Three Empire State Plaza, Albany, NY 12223-1350
www.dps.ny.gov



April 25, 2024

VIA EMAIL

Hon. Michelle L. Phillips
Secretary to the Commission
3 Empire State Plaza
Albany, NY 12223-1350

Re: Matter No. 21-01188 – In the Matter of the Indian Point Closure Task Force and Indian Point Decommissioning Oversight Board.

Dear Secretary Phillips:

Please accept for filing in the above-captioned matter, the April 25, 2024 presentation by Fairewinds Energy Education to the Indian Point Decommissioning Oversight Board regarding exploring the option of onsite wastewater storage. Should you have any questions regarding this filing, please contact me. Thank you.

Respectfully submitted,

Tom Kaczmarek
Executive Director
Indian Point Decommissioning Oversight Board

# New York State
# Decommissioning Oversight Board

FAIREWINDS
ENERGY EDUCATION

**Presented by**
**Arnie Gundersen, Chief Engineer**

**501(c)3 Non-Profit Organization**
**https://www.fairewinds.org/**
**St. Albans, VT, USA**

# Fairewinds’ Presentation to:
# The New York State
# Indian Point Decommissioning Oversight Board

## Arnie Gundersen: Background and Fairewinds

## NYS DOB: Summary of Storage of Radioactively Contaminated Water in Tanks

## Submitted Questions: by members of the NYS DOB

# Review of Option of Storing Contaminated Water in Tanks within the Turbine Building at the Indian Point site

# **New York State Decommissioning Oversight Board – Questions and Fairewinds' Responses**

# Review of the Option of Storing Contaminated Water in New Tanks within the Turbine Building

This option would store radioactively contaminated water inside storage tanks installed in the turbine building after the removal of equipment. Water would be stored in multiple tanks with an empty tank serving as a standby tank in case a tank begins to leak. The storage tanks would be vented to enable air to leave as water is transferred into the tanks; the vent line could then be closed since the subsequent storage would be static (i.e., no adding or removing water from the tanks).

This description was written by NY State DOB.

## Q1.

**Would the contaminated water in the spent fuel pools et al be processed through filter and demineralizers to remove the majority of radioactivity (other than tritium) prior to being placed in the turbine building's storage tanks?**

**A1 —**

**The water has undergone several filtration and demineralization cycles, yet it continues to remain radioactive as no filtration or demineralization method is fully capable of eliminating radioactivity. If I were to establish these processes, I would add an additional filtration or demineralization step. This is because transferring the water from the spent fuel-pool could potentially stir up further radioactive contamination in the spent fuel pool and connected tanks.**

**A. 1.2 The water would be stored in multiple tanks, with an empty tank serving as a standby tank in case a tank begins to leak. This methodology has been used successfully previously, and the spare tank is an extra layer of protection as required/envisioned in a failsafe nuclear power program.**

**Once the tank is filled, it is static, meaning nothing comes in or goes out. The storage tanks would be vented to enable air to leave as contaminated water is transferred into each tank; then, the vent line would be closed so the subsequent storage would remain static (i.e., no adding or removing water from the tanks until they have decayed to the level decided by the state and its stakeholders).**

**Q2.** Processed water is sampled after its collection tank is recirculated for at least three tank volumes to achieve homogeneous mixing of the tank's contents (ML22182A076 page 162).

**If the water in the spent fuel pools et al is processed prior to being placed in the turbine building's storage tanks, why is it advocated that approximately 30 samples from each spent fuel pool be drawn for independent analysis?**

**A.2**

**Tank recirculation may be effective if the liquid is genuinely homogeneous. However, it is not clear that homogeneity can be achieved in the spent fuel pool. Gravity will separate the radioactive isotopes, so the heavier radioactive material will settle into the bottom of the tank and will not be resuspended by remixing. Therefore, as the tank is drained, the radioactive material at the top may be less radioactive than the radioactive isotopic water remaining at the bottom. The regular stratification of radionuclides drives the need for 30 samples in a spent fuel pool. This necessary process is not expensive, nor is it time-consuming.**

**Q3.**

In May 2021, a storage tank at Indian Point was overfilled with radioactively contaminated water due to a faulty level instrument (ML23047A154). Storage tanks for radioactively contaminated water at Fukushima have been overfilled due to various miscues.

**How would the radioactively contaminated water at Indian Point be transferred into the storage tanks installed in the turbine building?**

**A.3.1**
**The Indian Point tank in your example was installed fifty years earlier. As I have suggested, overfilling three brand-new tanks with brand-new instrumentation is very unlikely. Considering the public interest in the process, if I were managing the project or had a team managing the project, I would have an unbiased scientist(s) who understand the process, observe the transfer, and minimize risk.**

## A.3.2

**As a double failsafe system, I recommend placing a berm around the tanks to collect any potential leakage before it becomes excessive. Holtec has already planned to transfer radioactive water between Units 2 and 3 using tanker trucks. Thus, the transfer of water is something that Holtec had previously planned. Therefore, I would review their processes for doing so and thereby ensure that similar failsafe methods for transferring radioactive water and mitigating problems are in place to protect the integrity of the Hudson River Valley in its unique role as a tourist, recreational, and economic center of life in New York State.**

## Q4. How long would the tritiated water be stored in the turbine building's tanks?

**A.4.1. Let me make two points in this answer: First, Normal natural water contains small amounts of tritium. The water stored at Indian Point is tens of thousands of times more radioactive than naturally occurring river water.**

**Second, it is a fallacy to call the water stored at Indian Point *tritiated*. Yes, the water in the Indian Point (IP) spent fuel pools contains tritium, and more importantly, it also contains numerous other radioactive isotopes.**

## A.4.2.

Although **the storage duration is undefined and unspecified,** I firmly believe that the immediate release of radioactive water into the Hudson River, one of the top 14 estuaries in the U.S., is unwarranted, unnecessary, and unscientific. Additionally, as a nuclear engineering major at **RPI in upstate New York, I was trained** to accept the **industry mantra that the beta particles released from the decay of tritium had inconsequential health effects. More importantly, I was never taught that tritium could become organically bound. Based on misconceptions gleaned from the 1950s bomb program, current EPA drinking water standards for tritium were determined with no scientific basis in 1977.**

**A.4.3**
**In 2014, Scientific American published an article about the history of EPA tritium standards. In the article, David Kocher of the Oak Ridge Center for Risk Analysis noted that "…as a health physicist who has studied tritium for years observes, in the 1970s, the EPA did not rely on any health studies in setting its original standards. Instead, the EPA back-calculated acceptable levels of tritium in water from the radiation exposure delivered by already extant radionuclides from nuclear weapons testing in surface waters.**

**Kocher added, "It's not a health-based standard, it's based on what was easily achievable,".**

**https://www.scientificamerican.com/article/is-radioactive-hydrogen-in-drinking-water-a-cancer-threat/**

A.4.4

In several previous presentations at other locations, I noted and stressed the recent and vital scientific research done separately by four well-known and acknowledged scientists concerned about tritium's unanalyzed health effects.

Those scientists are Dr. Gordon Edwards in Montreal, Canada, Dr. Ian Fairle in the UK, Dr. Arjun Makajani in Washington DC, and Dr. Tim Mousseau in South Carolina.

Each scientist conducted their research independently and concluded that the health effects of tritiated water have never been adequately analyzed.  Separately, these four scientists discovered little research on organically bound tritium worldwide.

**Q5. What would happen to the tritiated water after being stored in the turbine building's tanks?**

**A5.** After retention for further scientific analysis of its health effects, the ultimate disposal of water shown to meet the criteria I have addressed in Response #4 above should be a community decision made later.
A decision should not be made until all the scientific analyses regarding synergistic toxicity have been evaluated and precise, reliable information and data are available for analysis.

**Q6.** The spent fuel pools are designed as Seismic Class I structures to remain intact in event of a design basis earthquake (DBE, also called the safe shutdown earthquake, SSE). (ML17299A211 page 48). The turbine building is designed as a Seismic Class III. Class III includes "*Those structures, systems, and components which are not directly related to reactor operation and containment, and which do not have to maintain structural integrity during or following a SSE.*" (ML17299A299 page 1). In August 2011, an earthquake caused ground motion at the North Anna nuclear plant exceeding its DBE/SSE levels. (ML112420551 slide 3). In 1979, an earthquake caused ground motion at the Summer nuclear plant exceeding its DBE/SSE levels and in 1986, an earthquake caused ground motion at the Perry nuclear plant exceeding its DBE/SSE levels. (ML12005A034, page 1).

**How would the storage tanks inside the turbine building be protected from failure during/following an earthquake?**

**A6. To answer this question, it is essential to put the Design Basis Earthquake, also called the Safe Shutdown earthquake, in perspective. An earthquake of that magnitude would disable bridges crossing the Hudson River and infrastructure and communities near Indian Point.**

**The Sumner quake cracked the Washington Monument, which was 400 miles away. In the examples mentioned (Perry and Sumner), which both exceeded their DBE, the turbine halls and equipment within remained intact, and both units rapidly returned to operation.**

**I expect the turbine halls at Indian Point to react similarly to those at Sumner and Perry. However, I am not opposed to storing the radioactive liquids in the even more robust containment or auxiliary structures on site if that option is desirable to Holtec. I chose the turbine halls to allow Holtec time to dismantle the remainder of the site while leaving the turbine buildings intact.**

# Q7.

On January 25, 1994, workers discovered 55,000 gallons of water in the basement of the unheated containment building for the Dresden Unit 1 reactor from a water-filled pipe that had frozen and ruptured. (ML031060534 page 1). On 15 March 3, 2015, the owner of Indian Point Unit 3 informed the NRC that both of the level alarms for the Unit 3 refueling water storage tank were disabled when they froze during cold weather. (ML15069A080 page 1). On March 24, 2003, the owner of the McGuire nuclear plant informed the NRC that the level instrumentation for the Unit 1 refueling water storage tank were disabled when they froze during cold weather. (ML030970588 page 1). **How would the instruments monitoring the level inside the turbine building's storage tanks be protected during cold weather?**

**A7. The failures identified above were in unheated or inadequately heated structures. Given the $2B decommissioning trust fund, we should anticipate that Holtec has enough funds to keep the heat on and avoid freezing the tanks. Additionally, once the tanks are full, their levels will remain unchanged, so continuous monitoring tank levels is unnecessary.**

**I have recommended a berm to surround the tanks in case of leakage or overflow. The berm would identify and contain leakage early until rapid intervention and mitigation occur.**

**Q8.** The NRC reported that an estimated 10,000 gallons of radioactively contaminated water leaked from the condensate storage tank at the Oyster Creek nuclear plant before being detected. "*The leak could have existed for as much as eight hours*." About 2,000 gallons of contaminated water leaked into the ground outside the building. According to the NRC, "*the instruments [sic] used to measure condensate storage tank levels are inherently inaccurate and used to detect only gross changes in tank level (the tank has a 500,000 gallons capacity)*." (ML20010E950 pages 8-9).

**How would leakage from storage tank(s) inside the turbine building be detected before contaminated water left the building?**

**A8.**
**Unlike in the examples suggested above, once filled, the level in the new tanks is static. Daily inspections of the tanks are appropriate. I have recommended that a berm be installed around the tanks so that leakage can be immediately identified and suitable mitigation measures can be taken.**

**Q9.**
Are you aware of Holtec’s dry storage technology currently being deployed in Ukraine? **Is this storage method viable at Indian Point for the liquid waste?**

**A9**
**Holtec’s dry storage technology in Ukraine is not appropriate for storing liquids.**

**Q10.** We have heard from another nuclear expert that onsite storage has associated risks, including evaporation and leaks. **Can water be stored in tanks without evaporation or leaks?**

**A10.1. Once the proposed on-site tanks are completely filled, the level will not fluctuate. Vents on all tanks are designed to allow air movement as the level fluctuates. Putting a rubber diaphragm seal over the tank vent once full would allow air movement due to minor temperature changes while preventing evaporation.**

**A10.2.**
**The proposed tanks are not under pressure or subject to significant temperature change. A berm would surround them. Leakage in an unpressurized tank is unlikely, but should it occur, it would be captured within a berm built around the tanks. The berm would be alarmed to notify the monitoring teams for leak intervention, mitigation, and remediation—a much more robust plan than at other sites.**

**Q11.1. If there is evaporation from tanks, what is the amount of tritium that is released into the environment?**
**Q11.2. How does this level of radiation compare to the level of radiation associated with discharge to the Hudson?**

**A11.1. Several gallons of water might evaporate. Holtec is proposing dumping more than one million gallons of radioactive liquids into the Hudson River.**

**A11.2. Holtec's approach, therefore, releases one million times more radioactivity into the environment.**

**Q12.**
How much storage capacity is currently available on site? What are the ages of these tanks/vessels, and have there been leaks?

**A12. I have not proposed reusing old tanks presently in use at Indian Point. I have proposed building three new tanks within a berm in an existing structure at Indian Point. I have suggested they be built in the turbine hall, but the containment or auxiliary building are also solid options.**

**Q13. Are you aware of advancements in technology to remove tritium from water? What is the viability of any alternative solutions?**

**A13. To answer this question more specifically, a tritiated water molecule weighs approximately 10% more than a regular one. This means it evaporates at about 2 degrees F higher than regular water (212 v 214F). Although complex and costly, using this weight difference, it is possible to separate tritiated water from regular water. However, this question also neglects the fact that other radioactive contaminants are present in the fuel pool water.**

**Q14.** The Village of Buchanan passed a resolution last year expressing its intention not to approve any permit for onsite storage of tritiated water. **Do you agree the Village's position should be respected? Does the NRC or local authorities take precedence?**

**A14.1. I agree that the will of half a million people who signed the petition to stop Holtec from dumping into the Hudson River should be respected. [The town of Buchanan benefited from lower taxes for the years of Indian Point's operations.] Many spills, leaks, and ongoing releases have already compromised the Hudson River – a valuable economic and tourist resource that belongs to all New Yorkers.]**

**A14.2. I have never suggested outside storage of radioactive and tritiated water. Instead, I have used Vermont Yankee's precedent for my guidance. Vermont Yankee stored an unexpected increase in tritiated water in new tankage it built in its turbine building without asking for the town’s or the NRC's approval.**

**More importantly, Holtec has a long legislative history of manipulating governments and agencies (including the NRC) to achieve favorable legislative outcomes for itself.  For example, Holtec coopted the NRC into accepting its application for an interim high-level spent nuclear fuel dump in the desert Southwest over the opposition of States and citizen groups.**

**A14.3. After the NRC approved this illegal scheme, citizen groups and States appealed the NRC decision. The conservative Fifth Circuit Court reversed and rebuked the NRC's decision.**

**Holtec also anticipates that the NRC will issue a never-before-tried restart license for the Palisades reactor in Michigan, which defies legal precedence. Citizen groups are preparing to litigate, expecting the NRC to swallow Holtec's untried approach again.**

## A.14.4

I was one of five Vermont Yankee oversight panel members for several years.  The panel approved VY's license extension for 20 more years of operation if the utility made the appropriate repairs and upgrades.

When I looked at Indian Point, and I have been there in person many times, I chose to preclude any NRC licensing issues by using the interior of a preexisting building for the new tanks, given that this precedent has already been accepted as a valid procedure at Vermont Yankee.

**A14.5.**
**However, given Holtec’s efforts nationwide to push the envelope, I am sure the corporation will attempt, once more, to coopt the NRC to try to prevent this reasonable option.**

**I aim to protect the Hudson River's economic, tourist, and agricultural viability, and the significantly larger population of its neighbors, stakeholders, and recreational users.**

**As I mentioned, I was one of its recreational users for many years.  The State of New York, its people, and the communities we know and cherish here are very dear to my family and me.  I will continue to work to protect this state from environmental pollution and synergistic toxicity.**

**Thank you to Governor Hochul, The New York State Decommissioning Oversight Board, and all the advocates who seek to protect the Hudson River for inviting me to answer questions in this presentation.**

***Arnie Gundersen, Fairewinds***
***April 25, 2024***

# Arnie Gundersen, Chief Engineer
# Fairewinds Energy Education

## Nuclear Engineering, Safety, and Reliability Expert

## 53 years of nuclear industry experience

## including oversight analysis and financial management

| | |
|---|---|
| **ME NE** | **Master of Engineering Nuclear Engineering**<br>**Rensselaer Polytechnic Institute, 1972**<br>**U.S. Atomic Energy Commission Fellowship**<br>**Thesis: Cooling Tower Plume Rise** |
| **BS NE** | **Bachelor of Science Nuclear Engineering**<br>**Rensselaer Polytechnic Institute, 1971, Cum Laude**<br>**James J. Kerrigan Scholar** |
| **RO** | **Licensed Reactor Operator**<br>**U.S. Atomic Energy Commission**<br>**License # OP-3014** |


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