IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

Beyond Nuclear, Nuclear Information and Resource Service, Savannah River Site Watch, Citizens for Alternatives to Chemical Contamination, Lone Tree Council Sierra Club and Environmentalists, Inc., Plaintiffs, -vs- U.S. Department of Energy 1000 Independence Ave., SW Washington, DC 20585 And Ernest Moniz, Secretary U.S. Department of Energy 1000 Independence Ave., SW Washington, DC 20585 And Monica C. Regalbuto Assistant Secretary for Environmental Management U.S. Department of Energy 1000 Independence Ave., SW Washington, DC 20585 And David Huizenga Assistant Deputy Administrator National Nuclear Security Administration U.S. Department of Energy 1000 Independence Ave., SW	)	Case No. 16-CV-1641

Washington, DC 20585)

And

Jack R. Craig, Jr., Manager)
U. S. Department of Energy
Savannah River Site Operations Office)
P. O. Box A

Aiken, SC 29802,)

And

United States of America)
c/o Attorney-General of the
United States)
U.S. Department of Justice
Environment and Natural Resources)
Division
Law and Policy Section)
950 Pennsylvania Avenue, N.W.
Washington, DC 20530-0001)
and
United States of America)
c/o United States Attorney's Office
Civil Process Clerk)
555 4th Street, NW
Washington, DC 20530,)

Defendants.

DECLARATION IN SUPPORT OF COMPLAINT FOR DECLARATORY AND ADMINISTRATIVE RELIEF, PRELIMINARY AND PERMANENT INJUNCTION BY MARVIN RESNIKOFF, Ph.D.

I, Marvin Resnikoff, declare as follows,

Qualifications

1. My name is Marvin Resnikoff. I am the Senior Associate at Radioactive Waste Management Associates and an international consultant on radioactive waste management issues. I am the Principal Manager at Associates and the Project Director for dose reconstruction and risk assessment studies of radioactive waste facilities and transportation of radioactive materials. I have concentrated exclusively on radioactive waste issues since 1974. I have authored or co-authored four books on radioactive waste issues, including one on the subject of transportation

of nuclear materials. In June 2000, I was appointed to a Blue Ribbon Panel on Alternatives to Incineration by DOE Secretary Bill Richardson. I was an invited panelist to the President's Blue Ribbon Commission on Nuclear Safety in August 2011.

2. I am a 1965 graduate of the University of Michigan with a Doctor of Philosophy in Theoretical Physics, specializing in group theory and particle physics. I am a member of the Health Physics Society. I have specialized on the transportation of nuclear materials since 1975 when I testified on behalf of New York State General Lefkowitz before the Federal District Court in New York on the subject of transportation of liquid plutonium through JFK Airport from the United States to Germany. I have since testified before the Federal Court several times. I have presented papers on nuclear transportation before the American Nuclear Society and presently serve as a consultant to the State of Nevada on proposed shipments of high level waste to the proposed waste repository at Yucca Mountain, Nevada.

3. To prepare this declaration, I reviewed the Safety Analysis Report for the NAC-LWT cask and all correspondence with the Nuclear Regulatory Commission (NRC). I also reviewed all documents related to this issue before the Canadian Nuclear Safety Commission (CNSC). These shipments relate to the proposed transportation of liquid high level radioactive waste from the Chalk River facility in Canada to the Savannah River Plant in South Carolina by highways, a distance of xxx miles. These shipments are unique in that the high level waste will be in liquid form. All other shipments of high-level waste are of solid hlw in the form of spent fuel. A regulatory fire at 1475 ^{o}F or a real hydrocarbon fire at a temperature of 1850 ^{o}F have the potential of releasing the HEUNL and the potential for serious accidents, particularly involving fire. Shipments involving liquid waste is not been well analyzed by the federal government. The only previous analysis that comes close to the proposed transport involved shipments of solid waste in a container cask containing liquid. This analysis was done in 1978 and showed that in a regulatory fire, seals and valves of the cask would be damaged within one half hour of the regulatory fire and liquid would be expelled from the cask.[1]

4. Before the present generation of transportation casks, nuclear fuel was transported to the Nuclear Fuel Services reprocessing plant in West Valley, NY by Nuclear Assurance Corporation (NAC). In the case of a transportation accident involving a hydrocarbon fire, the pressure valves in the cask were expected to open, even if the fire duration was as short as 15 minutes, according to a DOE contractor, Pacific Northwest Laboratory[2].

[1] Pacific Northwest Laboratory, for the U.S. Department of Energy, "Assessment of the Risk of Transporting Spent Nuclear Fuel by Truck, PNL-2588, November 1978.
[2] *Ibid*.

TABLE 6.3. Thermal Failure Thresholds

Type of Failure	Minimum Duration of Fire(a) to Cause Failure
Loss of Coolant from Rupture Disk	15 min.
Closure Seal	30 min.
Drain Valve Seal	30 min.
Vent Valve Seal	30 min.

(a) All fires assumed to be 1010°C (1850°F).

5. A regulatory fire involves a 30 minute fire at 1475°F with the cask fully immersed in the fire. This is meant to simulate a real fire that could take place. However most real fires are hydrocarbon fires involving say diesel fuel and have a flame temperature of 1850°F, that is, much higher than the regulatory fire. Some flammable materials that are in commercial use have temperatures even higher than 1850°F. No casks containing high-level waste or spent fuel presently in use in the United States have actually been physically tested. The tests have been by computer simulation or have been of scale models. This introduces a level of uncertainty in the computer simulations.

6. All discussion of thermal matters in the NAC-LWT Safety Analysis Report (SAR) re. HEUNL are redacted for proprietary reasons, according to NAC. All assumptions and calculations have been blacked out. I have not been able to locate any non redacted versions. Therefore it is impossible for scientists and the informed public to review the calculations by NAC.

7. The NRC requested additional information regarding the thermal issues and pressure calculations[3]. The questions are excellent, but the response by NAC is almost entirely redacted, particularly the section on thermal evaluation. I count at least 54 of 83 pages fully or partly redacted. It is impossible to know what NAC has done.

8. Shipping casks like the NAC-LWT consist of massive amounts of steel alone or, like the NAC-LWT, steel and lead. The lead serves to shield workers and the public from gamma radiation emanating from the enclosed radioactive material. Steel adds structural integrity. Casks also contain neutron absorbing material, such as a chemical form of

[3] (NRC, 2014a) ML 1407 a 423

boron. In a potential fire, the exterior of the cask heats up rapidly to the temperature of the external fire; the interior of the cask heats up more slowly. Because of the massive amount of steel, the interior of the cask continues to heat up even after the fire is extinguished. It is impossible to know, since their calculations are redacted whether this thermal inertia has been taken into account.

9. It is also impossible to know whether the Orings and pressure relief valves are degraded in a regulatory fire of 1475 ^{o}F.

10. The regulatory standard of 1475 oF in a fully engulfing fire goes back to the 1940's and is the temperature of a house fire. A hyrdrocarbon fire of 1850 oF would be much more serious and could easily overpressurize the HEUNL containers and destroy the Oring seals and valves. It is impossible to know whether NAC and the NRC have taken into account more serious fires such as the Macarthur MAZE fire[4] or[5] the Caldecott Tunnel fire.

.

11. According to NUREG/CR-7209, the MacArthur Maze fire accident would raise the internal temperature of the lighter highway casks so that burst rupture of fuel cladding is expected. In the MacArthur Maze fire, an overturned tanker truck caught fire, weakened the girder holding the highway above, which subsequently collapsed on the tanker truck below. Thus here one must model the fire and crush forces if a nuclear fuel cask were also involved. On April 29, 2007 at approximately 3:37 a.m., a tanker truck and trailer carrying 8,600 gallons (32,554 liters) of gasoline overturned and caught fire on the Interstate 880 connector of the MacArthur Maze interchange located in Oakland, California. The intense heat from the fire weakened the steel girders of the Interstate 580 roadway above, collapsing two adjacent sections. It is assumed the highway nuclear cask is on the lower I-880 roadway, fully engulfed in fire for 37 minutes, exposed to a flame temperature of 2012°F (1100°C). A video shows the I-580 roadway span above the I-880 roadway beginning to sag about 5 to 10 minutes into the fire and collapsing completely at approximately 17 minutes. In all, the fire continued to burn intensely until for about 102 minutes; the cask was assumed to be crushed between the highway ramps.
12. The MacArthur Maze fire is the harshest environment for a truck cask. The peak clad temperature would exceed burst rupture conditions for a spent fuel rod. While the seals in the cask are expected to degrade, the peak clad temperatures, 845°F (452°C) would easily cause the water in the NAC-LWT to boil away, exploding the 4 containers, and destroying the cask seals and pressure relief valves.

.

[4] NUREG/CR-7209
[5] *Ibid.*

13. The Caldecott Tunnel fire near Oakland, California occurred shortly after midnight on April 7, 1982. The tunnel consists of two lane roads in each direction, separated by a wall. In the accident, the tank trailer overturned and the entire vehicle came to rest approximately 1650 ft (503 m) from the west portal of the tunnel. The tanker contained 8,800 gal. (33,310 liters) of gasoline. The overall duration of the fire is estimated at approximately 2.7 hours, but the intensely hot gasoline-fueled portion of the fire is estimated to have lasted about 40 minutes. The maximum temperature at the ceiling, 935°C, about 80 meters downwind, was reached after only 10 minutes into the fire. NUREG/CR-7209 does not discuss the deformation of thick metal grates in the tunnel. There is no indication this fire was considered by the NRC or the CNSC.

14. The Canadian Technical Assessment by the CNCS is a bit more forthcoming than the redacted NRC Safety Analysis Report.. It shows that the internal temperature of the contained liquid will reach 97°C, that is, almost to the boiling point, but again we don't know whether the calculations have been cut off at 30 minutes, the regulatory time period or if the fire exceeded 800 °C, the regulatory fire temperature. In any case, in a real fire that could occur on the highway at 1850°F or 1000 °C, it is likely that the liquid in the NAC-LWT would boil, burst the containers and enter the external environment.

15. The NRC regulatory requirements also require that a shipping cask withstand a 30 foot drop onto an unyielding surface such as hard rock. Many locations along the shipping route have heights greater than 30 feet, such as bridges over the Niagara River or St. Lawrence Seaway. The Peace Bridge into Buffalo from Ontario is 100 feet above water[6]. The other four bridges that cross from Ontario over the Niagara River are higher ranging from 202 feet above water to 370 feet (Lewiston-Queenston Bridge)[7].

16. The maximum payload per inner container is 58.1 L. The NAC-LWT contains 4 containers. As one way to estimate the radiotoxicity of the inventory of the NAC-LWT 4 containers, we can ask the question, how much water can convert the inventory to the NRC's regulatory limit[8]. One answer is 25% of Lake Erie. Other toxic materials should also be taken into account.
17.

a. Health impact – inhalation of Sr-90 and Pu; direct gamma from Cs-137, an X-ray machine that cannot be turned

Summary

[6] https://www.google.com/search?q=Buffalo+peace+bridge+height&ie=utf-8&oe=utf-8#q=Buffalo+peace+bridge+height&start=10
[7] https://en.wikipedia.org/wiki/List_of_bridges_in_the_United_States_by_height
[8] 10 CFR Part 20, appendix B

It is impossible to verify the calculations by the Department of Energy and the Nuclear Regulatory Commission regarding the safety of the proposed shipments of liquid highly enriched nuclear fuel and waste. Even if the NAC-LWT transport cast satisfies even the modest NRC cask regulatory requirements, this will not guarantee the cask will satisfy real life conditions on the proposed transportation route. The cask is designed to withstand a 30 foot drop onto an unyielding surface but bridges 100 feet above water and land and higher are present along the transportation route and fires greater than the 1475°F regulatory fire are possible. Standard hydrocarbon fire burns at 1850°F and would last for greater than one half hour duration, the regulatory time period. If the cask was present in a real high temperature fire long-duration, the cask contents would likely boil and overpressurize the cask leading to the release of radioactive material containing cesium 137 and strontium 90. This would have serious health consequences which are enumerated in the report I've prepared. In addition there would be economic consequences in such an accident. Highways and local businesses and residences would be closed to commercial traffic while cleanup took place. None of these matters, serious health consequences and serious economic consequences, have been evaluated in the environmental impact statement by the Department of Energy and Canadian Nuclear Safety Committees. Almost all the thermal analysis has been redacted. I estimate from questions proposed by the Nuclear Regulatory Commission in the form of Requests for Additional Information 58 of 84 pages have been redacted so it is impossible to evaluate the agency's calculations. It is not clear that their calculations have taken into account the serious fires that have occurred on highways including the Maze fire and the Caldecott Tunnel fire in California. In sum, I regard the environmental impact statement as seriously deficient, or in the case of the CNSC, non-existent. They should be redone or in the case of Canada, done, and the calculations should be available for the public to review

I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 20, 2016,

.._____

Marvin Resnikoff