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General Comment

(Beyond Nuclear comment #6, Part 2 of 3 -- this is a continuation from Part 1)

A cask sinking to the bottom of Lake Michigan would present unprecedented emergency challenges. If the cask breaches, as due to the immense pressures at such depths, and/or due to damage caused during the accident or attack that led to the sinking in the first place, it will be very difficult to recover. Even older 24 Pressurized Water Reactor (PWR) irradiated nuclear fuel (INF) assembly shipping containers are very heavy, well over 100 tons. But current 37 PWR INF assembly shipping containers are around 50% more heavy. A very powerful ship-board crane would have to be brought in, set up, and activated, all assuming the cask's location on the bottom of Lake Michigan has been found, weather conditions (which could have caused the sinking in the first place) are amenable to such emergency operations, etc. The longer the cask or casks remain on the bottom of Lake Michigan, the more likely they will breach and begin to release their forever hazardous, deadly contents.

NRC's water submersion design criteria leave a lot to be desired. A cask that has undergone the puncture design criteria (a free fall from a mere 40-inch height, onto an 8-inch spike) must withstand submersion under 3 feet of water. Lake Michigan is much deeper than 3 feet, across most of its vast expanse.

An undamaged cask must withstand submersion under 200 meters (656 feet of water) for one hour. There are deeper depths in Lake Michigan, and the potential for a cask barge to stray (or be hijacked) to areas of such deeper depths is greater than zero. No matter how far under water the cask is or casks are submerged, it is very unlikely they could be recovered in just one hour's time. Chances are, it would take a very much longer period of time than that. And the longer a breached container remained on the bottom of Lake Michigan, the more of its forever hazardous, deadly contents it would release.

To make matters even worse, if a cask does breach, allowing radioactive poisons out, that means it is also

allowing water in. Water is a neutron moderator. There is enough fissile material -- uranium-235, plutonium-239 -- in irradiated nuclear fuel to spark an inadvertent nuclear chain reaction, if a critical mass has formed in the course of the accident, in the presence of neutron moderating water. If such an inadvertent chain reaction were sparked in a cask, this would make harmful radiological releases into Lake Michigan even worse. But it would also make emergency response a potential suicide missions. Divers, or even emergency responders in submersibles, could not approach the chain reacting waste without risking potentially fatal exposures to gamma and neutron radiation emanating from the chain reaction, especially through the breached radiation shielding of the container.

And even if the cask were raised to the surface of Lake Michigan during recovery operations, if the waste inside were chain reacting, as it got closer and closer to the surface of the water, the gamma and neutron doses to emergency responders at the surface would increase, and could even risk lethal levels, depending on how close the responders were to the cask, how much and what kinds of radiation shielding they had, etc.

Yet another 20 year license extension at Point Beach would generate 800 metric tons, or more, of additional irradiated nuclear fuel. That INF would have to be transported away from Point Beach some day (or year, decade, century, etc.). If those shipments take place by barge, each one represents a potential for radiological catastrophe in Lake Michigan.

As Arnie Gundersen, chief engineer at Fairewinds Energy Education, pointed out in the aftermath of the 2011 Fukushima Daiichi nuclear catastrophe in Japan, the Great Lakes represent only 1/30,000th the water volume of the Pacific Ocean. If a Fukushima-scale radioactivity release were to happen on the Lake Michigan shore, the concentration of the hazard would be 30,000 times worse than Fukushima's radioactivity releases into the Pacific. See Arnie Gundersen's essay, "Downstream," posted online at this link: <https://www.fairewinds.org/demystify/downstream?rq=downstream>.

While an open Lake Michigan sinking along Wisconsin's shore between Point Beach and Milwaukee would be quite catastrophic enough, an accident or attack in the Port of Milwaukee itself could prove to be even worse. After all, such barge shipments would bring high-level radioactive waste into very close proximity to a densely contrated, very large urban population. Potential casualities (acute radiation poisoning deaths and injuries, latent cancer fatalities), as well as property damage, could prove even worse, and even more near term, than a sinking in a more remote, or rural, location.

(to be continued, at Beyond Nuclear comment #6, part 3 of 3)