Uproar over Japan’s Decision on Waste Water

Corrosive Radioactive Sludge

Fukushima Waste Filter Leaves Corrosive Radioactive Sludge

Even wonder what happens with the radioactive materials that Tokyo Electric Power Co. said it would remove using a filter system from its 1.25 million tons of Fukushima water waste? The cesium-137, strontium-90, cobalt-60, ruthenium-106, carbon-14, tritium, iodine-129, plutonium-239, and dozens of other isotopes end up as highly radioactive sludge collected by the Advanced Liquid Processing System. And although the ALPS system has failed to remove those deadly isotopes from 70 percent of the water, the “clean-up” system has so far produced some 3,000 large containers filled with the radioactive sludge. Approximately 875,000 tons of waste water stored in large tanks must be refiltered, which will produce more “hot” sludge. In June, Japan’s Nuclear Regulation Authority announced that 31 of the 3,000 containers holding this deadly sludge were corroded badly enough that they must be replaced, the daily Mainichi Japan reported. The authority also warned that another 56 cylinders would need replacing within two years. Each waste cylinder is reportedly about 5 feet in diameter and 6.2 feet tall. So, with about 30 cubic feet of hot sludge each, the 3,000 cans hold at least 90,000 cubic feet of highly radioactive waste that will require expensive permanent isolation. Because of its corrosiveness and extremely long-lived radioactivity, this waste will require monitoring and repeated re-packaging in perpetuity — an expense not included when nuclear power advocates report electric benefits to customers.

Reassessing Tritium’s Threats to Humans and the Environment

By Ian Fairlie

Tritium decays via beta particle emissions and can be more dangerous than most X-rays. It has a radioactive half-life of 12.3 years. While most of its atoms will have decayed in ten half-lives (123 years), many scientists believe it might take 20 half-lives (246 years) or more to reach safe levels. The safety of tritium after centuries depends partly on how much was emitted, since a small fraction of a large amount can still be very hazardous.

Tritium’s gaseous form, tritium oxide (i.e., radioactive water or radioactive water vapor), enters the body by inhalation, ingestion, or absorption through the skin. Tritium in the body immediately mixes with body fluids and is dispersed widely because water is found everywhere in our bodies. Once inside the body, it becomes organically bound and can concentrate in cells and certain organs. Because of its long half-life, it resides in tissues and organs for extended periods. This can increase cancers and congenital malformations for those living near nuclear facilities.

For most of the 20th century, tritium was often dismissed as a “weak” radionuclide which led many to underestimate its hazards. All this changed in the 21st century when scientists began to realize that tritium is much more dangerous than previously suspected. Although tritium is a low-range beta particle emitter, it can be very harmful as an internal emitter (when it gets inside the body). It is also quite dangerous because it remains in the body for long periods. Studies reveal that tritium is one of the most common internal emitters found in humans. As an internal emitter, tritium can alter cellular DNA and cause a variety of damaging health effects. One of the most significant is its impact on cancer which sometimes takes years to develop. Many epidemiological studies have reported increases in cancers and congenital malformations among people living near nuclear facilities.

The new concern about tritium is partly because all nuclear facilities emit very large amounts of tritium. In its elemental form, tritium diffuses through most containers, including those made of steel and concrete. Tritium is difficult to contain, and in its oxide form it is generally not detected by commonly used survey instruments. Large amounts are produced in nuclear reactors. It contaminates the concrete structures at nuclear power reactors so that the older the stacks the more the contamination. Large amounts of tritium continue to be released for decades after a reactor is closed.

We now know that tritium has an exceptionally high molecular exchange rate with stable hydrogen atoms thus making it extremely mobile in the environment. Emissions from nuclear facilities can rapidly contaminate all biota in adjacent areas. Tritium binds with organic matter to form organically bound tritium. Tritium is the only one of the three hydrogen isotopes that is radioactive. It is an essential component of every nuclear weapon.

— Dr. Ian Fairlie is a radiation biologist and author of “The Other Chernobyl Report,” updated as “TORCH-2016: An independent scientific evaluation of the health-related effects of the Chernobyl nuclear disaster,” of March 2016.