NEW YORK STATE

Indian Point Decommissioning Oversight Board

## Working Group Recommendations

# School Monitoring

September 3, 2021

# Agenda

- Introductions
- Scope of Concerns
- School Profile
- Oversight
- Monitoring Assessment
  - Potential Release Pathways
  - Risk Assessment
  - Existing Monitoring
  - Monitoring Examples
- Recommendations
- Feedback and Additional Research
- Proposed Next Steps

# Participants

- Dan Fuller, Deputy Secretary for Education
- Senator Peter Harckham
- Linda D. Puglisi, Supervisor, Town of Cortlandt
- Theresa Knickerbocker, Mayor, Village of Buchanan
- Joseph Hochreiter, Superintendent, Hendrick Hudson School District
- Dave Lochbaum, Nuclear Engineer (ret.)
- Susan Spear, Westchester County

- Department of Public Service
  - Tom Congdon
  - John Sipos
  - Tom Kaczmarek
  - Bridget Frymire
  - Ryan Coyne
- Department of Environmental Conservation
  - Kelly Turturro
  - Dan Evans
  - Maria Antoniou
- Department of Health
  - Alex Damiani
  - Cindy Costello
  - Dan Lang
  - Nicole Vitillo
  - Thomas Wainman
  - Ryan Macfee

# Scope of Concerns

- Radiological exposure during spent fuel transfer and decommissioning phases
- Non-radiological particulate exposure (concrete, asbestos, lead, etc.) resulting from demolition activities
- Use of heavy machinery and trucks near school

# Buchanan-Verplanck Elementary School

- 160 Westchester Ave, Buchanan, NY 10511
- 349 Total Students in Grades K through 5
- Approximate distances to:
  - ISFSI Dry Cask Storage – 4,120 feet
  - Unit 2 Spent Fuel Pool – 3,910 feet
  - Unit 3 Spent Fuel Pool – 3,650 feet


Dry Cask Storage
Lents Cove Park
U2 SFP
U3 SFP
Broadway
Lafarge Gypsum
Broadway
Continental Building Products
Buchanan-Verplanck Elementary School

# Oversight

# New York State Oversight

- *Federal NRC oversees radiological aspects (25mrem) until license terminated*
- DPS / PSC
  - Supervisory powers over retired nuclear facilities
  - Regular on-site visits
- DEC
  - Jurisdiction over non-radiological contamination and residual radiation
  - Review decommissioning and restoration plans
  - Can advise where air samplers are placed
  - Administrative Order on Consent – May 2021
- DOH
  - Supervise and regulate the public health aspects of radiation
  - Make recommendations for environmental monitoring and review data to determine public health impact
  - Regulation of public drinking water supplies

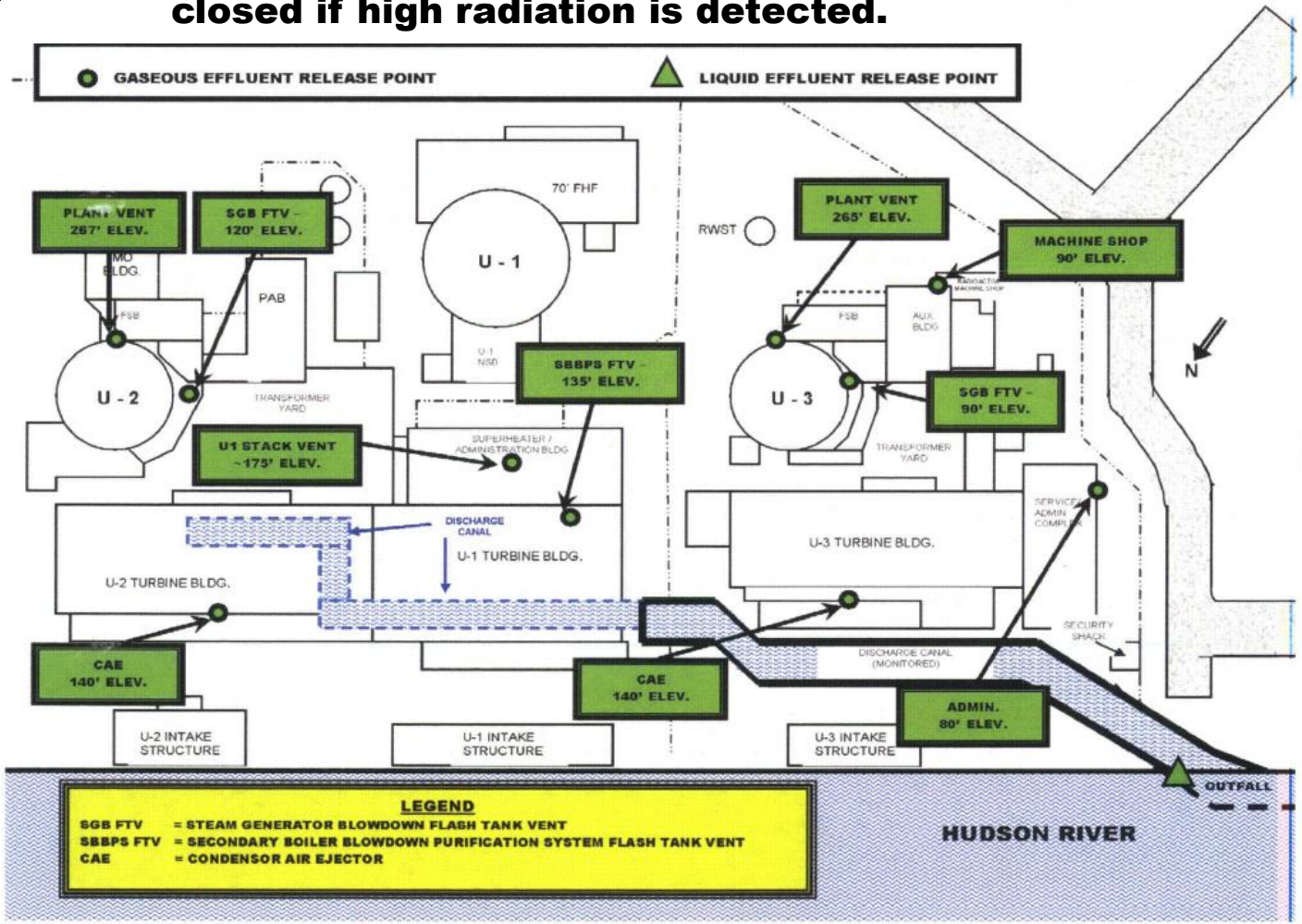
# Federal Oversight

- NRC – oversight of radiological aspects (25mrem) of decommissioning leading to termination of federal operating license
- OSHA - Employee Health & Safety for non-radiological exposure

# Monitoring Assessment

# Potential Release Pathways

**pathways are monitored and automatically closed if high radiation is detected.**



# Risk Assessment

# Risk Assessment

- Risk of significant radiological release at site decreased following April 2021 IP3 reactor retirement.
- When spent fuel is in pool, risk is from loss of cooling and zirconium (zirc) fire. Progressively reducing volume of spent fuel, and emptying pools, would further reduce risk.
- During spent fuel transfer, NRC anticipates that possible releases from a dropped/damaged fuel assembly would be limited to the vicinity of the drop.
- Without the radioactivity in a reactor core (and high-pressure steam) or fuel collectively stored in a pool (and potential for a zirc fire), potential releases from decommissioning would generally be expected to remain on site.

# Risk Assessment

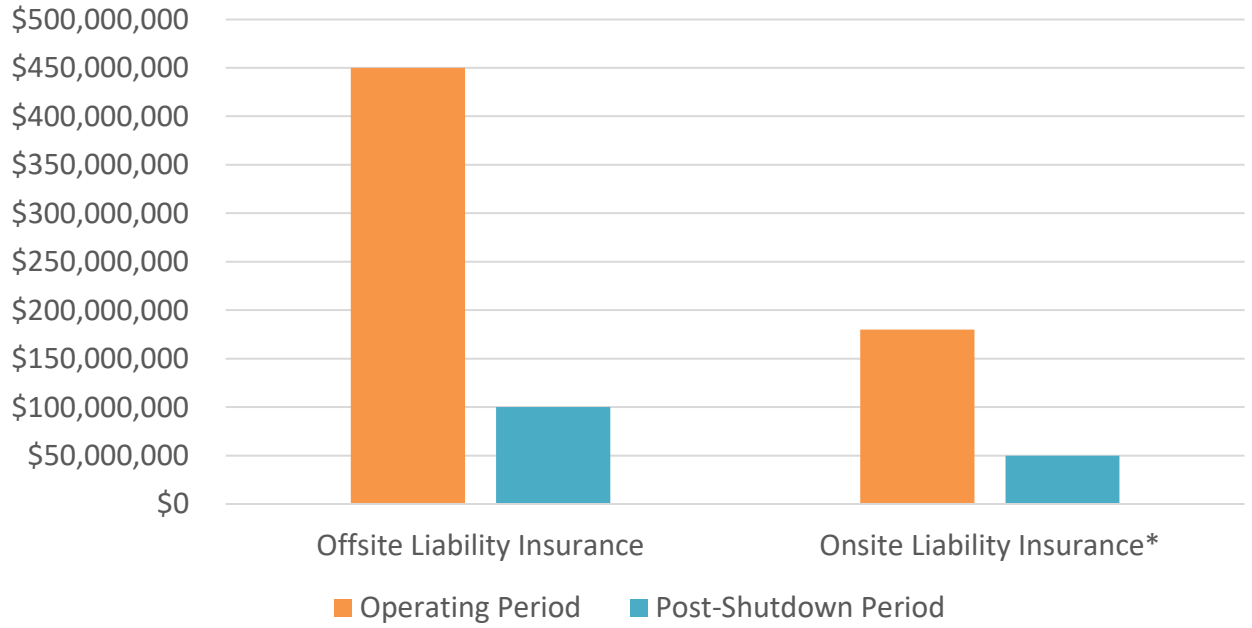
- Once all spent fuel is on a dry cask spent fuel storage facility, risk declines
- Most radiological remediation will occur inside buildings, limiting the potential for any off-site releases
- While highly unlikely, the most probable pathway for off-site releases during decommissioning are from open-air demolition activities after most of the radioactive material has already been removed

# Visualizing Magnitude of Reduced Risk

| Financial Protection Required of Licensees[1] | | | |
|---|---|---|---|
| Offsite (Primary) Liability Insurance[2] | | Onsite Liability Insurance | |
| Operation Period | Post-Shutdown Period | Pre-Dry Cask Storage | Dry Cask Storage |
| $450 million | $100 million[3] | Varies; Up to $1.06 billion | $50 million[3] |

[1]Amounts listed are per reactor
[2]Owners are required to obtain secondary insurance to cover incidents at other sites (reactors can be invoiced up to $131 million each). That requirement has typically been waived for permanently shutdown plants.
[3]NRC has been granting drops in coverage for permanently shutdown reactors

# Visualizing Magnitude of Reduced Risk




*Onsite liability insurance varies based on several factors; the example provided reflects LaCrosse Nuclear Plant (WI) - NRC approved a reduction from $180 million to $50 million in 2018

# Spent Fuel Cooling and Transfer of Assemblies into Dry Casks

- **Where activities occur:** Within fuel handling buildings (FSB)
- **Potential release points:** Vents and doors
- **If something were to happen:** It would be detected within buildings
- **Why risk is low:** Handling equipment is designed such that a single failure (e.g., hoist failure or crane break malfunction) is unlikely to damage fuel;  Fuel bundles are moved one at a time;  Area radiation monitors inside buildings would detect any releases immediately

# Moving Dry Casks to Spent Fuel Pad

- **Where activities occur:** Between spent fuel pool and dry cask spent fuel storage pad (ISFSI)
- **Potential release points:** At site of incident
- **If something were to happen:** Exposure to material unlikely; Any exposure would be limited to immediate radius (on-site)
- **Why risk is low:** Casks designed to withstand significant impacts; over 2,500 casks have been loaded and stored onsite at nuclear power facilities without a breach of cask integrity

# Decommissioning

- **Where activities occur:** On-site
- **Potential release points:** At site of incident
- **If something were to happen:** Any exposure would be limited to immediate radius (on-site)
- **Why risk is low:** Once all spent fuel is in casks, the amount of radioactive material available for release during decommissioning activities is segmented and decreased.

# Transfer of radiological waste off-site

- **Where activities occur:** Between IP and WCS facility in TX
- **Potential release points:** At site of incident
- **If something were to happen:** Exposure to material unlikely; Any exposure would be limited to immediate radius
- **Why risk is low:** Radiological waste contractor WCS intends to ship most waste in 20’ fully-enclosed intermodal containers; waste will be packaged into approved shipping containers before being placed into the intermodals; planned route avoids BV Elementary, Buchanan Pool, Village Park, Village Day Camp

# After Partial Site Release

- **Where activities occur:** N/A
- **Potential release points:** At site of incident
- **If something were to happen:** Exposure to material unlikely; Any exposure would be limited to immediate radius (on-site)
- **Why risk is low:** Active decommissioning work complete; site is not released until license termination criteria met (radiation doses <25 mrem/year to the public); security continues until spent fuel is removed from IP site

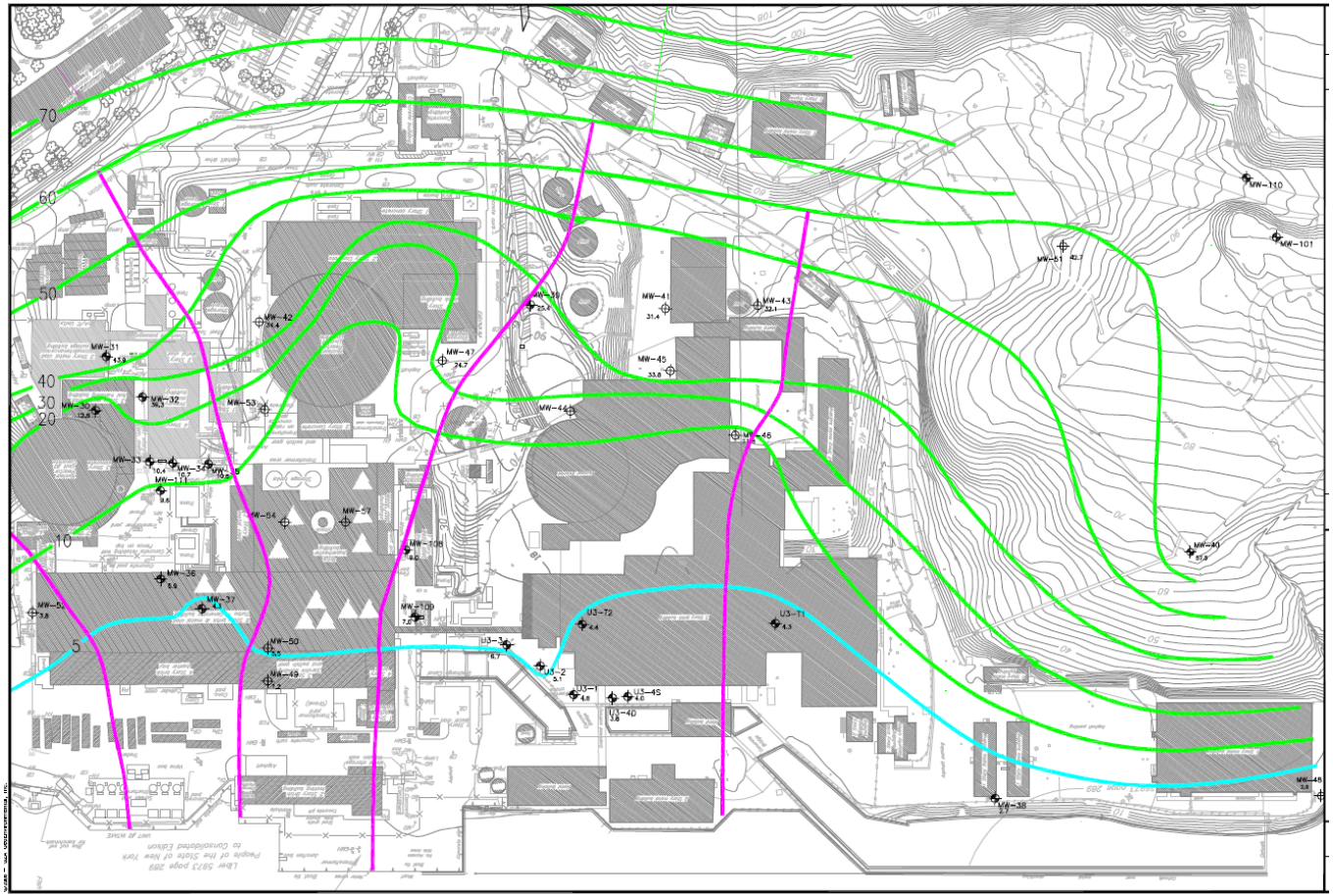
# Groundwater

- For Several Years (2005 – 2010) DEC Env Radiation Specialist and Engineering Geologists worked with:
  - DOH Radiological Health Specialist
  - NRC Senior Health Physicists and Hydrologist
  - USGS Hydrologist, and
  - Entergy & their hydrogeological consultant (GZA)
- To investigate groundwater movement, contaminants, and potential public exposure pathways

# Groundwater Investigation Conclusions

- There were leaks from U-2 SFP (Tritium, $^{3}H$) and U-1 SFP (fission products including Strontium, Sr-90)
- Contaminant plumes from both SFPs reached the Hudson River
  - The volume of water in the river dilutes any radioactive effluents reaching the river.
  - Concentrations of radioactive materials in the river are either below detection limits or a small fraction of the public drinking water limits
- Groundwater flow around all 3 units is towards the river
- Neither plume impacts groundwater around the site (DEC, NRC, USGS) or drinking water sources (DOH, DEC, USGS, NRC)
- There are no significant public exposure pathways, including drinking water, river water, or fish consumption (DOH, DEC, NRC)

(For Fish Study, see #2. in: https://www.dec.ny.gov/docs/fish_marine_pdf/boh09emrep.pdf)




# Indian Point Groundwater
- Contours
- Flow Paths
- Tidal Influence

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# Existing Monitoring

# Purpose of Radiological Monitoring

- Protect Public
  - There are regulatory requirements that limit radiation doses to members of the public (100 millirem total dose)
    - Includes both external and internal exposures
  - Monitoring is necessary in order to be able demonstrate compliance with these limits
  - An annual report is submitted to the NRC. Reports can be found at https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-specific-reports/ip2-3.html

# Purpose of Radiological Monitoring

- Protect Workers
  - There are regulatory requirements that limit radiation doses to workers (5000 millirem/yr total dose).
    - Includes both external and internal exposures
  - Workers are monitored in order to demonstrate compliance with these limits.
    - External dose is usually measured with a personnel monitoring device (i.e., radiation badge)
    - Internal dose from inhalation can be monitored using area air sampling or personal air samplers worn by employees.

# Current Radiological Monitoring: Reuter-Stokes

- Continuous monitoring (15 second intervals)*
- Secure, closed data feed to County & State (DPS, DOH, DHSES)
- 16 monitors located near Indian Point site
- Monitoring program through spent fuel transfer (required under PSC Order 19-E-0730)
- Monitor Nos. 8 and 9 Approx. 1,200ft and 1,300ft from school

*Indian Point is one of only five US nuclear power plants with continuous radiation monitoring capability

# RS Monitor #9


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# Ongoing Radiological Monitoring at Indian Point – Holtec

- The license issued to IP/Holtec requires limiting doses to members of the public to 100 millirem per year (the values listed in 10 CFR Part 20)
- An annual environmental report must be submitted to NRC showing the results of environmental monitoring at the site in order to show compliance with 10 CFR Part 20.
- Previous reports are available at: https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-specific-reports/ip2-3.html

# Ongoing Radiological Monitoring - NYS

- The NYS Department of Health also performs routine radiological monitoring around IP
  - Weekly air sample collected south of the site at Highland Ave & 11th St (0.7 mi from school)
  - Monthly water samples collected at IP intake, outflow, and Verplanck
  - Quarterly Thermoluminescent dosimeter south of the site, co-located with the air sampler.
  - Previous year's data available at: https://health.data.ny.gov/Health/Environmental-Radiation-Surveillance-Indian-Point-/ms7x-sfpf/data

# Air Sampler


Dry Cask Storage
U3 SFP
U2 SFP
Broadway
RS-6
RS-7
Lafarge Gypsum
RS-8
Broadway
Westchester
RS-9
Buchanan-Verplanck
Elementary School
RS-10
DOH Air Monitor
Westchester Ave

# Monitoring Examples

# Examples – C-10 @ Seabrook

- Monitoring, research, and education foundation
- Operate Continuous Real-Time Monitors
  - 17 sites within 10-mi radius of reactor & spent fuel pool
  - Not appropriate for monitoring potential low-level releases from a dry cask storage facility
- Conducts regular public meetings to share monitoring data and educate public on what readings mean
- Archival data a rich resource to interpret and contextualize trends and anomalies

# Examples – Brookhaven Nat'l Lab

- Personnel (lapel) air samplers
- Facility perimeter air samplers
- Site boundary samplers

# Examples – Key Takeaways

- Various models for effective monitoring
- Variety of monitoring and sampling devices
- Consider different equipment and capabilities that are appropriate for different phases

# Recommendations

# Radiological Monitoring Recommendations

- Phase 1 - Immediate Steps: Until spent nuclear fuel is out of spent fuel pools:
  - Continue to utilize existing RS Monitors
  - Provide periodic reports to School Superintendent
- Phase 2 - After Spent Fuel Transfer: Consider a multi-layered approach on-site that would provide the most useful data, such as:
  - Continuous air monitors on site in the vicinity of open-air demolition would provide real-time data and early indications of a problem
  - Fixed air samplers in a ring near the perimeter of the site (if needed) Ambient air samplers at locations of interest

# Feedback and Additional Research

# Proposed Next Steps

# Proposed Next Steps

- Conduct additional research as requested
- Present findings and recommendations at next DOB meeting, tentatively September or October 2021
- Provide regular monitoring updates at DOB meetings
- Reconvene Working Group as appropriate