History of Radiation in Pennsylvania

Terry Derstine
PA Department of Environmental Protection
Southeast Regional Office
August 19, 2021
• Pennsylvania Department of Health, Bureau of Industrial Hygiene developed interest in the exposure of radium dial painters.

Bureau purchased a Geiger counter from a Canadian firm.

• To determine the bone burden of the worker. The counter was placed in the armpit of the worker to allow the bones of the ribs and humerus to surround the detector.
• December 2, 1957 – Shippingport Atomic Power Station achieved criticality.

• The reactor was owned by the Division of Naval Reactors in the Department of Defense and the turbines were owned by Duquesne Light Co.

• Dwight Eisenhower pushed the button to start the reactor.

• Division of Naval Reactors was intensely interested in assuring the new technology was used in a safe manner.
• Interest continued in the occupational exposure from medical and dental x-rays as well as radium used in the healing arts.

• First radiation protection regulations were promulgated.

• The Radiological Health Section was established under the Bureau of Occupational Health.
• Early 1960’s public interest surrounding fallout surged.
• Led to influx of federal funding to state health agencies.
• Money was to be used for radiation laboratories and radiation training for staff.
• The state “Radiation Laboratory” was equipped with windowless proportional counters, thin window proportional counters, and 512 channel gamma spectroscopy system.
• Physician was found to be manufacturing radium sources in his home located in Lansdowne, PA.

• Remediated to a dose of 50mrem/y to occupants.

• Cost $120,000

• Project was to be revisited at a later date.
• Three Mile Island Unit 1 permit was submitted to USAEC.

• Peach Bottom Atomic Power Station began operation.

• Signing of the Atomic Energy Development and Radiation Control Act by Governor Scranton at Peach Bottom Atomic Power Station
1956-1967

- Commonwealth became aware of 29 individuals who suffered acute accidental exposures to external radiation sources.
- 22 were from analytical x-ray sources.
- Cause was due to carelessness, inadequate instruction and equipment failure.
- Equipment failures were due to shutter failures.
1956-1967

- Accidents were evaluated and the Commonwealth disseminated 13 recommendations.
- Recommendations were codified into 15 regulations.
- Regulations have been revised over the years, but the basis remains true.
- While it is not possible to regulate away carelessness, the guidelines help to prevent access.
• 3 individuals exposed at the Gulf Research Lab in Harmerville, Allegheny County.

• One individual received 5Gy midline whole body, 66Gy to feet and legs, 88Gy to hands and forearms.

• Bone marrow transplant from twin brother saved his life. Lost extremities.

• The other two received doses of 1.25Gy and 3Gy whole body.

• Underground detonation of nuclear devices to form caverns for natural gas storage.

• Project was canceled due to public outrage.
• Polyclinic Hospital in Harrisburg had a compromised Technetium generator.

• Generator has been transported on a passenger aircraft.

• Plane continued to New Jersey

• Jersey “raddies” impounded the plane for decontamination.

• Radiation health staff decontaminated the taxis used to transport the
• H.B Fowler project intended to removed radium contaminated soil from an old dial painting facility

• Soil was barreled up and sent to a facility in New York.

• Ultimately wound up at the Maxey Flats facility in Kentucky, which later became a superfund site.
• Radiological Health Section in the Bureau of Occupational Health was reorganized into the Office of Radiological Health

• The new office reported to the Deputy Secretary for Environmental Health.

• Basis for this arrangement was the realization that the Department needed to deal with radiation in environments beyond the workplace.
• Department of Natural Resources was created in 1971.
• Pulled in Environmental Health Deputate, former Department of Mines and Mineral Industries, and former Department of Forests and Waters.
• Radiological Health was changed to “Radiation Protection” as a means of signaling our departure from the Health Department.
• Tropical Storm Agnes in June 1972.
• Lead to the permanent shutdown of Peach Bottom Unit 1.
• Serious flooding occurred at Three Mile Island, which slowed the construction.
1973-1975

- Participated in the Nationwide Evaluation of X-ray Trends program.

- 1973-1975 one inspector expanded program to include breast dose.

- Skin entrance exposures for breast ranged between 0.25 to 47R.

- FDA became interested and established the Breast Exposure – Nationwide Trends program.
• First radiation emergency plan for nuclear power stations accidents was completed.

• Plan focused on plant conditions and not measurements.

• Plan included homegrown “Protective Action Guides”.

• EPA guidance was not published until 1975
• Professor Ernest Sternglass, from the University of Pittsburg, used pre-operational data from Beaver Valley to imply the Shippingport reactor was contaminating the environment.

• Data was not properly scrutinized. Indicated fission products in milk, when it was actually a radon daughter product.
• Hotbed of proposed nuclear power projects. Including:
  – Liquid metal fast breeder reactor.
  – High temperature gas cooled reactors know as Fulton Generating Station
• Led to the consideration of mining for uranium in Pennsylvania.
• Bill Dornsife, our first Nuclear Engineer, was hired in 1975.
• Fall out from China following an atmospheric test of a nuclear device fell over the Northeast.

• Due to an intense low-pressure system, it was deposited via rainwater.

• None of the fallout was detected on air monitoring.

• The next day workers at Peach Bottom Atomic Station showed up contaminated.

• Sent non-essential employees home
• The next day, workers at Peach Bottom Atomic Station showed up contaminated.

• Sampled puddles in the parking lot and found short-lived fission products.

• Assumed it was from the plant, but there was nothing abnormal with the plant.

• Were not aware of a weapons test.

• Sent non-essential employees home and notified BRP
• BRP contacted the other sites to have them take samples at their facility

• Widespread contamination was found across the state.

• Greatest concern was milk supply.

• Highest concentration was 400pCi/l which is the highest ever found in PA.
• March 28\textsuperscript{th} an accident occurred at Three Mile Island.
• This event consumed staff for months.
• Almost all the field staff were called on temporary duty.
• The highest I-131 milk sample found as a result of the accident was about 20pCi/l in a nearby dairy herd.
• Community Monitoring Program for the venting of accident generated Kr-85 at TMI.

• Accident related issues continued to draw staff attention for the rest of the decade

• Personal injury suits were heard beginning in 1995.

• Radiation Protection Act under Governor Thornburgh was promulgated as a result of the accident.
• Canonsburg facility was decommissioned
• Cost of $38 million
• 10% State funds. 90% Federal.
• Cleanup ran through 1985.
• Reduced lung cancer risk from radon inhalation by once case per 100 years.
• New interest in the Lansdown house.
• The house along with it’s neighboring twin became a Super Fund site.
• Total cost ran over $7 million.
• December 4\textsuperscript{th}, 1984, Stanley Watras arrived at Limerick Generating Station contaminated from natural sources.

• Utility checked the home and found extremely high concentrations of radon.

• This event led to the development of a statewide radon program.
• April 26\textsuperscript{th}, 1986 accident at Chernobyl.
• By the first week of May, I-131 was detected throughout the milk supply in Pennsylvania.
• Concentrations around 50pCi/l.
• Department became involved in the remediation of a state-owned building at Quehanna.

• Building was administered by Bureau of Forestry.

• Contaminated by previous tenants.
• Decommissioning of a GPU owned test reactor at Saxton.

• 1990 independent measurements project using in situ gamma spectroscopy to verify decontamination of structures other than reactor building.

• Special studies in 1988 and 1989 by DOE to determine whether contamination was detectable off site.
• Saga of Lansdown continued, this time on Austin Ave.

• Uranium/radium refining process which operated in the early decades of the century led to distribution of radium contamination of the facility and surrounding structures.

• This became yet another superfund site.
• March 31, 2008 Pennsylvania became the 35th agreement state.

• NRC transferred the responsibility for licensing, rulemaking, inspection, and enforcement for approximately 650 licenses.
Thank you!

Terry Derstine
tderstine@pa.gov