribunal Officer, Secretariat
Canadian Nuclear Safety Commission
280 Slater Street, P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9

January 25, 2020

To whom it may concern,

I am submitting this intervention in opposition of the BWXT licensing renewal and expansion regarding the uranium fuel bundling and potential pelleting operation at its plant in Peterborough, Ontario. As a parent of a very young student at the neighbouring Prince of Wales public school and a resident/homeowner in close proximity to the plant, I believe it's negligent, irresponsible and potentially lethally dangerous to conduct this type of activity so close to a school, playground and thousands of residences. There are many reasons for this, which I will outline below. With regard to this licensing renewal and expansion, there has been absolutely no communication to the parents and faculty at Prince of Wales or local residents. All potential risks of this operation are virtually ignored by BWXT, the CNSC and Arcadis (the company who compiled the Environmental Risk Assessment Report). I believe that BWXT and its parent and associated/subsidiary companies have a dubious safety record. Proper monitoring of emissions and unbiased environmental assessments are not done and that this type of operation has no business in a residential and school zone in any city or densely populated area, let alone Peterborough.

Communication

As part of BWXT's current license, we are told that direct and open communication with the community is paramount to the plant's license to operate. As a parent of a student at Prince Of Wales, I have received absolutely no communication from the company regarding its operations and request to expand its license. Only one teacher I have spoken to is aware of this current licensing application, and very few parents are aware of it and what is currently happening at the plant just metres away from the junior playground at the school. As a resident, there has also been zero direct communication from the company. Notices posted on the company's own website don't constitute *open and direct* communication by any stretch of the imagination and holding random tours, information nights and BBQ's without any direct notice to the affected public is just not good enough.

My question to BWXT and the CNSC is this: Why have you failed to directly communicate to the parents of Prince of Wales your intentions with regard to expanding your license? What is the fear with taking responsibility and contacting the public directly with your request? How, exactly, do you feel you have met the licensing requirement to openly communicate with the public at large and the neighbours directly bordering your operation, seeing as you have neglected to inform the parents of the most vulnerable residents in our community of your request to expand your operations?

In addition to failing to notify those directly affected by your operations, it seems even Peterborough city council and the mayor are largely unaware of what you are proposing. In the city council committee meeting on January 20, 2020, two councillors brought the issue to the attention to the rest of city council. The other councillors were completely unaware and uninformed about what you are proposing, the timelines of the proposal and licensing hearings, and what the potential dangers are. Therefore, those councillors used their ignorance to vote down several important measures to study and protect citizens of this community. What steps have you taken to openly and directly communicate with city council, the mayor, our MP and MPP?

Potential Risks of Current Operations at BWXT Peterborough

In addition to the virtual lack of communication from the company, there is a veil of secrecy surrounding its current operations and what it hopes to achieve in the future. Currently there is no independent environmental monitoring of these risks, and we residents are told to trust the “honor system” of self-monitoring and self-regulation. This is clearly foolish as we have seen how dangerous it can be when industry is allowed to do this.

Under the current scope of its operations, the greatest potential risk to the public and workers of BWXT is beryllium.

As documented in the [February, 2017 “Report of the Advisory Committee” regarding the toxic legacy of GE’s past operations](#)ⁱ, the investigative reports in the Toronto Star by reporter Sara Mojtehedzadeh [“Lethal Legacy”](#)ⁱⁱ, the masters thesis [“Go to Work on Monday One More Time: An analysis of the compensation process for occupational disease at General Electric in Peterborough” by Natasha Luckhardt](#)ⁱⁱⁱ, the excellent investigative CBC/independent documentary [“Town Of Widows”](#)^{iv} and many medical studies, beryllium is highly toxic to people with even minimal exposure. Workers exposed to beryllium are subject to Chronic Beryllium Disease (CBD), a scarring of the lungs, and are much more likely to contract lung and other cancers.

“The lightweight chemical is extremely toxic and can cause chronic beryllium disease (CBD) which is a crippling ailment that scars the lungs (Michaels and Jones, 2005, 96-97). The potency of Beryllium is demonstrated by the fact that CBD has been diagnosed in those who work for a short period of time – **a matter of weeks each year** for one accountant – **as well as in people who live in close proximity to beryllium factories**” - Natasha Luckhardt

According to ex-GE employee Roger Fowler in Town Of Widows “There’s one room there they call the Beryllium Room... That’s a death sentence... You work in there and you’re DEAD”. Apparently over half of the people who worked in the GE nuclear division in Peterborough over the last few decades are either dead or dying of various forms of cancer.

It’s absolutely insane for the beryllium exhaust stack to be located mere metres away from a Kindergarten playground at a public school. That is

negligence on behalf of BWXT and it must be moved or removed completely to a safe location.

It's clear that BWXT places low value on its workers' safety (let alone the general public) when, it was discovered in 2017, that several workers in the Beryllium Room at BWXT were using the wrong air filters and were exposed to severe doses of this toxic chemical for 20 months before the mistake was discovered and reported to the public on BWXT's website on November 17, 2017^v. As noted above, even slight exposure (over a few weeks) to beryllium is toxic and potentially lethal. I have several questions regarding this incident and beryllium in general:

- What is the fate and current health status of those affected workers? What are their names?
- How could a responsible company allow this potentially lethal mistake to go un-noticed for almost 2 years?
- What is the exposure of beryllium on the neighbouring Kindergarten playground and what measures has BWXT taken to ensure that the health of those children is protected from the potentially lethal effects of Beryllium?
- Why does the exhaust stack for beryllium need to be only a few metres away from the playground at this school?

Potential Risks of Proposed Future Operations at BWXT Peterborough

With the proposal to expand operations at the BWXT site in Peterborough to include pelleting, the risk to the students at Prince of Wales and the tens of thousands of residents surrounding the plant increases exponentially. The storage, transport and processing of massive amounts of raw powdered uranium and the increased emissions of this material into the air, soil and water in our city is just one risk. The storage, transport and usage of massive amounts of liquid hydrogen is another.

While BWXT and the CNSC would have us believe that the uranium emissions from the plant would be negligible, any amount of the alpha-radiation-emitting substance ingested or inhaled by a person (especially a child of 4 or 5 years of age) is potentially carcinogenic and is definitely dangerous to the health and well-being of the citizens of our city. There is absolutely no reason that this should be happening in a populated area adjacent to a public school. Any amount of risk, in this case, is too much. I

am aware that BWXT occasionally tests surrounding areas for gamma radiation, however, I have seen no reports that they bother to test for Alpha radiation. Why is this? I am sure BWXT and the CNSC is aware of the dangers of alpha radiation and the fact that uranium emits this form, yet no testing is done to ensure our children are safe? That seems like quite the oversight (or negligent practice) on behalf of the company.

In a [study on potential dangers of uranium mining](#), it is stated that:

“1. Uranium mining and processing are associated with a wide range of potential adverse human health risks. Some of these risks arise out of aspects of uranium mining and processing specific to that enterprise, whereas other risks apply to the mining sector generally and still others are linked more broadly to large-scale industrial or construction activities. These health risks typically are most relevant to individuals occupationally exposed in this industry but **certain exposures and their associated risks can extend via environmental pathways to the general population.**

2. Protracted exposure to radon decay products generally represents the greatest radiation-related health risk from uranium-related mining and processing operations. **Radon’s alpha-emitting radioactive decay products are strongly and causally linked to lung cancer in humans.** Indeed, the populations in which this has been most clearly established are uranium miners that were occupationally exposed to radon.”^{vi}

It is clear that uranium processing and exposure to uranium particles in the air causes lung cancer in those exposed. It’s hard to imagine that those children playing for hours mere metres away from BWXT would NOT be exposed, even when BWXT claims to filter out *most* of the uranium it releases into the air. In fact, even with stringent air filtering, trillions of particles of alpha-emitting radiation will be released into the air. Inhaling just one of these particles represents an unreasonable risk to our children. Furthermore, our children have NOT consented to allow this to happen in their playground.

In addition to the dangers posed by uranium, there is another massive and unreasonable danger posed to the students and the public with the storage of 9,000 gallon tanks of hydrogen on site. As well all know, hydrogen is incredibly explosive and industrial accidents involving hydrogen explosions are far from uncommon. In fact, a 5-minute Google

search has revealed no less than 7 such incidents that have occurred over the past 10 months. These include an explosion that killed six at an industrial gas plant in India due to [leaking hydrogen cylinders](#)^{vii}, an explosion in Philadelphia described as [“one in a string of near misses”](#)^{viii}, several workers in Massachusetts severely burned by an [explosion of compressed hydrogen gas](#)^{ix}, flames shooting 50 feet in the air and buildings shaking in a 5-mile radius during a [hydrogen refuelling accident](#) in Santa Clara California^x, an [explosion at a hydrogen filling station](#) in Norway (which caused much of the EU to temporarily shut down all similar operations)^{xi}, [4 workers killed](#) in a blast felt 30KM away from a leaking hydrogen tank at a plant in Illinois^{xii} and an [explosion at a hydrogen storage facility](#) in Wisconsin.^{xiii}

All of the above events have occurred since April of 2019. I am certain that I could compile a list of hundreds of such incidents over the past decade with more focused research. What business does any company have proposing to place such a huge risk for danger and explosion right beside a public school? In addition to the risk of explosion, storing such a massive amount of raw uranium in the same complex which could easily be scattered around the city if such an explosion were to occur (making most of it uninhabitable for years to come due to radioactive contamination) is absolutely ludicrous. The dangers transporting all of this hydrogen around the city, refilling the tanks and safely operating with it 100% of time is just too much. There is no way to guarantee that there will never be an accident.

Is BWXT prepared to fully compensate the almost 12,000 property owners within a 2km radius of their plant should there be a worst-case-scenario hydrogen explosion event which releases uranium into the surrounding city? Does BWXT hold enough insurance to cover those whose properties would become uninhabitable? The absolute minimum would be \$6billion. My research indicates that BWXT doesn't even hold Nuclear Accident Liability Insurance. What about then compensating the city of Peterborough for all of its lost property tax revenues? While some may argue that an event like that is highly unlikely, it would be foolish to think that it's impossible. Accidents DO happen and one mistake is all it would take. What about the lives of the 600 students and faculty at Prince of Wales? Is the health, safety and lives of these young people less important than profits?

In the case of accident, is the City of Peterborough equipped to deal with the consequences of radioactive emissions? Are the fire department properly trained to respond to an accident of this scope? If not, is BWXT prepared to pay for the cost of training, upgrades to equipment and hiring of more staff to adequately deal with the type of accident which could only occur at the BWXT property?

What about releases of uranium into the water? Peterborough has one source of drinking water, and that is precisely where BWXT plans to release their contaminated waste water. Will you commit to upgrading the city's water treatment facilities to ensure that absolutely ZERO traces of uranium are found in it (and the surrounding environment of Little Lake and the Otonabee River)? If the answer is no, then clearly this business does not belong in this city. And that leads me to my main question: WHY does this business need to be in this city? What are the benefits of processing uranium in the middle of a populated residential area metres away from a public school in an aging facility on highly contaminated otherwise vacant property that needs to be properly remediated? Why can't the business be moved to a safer locale far away from a populated area? I suspect the answer is simply: corporate profits. Why should the children at Prince of Wales care about the corporate bottom line of BWXT (an American-based manufacturer of nuclear weapons) when they so clearly don't care about the health of its workers or neighbours? Why should property owners in Peterborough care about the bottom line of the company when they certainly don't care if property values in surrounding neighbourhoods plummet.

Aside from 100 or so jobs, what is the benefit to having this operation beside a captive audience of 600 of school children, our most vulnerable citizens? How does Peterborough as a city benefit? How many employees of BWXT even live within the city of Peterborough?

It's abundantly clear that, by attempting to increase the scope of its license here in Peterborough, that BWXT is planning on closing the plant in Toronto (due to significant pressure from that local community). We must make it clear to BWXT that this operation is NOT welcome here in Peterborough either. The risk of allowing this operation in our city is simply too great and the citizens of this town, like Toronto, are waking up to this reality and ready to fight this every step of the way.

BWXT History of Safety

Despite public claims to the contrary, BWXT is certainly not free of past and present safety issues and, along with their parent and associated companies (historically and currently), have a history of dangerous safety violations which have put millions of people at risk.

As we well know, BWXT's history in Peterborough is incredibly short having only purchased the operation roughly 3.5 years ago from GE Hitachi. The horrific history of safety violations at the same operation by GE Hitachi is well documented and gaining more and more recognition as time goes on (see my references above). In roughly 40 months of operation, 20 months of that time was spent with employees in the beryllium room operating without the proper air filters for their respirators. 20. Months. That's a severe safety violation that went undetected by this corporation for half of its existence in this city. Those poor employees and their families! What kind of confidence should we have in this company when something as simple as double-checking that their employees working with toxic metals are safe is overlooked for 600+ days? Are you sure the right air filters will be placed on the exhaust stacks affecting our community? Are they currently using the proper air filters? Are you sure? Why should we trust you?

Currently, there is a class-action lawsuit in the United States where BWXT is a named defendant. In this case, the situation is remarkably similar to one of the biggest potential risks we face if the license application here in Peterborough is granted.

["The 27-page suit, which now resides in federal court, alleges the entities involved with the uranium enrichment plant "could have prevented or mitigated the offsite impact" of the facility's operations—and minimized harm to nearby residents—by exercising simple caution, complying with applicable regulations and using reasonable care.](#)

["The foreseeable risks of harm posed could have been reduced or avoided by reasonable instructions or warnings when it became clear that toxins had been released into the environment," the plaintiffs argue. "Those omission \[sic\] render Defendants' operations not reasonably safe."](#)

["At the heart of the complaint is Zahn's Corner Middle School, which suddenly closed on May 13, 2019 after enriched uranium was detected](#)

[within the school itself.”^{xiv}](#)

Basically, BWXT and its partner companies released massive amounts of uranium into the air from its Portsmouth, Ohio plant and failed to notify the public or take reasonable steps to ensure the safety of the public. It was then found in a PUBLIC SCHOOL over 2 miles away which caused the school to close indefinitely. It was the school itself which resulted in the first notification to the community, not BWXT. The silence and inaction by BWXT is absolutely negligent and further proves that the company is not prepared to or even interested in keeping its neighbours safe. It also proves that BWXT is far from immune to accidents and will willingly engage in cover-ups to protect its profits and reputation. The class-action lawsuit now involves residents in a 7-mile radius from the event. This occurred in a largely rural area with far less residents than Peterborough. A similar event here would affect almost the entirety of Peterborough County, let alone the city. I am not even going to pose the question of how residents can be expected to trust BWXT because it is abundantly clear that we can not.

BWXT is affiliated with the company Babcock & Wilcox Enterprises (The ‘B’ & ‘W’ in BWXT). Babcock & Wilcox has a long history in the nuclear industry most famously, perhaps, for manufacturing the reactors for 3 Mile Island. After the reactors there nearly melted down, Babcock & Wilcox were sued for damages by the public utility [“charging that B&W had caused ‘unthinkable risks to human life’...](#) The keystones of GPU's negligence claim were two memos written in February 1979 by a B&W engineer describing a September 1977 incident at an Ohio nuclear plant. The Ohio problem, also involving a loss of coolant to a B&W-built reactor, was identified and corrected in 20 minutes. The memo advised B&W management to warn other BPW reactor owners to revise emergency instructions to prevent a recurrence. (The warning finally was sent out after the TMI accident.) The memos, Klingsberg declared, ‘are the smoking guns of this case.’^{xv}

It's clear that B&W has a history of technical issues and with failure to communicate those issues, resulting in grave danger to human life and the communities surrounding its operations. A report from the mid-1980's describes no less than [30 similar issues at 8 different nuclear power plants built by B&W over the span of just 7 years \(1978-1985\)](#)^{xvi} It would seem that B&W's engineering is riddled with problems and its communication to the public and relevant authorities is dubious at best. How can our

community be assured that BWXT takes safety seriously based only on their word and their own self-reporting? How many more incidents and near-misses are there that we don't know about? Why are we supposed to be ok with relying solely on trust and the honour system without any independent 3rd party oversight of their operations and proposed operations in Peterborough?

In order for this license to be granted or renewed, we MUST have independent 3rd party oversight, monitoring and environmental assessments. The report compiled for BWXT by Acardis Design & Consultancy is a complete sham. It fails to actually study the potential impacts of this operation on the "critical receptor (a toddler aged 0.5-4 years)" based on the fact that BWXT's self-reported emissions are well below the (completely arbitrary industry-set) regulatory limits. Therefore, no further study is needed? This report completely ignores the fact that there is a Junior Kindergarten playground 20 metres away from the plant which is filled with 100 "[critical receptors](#)" who play there for hours a day, 200 days a year. That's a captive audience of incredibly vulnerable young people and the report barely acknowledges their existence.^{xvii} The only safe level of ingestion or inhalation of alpha-emitting uranium and toxic beryllium (especially for a 4-year-old) is ZERO. There needs to be a third-party study using this number as opposed to the sham arbitrary report that completely glazes over this most important fact. By granting every license that has ever come before it, the CNSC is clearly failing as any kind of regulatory oversight body and is doing nothing to protect the citizens surrounding nuclear operations.

Conclusions

BWXT has a very short history in Peterborough. The company they purchased their nuclear division from has a long and toxic history in Peterborough. For over half of BWXT's history here, they put their own employees at grave risk due to the company's lax safety protocols. Their entire existence in this city and the safety of our children, citizens and property owners relies solely on the honour system of self-monitoring, self-regulation and self-reporting. As I have demonstrated, BWXT and its associated companies have demonstrated a past of dubious safety and a lack of communication when grave situations arise. Despite their claims, safety is certainly not near the top of the list of their concerns. BWXT has failed to communicate with its most important and most vulnerable

neighbour (Prince of Wales school and its parents and faculty) and has made virtually no attempt to communicate with its most important community members (city council, who are unaware of what the license renewal even entails, our mayor, MP and MPP's, local residents etc) which is in direct violation of its current license. They have never attempted to explain or justify why a pelleting operation NEEDS to take place in a densely populated neighbourhood adjacent to a school. BWXT has no business further polluting our city and endangering our children's health. The land that it sits on needs a rest. A full clean-up needs to happen and 10+ more years of heavy industry in a residential and school zone area is not only incredibly damaging to its closest neighbours, but to the city and county as a whole. There can be no guarantee of 100% safety with regard to emissions and the transport and storage of incredibly dangerous materials (powdered uranium and liquid hydrogen). Therefore, for the first time in its history, the CNSC *MUST* stand up for protecting communities and absolutely 100% deny this license renewal. If an accident were to occur and any children were harmed because of it, BWXT, the CNSC, the municipal, provincial and federal governments will have a lot to answer for. To grant this license renewal and/or expansion is irresponsible, negligent and completely disconnected from the needs, wishes and will of the community you are forcing this industry on without our consent.

Recommendations

- I request, on behalf of the students, parents and faculty at Prince Of Wales public school and the tens of thousands of residents surrounding the BWXT plant in Peterborough, that the license renewal be absolutely denied. There is no place within a populated area, especially a few metres from a kindergarten playground, for this type of operation to safely exist.
- Being that the CNSC is nothing more than a captured regulator and has no history whatsoever of denying a licensing request from the nuclear industry, I am sadly aware that my first request will be denied. Therefore, if the licensing renewal is to be granted, I demand that the scope be limited to the current operation of assembling fuel bundles ONLY. There is absolutely no place within a populated area, especially a few metres from a kindergarten playground for raw powdered uranium to be stored and processed. There is absolutely no need for this type of operation to take place within a populated area and it should be completely moved to a new facility with a reasonable buffer zone of 2km or more around it to ensure

public safety. Further, there is no way to absolutely guarantee safety of residents and students when massive tanks of hydrogen are stored and used on-site. There is incredible potential danger of explosion particularly when refilling these tanks. There is considerable danger to the public when transporting hydrogen and powdered uranium through our residential neighbourhoods. Explaining it away as “well, there’s never been an accident here” is foolish and short-sighted. Accidents can and DO happen on a regular basis and our children and innocent residents of this city are in grave danger if the pelleting operation is to be allowed.

- If the license is to be renewed, I request that the maximum length of the renewal is 2 years, after which it should be examined again. Seeing as BWXT has only 3 years of history in this city, to grant them a blanket 10-year license is ludicrous. They don’t have a proven history in this city and, in fact, they have quite a dubious safety record in many of their other operations dating back decades. The previous operator of the facility has an even worse safety record with thousands of past employees dead or suffering from various forms of workplace-related cancers.

- If the license is to be renewed, the beryllium stack **MUST** be moved to a much safer location on site, or the beryllium brazing portion of the manufacturing process must be moved to an entirely different location. Having the beryllium output stack within 20 metres of the junior playground at a public school is the worst possible location it could ever be. It’s negligent, irresponsible and clearly shows how little regard for the health and safety of the local children BWXT has.

- If the license is to be granted, I demand that a proper, impartial environmental assessment be conducted on the potential impact to residents, and especially to students of the neighbouring school.

- If the license is to be granted, I demand that the surrounding neighbourhoods, school and playground be constantly monitored, not only for gamma radiation, but for alpha radiation emissions, beryllium emissions and uranium particles in the air and soil. The acceptable thresholds should be ZERO. If there is anything more than that, the plant and school should be immediately shut down, residents immediately notified and instructed on what action to take and steps be taken by the company to immediately rectify the situation. To do anything else is playing Russian Roulette with the health and safety of our children.

- If the license is to be granted, any usage of hydrogen (especially potentially dangerous operations like re-fueling the tanks) be limited to times when school across the street is not in session.
- If the license is to be granted, transport of dangerous and/or radioactive materials should be limited to a route with the LEAST amount of residences (ie along Landsdowne and up Monaghan ONLY... no transport allowed along Clonsilla & Charlotte, for example).
- If the license is to be granted, the storage of uranium on-site should be severely limited. The current guideline of over 100,000 tons is completely unacceptable. Being that this plant is in a flood zone and has a history of contamination and being unable to control the effects of floods, there needs to be greater care placed on where the uranium is stored and what to do if material was allowed to escape in the likely event of a major flood.
- If the license is to be granted, on a limited timeline, BWXT should outline plans for future operations at a brand-new facility away from populated areas where they can safely protect the public and the environment from any potential negative consequences due to their activities. The only safe and responsible thing to do is to shut down the Toronto and Peterborough plants and consolidate them into a brand-new operation somewhere safer. The facility in Peterborough is well over 100 years old and the entire land that the GE plant once stood on needs to be properly remediated, cleaned up and given back to the city that donated the land to them in the first place. There is no place for this type of operation in the middle of a growing city in 2020.
- If the license is to be granted, BWXT should clearly and publicly outline what its emergency response plan for ALL potential emergency situations is. BWXT must make public what kind of insurance they hold and they MUST take responsibility for any and ALL potential negative outcomes due to their operations in the city. This includes but should not be limited to: negative health consequences to the children at Prince of Wales school and the almost 25,000 residents of Peterborough within the 2km radius surrounding the plant; environmental cleanup of tainted air, water and soil within the city and in Little Lake & the Otonabee river (the source of drinking water for the city); full compensation, in the event of an accident or environmental contamination for all of the owners of the 10,000+

properties within the 2km radius of the plant; an assurance of full environmental remediation once the plant ceases operations in the city; full compensation for the workers of BWXT and their future widows for the dangerous working conditions and chemical and radioactive exposures they are subject to.

- If the license is to be granted, BWXT must assure the public that they will NEVER use or process enriched uranium on site (which was attempted once before) and that none of their operations will ever contribute to the manufacture or proliferation of weapons. They should only ever supply power for existing CANDU reactors. Nothing more.

Sincerely, and with grave concern,



Michael Phillips,
Parent of student at Prince of Wales
Resident of Peterborough, ON

i https://www.unifor.org/sites/default/files/documents/document/ge_advisory_cmtt_report_may_15_final_for_web.pdf

ii <https://projects.thestar.com/lethal-legacy/>

iii https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKewjA15iezp_nAhVKmeAKHZbCDuQQFjABegQIARAB&url=https%3A%2F%2Fmacsphere.mcmaster.ca%2Fhandle%2F11375%2F16435&usg=A0vVaw3G-3lykMp7Fe1UzNZ8Ly30

iv <https://www.cbc.ca/player/play/1579855939557>

v <https://www.bwxt.com/media/8cf24806-9222-4cec-a779-da518becd908/JR2ZYg/BWXT%20Nuclear%20Energy%20Canada/Public%20Disclosure%20Documents/PTBO.PPE.Nov.2017.FINAL.PDF>

vi <https://www.ncbi.nlm.nih.gov/books/NBK201047/>

vii Blast in Vadodara co kills 6 Ahmedabad Mirror | Updated: Jan 12, 2020

<https://ahmedabadmirror.indiatimes.com/ahmedabad/others/blast-in-vadodara-co-kills-6/articleshow/73208046.cms>

“Six persons were killed and four injured in a blast at an industrial and medical gas manufacturing company in Padra taluka of Vadodara district on Saturday. The blast is believed to have been caused by leakage in the hydrogen cylinders.”

viii Philadelphia Explosion One in String of 'Near Miss' Accidents at Refineries Using Deadly Chemical: Wednesday, July 3, 2019

<https://www.desmogblog.com/2019/07/03/philadelphia-energy-solutions-explosion-refineries-hf-deadly-chemical>

“Hydrogen fluoride (HF) is one of the most dangerous chemicals used by industry. When released, it forms [rolling clouds](#) that cling low to the ground and can spread rapidly over long distances.

On the skin, HF [burns and causes ulcers](#). Mixed with water, it forms hydrofluoric acid. Inhaled into the lungs, it can cause a range of harms, from cough to lung collapse to the [deadly destruction](#) of organs and bones. Breathing the gas for as little as five minutes can cause death within “a couple of hours,” [according to](#) the University of North Carolina at Chapel Hill. Symptoms can be immediate or delayed for days.”

i× Three industrial workers injured in chemical explosion: Apr 14, 2019

<https://www.wcvb.com/article/three-industrial-workers-injured-in-chemical-explosion-at-ige-in-taunton/27140335>

“TAUNTON, Mass. — Three industrial workers were injured in a chemical explosion at a plant in the Myles Standish Industrial Park in Taunton, according to the Taunton Fire Department...

Upon arrival, firefighters found three employees suffering from flash burns on their faces and hands. Firefighters were notified that the explosion could have possibly released hazardous materials into the air...Officials at the scene determined the explosion involved compressed hydrogen and arsine.”

x Hydrogen explosion shakes Santa Clara neighborhood: June 2, 2019

<https://abc7news.com/5326601/>

“An explosion at a chemical plant in Santa Clara caused a shelter in place for residents and businesses in the area.

Flames bursting out of Air Products chemical facility shook buildings and residents at least five miles away from it.

‘You heard the boom and then you felt like a wave, a pressure... a force. It just hit you all around you and moving you slanting you back,’ said Evan Rosales.

Rosale's catering business is a 10-minute drive from the plant and describes the flames as 50 feet high. Rosales says his first thought was to save his workers.

The tanker truck was in the process of being fueled and it began to leak and there was a large hissing noise. The workers on site tried attempted to shut down the valve of the line that was fueling one of the trucks”

^{xi} Norway: Explosion at hydrogen filling station: Jun 11, 2019

<https://www.electrive.com/2019/06/11/norway-explosion-at-fuel-cell-filling-station/>

“In Sandvika near Oslo, an explosion occurred at a hydrogen filling station for fuel cell cars on Monday...

Update 01.07.2019: The hydrogen leak was caused by an improperly installed plug.”

^{xii} Hydrogen blast led to deaths at US silicones plant : December 19, 2019

<https://cen.acs.org/safety/industrial-safety/Hydrogen-blast-led-deaths-US/97/web/2019/12>

“Leaking and uncontained hydrogen led to an [explosion that killed four workers and seriously injured a fifth](#) last May at AB Specialty Silicones in Waukegan, Illinois... However, despite the output, the quantities of material the facility used and stored fell below threshold levels triggering oversight by the US [Environmental Protection Agency’s Risk Management Program](#)

... The blast was felt 30 km from the facility... While the building filled with flammable vapors, the workers attempted to open the emulsion area to outside air and turn on fans. They were unable to complete these efforts before the building exploded.”

xiii [Leaking hydrogen tanks spark explosion, fire in Waukesha : Dec 12, 2019](#)

<https://wkow.com/2019/12/12/waukesha-firefighters-investigate-airgas-explosion-reports/>

“An explosion in a hydrogen storage facility in Waukesha was safely extinguished Thursday afternoon.

Firefighters were called about 1:45 p.m. to the Airgas company, where officials said there was an explosion in the hydrogen storage area of the plant.”

xiv https://www.classaction.org/news/another-class-action-filed-over-alleged-radioactive-contamination-near-ohios-portsmouth-gaseous-diffusion-plant?fbclid=IwAR1YJ4-oXypHXcesQFo6WskQdetEW34pegd3uhW-f8MUOSIhViRav9J_9AY

xv <https://www.washingtonpost.com/archive/opinions/1983/02/20/the-real-three-mile-island-story-leaks-out/75d044b4-6bab-42f2-8738-d4292c9d8ed0/>

xvi <http://digitalcollections.library.cmu.edu/awweb/awarchive?type=file&item=439788>

xvii <https://www.bwxt.com/bwxt-nec/safety/licensing/environmental-risk-assessment>