Appalachian Public Interest Environmental Law Conference

Nuclear Power, Nuclear Weapons and Nuclear Incineration

Sunday, October 28, 2012, Session IV.c, 2:00 PM, Room 241

Blue Ridge Environmental Defense League

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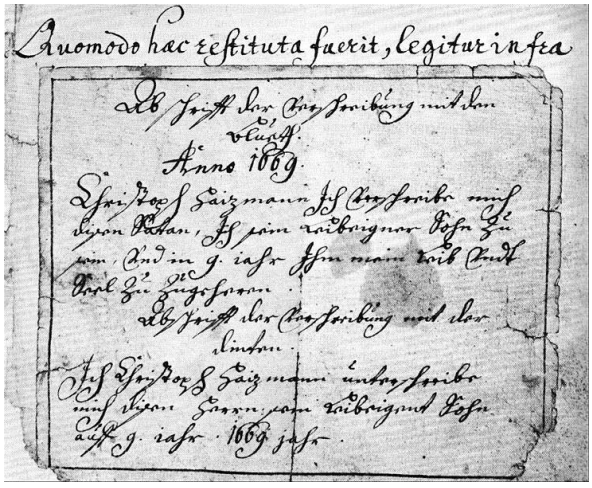
This workshop will center on dangerous aspects of nuclear technology, the impacts in Tennessee and nearby states and the permits which allow more radioactive poison to contaminate the environment and harm public health. Legal aspects will include potential avenues to oppose and reverse the trend. Ongoing nuclear power plant legal actions brought by BREDL are directed at Southern Companyôs Vogtle in Georgia, Duke Energyôs Lee in South Carolina, Dominionôs North Anna in Virginia and TVAôs Bellefonte and Browns Ferry in Alabama. For example, BREDL was one of three organizations which initiated the legal challenge to the NRCôs nuclear waste confidence rule in the US Court of Appeals for the District of Columbia Circuit, creating a two year suspension of nuclear power plant licenses. Blue Ridge Environmental Defense League *et al* v. U.S. Nuclear Regulatory Commission (February 18, 2011) later consolidated as New York *et al* v. U.S. Nuclear Regulatory Commission, No. 11-1045, argued March 16 2012 and decided June 8, 2012 . That action now has been broadened to include two dozen plaintiffs in further legal challenges at reactors across the nation. Also, for the last decade we have been one of two parties challenging the construction and operating licenses for the manufacture of plutonium fuel (also known as MOX), which would manufacture commercial reactor fuel from dismantled warheads at the old atomic bomb plant at the Savannah River Site in South Carolina. Finally, the workshop will delve into the ongoing incineration of radioactive wastes at the Oak Ridge National Laboratory.

Introduction

From the dawn of the atomic age to the present day, nuclear technology has left death and destruction in its wake. And it has lit a few light bulbs. The question we ask: Is it worth it?



The history of atomic power lends itself to analogy with other epic struggles between darkness and light. As if compelled by Mephistopheles, the United Statesð first alone, then followed by othersð forged a Faustian bargain for worldly wealth and power. That a nation founded on the rule of law could seemingly be led astray by Perditionôs Liar is testament to political and human folly. The lie is twofold: that nuclear powerð electric energy too cheap to

meterð and weaponsð military power to make the world in our imageð are acceptable in human society. During the Dark Ages, sometime between the end of the Roman Empire and the Enlightenment, an actual priesthood held sway over royal leaders. Today, nuclear clerics seek to command energy policy. But the verbal vestments shrouding nuclear power today are made from the cloth woven in previous decades.

Nuclear power had from the beginning been endowed with supernatural abilities. The former head of nuclear operations at Oak Ridge National Labs, speaking about nuclear power plants, envisioned the ñcreation, and continuation into eternity, of a cadre or priesthood who understand nuclear systems, and who are prepared to guard the wastes.ò He detailed ñ100,000 year-priesthoodsò to guard existing nuclear facilities from future intrusions.[1]

There is an odd element of guilt associated with the atomic tale, palpable in the swords-into-ploughshares justification launched during the Eisenhower Administration, lending a Biblical context. Manifest Destiny, invoked to justify expansion across the continent, the hemisphere and the Pacific, provides historical background. However, a nation of laws cannot ignore its founding principles with impunity. How can the worldôs Last Best Hope break the bargain with the forces of darkness and avoid the fate of Dr. Faustus?

The United States was the birthplace of nuclear technology; therefore, it stands to reason that this must be the place where it must end. One possible strategy to explore is making the Rule of Law stronger than the Rule of Might. This objective is not strictly conservative nor liberal, it is both. Examples exist. The great power of the Soviet Union, our Cold War nemesis, is no more. The erstwhile soviet republics have renounced nuclear weapons completely. Germany is abandoning nuclear powered electric generating plants. Japan will phase out theirs.

It is up to the generation which will lead the United States in the 21st Century to return us to the Foundersô principles: a true *novus ordo seclorum*, a new order of the ages. A conservative think tank posits:

> The proposition that ñall men are created equalò was a wholly new basis for legitimate government in the history of man; likewise, to pronounce certain ñrightsò ñinalienable,ò such as those to ñlife, liberty, and the pursuit of happiness,ò meant that an objective standard of justice was to forever guide our experiment in self-government. Equality, especially, was the foundation for legitimate government in that it pointed to government by consent, because there can be no claim to legitimate rule by a man over his fellow men if all are equal in their rights. These founding principles implied a certain kind of relationship between rulers and ruled, thus providing the justification for the complaints against the King of England, the basis for the delayed fight over slavery, and the engine for that vibrant American tradition of a perpetual conversation about

[1] Alvin Weinberg, Director Oak Ridge National Laboratory, 1974-developer of atomic weapons and power, cited by Garret Harden in *Living Within Limits*, (1995) page 156

justice under the law.[2]

Likewise, a liberal spokesman comes to a similar conclusion:

> Civic virtue, the common good, the idea that with the rights of the citizen there are also duties and responsibilities of the citizen, the creation of the commonwealth, and the opposition to corruption at every turn, are not naïve notionsð they are the tenets of a sound and healthy republicð the principles on which our nation was founded. Paramount to the very idea of a republic is the active participation and involvement of the people in matters of common concern. Americaôs founders, particularly Thomas Jefferson, believed that in our republic the people were to be the sovereignð and no one else. [3]

Jefferson himself directed his ire at those whose quest for wealth and power would undermine American society: ñI hope we shall crush in its birth the aristocracy of our moneyed corporations which dare already to challenge our government to a trial of strength and bid defiance to the laws of our country.ò Can we find a legal foundation for the elimination of nuclear power and weapons?

Bases

- Fifth Amendment: No person may be...deprived of life, liberty, or property without due process of law.
- Fourteenth Amendment: ... nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.
- Nuclear Non-proliferation Act, Public Law 95-242, 92 Stat. 120, 22 USC 3201
- Atomic Energy Act of 1954, Public Law 83-703 as Amended in NUREG-0980
- National Environmental Policy Act, P.L. 91-190, 83 Stat. 852, 42 USC 4321
- Clean Air Act P.L. 101-549, 104 Stat. 2399, 42 USC 7602, §112(b), §502(a) and 40 CFR 70.3, radioactive materials as hazardous air pollutants (HAP),
- Clean Water Act, P.L. 92-500, 86 Stat. 893, 33 USC 1371, Section 316(a), 33 USC. 1326(a). National Pollution Discharge Elimination System (NPDES) permits
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, February 11, 1994

Argument

Three general areas of argument are presented: nuclear power (page 4), nuclear weapons (page 15) and nuclear incineration (page 20).

[2] Founding.com, a project of the Claremont Institute, http://www.founding.com/the_declaration_of_i/pageid.2417/default.asp

[3] Joe Trippi, MSNBC, December 4, 2004, ñA return to America's founding principles,ò http://www.democraticunderground.com/

Nuclear Power

Constitutional Due Process and Equal Protection

The Fifth Amendment to the US Constitution states, ñNo person shallé be deprived of life, liberty, or property, without due process of law.ò The Fourteenth Amendment adds that the States may not, ñdeny to any person within its jurisdiction the equal protection of the laws.ò In addition to the Atomic Energy Act, the National Environmental Policy Act and other statutes, the Nuclear Regulatory Commission must certainly abide by the highest law in the land. However, the agency has violated these rights by applying inequitable standards of protection by treating different people differently and depriving them of Constitutional guarantees.

For decades NRC regulations have been inequitable. The limits for radiation dose to individual members of the public is 100 millirem, a dose which equates to an annual risk of 5 in 100,000 (5.0xE-05) and a lifetime risk of 3.5 in 1,000 (3.5-E03). This means that 5 persons could die for every 100,000 members of the public exposed the plantôs ionizing radiation for a year; 3 to 4 persons per 1,000 could die if exposed over a lifetime. *Table of Fatal Cancer Risk from Ionizing Radiation, NRC Below Regulatory Concern Policy, 22 June 1990*.

Radioactive exposure standards do not protect all members of the public. U.S Nuclear Regulatory Commission regulations allow the general public to receive radiation exposures of 100 millirem per year. But it is not an individual limit, it is an average applied to a population. It does not protect an individual from exposure to radiation. Therefore, as a standard it is not protective of public health.

> It is derived and applied using averages. It is quite allowable for some people to get 10 times more radiation, just so long as they are balanced by as many who get ten times less. The regulators rely on the assumption of a standardized individual ï so doses are calculated and applied to the Standard Man (average height, weight, 35 years old). Children, fetuses, elders and others will actually receive a higher dose from the same level of radiation exposure. [4]

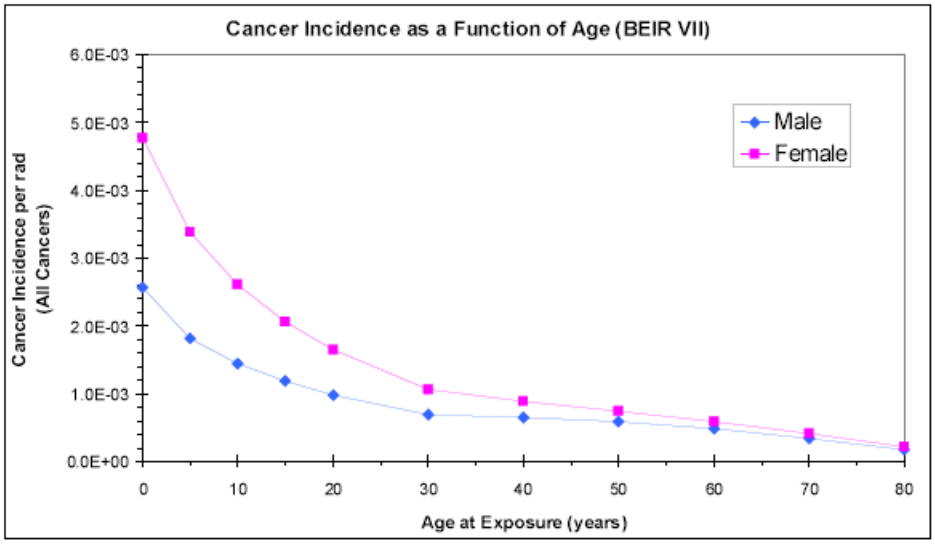
According to International Committee on Radiological Protection, the cancer death rate from radiation is 3.5 per 1000 males exposed to 100 millirems over a 70 year lifespan. This is equivalent to 1 in 286 fatal cancers from the legal 100 millirems exposure. The rate for females and children is worse. This rate is 35 times higher than allowed under the US EPA standard for toxic chemicals.

In 1999 the US EPA published guidance which indicated a higher risk of cancer in children.[5] In 2002 the EPA published a database detailing the increased risk to

[4] Mary Olson, Nuclear Information and Resource Service, September 1998, www.nirs.org

[5] U.S. Environmental Protection Agency, ñCancer Risk Coefficients for Environmental Exposure to Radionuclidesò, Federal Guidance Report No. 13, September 1999 (EPA 402-R-99-001)

children from exposure via ingestion and inhalation to many radionuclides.[6] In 2005 the BEIR VII Committee published data, see chart *infra*, showing higher risks at lower ages as estimated by the U.S. National Academy of Science. [7]



The chart indicates the greatly increased risk of cancer in younger children and in women at all ages from equivalent low-level radiation exposures.

The BEIR VII Committee published morbidity and mortality data in 2006 which show that children have a significantly higher risk of developing cancer from radiation than adults do and women have a higher risk of radiation-induced cancer than men do. BEIR VII found that a lifetime dose of one million person-rem results in a cancer incidence rate of 900 for men and 1370 for women; mortality rates for the same dose are 480 and 660 for men and women, respectively. See *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII – Phase 2*. [8]

Regulations limiting carcinogens in other federal agencies are set at much more protective levels. Equal protection under the law must mean that equal standards for protecting public health. The National Research Council published the following analysis:

> ñRather than gear criteria to an analytic technique, the agency defined its standards in terms of risk. It proposed that any assay approved for controlling a

[6] U.S. Environmental Protection Agency, ñCancer Risk Coefficients for Environmental Exposure to Radionuclides: CD Supplementò, Federal Guidance Report No. 13, 2002 (EPA-402-C-R-99-001, Rev. 1)
[7] Richard R. Monson *et al*. Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII ï Phase 2. Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, Board on Radiation Effects Research, National Research Council of the National Academies. Washington, DC, National Academies Press, 2005

[8] Richard R. Monson et al, Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, Board on Radiation Effects Research, National Research Council of the National Academies. Washington, DC: National Academies Press, 2006, page 15.

> carcinogenic drug must be capable of measuring residues that present more than an insignificant risk of cancer, and specified a 10^{-6} lifetime risk of cancer as a quantitative criterion of insignificance.ò

See *Risk Assessment in the Federal Government: Managing the Process*.[9]

In a Fourth Circuit Court decision challenging the Price Anderson Nuclear Industries Indemnity Act, plaintiffs raised *inter alia* the issue of due process. In 1978 the Supreme Court overturned the decision of the lower court. Justice John Paul Stevens concurred in the judgment but in a separate opinion said:

> With some difficulty I can accept the proposition that federal subject-matter jurisdiction under 28 U.S.C. 1331 (1976 ed.) exists here, at least with respect to the suit against the Nuclear Regulatory Commission, the agency responsible for the administration of the Price-Anderson Act. The claim under federal law is to be found in the allegation that the Act, if enforced, will deprive the appellees of certain property rights, in violation of the Due Process Clause of the Fifth Amendment. One of those property rights, and perhaps the sole cognizable one, is a state-created right to recover full compensation for tort injuries. The Act impinges on that right by limiting recovery in major accidents. [438 U.S. 59, 95] é But there never has been such an accident, and it is sheer speculation that one will ever occur. For this reason I think there is no present justiciable controversy, and that the appellees were without standing to initiate this litigation. (emphasis added)

Now, there has been such an accident. The Supreme Court decision occurred the year before the partial meltdown at Three Mile Island and the release of the eponymous ñChina Syndrome.ò Justice Stevens continued:

> The Court's opinion will serve the national interest in removing doubts concerning the constitutionality of the Price-Anderson Act. I cannot, therefore, criticize the statesmanship of the Court's decision to provide the country with an advisory opinion on an important subject. Nevertheless, my view of the proper function of this Court, or of any other federal court, in the structure of our Government is more limited. We are not statesmen; we are judges. When it is necessary to resolve a constitutional issue in the adjudication of an actual case or controversy, it is our duty to do so. But whenever we are persuaded by reasons of expediency to engage in the business of giving legal advice, we chip away a part of the foundation of our independence and our strength.

See *Duke Power Co. v. Carolina Environmental Study Group*, 438 U.S. 59 (1978)

Certainly, after thirty years it is time to revisit the issues of due process, equal

[9] Committee on the Institutional Means for Assessment of Public Health, Commission on Life Sciences, National Research Council (1983) ISBN 0-309-03349-7

protection and ñthe business of giving legal advice.ò[10]

Nuclear Power and the Clean Air Act

Nuclear power plants must obtain permits to discharge pollution to the atmosphere. But these permits may be challenged in state regulatory proceedings. Air pollution sources subject to Part 70 operating permit rule requirements are determined by the Clean Air Act[11] and include area sources and hazardous air pollutants (HAP). Section 112(b) of the Act includes radioactive materials on the list of hazardous air pollutants and imposes health-based emission standards. Title III of the Act directs regulatory agencies to assess residual risk after the implementation of the initial standards and impose tighter standards to protect public health.

For example, the US EPA and the Georgia Environmental Protection Division should not have approved the permit modification[12] for the Vogtle Electric Generating Plant for four new cooling towers, increasing radioactive air pollution. During normal operations, Plant Vogtle emits radioactive pollution into the air. The following table lists annual emissions:

Table 1: Radioactive Air Emissions from Plant Vogtle[13]

Year	Microcuries
1987	20
1988	18
1989	1250
1990	85
1991	2080
1992	5870
1993	521

The emissions included in Table 1 are radioactive isotopes with a half life of more than eight days, including Iodine-131 and particulates, which persist in the environment, therefore making them more likely to be directly inhaled or enter the body by some other route. Table 2 lists gaseous emissions of nuclear fission and activation products.

[10] The substance of this argument was submitted in a petition for intervention in the Tennessee Valley Authorityôs request for a combined operating license at the Bellefonte Nuclear Plant in Hollywood, Alabama by the Blue Ridge Environmental Defense League, Nuclear Regulatory Commission Docket Nos. 52-014 and 52-015 (June 6, 2008)

[11] Clean Air Act §502(a) and 40 CFR 70.3

[12] A modified source is ñany physical change iné a stationary source which increases the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted.ò Clean Air Act Section 111(a)(4)

[13] Tichler J, Doty K, Lucadamo K. *Radioactive Materials Releases from Nuclear Power Plants*. Upton NY: Brookhaven National Laboratory, prepared for the U.S. Nuclear Regulatory Commission annual reports. NUREG/CR-2907, BNL-NUREG-51581

Table 2: Gaseous Emissions, Vogtle Electric Generating Plant [14] (Curies)

Year	Vogtle Unit 1	Vogtle Unit 2
2001	12.13	0.42
2002	23.89	2.36
2003	1.68	0.64
2004	0.64	1.31

The Vogtle 1 reactor emitted about eight times more radioactivity than did reactor 2 (28.34 to 4.73 curies). The majority of these emissions are often clustered into relatively brief time periods. For example, of the 23.89 curies emitted from Vogtle 1 in 2002, 20.40, or about 85%, occurred during the first quarter. During this quarter, relatively high levels of other radioisotopes occurred as well. For example, Vogtle 1 emitted .0191 of a curie of Iodine-131 into the air; making it the third greatest emission of any U.S. reactor during this time, or thousands of times more than typical emissions.[15]

Radionuclide emissions to the atmosphere are regulated as hazardous air pollutants under Title III of the federal Clean Air Act. National Emission Standards for Hazardous Air Pollutants (NESHAP) are subject to maximum achievable control technology standards (MACT). Specifically, the Vogtle Electric Generating Plants will not meet Clean Air Act standards because: 1) without maximum achievable control technology, routine emissions from the plant would be excessive especially when considered in addition to the existing site-wide radioactive emission levels and 2) the company does not properly account for the higher levels of morbidity and mortality in females and infants caused by low levels of radiation.

Enforcement of the Clean Air Act regulations related to nuclear power plants are delegated to the NRC. Radionuclides are listed as hazardous air pollutants in Section 112 of the Clean Air Act Amendments of 1977 (Public Law 95-95). NRC-licensed facilities must meet requirements of the Clean Air Act which limit radionuclide emissions to the atmosphere. The goal of the radionuclide emission standard is to limit the lifetime risk of induced fatal cancer to a maximally exposed individual to approximately one in 10,000. The implementing regulations translate this into a maximum individual exposure of 10 millirem/year for airborne emissions that result in exposure through any environmental pathway. 10 CFR § 50 Appx. I This translates into a risk of 5.6 excess fatal cancers/10,000 people. BEIR V, Table 4-2, pp. 172-173. The US EPA develops standards for industries which are major emitters of hazardous air pollutants (HAP) that require the application of controls, known as maximum achievable control technology (MACT).

However, no MACT has been issued for radionuclides. Further, although emission rates from the cooling towers and other sources are measured, the millirem

[14] Source: U.S. Nuclear Regulatory Commission, www.reirs.com/effluent

[15] Joseph Mangano, MPH MBA, *Preliminary Findings: Radioactive Contamination from the Vogtle Nuclear Plant and Cancer Risk for the Local Population*, Radiation and Public Health Project, 6 December 2006

standard for maximum allowable dosage to the public is an ambient standard, not an emission limit. Without ambient measurements, state regulatory agencies cannot assure that emissions of radionuclides are below 10 millirem per year to any member of the public as required by law. At present, air permit agencies cannot assure that nuclear power plants meet NESHAP radionuclide emissions limits.

Nuclear Power Plants in Hot Water

People living near nuclear power plants suffer disproportionately from the negative impacts of pollution from nuclear power plants. The pollutants include toxic chemicals, radioactive poisons and hot water. In 2009, a court ruled that a waste water discharge permit for a nuclear plant violated the federal Clean Water Act and remanded the permit to the state for compliance.[16] However, the decision was later reversed on appeal. Nevertheless, this case provides insights regarding inland thermoelectric power plants and could affect over 600 others nationwide.

The 2009 case centered on a Clean Water Act NPDES permit for a nuclear power station located in Louisa County, Virginia. For decades the State Water Control Board of Virginia has issued pollution permits to Dominion-Virginia Power, the second-largest electric power company in the nation. In 2007 the Blue Ridge Environmental Defense League challenged the permit in Virginia Circuit Court for the City of Richmond. BREDL sought judicial review of the State Water Control Boardôs Virginia Pollution Discharge Elimination System Permit No. VA0052451 issued to Dominion-Virginia Powerôs North Anna nuclear power plant. The court ruled that the stateôs NPDES permit was contrary to federal law and remanded it to the Virginia Department of Environmental Quality for compliance. BREDL won the first round. However, at the behest of Dominion-Virginia Power, the state appealed and obtained a reversal in a decision which was fraught with bland assertions and legal errors. Virginiaôs approval of the permit hinged on the granting of a variance under Section 316(a) of the CWA 33 U.S.C. 1326(a).

Since 1978, Virginia Electric and Power Company (Dominion) has operated North Anna Power Station on the shores of Lake Anna. Like every other nuclear power plant, it generates enormous amounts of heat as a by-product of its operations. The heated wastewater flows through the ñhot sideò of the lake and, over the course of a few days, to the ñcool side.ò

The federal Clean Water Act forbids the discharge of heat into ñwaters of the United Statesò without a permit. 33 U.S.C. § 1342(a) (2006); *see also* 33 U.S.C. § 1362(6) (defining ñheatò as a pollutant). Seeking to take advantage of a narrow regulatory exemption for waste treatment systems, Dominion labeled the ñhot sideò as its ñwaste heat treatment facility.ò Virginia obligedð no permits the state has issued since 1977 has ever attempted to limit thermal discharges into the ñhot sideò and billions of gallons per day of thermal pollution have flowed into the lake. BREDL, the Sierra Club and the Natural Resources Defense Council submitted public comments citing health and

[16] *Blue Ridge Environmental Defense League et al. v. Commonwealth of Virginia ex rel., et al.,* Record No. 101476, Virginia Court of Appeals, Case Nos. 2221-09-2 and 2222-09-2

environmental concerns. But the State Water Control Board, relying on a ñno objectionò letter from Region III EPA, issued the permit. [17]

BREDL appealed the stateôs permitting decision to the Circuit Court for the City of Richmond. BREDL argued, among other points, that the state boardôs determination violated Virginia law, which, by incorporating federal law and agreeing to administer locally the CWA National Pollutant Discharge Elimination Program, required the state to regulate and protect all ñwaters of the United Statesò just as if the program remained in federal control. The ñhot sideò of Lake Anna constituted ñwaters of the United Statesò and did not fall within the narrow ñwaste treatment systemsò exemption. But Virginia provided ñwaste treatment systemsò with a wholesale exemption from jurisdiction, whereas the federal definition of ñwaters of the United Statesò contained an exception to that exemption for ñcooling ponds.ò In promulgating the ñcooling pondsò exception, EPA differentiates ñcooling lakesò from ñcooling pondsò because they are always ñwaters of the United Statesò and are never subject to exemption. The circuit court disagreed with the state on this point and agreed with BREDL that the SWCB violated state law which had to be consistent with the federal CWA. Accordingly, the circuit court set aside the permit.

Ultimately, the Court of Appeals concluded that the circuit court should have deferred to the SWCBôs interpretation of its jurisdictional limitations based upon ñvoluminous informationò contained in the record, which included the ñno objectionò letter from the EPA, along with ñthe past twenty yearsô historyò of the SWCB holding the ñhot sideò exempt from regulation, and the state agencyôs recommendations to reissue the permit without regulation. The court did not concern itself with the correctness of either the EPAôs letter or the material differences between the state definition of ñsurface watersò and the federal definition of ñwaters of the United States.ò

Despite both Dominion and the state referring to it as the Waste Heat Treatment Facility, the ñhot sideò is in reality a 3,400-acre body of water that area residents and visitors enjoy every day. Congress enacted the CWA ñto restore and maintain the chemical, physical, and biological integrity of the Nationôs waters by reducing, and eventually eliminating, the discharge of pollutants into these waters.ò *Natural Res. Def. Council v. EPA*, 16 F.3d 1395, 1399 (4th Cir. 1993) (quoting 33 U.S.C. § 1251(a)). The CWA requires regulation over and protection of all ñnavigable waters,ò which EPA defines as ñwaters of the United States.ò 33 U.S.C. § 1362(7). EPA has broadly circumscribed ñwaters of the United Statesò to cover many water bodies, including, among others ñ[a]ll waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide,ò ñ[a]ll other waters such as intrastate lakes, rivers, streams . . . ,ò and ñ[a]ll impoundments of waters otherwise defined as waters of the United States.ò 40 C.F.R. § 122.2 (2007). Notably, the ñwaters of the United Statesò do not include ñ[w]aste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR

[17] The EPA never approved the SWCBôs jurisdictional determination; it merely decided not to object to it.

423.11(m)[18] which also meet the criteria of this definition).ò *Id.*[19]

In conclusion, Section 316 of the Clean Water Act governs thermal discharges from industrial plants to waters of the United States; the NPDES permit issued by the Commonwealth of Virginia failed to do that. The goal is to enforce the Clean Water Act which for the maintenance of water quality and the protection of public health here and across the nation.

Environmental Justice

Recent demographic research points to environmental injustice related to commercial nuclear power in the Southeast. That radioactive pollution may fall within regulatory limits only highlights the fundamental unfairness of building more nuclear power plants in this region. The study centers on Plant Vogtle operated by Georgia Power and Southern Company in Burke County, Georgia, on the banks of the Savannah River.

In 2009, a nuclear power siting study was published which suggests that there is a ñreactor-related environmental injusticeò at Plant Vogtle. The study found:

> The mining, fuel enrichment-fabrication, and waste-management stages of the US commercial nuclear fuel cycle have been documented as involving environmental injustices affecting, respectively, indigenous uranium miners, nuclear workers, and minorities and poor people living near radioactive-waste storage facilities. After surveying these three environmental-injustice problems, the article asks whether US nuclear-reactor siting also involves environmental injustice. For instance, because high percentages of minorities and poor people live near the proposed Vogtle reactors in Georgia, would siting new reactors at the Vogtle facility involve environmental injustice? If so, would this case be an isolated instance of environmental injustice, or is the apparent Georgia inequity generally representative of environmental injustice associated with nuclear-reactor siting throughout the US? Providing a preliminary answer to these questions, the article uses census data, paired t-tests, and z-tests to compare each stateôs percentages of minorities and poor people to the percentages living in zip codes and census tracts having commercial reactors. Although further studies are needed to fully evaluate apparent environmental injustices, preliminary

[18] This cross-referenced section no longer exists in the current Code of Federal Regulations. However, when EPA originally promulgated the definition for ñwaters of the United States,ò 40 C.F.R. § 423.11(m) provided that ñcooling pondsò meant ñany manmade water impoundment which does not impede the flow of a navigable stream and which is used to remove heat from condenser water . . . .ò 40 C.F.R. § 423.11(m) (1979).

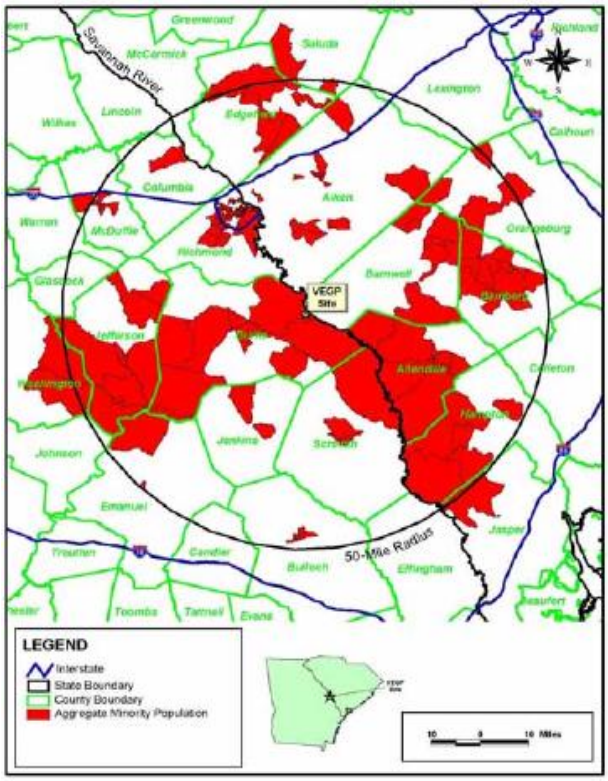
[19] The regulatory definition still contains an explanation that the ñwaste treatment systemsò exemption ñapplies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) not resulted from the impoundment of waters of the United States.ò *Id*. Although EPA suspended that portion of the definition in 1980, 45 Fed. Reg. 48,620 (July 21, 1980), it continued to maintain, and courts have agreed, that it was ñmerely explanatory in natureò and had ñno effect upon the clear definitional mandate that impoundments of waters of the United States remain ówaters of the United States.ôò *W. Va. Coal Ass'n v. Reilly*, 728 F. Supp. 1276, 1289 (S.D.W. Va. 1989), *aff'd*, Nos. 90-2034, 90-2040, 1991 WL 75217 (4th Cir. May 13, 1991).

> results indicate that, while reactor-siting-related environmental injustice is not obvious at the census-tract level (perhaps because census tracts are designed to be demographically homogenous), zipcode-scale data suggest reactor-related environmental injustice may threaten poor people ($p < 0.001$), at least in the southeastern United States.[20]

According to the US Census Bureau, 12.6% of Georgia households are below the Federal poverty threshold; however, within a 50-mile radius of Vogtle 13.6% of the families (and 17.1% of the individuals) live below the threshold. The map on the next page shows the census block groups with majority African-American areas near Plant Vogtle.

Under the National Environmental Policy Act (NEPA), it is the Nuclear Regulatory Commissionôs duty to consider alternatives ñas they exist and are likely to exist.ò *Monarch Chemical Works, Inc. v. Exxon*, 466 F.Supp. 639, 650 (1979), *Carolina Environmental Study Group v. U.S.*, 510 F.2d 796, 801 (1975). There is significant informationð information published after the Plant Vogtle license application and environmental impact statementð regarding environmental justice which the NRC has ignored.

Majority African-American Areas Near Plant Vogtle [21]



> To the greatest extent practicable and permitted by law, and consistent with the principles set forth In the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and

[20] *Environmental Injustice in Siting Nuclear Plants,* Mary Alldred and Kristin Shrader-Frechette, ENVIRONMENTAL JUSTICE, Volume 2, Number 2, 2009 © Mary Ann Liebert, Inc. DOI: 10.1089/env.2008.0544

[21] ñMinority block groups in 2000 within a 50-mi radius of VEGP,ò NUREG-1437, Supplement 34, December 2008, Figure 4-1, page 4-35

> activities on minority populations and low-income populations The NRC must avoid disproportionate, adverse environmental impacts on low income and minority populations and impacts on important religious, subsistence, or social practices.[22]

There are routine releases of airborne radioactive pollution from plant Vogtle, and large increases in radioactivity downstream from the plant. Even without an accident, Vogtle emits radioactive pollution. Every year, radioactive water in the form of Tritium is emitted by Plant Vogtle into the river. In 2003, Vogtleôs pollution was 1,900 curies; in 2004, 1,200 curies and in 2005, 1860 curies.[23] The discharge of Tritium (Hydrogen-3) in the form of radioactive water pollutes the Savannah River all the way to the ocean. Downstream drinking water wells are also contaminated. Residents of Beaufort, SC (112 miles downriver) and Port Wentworth, SC (122 miles downriver) have had their public drinking water supplies contaminated with radiation.[24] Other radioactive pollutants, including Cesium-137 and Cobalt-60, have also increased downstream from the Vogtle reactors since they began operation. The two existing reactors at Plant Vogtle discharge 10,000 gallons of liquid waste per minute into the Savannah River.[25] The everyday discharge of hot water includes nuclear fission products and tritium at over 1,400 curies/year. Two new proposed reactors would increase this radioactive pollution by an additional 2,020 curies per year.

The Final EIS for an early site permit for Plant Vogtleôs Units 3 and 4 was completed in July 2008.[26] Despite evidence to the contrary, the FEIS concluded: ñ[T]he impacts of plant operations on environmental justice would be SMALL because no environmental pathways, health characteristics, or other preconditions of the minority and low-income population were found that would lead to adverse and disproportionate impacts.ò Unbelievably, the report attributed the high percentage of minority and low-income people on the ñsparsenessò of the rural population. The data collection for this report consisted of interviews with just three residents.

The Disproportionate Impacts From Radionuclides in Fish

Section 4ï 401 of Executive Order 12898 states: ñIn order to assist in identifying the need for ensuring protection of populations with differential patterns of subsistence consumption of fish and wildlife, Federal agencies, whenever practicable and appropriate, shall collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence.ò

Local residents depend on the Savannah River for fish to feed their families. Radiological monitoring reveals that Savanna River fish are contaminated with Cesium-

[22] Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, February 11, 1994

[23] Westinghouse Savannah River Company Environmental Reports: 2003, 2004, 2005, WSRC-TR-2004-00015, WSRC-TR-2005-00005, WSRC-TR-2006-00007

[24] Beaufort/Jasper County Water Treatment Plant and Cherokee Hill Water Treatment Plant recorded 17% increase in beta radiation in finished drinking water and 37% increase in beta radiation in raw water supply.

[25] Sources: SNOC Vogtle ESP ER Table 2.9-1; Table 3.0-1; Table 3.5-1

[26] NUREG-1872, published August 2008

137.[27] Tests in the vicinity of Plant Vogtle routinely find Cesium-137 in the edible parts of fish. Radioactive Cesium-137 is of particular concern because levels actually increase when fish is cooked.[28] One study found that cesium levels increase by 32% when fish are fried with breading, and by 62% when fried without breading.[29]

African American and low-income individuals are at specific heightened risk from hazardous materials in the Savannah River, and although individuals from all socioeconomic backgrounds engage in fishing in the area, African Americans in particular commonly engage in subsistence fishing along the Savannah River and have a higher than average consumption of fish, frequently surpassing allowable contaminated fish consumption levels.[30]

Multiple Exposure Analysis is Required

Section 3ï 301(b) of Executive Order 12898 states that ñEnvironmental human health analyses, whenever practicable and appropriate, shall identify multiple and cumulative exposures.ò A missing factor in the assessment of Vogtleôs impact is the proximity of the nuclear power station to the Department of Energyôs Savannah River Site. Vogtle and SRS emissions intermingle, making independent assessment challenging. The principal contractor at the Savannah River Site publishes annual reports which contain the following data.

Tritium Transport in Streams[31]

Year	SRS emissions	Vogtle emissions	Total curies
2003	4010	1900	5910
2004	2430	1200	3630
2005	2620	1860	4480

The discharge of Tritium in the form of radioactive water pollutes the Savannah River all the way to the ocean. Downstream drinking water wells are contaminated. Does the pollution come from SRS or Vogtle? The answer is ñboth.ò Until a few years ago, the Georgia Department of Natural Resources Environmental Protection Division published reports on its radiation monitoring program. The program tested samples of air, surface water, groundwater, rain, sediments, fish, soil, vegetation, milk and agricultural crops near facilities which are known to emit ionizing radiation and compares these data to background levels. Test results for Vogtle from 1995 to 2002 indicated that the nuclear power plant is the source of a variety of radionuclides which contaminate

[27] *Vogtle Electric Generating Plant, Annual Radiological Operating Report for 2005*, Southern Company (2006).
[28] Joanna Burger, et al., *Effects of Cooking on Radiocesium in Fish from the Savannah River: Exposure Differences for the Public*, Arch. Environ. Contam. Toxicol. 46, p. 231, 2004. (Exhibit 2.6).
[29] *Id.* The weight loss during cooking of a breaded fish was 25% and the weight loss of an un-breaded fish was 39%.
[30] Senate Resolution 598, Senator Thomas of the 2nd, 07 LC 25 4926ER, http://www.legis.ga.gov/legis/2007_08/fulltext/sr598.htm
[31] Westinghouse Savannah River Company Environmental Reports: 2003, 2004, 2005, WSRC-TR-2004-00015, WSRC-TR-2005-00005, WSRC-TR-2006-00007

sediment, river water, fish and drinking water. The stateôs test results reveal striking elevations of harmful radionuclides. The test results range from 2 times to 50 times above background level.

A study conducted by the University of South Carolina has shown that there is a higher than average instance of cervical cancer in black women, and a higher rate of esophageal cancer in black men, within a fifty mile radius of Plant Vogtle.[32] Georgia EPD monitoring indicates much of the radioactive pollution comes from the two nuclear reactors at Plant Vogtle. Studies of U.S. Centers for disease Control and Prevention data indicate that the death rate per 100,000 population from all cancers in Burke County increased by 24.2% and that infant deaths increased by 70.1% in Burke County after the Plant Vogtle reactors went online.[33]

By allowing Georgia Power to add two more reactors at Plant Vogtle, NRC has effectively doubled the danger of radiation exposure, doubled the risk of nuclear accidents, and doubled the impact on future generations. The Commission must reassess its environmental justice conclusions in order to prevent disproportionate adverse environmental impacts on low income populations in the Shell Bluff community and other communities near Plant Vogtle.

Nuclear Weapons

Overview

International treaty obligations and U.S. law prohibit further development of atomic weapons. The Nuclear Non-proliferation Treaty (NPT) compels the United States to end nuclear weapons development. The preamble to the treaty is unequivocal in its purpose:

> Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmamenté to seek to achieve the discontinuance of all test explosions of nuclear weaponsé the establishment and maintenance of international peace and security are to be promoted with the least diversion for armaments of the worldôs human and economic resources.

The NPT specifically requires that:

> Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control. [34]

Yet there are those who seek to maintain or even increase Americaôs nuclear

[32] 1997 FEB 3, Cancer Weekly via NewsRx.com & NewsRx.net (Exhibit 2.7).
[33] U.S. Centers for Disease Control and Prevention ICD-9 codes 000.1-799.9 (http://wonder.cdc.gov)
[34] Article VI, Treaty on the Non-Proliferation of Nuclear Weapons

weapons capability. In 2006, the Defense Science Board, a federal advisory committee of the US Department of Defense, stated:

> Any discussion of options for improving the U.S. nuclear deterrent must be grounded in an understanding of the role of nuclear weapons in the 21st century. Nuclear capabilities remain an essential element of U.S. national security strategy and defense posture. The knowledge needed to create the power and destructive potential of nuclear weapons is widespread and is a continuing fact of life. Global abolition of these capabilities is a naïve hope.[35]

However, the NPT does not seek to abolish ñknowledge needed to create the power and destructive potential of nuclear weapons,ò and world leaders are no more naïve today than they were in 1970 when the treaty entered into force. Under the Obama Administration, the push for weapons development has abated somewhat, but maintaining a nuclear stockpile is still US policy.

> Each year the NNSA reports on how it plans to maintain the nuclear weapons stockpile. Specifically, Section 4203 of the Atomic Energy Defense Act (Title 50 of the U.S. Code, Section 2523) requires that: ñThe Secretary of Energy shall develop and annually update a plan for maintaining the nuclear weapons stockpile. The plan shall cover at a minimum, stockpile stewardship, stockpile management, and program direction.ò This document, originated in February 1996, came to be known as the *Stockpile Stewardship Plan* and has been submitted to Congress every year since 1998.[36]

The National Nuclear Security Administration (NNSA), which runs the Department of Energyôs nuclear weapons design and production complex, is planning to build three new facilities to expand U.S. warhead production capacity, one of them at Oak Ridge National Laboratory. NNSA has made building the Uranium Processing Facility at Oak Ridge a high priority. Proposed spending for the UPF in FY 2013 is $340 million, a 112% hike from last year. The total project is estimated to cost between $4.2 and $7.5 billion. Overall, The NNSDAôs FY 2013 budget request for nuclear weapons activities is $7.6 billion, which is 5% higher than FY 2012 and 10% higher than FY 2011.

The central issue in the United States is our own violation of the Nuclear Non-Proliferation Treaty. Construction of new weapons is immoral, unnecessary and illegal. In 1969 Congress ratified and President Nixon signed the Nuclear Non-proliferation Treaty which commits the nation to stop nuclear testing, to eliminate stockpiles, to end the manufacture of nuclear weapons, and to put an end to the arms race. The 188 other nations who have signed the Nuclear Non-proliferation Treaty are watching what we do.

The Danger of Reprocessing Nuclear Materials for Energy Use

An international expert on energy and the environment attached great danger to the

[35] *Report of the Defense Science Board Task Force on Nuclear Capabilities Report Summary*, Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics, Washington, DC, December 2006
[36] FY 2011 Stockpile Stewardship and Management Plan, May 2010, page ix

continued development of nuclear power technology. He stated:

> The revival of interest in nuclear power could result in the worldwide dissemination of uranium enrichment and spent fuel reprocessing technologies, which present obvious risks of proliferation as these technologies can produce fissile materials that are directly usable in nuclear weapons.[37]

The Savannah River Site in South Carolina is a 310 square mile federal complex employing more than 12,000 people largely involved with managing the toxic legacy of the Cold War. Environmental cleanup at SRS is a massive undertaking complicated by new polluting activities from ongoing tritium production, new plutonium disposition facilities and additional nuclear waste storage.

The shallow groundwater at SRS is severely contaminated with tritium, TCE, and other pollutants. While the water in the Savannah River is still within drinking water standards, radioactive tritium has already been found in drinking water more than 100 river miles downstream from SRS at Beaufort, SC. SRS is out of compliance with the federal Clean Air Act.[38] Recent evidence indicates that radioactive pollutionð cesium 137, strontium 90 and cobalt 60ð is between 20 and 100 times background downstream of the old atomic weapons facilities, depending on how one measures natural background relative to fallout from atmospheric testing.[39]

Proliferation from Weapons-grade Plutonium to Fuel Electric Generating Plants

The Savannah River Site in South Carolina has fissile materials facilities already under construction. Under a program to fuel commercial nuclear power reactors with weapons-grade plutonium, the Department of Energy is building a plutonium fuel factory at the Savannah River Site. Federal funding for plutonium fuel could support new weapons capability; fuel operations will include a new plant to purify plutonium by liquid acid processing which is also essential for production of nuclear weapons.

The reprocessing of plutonium as civilian nuclear power fuel presents a real danger because of the unsupportable risks to public safety and the environment. Plutonium fuel requires transportation of weapons grade plutonium and fuel across thousands of miles of open country, making transport vulnerable to terrorist attacks and theft. Manufacturing plutonium fuel would create vast quantities of radioactive waste. The plutonium fuel contractor for the US estimates *annual* waste outputs of up to 21,000 gallons of high activity radioactive waste containing 84,000 Curies of americium, 46,000 gallons of plutonium- and uranium-bearing wastes, and 385,000 gallons of low-level radioactive waste.[40]

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[37] Benjamin K. Sovacool (2011). ñContesting the Future of Nuclear Power: A Critical Global Assessment of Atomic Energy,ò *World Scientific*, pp. 187-190

[38] Comments re: Part 70 Air Quality Permit No. TV-0080-0041, US Department of Energy, Westinghouse Savannah River Company-Savannah River Site, BREDL, November 21, 2002

[39] Under A Cloud: Fallout from the Savannah River Site, The RadioActivist Campaign, October 2003

[40] *Mixed Oxide Fuel Fabrication Facility Environmental Report, Revision 1 & 2*, Duke COGEMA Stone & Webster, 11 July 2002, (tables 3-3 and 3-4)

Further, the use of plutonium fuel at commercial nuclear power reactors anywhere, including those operated by the Tennessee Valley Authority; specifically, three boiling water reactors at Browns Ferry, Alabama and two pressurized water reactors at Sequoyah near Soddy-Daisy, Tennessee, would compound the danger and expand the risk to public health.

Radioactivity around SRS rising, health impacts mounting

A report issued in February by Joseph J. Mangano, MPH MBA, finds that in the past decade, levels of most types of radioactivity at the Savannah River Site are rising, as are rates of radiosensitive diseases. The 75-page report is available on our website and is incorporated into my comments by reference.[41] The Mangano report is based on a year-long study of data from the U.S. Energy Department, state and federal environmental regulators and health departments in Georgia and South Carolina. Among the findings were indicators that radiation levels are gradually increasing, rather than decreasing, and that ñradiosensitiveò diseases and deathsð including infant and fetal deaths, thyroid and lung cancers and leukemiað exceeded the national average in the five-county area surrounding SRS, where about 2,000 excess morbidities and mortalities have occurred since 2002.

Pursuant to NEPAð specifically, Section 102 42 U.S.C. 4332ð DOE must utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on manôs environment. Therefore, before proceeding with any new facilities at SRS, the DOE must ensure that future activities proposed in this EIS do not undermine the safety and health of local residents and workers.

Commercial Nuclear Reactors are Unsuitable for Plutonium Fuel

Originally, DOE had contracted with two electric utilities to use plutonium fuel in their power plants: Duke Energy and Virginia Power. But both have withdrawn their reactors from the program. In 2008, Duke Energy aborted its experiment with plutonium fuel. Tests of plutonium fuel scheduled to run for four-and-a-half years in Dukeôs Catawba nuclear reactor were ended after three years. The fuel assemblies grew abnormally long in the reactor, indicating a safety hazard in the MOX/plutonium fuel.[42] Also, during tests utilizing plutonium fuel in France, in accidents involving the loss of cooling water, slumping and ballooning of zirconium-clad fuel was observed, altering core geometry and restricting water flow.

Now TVA has stepped into the breach. The draft EIS considers the use of Sequoyah and Browns Ferry. However, there are critical differences between plutonium

[41] *Assessing Changes in Environmental Radioactivity and Health Near the Savannah River Site*, Joseph J. Mangano, Executive Director, Radiation and Public Health Project, February 22, 2012, available at http://www.bredl.org/pdf3/FINAL_CIF_Report.pdf

[42] Duke Energyôs report to the NRC, ADAMS digital library: ML081650181, June 10, 2008, available at www.nrc.gov/reading-rm/adams/web-based.html

fuel and conventional uranium fuel which should disqualify both of the subject TVA reactors.

The critical problem is that plutonium is fundamentally different from uranium. With plutonium fuel loaded into any commercial reactor, the power station becomes more dangerous because plutonium releases energy in a different way than uranium. Plutonium has a higher neutron flux, meaning higher energy particles at higher speeds. This and other nuclear phenomena break down metal reactor parts quicker; a process called embrittlement. This weakening of metal components would be accelerated in any reactor using plutonium fuel. Greater embrittlement means the reactor vessel may fail under circumstances which would otherwise not cause a problem. If and when failure happens and radioactive materials are released from the plant, more dangerous radionuclides are released from a reactor containing plutonium fuel, including greater quantities of radioactive elements which pose hazards to human health. The NRCôs reactor safety committee stated:

> Public attention has been drawn to the higher actinide inventories available for release from MOX than from conventional fuels. Significant releases of actinides during reactor accidents would dominate the accident consequences. Models of actinide release now available to the NRC staff indicate very small releases of actinides from conventional fuels under severe accident conditions. (emphasis added) [43]

No matter the utility or type of reactor, plutonium fuel has greater quantities of plutonium and other hazardous radioactive isotopes such as Americium 241 and Curium 242ð actinide elementsð which would cause additional harmful radiation exposure to the public.

Sequoyah

Sequoyahôs nuclear reactors utilize ice condenser containments, baskets of borated ice, to reduce heat and pressure in the event of an accident. Sandia National Laboratories evaluated the reactor containment structures at similar to those at Sequoyah Units 1 and 2 and found that if an accident involving hydrogen ignition occurs, the concrete containment will almost certainly fail.44 Such systems are particularly vulnerable to reactor sump clogging; numerous problems with ice condensers have been identified during the last two decades of operation.

Browns Ferry

The Nuclear Regulatory Commission has issued a notice of violation to the Browns Ferry plant because of the failure of a coolant injection valve, a ñredò finding of

[43] Letter from Advisory Committee on Reactor Safeguards to US Nuclear Regulatory Commission Chairman, May 17, 1999

[44] NUREG/CR-6427, Assessment of the Direct Containment Heating Issue for Plants With Ice Condenser Containments, April 2000

ñhigh safety significance.ò The NRC has only issued five red findings nationwide in the past decade. Browns Ferry is a similar design to the Fukushima Dai-ichi nuclear plant in Japan and should be closed down entirely rather than subjected to a plutonium fueled experiment.

In conclusion, for over a decade the Blue Ridge Environmental Defense League has opposed the reprocessing of plutonium as civilian nuclear power fuel because it presents unsupportable risks to public safety and the environment. We have partnered with Russian non-governmental organizations who, like us, support dismantling of nuclear weapons but who also call for abolition of the plutonium fuel program. Our overall opposition to plutonium fuel programs is based on the negative impacts on public health, the critical safety hazards of plutonium fuel in commercial nuclear power plants and the fundamental injustice of siting plutonium waste facilities in African-American and Native American communities in the Central Savannah River Area and New Mexico. A half century of radioactive contamination is causing an invisible yet real epidemic. The cumulative impact of new plutonium plants and past contamination at SRS would result in more death and disease to the people in this region. A local resident said, ñOur communities need jobs. But most of all we need life.ò[45]

Nuclear Incineration

Overview

IMPACT Services Inc. is a privately owned radioactive waste processing facility located in the East Tennessee Technology Park in Oak Ridge, Tennessee (on the site of the former K-25 Gaseous Diffusion Plant). IMPACTôs operations include a variety of services to US government and commercial generators of so-called low-level radioactive waste. The activities include decontamination and various methods of waste processing. IMPACTôs clients have included: Batelle, Connecticut Yankee, Babcock & Wilcox Y-12, Grand Gulf, Diablo Canyon, AREVA and Los Alamos National Labs. These are nuclear research laboratories, nuclear weapons sites, nuclear power plants and nuclear fuel manufacturers.

Tennessee Issued Permit on Faulty Premise

Pursuant to Tennessee 1200-2-10-.19, Amendment of Licenses at Request of Licensee,[46] and the Notification of Licensing Action published June 22, 2009, the Division of Radiological Health amended the Tennessee Radioactive Materials License for IMPACT Services to allow pyrolytic volume reduction of wastes contaminated with

[45] Rev. Charles Utley, Blue Ridge Environmental Defense League Environmental Justice Campaign Coordinator.

[46] 1200-2-10-.19 AMENDMENT OF LICENSES AT REQUEST OF LICENSEE. Applications for amendment of a license shall be filed in accordance with 1200-2-10-.11 and shall specify the respects in which the licensee desires his license to be amended and the grounds for such amendment.
Authority: T.C.A. §68-23-101 et seq. Administrative History: Original rule certified June 7, 1974. Amendment filed August 15, 1978; effective October 2, 1978. Amendment filed April 3, 1986; effective May 31, 1986.

radioactive materials.

As stated in the Division of Radiological Healthôs public notice of June 22, 2009, ñThe Division of Radiological Health is prepared to approve a request from IMPACT Services, Incé . to amend their Tennessee Radioactive Material License Number R-73024-E17 to authorize a pyrolytic volume reduction process for wastes contaminated with radioactive materials.ò The Radioactive Material License permits IMPACT Services, Inc. to ñreceive, acquire, possess and transfer radioactive materials.ò[47] The license lists the following radioactive materials as permitted: Uranium 233, Uranium enriched in the isotope U-235, Plutonium, Hydrogen 3, Carbon 14, Iron 55, Nickel 63 and any radioactive material with atomic numbers 3 through 92, inclusive.[48]

According to IMPACT Services, ñThe subject pyrolysis unit is not an incinerator since no burning [oxidation] occurs in the pyrolytic process.ò[49] However, this statement is incorrect. Also, as TDEC has agreed with IMPACTôs assertion, as indicated in their January 6th request, *supra*, the Department is also in error. Moreover, the company is splitting hairs because, as demonstrated *infra*, the pollution emitted from both pyrolysis and incineration is similar.

First, federal regulations do not exempt IMPACTôs pyrolytic volume reduction process. IMPACT is preparing to install a Honua Model 1200E Pyrolytic-Destructor™, a pyrolysis unit manufactured by Honua Technologies. According to Honua, theirs ñare the only such units that meet the U.S. EPA exemptionò under 40 CFR 60.50c(f). Indeed, federal regulations for medical waste incinerators state: ñAny pyrolysis unit (defined in §60.51c) is not subject to this subpart.ò[50] The relevant definition states: ñ*Pyrolysis* means the endothermic gasification of hospital waste and/or medical/infectious waste using external energy.ò[51] (emphasis added) However, the exception for pyrolysis specifically applies to medical waste units, not radioactive waste from decommissioned nuclear power plants, defense labs and fuel manufacturing facilities for which IMPACT provides services. Honua's Pyrolytic Destructor™ is a proprietary and experimental technology for low-level radioactive waste. The company states:

> The Pyrolytic Destructor completely destroys all organic matter in the medical waste stream, while releasing the energy stored in the waste stream to fuel both the pyrolysis process and to make steam that can be used to treat other components of the waste stream.[52]

Nuclear laboratories are not medical facilities; their waste streams differ significantly.

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[47] Tennessee Dept. of Enviroment and Concervation, Division of Radiological Health, Radioctive Material License No. R-73024-E17, Amendment 31, May 23, 2007
[48] *Ibid*
[49] Stated in a letter from Chris Hepler, RSO, IMPACT Services Inc. to Johnny C. Graves, Licensing and Registration Manager, Tennessee Division of Radiological Health, January 6, 2009
[50] 40 CFR 60 Subpart Ecï Standards of Performance for Hospital/Medical/Infectious Waste Incinerators for Which Construction is Commenced After June 20, 1996
[51] 40 CFR §60.51c Definitions.
[52] HonuaTech website, downloaded July 21, 2009, http://www.honuatech.com/index.html

The pyrolysis cited in 40 CFR Subpart Ec is designated specifically for pathological and chemotherapy wastes.

Second, the proposed pyrolysis unit releases illegal and dangerous levels of radioactive and toxic substances into the air and landfills of Tennessee. Pyrolytic volume reduction (PVR) proposed by IMPACT results in particulate matter, acid gases, heavy metals and dioxins which require the installation of scrubbers and precipitators to reduce the level of these pollutants[53] ñbefore being discharged to atmosphere.ò[54]

The IMPACT pyrolysis unit is operated in conjunction with an oxidation unit which burns gases created during the pyrolysis stage. IMPACT Services Inc. states ñThe PVR of licensed radioactive material shall be conducted such that effluent airborne radioactivity associated with the operation is limited to 0.90 times (90%) the requirements of Column 1 of Table 2 of Schedule RHS 8-30 of Chapter 1200-2-5-.161 of the Tennessee Standards for Protection Against Radiation. The programmatic controls to ensure this requirement is met are included in this procedure.ò[55] Table 2 is over forty pages long and lists hundreds of radioactive isotopes. Many of these elements, when released into the atmosphere, are toxic as well as radioactive, including three isotopes of chlorine, eight isotopes of arsenic, nine isotopes of cadmium , nine isotopes of mercury, and fourteen isotopes of lead. Further, chlorine is an essential component of dioxin which is created as a byproduct of the thermal process. Radioactive chlorine combined with carbon and hydrogenð which also have radioactive isotopesð produce radioactive organochlorines including dioxin. Radioactive chlorine in a dioxin matrix is not accounted for anywhere in the ñprogrammatic controlsò which IMPACT relies upon for meeting state air pollution requirements.

Table 2 of RHS 8-30 also lists radioactive elements which present particular threats to human health including tritium (hydrogen 3) and isotopes of strontium, iodine, cesium, polonium, radon, uranium, plutonium, and americium.

IMPACT Services PVR procedures contain troublesome provisions with regard to meeting low-level radioactive waste limits. IMPACT states, ñEach batch shall be *developed* such that the limitsé of the Tennessee Standards for Protection Against Radiation are not exceededé .ò[56] (emphasis added) The verification of the pyrolysis process relies on data from a ñbatch verification worksheetò which includes ñdecontamination factorsò and other factors and formulae subject to manipulation. How can DRH ensure that TSPAR are not exceeded under this system?

The IMPACT Services incinerator does not meet Clean Air Act standards because: 1) Neither the Division of Radiological Health nor the Tennessee Department of Environment and Conservation have required maximum achievable control technology

[53] IMPACT Services Inc. license amendment request, Attachment B, Process Description, January 6, 2009
[54] IMPACT Services, Inc., Operations Procedure (OPS-09) Revision 1, Attachment 3, Section 1.0 System Layout, 6/5/09
[55] *Ibid*, OPS-09, Section 1.0 General, page 1 of 13
[56] *Ibid*, OPS-09, Section 5.1, Batch Development, page 4 of 13

on the proposed unit and 2) Neither IMPACT nor TDEC/DRH properly accounts for the higher levels of morbidity and mortality in females and infants caused by low levels of radiation. Radionuclide emissions to the atmosphere are regulated as hazardous air pollutants under Title III of the federal Clean Air Act. National Emission Standards for Hazardous Air Pollutants (NESHAP) are subject to maximum achievable control technology standards (MACT). Enforcement of Clean Air Act regulations are delegated to the State of Tennessee. Radionuclides are listed as hazardous air pollutants in Section 112 of the Clean Air Act Amendments of 1977 (Public Law 95-95). TDEC-licensed facilities must meet requirements of the Clean Air Act pursuant to 40 CFR Part 61 which limit radionuclide emissions to the atmosphere.

IMPACTôs pyrolysis system would utilize high-efficiency particulate air (HEPA) filters.[57] But according to Dr. Peter Rickards, a former member of the Centers for Disease Control Advisory Panel on the Idaho National Laboratory (INEEL), HEPA filters are an unreliable means of controlling radionuclide emissions. The HEPA filterôs failures include alpha migration, re-entrainment of particles, and alpha recoil through multiple filters. Alpha emitters include uranium and plutonium. In a letter to the US Department of Energy (Attachment A), Rickards said:

> ñAlpha recoilò is a DOE term, for the ability of alpha emitters, like plutonium, to ñcreepò through 4 HEPA filters in a row! Nobody knows how much plutonium comes out of the last filter.[58]

We question the validity of emission reduction efficiencies based on HEPA pollution control devices for atmospheric emissions. DRH cannot assure that the IMPACT incinerator meets NESHAP radionuclide emissions limits.

Perhaps the most damning evidence of the false promise of thermal destruction is an apples-to-apples study of pyrolysis and incineration recently published in the peer-reviewed *Journal of Analytical and Applied Pyrolysis*. The authors of the study found that the thermal destruction of waste in both processes produces light hydrocarbons, polyaromatic hydrocarbons (PAHs) and polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs). Further, the research indicates that decreasing the available oxygen, the necessary condition of pyrolysis, actually ***increases*** the emissions of some toxic compounds. Regarding the production of dioxins and furans, the study concluded:

> ñThe formation of PCDD/Fs is important in both combustion and pyrolysis processes. In pyrolysis, there can be a significant increase of cogeners and/or an increase of the total toxicity due to the redistribution of the chlorine atoms to the most toxic cogeners.ò[59]

[57] Described in a letter from IMPACT Servicesô Chris Hepler, Radiation Safety Officer to Johnny C. Graves, DRH Licensing and Registration Manager, April 16, 2009

[58] Letter from Dr. Peter Rickards to US Department of Energy, November 22, 2002

[59] ñComparison between emissions from the pyrolysis and combustion of different wastes,ò *Journal of Analytical and Applied Pyrolysis*, Volume 84, Issue 1, January 2009, Pages 95-102

In other words, the dioxins and furans created by waste pyrolysis could be even more toxic than the similar pollutants emitted by incinerators.

Finally, the inequity inherent in using the ñreference manò in the development of radiation protection standards has not been factored into the IMPACT request. Cancer mortality caused by ionizing radiation is significantly higher in females than in males. In 2005 the National Academies of Science published BEIR VII, a comprehensive review of all available biological and biophysical data on human exposure to ionizing radiation with a focus on the effects of low linear energy transfer radiation such as x-rays and gamma rays. The National Academies of Science concluded that the evidence supports the linear-no-threshold risk model; i.e., there is no safe level of radiation. Low linear energy transfer radiation is defined by the NAS as doses from zero to 100 mSv. BEIR VII also raised its previous estimates of the relative effects of radiation in females; cancer morbidity and mortality rates in females for cancer of the lung, kidney, liver and other solid tumors are double the rate of morbidity and mortality in males with similar exposures.

Conclusion

Based on the foregoing, the Division of Radiation Health should have rejected the license amendment requested by IMPACT Services to use pyrolysis for volume reduction of low-level radioactive waste. Pyrolysis technology fails on the bases of technical, legal, environmental and public health factors. As approved, the action has violated the principles of medical ethics and undermines the agencyôs fundamental mission; that is, to protect Tennesseans and the environment from the hazards of ionizing radiation.

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