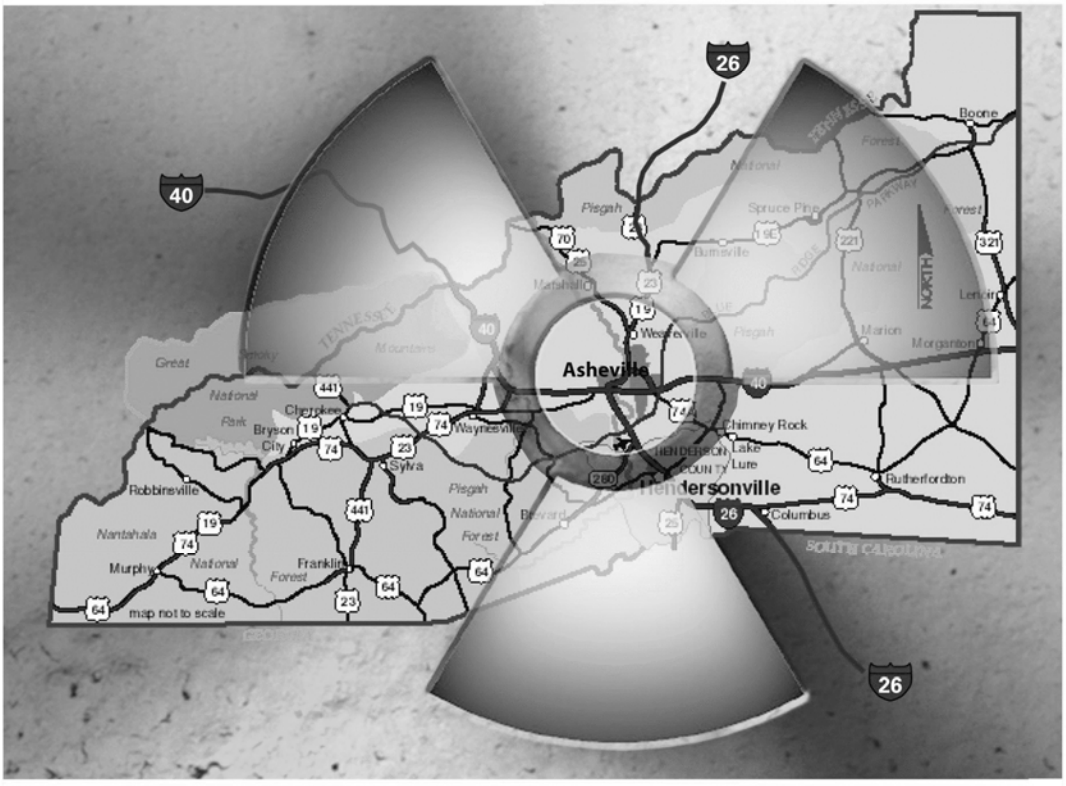
Asheville: At the Nuclear Crossroads

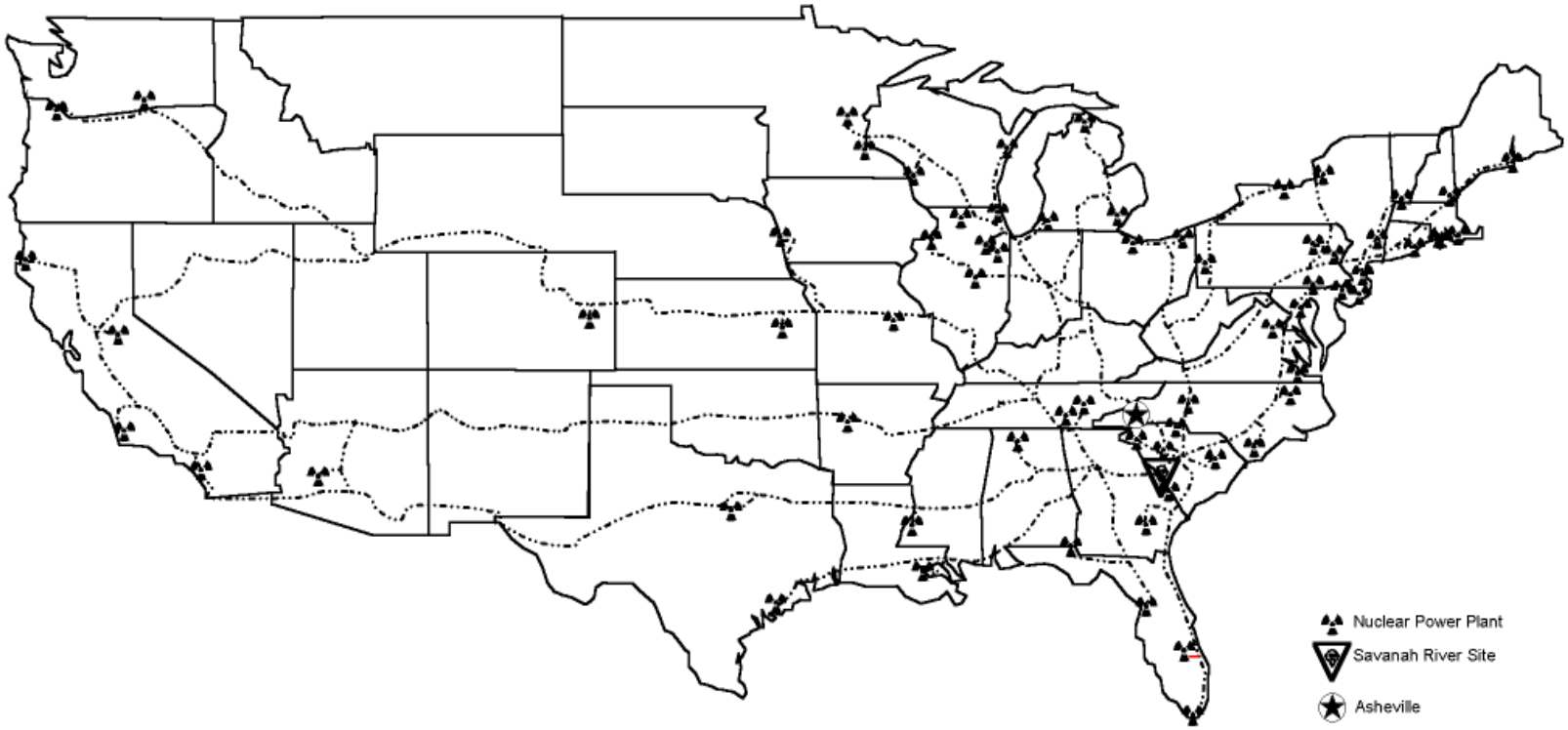
A report of radioactive transports on the roads of Western North Carolina, presented by members of Common Sense at the Nuclear Crossroads, a coalition of concerned residents and organizations.



June 2006

Mike Hopping, John Clarke, Mary Olson, Louis Zeller and Ned Doyle

Edited by Cynthia Heil



Map shows locations of 103 operating commercial nuclear power reactors and rough projection of the Interstate highway routes that might be used to transport irradiated nuclear fuel (high-level waste) to the federal nuclear site in South Carolina called the Savannah River Site — located across the river from Augusta, Georgia. Map by John Sticpewich, 2006 for Common Sense at the Nuclear Crossroads, based on data from the US Nuclear Regulatory Commission.

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Executive Summary

"Axles of Evil." Members of Common Sense at the Nuclear Crossroads (CSNC), a citizens' campaign to raise awareness of the issues surrounding the transport of radioactive materials on our Western North Carolina (WNC) highways and, perhaps in the future, on our rails, arrived at this seemingly cute and clever catch phrase to succinctly describe the deadly cargo rolling down our roads.

Trucks carrying low- to high-level radioactive material routinely travel through the southeastern U.S., making great use of I-40 and I-26 around Asheville to get to and from the Savannah River Site, SC (SRS), and any of the several nuclear-processing facilities in our region. Investigative journalist Michael Hopping dug deep into the federal/nuclear-industrial/transport labyrinth behind these toxic shipments. He untangled the tentacles of those entities, and he explains why they have such a grip on our WNC home. He found that presently there's little high-level radioactive spent nuclear-reactor fuel (used uranium fuel rods), a.k.a. waste, moving on U.S. roads or rails, but he notes that it's only a matter of time. The nuclear industry is anxious to move this highly radioactive waste, which is presently stored on reactor sites, whether or not the proposed Yucca Mountain permanent high-level waste storage facility in Nevada ever opens. Moreover, if the Bush Administration's proposed reprocessing program gets off the ground, highly radioactive waste from nuclear reactors around the country could make its way to SRS via our roads and rails here.

Apparently, I-40 and I-26 aren't enough. WNC resident John Clarke, Chair of the Clay/ Cherokee Chapter of the Stop I-3 Coalition, describes the federal government's plans to build another interstate highway, for now referred to as I-3. It so happens that I-3's route will run from the Savannah, GA, to the West Knoxville, TN, areas, which just happen to be quite close to SRS and the Y-12 nuclear weapons plant, respectively. Though rarely mentioned by I-3 proponents, it's likely that this nuclear connection is a key reason why this interstate project is being proposed.

Mike Hopping reports on the uranyl nitrate leak that occurred on I-26 south of Asheville in 2004. He spoke with officials involved in first-responder HAZMAT preparedness training on radiologicals and discusses national HAZMAT experience with radiological cargoes and the safety of packages containing this dangerous freight. He concludes that, although the U.S. hasn't experienced a catastrophic radiological HAZMAT incident on its highways or rails, unless federal policies change, only the occurrence of a catastrophe will reveal whether we've been whistling in the dark about another low-frequency but high-impact type of predictable accident waiting to happen.

Mary Olson, Director of the Southeastern Office of the Nuclear Information and Resource Service, explains the "how" and "why" of the nuclear transport issue: how WNC fits into the big national nuclear picture, and—why us? She explains what the Bush Administration's new federal plan—the proposed reprocessing program—is *really* all about by opening up the bucket of worms called the Global Nuclear Energy Partnership (GNEP). Promoted as a way to accelerate the expansion of nuclear power world wide, GNEP is designed to keep enrichment technology for nuclear fuel (or nuclear weapons) production in the hands of certain countries and away from others. Unfortunately, this effort to prevent nuclear weapons is fraught with irony: the GNEP plan would initiate unparalleled opportunity for nuclear weapons development because the new fuel that would be supplied to client countries would be made from plutonium—the bomb-maker's dream. Under GNEP, high-level radioactive waste from nuclear power reactors across the country would be sent to South Carolina, and as much as one-half of it

could come through North Carolina on the way. This waste is slated to go to the Yucca Mountain federal dump; GNEP would include a short stopover in South Carolina where plutonium would be stripped from the waste for reuse.

Louis Zeller, Campaign Coordinator of the Blue Ridge Environmental Defense League (BREDL), writes about the three fatal flaws of nuclear waste transportation: inadequate emergency response, risk of terrorism and sabotage, and radiation exposure from routine shipments, all of which endanger public health and safety. How? Waste fuel rods are intensely radioactive; an unprotected person standing nearby would receive a lethal dose within minutes. The common end point for nuclear waste is storage at reactors or shipment off-site. On-site storage is not without risks, but nuclear waste shipments present the greater hazard because transport cannot be done safely. Nuclear waste containers do not completely protect the public from radiation exposure under the best of circumstances. Capture and control of a cask (one type of transport container) by terrorist agents would allow it to be breached with a variety of devices including commercially available conical-shaped charges and cutting charges, or a massive diesel fuel-fertilizer truck bomb (think about the bomb used to attack the Oklahoma City Federal Building on April 19, 1995). Attackers could use transport personnel as hostages to retain control of the cask for hours, using that time to adapt the cask so that exploding it would create maximum damage. BREDL's campaign to educate the public of these dangers goes on.

Now that many of the negative impacts of the nuclear-energy industry, especially those affecting WNC, have been put forth, Ned Ryan Doyle, Director of the Southern Energy & Environment Expo, explains what the answer to our energy needs is all about: common sense in the form of sustainable energy. He notes that the primary argument in favor of new nuclear- and fossil-fueled power plants put forth by government, utilities and related corporations is an assumed "projected demand" for more power, and he examines the three fatal flaws with that argument. The bright ray of light and hope for the future is a common-sense solution: every day, more energy reaches Earth from its sun than we use in six months to a year. The established technological capacity to harness the free energy of the sun already exists, and shifting our investments from nuclear- and fossil-fueled power plants to energy efficiency and sustainable energy technologies will create secure jobs with minimal retraining required. Instead of billions of dollars wasted building a single nuclear facility and temporary employment for a few hundred workers, the same money will provide the foundation for literally tens of thousands of permanent, good-paying, industrial-service-sector jobs. Ned provides action steps so that even one person, alone, can get the sustainable-energy ball rolling. To help with this effort, contact information for our federal and state legislators and a list of Web site resources are provided at the end of this report.

It is our hope that, after reading this report, you'll understand why CSNC members believe Asheville is at the heart of the nuclear crossroads, you'll join us in educating the public, and you'll help us convince those who have the power to remove this dubious distinction to do so.

— Cindy Heil

To contact the **Common Sense at the Nuclear Crossroads** Campaign:

Call 828-296-0821, or write csatnc@aol.com, or c/o P.O. Box 7586 Asheville, NC 28802

Chapter 1.

Asheville: At the Heart of the Nuclear Crossroads

Michael Hopping, Senior Writer, *the indie,* Asheville, NC

On June 25, 2004, a tanker truck hauling liquid uranyl nitrate began leaking on I-26 near Asheville, NC.[1] Thanks to an alert motorist, the spill was detected and reported to the highway patrol. The truck was pulled over at the weigh station south of Fletcher, where the truck driver was able to stop the leak. A cleanup at the weigh station ensued.

This incident was probably the first indication most residents of Asheville and Western North Carolina (WNC) had that substantial radioactive cargoes travel through our mountains. WNC is not home to a nuclear power plant, major military base, nuclear dump, or array of missile silos. None of our factories is known to process radioactive substances for military or commercial applications. But these facts can be deceiving. Nuclear industries, like most other manufacturing concerns, depend on the movement of raw materials, sub-assemblies, finished goods, and waste products. Because of our location, at the intersection of two key interstate highways and also on the Norfolk-Southern rail line, Asheville is actually situated at an important crossroads for both commercial and military nuclear operations in the eastern United States.

Regional Nuclear Facilities

WNC is essentially surrounded by commercial nuclear reactors in Eastern Tennessee, Upstate South Carolina, and the North Carolina Piedmont. The I-26 and I-40 corridors also serve and connect several nuclear industrial sites in our region. They include:

- The Y-12 National Security Complex at Oak Ridge, TN, just west of Knoxville. Y-12 is the only original U.S. atomic bomb factory still in operation. It refurbishes nuclear weapons in addition to performing other nuclear functions.
- The Watts Bar reactor down the road from Oak Ridge. It supplies tritium, the radioactive hydrogen that puts the H in H-bomb.
- Nuclear Fuel Services in Erwin, TN, across the state line from Madison County, NC. This private company “down blends” (reduces the purity of uranium (U) -235 with additional U-238, which isn’t fissile) weapons-grade uranium for use in nuclear fuel rods. (This was the origin of the leaking uranyl nitrate tanker.)
- Next door to Erwin, at Jonesborough, is a depleted uranium munitions factory.
- The Savannah River Site (SRS) is where our leaking tanker was bound. SRS sits on the South Carolina side of the Savannah River, more or less across the

water from Augusta, Georgia, and the Master's Golf Tournament. SRS is a huge U.S. Department of Energy (DOE) reservation and industrial park for federal nuclear projects.

- The Barnwell low-level nuclear dump is close by SRS.

What Travels Our Roads?

The Tri-State Motor Transport Company has moved nuclear materials for the federal government, Tri-State Executive Vice President David Bennett told one of the authors, "since the days of Hiroshima and Nagasaki. We were awarded License 00001 for transporting nuclear materials." At present, his company hauls several types of radioactive cargo through the Southeast, including two to four loads per week of "legacy transuranic waste" (material contaminated with plutonium and other radioactive elements heavier than uranium) from SRS to the Waste Isolation Pilot Project near Carlsbad, New Mexico.[2] These shipments travel via Atlanta. They are not escorted.

Tri-State drivers are familiar with I-40 and I-26 as well. Bennett said that about twice a week his company hauls unescorted loads of enriched (3–7% U-235) uranium hexafluoride or uranium oxide bound for the Global Nuclear Fuels-Americas plant in Wilmington, NC. He didn't have specific figures about how many of these trucks pass through WNC, but he confirmed that the bulk of the uranium hexafluoride originates at the DOE Paducah Gaseous Diffusion Plant in Kentucky. He also said that I-40 is a route for these shipments and that the new section of I-26 through Madison County is a permissible alternate route for his drivers in the event of problems on I-40. A truck using this alternative route would reconnect with I-40, via I-240, at Asheville.

Uranium hexafluoride is a trebly dangerous cargo. Radiation is the least of the HAZMAT worries associated with it. This compound reacts violently with water and releases lethal fluorine gas in the process. Bennett downplayed the risks, saying that there have been no uranium hexafluoride releases in highway accidents. Nuclear Regulatory Commission (NRC) reports of two wrecks involving Tri-State uranium hexafluoride shipments in 2003 are consistent with his statement. One of these occurred in Montana.[3] The other load overturned on I-40 west of Knoxville.[4] The containment vessel was damaged in that one, but no radiation leaks were detected. Bennett said that Tri- State has also transported highly enriched (weapons-grade) uranium from SRS to Nuclear Fuel Services where it is downblended into nuclear fuel rods. These uranium shipments are or were done under contract with the secretive National Nuclear Security Administration (NNSA) and are escorted by armed guards.

NNSA is a semi-autonomous authority within DOE. Its Web site proclaims that since its inception in 2000, it has had

primary responsibility for "enhancing national security through the military application of nuclear energy."[5] NNSA spokesman Bryan Wilkes has a more homely way of putting it. "We own the bombs," he told one of us. "The Department of Defense (DOD) borrows them from us." NNSA's in-house transport division is the Office of Secure Transportation. Web pages for that office supply some security generalities, such as the presence of inconspicuous armed federal escorts.[6]

Wilkes regretted he couldn't talk about some of the security measures NNSA uses—the packaging system for the tritium being shipped from Watts Bar to SRS struck him as particularly ingenious. A conference report on Tritium Producing Burnable Absorber Rods available on a DOE Office of Scientific and Technical Information Web site is more informative.[7] It includes sketches of the rods and containment system in addition to data on the radiation emitted by tritium and the host of other radioactive substances involved. I-40 and I-26 would be a logical route for these shipments, and, after the tritium is purified, Asheville might see it again as it travels to nuclear weapons factories such as the Y-12 complex at Oak Ridge.

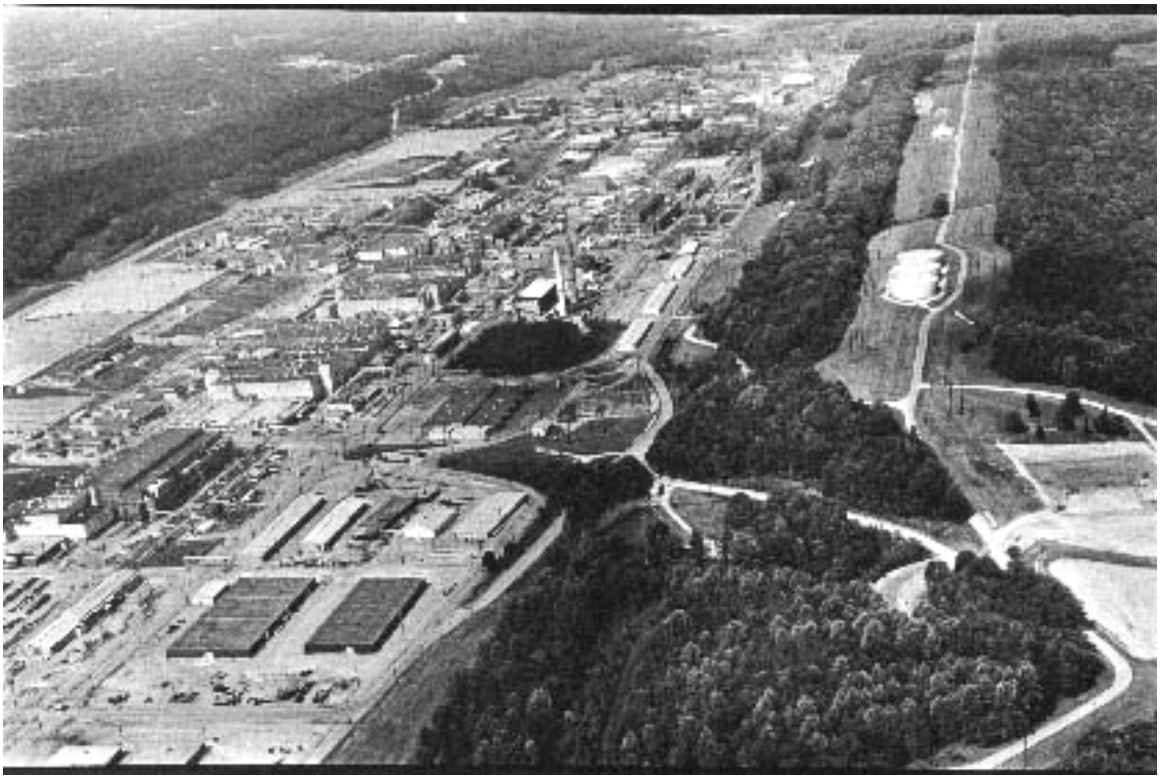
Wilkes wouldn't address those speculations other than to say, "The NNSA makes no public comment about any shipments." Except in special cases, he said, the NNSA information blackout extends to state officials. So Wilkes didn't discuss the Tri-State shipments of uranium to Nuclear Fuel Services and had no comment on whether fuel rods travel through Asheville destined for Navy submarines moored at Charleston. He definitely had nothing to say about movements of nuclear weapons.

However, Stewart Coates, the Director of Emergency Services for Madison County, told one of the authors that the Madison County section of I-26 is the secondary route for nuclear weapons passing through our mountains, presumably on the

Radiation

The world of radioactive substances is complicated. When most of us think "radiation," we're thinking about gamma rays. Like visible light and X-rays, they're electromagnetic waves. They travel and can do damage over great distances. Nuclear fuel, especially spent nuclear fuel, is a major gamma ray emitter. Other substances decay by emitting ionized bits of broken atoms, alpha or beta particles, instead. These particles don't travel far and have trouble penetrating skin. They become dangerous if eaten or inhaled. In the lung, a microscopic particle of plutonium, an alpha emitter, is likely to cause lung cancer. The most significant public health risk posed by the I-26 spill of uranyl nitrate would have been uranium dust from the dried droplets kicked up by the tires of passing motorists.

Heavy metals also carry non-radiological toxicities. Uranium, for instance, is known to be hard on kidneys. The extensive use of depleted uranium munitions in Iraq and elsewhere will, unfortunately, add much to the medical understanding of uranium's heavy-metal consequences in the human body.



Y-12 nuclear weapons assembly factory in Oak Ridge, Tennessee. Photo from air by Robert del Tredici

way to or from a refurbishment at Oak Ridge. His understanding was that these weapon shipments are not allowed to stop for any reason except on a secure military reservation. So, when traffic is problematic along I-40, the transports go through Madison. Though Coates, who doesn't get his information from NNSA, said weapons shipments through his county have been uncommon, they have been frequent enough for county fire and EMS personnel to recognize the trucks and escort vehicles. Because of increased sightings of known escort vehicles in recent months, he wondered if NNSA is considering a change of primary route. Obviously, if such a change occurred, I-240 through Asheville (and the proposed I-26 connector) would see an increase in nuclear weapons traffic.

Weapons-grade plutonium is also moving around, most likely in Office of Secure Transport vehicles. NNSA plans call for the "elimination" of up to 50 tons of surplus U.S. plutonium at SRS.[89] Much of this must travel to get to South Carolina. There, it may be used to make hydrogen bomb triggers or mixed with enriched uranium to produce mixed oxide (MOX) fuel, a new type of fuel rod for use in commercial applications.

This list of existing radioactive shipments is probably far from complete. Tri-State Motor Transport isn't the only private contractor hauling radioactive loads. Hittman Transport Services is another company in the business. George McGrath, spokesman for Hittman's parent company, Duratek, told one of the authors that Hittman averages 10–12 unescorted tractor-trailer loads of low-level nuclear waste through Asheville per week. The waste comes from nuclear power plants and other commercial and federal contracts. McGrath said Hittman does not handle nuclear fuel shipments or NNSA subcontracts.

At present, little high-level nuclear waste is moving on U.S. roads or rails, but it's only a matter of time. A recent federal estimate put the quantity of commercial spent fuel in temporary storage at the end of 2005 at 60,000 tons.[10] The bulk of this waste remains on-site at the reactors. By 2035, without any new power plants, the amount of spent fuel and other high-level waste is projected to exceed 100,000 tons.[11] The nuclear power industry is anxious that this material be moved, whether or not the proposed Yucca Mountain permanent high-level waste storage facility in Nevada ever opens. Chapter 4 discusses the potential implications of the construction of new nuclear power plants and the recent Bush Administration proposal for the reprocessing of spent nuclear fuel.

Nuclear Isotopes

Here's a brief description of some of the substances mentioned in the accompanying story:

- Plutonium is very rare in nature. Almost all of it is synthetically created through decay of other elements. It is, for example, a by-product of nuclear power plant operation. Plutonium comes in different "isotopes," which are atoms with different numbers of neutrons. Weapons-grade plutonium (Pu), what is used to make hydrogen bomb triggers and may be used in the manufacture of MOX fuel, is 90% pure Pu-239. Pu-239 is the famous alpha-emitting carcinogen.
- Tritium is a radioactive form of hydrogen gas. It is a rare natural variant of hydrogen, but most is produced as a by-product of nuclear power plant operation. Tritium emits beta particles.
- Uranium also comes in several "isotopes." U-235 is the form used in atomic bombs. Weapons-grade uranium is greater than 90% U-235. Uranium hexafluoride and uranyl nitrate are also high in U-235. Depleted uranium is almost entirely composed of the alpha particle emitter U-238.
- Spent nuclear fuel is a brew of uranium, plutonium, and several other radioactive metals produced by a controlled nuclear chain reaction. It gives off tremendous amounts of heat in addition to gamma rays and alpha and beta particles.
- "Low-level waste": This is a catch-all term. It covers hospital trash associated with nuclear medicine services, discarded nuclear power plant filters and reactor parts, and even machinery contaminated with plutonium dust.

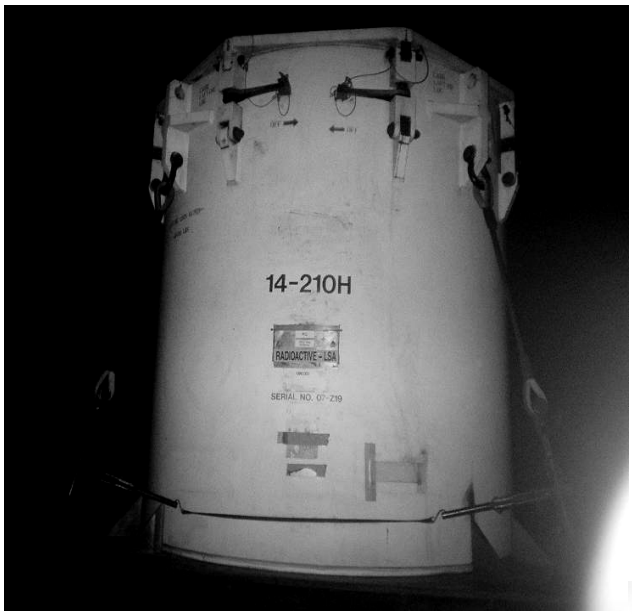


Photo taken by Mary Olson in January,2006 on I-26 West near the Forks of Ivy exit number 13 at about 10 p.m. Unfortunately radiation detection equipment was not available.

potential ramifications of I-3, the Asheville I-26-connector issue is small potatoes. However, given the hazards of transportation through the Pigeon River Gorge on I-40 and the fact that both NNSA and commercial shippers of radioactive materials already, apparently, use I-240 through Asheville, they may well share I-3's unspoken federal rationale. At the very least, it's something to think about, in addition to the six/eight-lanes I-26-connector issue.

Radioactive shipment, early 2006, on !-40 near Durham. Photo courtesy of NC WARN (North Carolina Waste Awareness and Reduction Network, http://www.ncwarn.org).

Two Interstates Not Enough?

It would be naïve to think that present and future military and commercial nuclear initiatives don't reverberate in other sectors, including construction priorities for interstate highways. "I-3," a recently announced plan for highway construction in the Southeast, would begin in Savannah, GA, pass near SRS, avoid Atlanta, and terminate in West Knoxville, TN, where I-140 intersects I-40 and Highway 162. That short highway leads directly to Oak Ridge and the Y-12 facility. Backers of I-3 don't list national defense considerations among their reasons for supporting the new road, but the proposed route speaks for itself. Compared to the

References Chapter 1

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Chapter 2.

Interstate 3: The Nuclear Connection

John Clarke, Chair, Clay / Cherokee Chapter, Stop I-3 Coalition

The politicians proposing "Interstate 3" (I-3) tout it as a connection between the port of Savannah, GA, and the numerous interstates running through Knoxville, TN, with connections to the industrial Midwest. However, a glance at the map of the proposed route shows that I-3 would go right by the massive Savannah River Site (SRS) nuclear complex in South Carolina, across from Augusta, GA, and would terminate, not in Knoxville itself, but at the recently completed I-140 spur running from Maryville-Alcoa to the nuclear weapons plant facilities at Oak Ridge, TN.

...it is likely that this nuclear connection is a key reason why this interstate project is being proposed.

Though rarely mentioned by I-3 proponents, it is likely that this nuclear connection is a key reason why this interstate project is being proposed. The nuclear weapons complex, composed of widely dispersed sites throughout the West and the Southeast, has for years depended on transporting dangerous radioactive materials, including plutonium and tritium, on our highways. The new nuclear weapons complex being planned will have production facilities concentrated at Oak Ridge, TN; Watts Bar, TN; SRS, SC; and the Pantex facility in Amarillo, TX. Currently, there is a large amount of nuclear material shipped between Oak Ridge and SRS,[1] and the nuclear power industry, having no solution to the problem of providing safe, long-term storage for reactor waste, seems to want no more than to move it around.

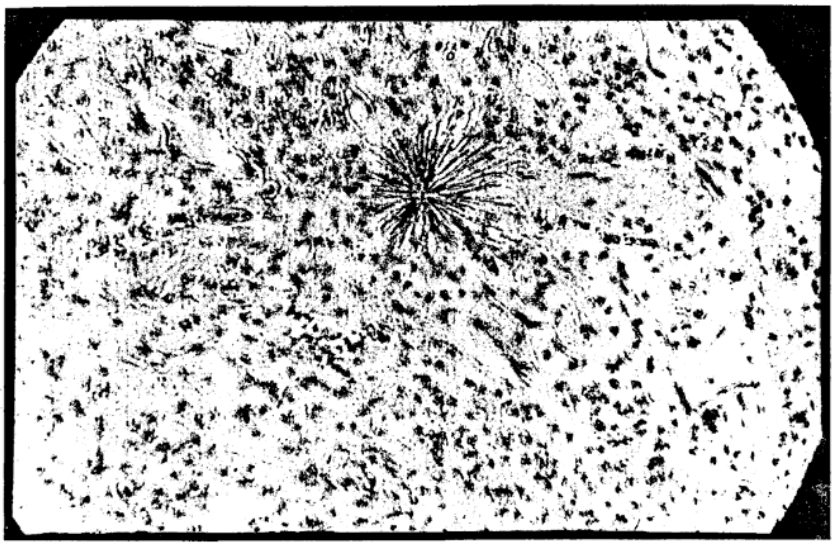
Problems with the nuclear waste dump that has been proposed for Yucca Mountain, NV, mean that SRS may also soon be on the receiving end of large amounts of radioactive waste. The guidelines for routing I-3, as proposed by Rep. Charlie Norwood (R-GA), call for the new interstate's route to be direct, from Savannah to Augusta to Knoxville. This is to the west side of Knoxville, i.e., Oak Ridge. Isn't it obvious that I-3 would be a very busy radioactive highway?

Below are some specific examples of the traffic in deadly materials that now takes place on I-26 and I-40 and would likely be shifted to I-3 if it's built.

- Weapons-grade plutonium moves from Amarillo, TX, to SRS in unmarked trucks.
- At SRS, the plutonium will be worked over and re-shipped, if the current proposals move forward. Destinations for the experimental mixed-oxide (MOX) plutonium fuel developed there include Duke Power's nuclear reactor plants in North Carolina and South Carolina and, for the plutonium "pits"—triggers for nuclear bombs—built at SRS, the Oak Ridge Y-12 nuclear

weapons plant.

- Rods used to produce tritium, which is used for hydrogen bombs, are being shipped from the Watts Bar reactor in Tennessee to SRS, where they will be processed to produce tritium gas.
- This gas will then be shipped back to Oak Ridge in trucks.
- High-level radioactive waste from commercial reactors is likely to be shipped along I-3 to SRS.
- So-called low-level radioactive waste is trafficked both to Oak Ridge and SRS.



Lesion in lung tissue of an ape, caused by plutonium.

Many of us get very nervous thinking about these dangerous materials being shipped on our highways and especially through our mountains. For the most part, the trucks carrying these radioactive materials are not marked, and the time and nature of the shipments are classified. Local emergency first responders and law enforcement personnel might not even know what kind of hazardous material they are dealing with in the event of an accident. Local hospitals in mountain communities are not even remotely equipped to deal with the radiation poisoning that might occur as a result of a "Mobile Chernobyl" accident or sabotage. Plutonium is so toxic and so long-lasting that a spill could render large areas of land unusable for centuries.

In conclusion, though the nuclear issue is not the only reason to oppose the building of I-3, it is significant and, indeed, may be the driving force behind the proposal.

Let's all work to keep the southern Blue Ridge area from being sacrificed for the sake of nuclear pork barrel politics, and while we're at it, we can work to shut down risky and potentially deadly nuclear shipments through Asheville and the I-40/ I-26 corridor, too.

Reference Chapter 2

1. See http://www.nirs.org/factsheets/ashevillenuclearcrossroads2004.pdf

Chapter 3.

Are We Ready?

Michael Hopping, Senior Writer, *the indie,* Asheville, NC

It seems reasonable to begin a consideration of the hazardous materials (HAZMAT) aspects of nuclear transport at a local fire hall. One of the authors visited the Riceville, NC, volunteer fire department to study the *Emergency Response Guidebook*[1] that accompanies firefighters and EMS personnel to the scene of traffic accidents. He was disappointed to find that much of the information pertaining to nuclear cargoes is reassuring boilerplate. In the event of a large spill of depleted uranium (the stuff used in armor-piercing bullets), emergency personnel are advised to clear the downwind area to a distance of 100 meters or more. The same distance is recommended for a large spill of fissile (potentially chain-reacting) substances. These are otherwise known as weapons-grade plutonium or uranium.

One of the young firefighters on duty described how he approaches a big rig accident. “We find some high ground upwind and get out the binoculars. We don’t go up on a truck wreck unless we know what’s inside. If it’s hazardous material or we can’t find the number code identifying the load, we call the HAZMAT specialists at Asheville City Station #2 and let them deal with it.”

Industrial quantities of many non-radioactive materials have a history of killing far more people in the United States than nuclear spills. So nuclear shipments weren’t foremost on his list of HAZMAT worries. But mishaps involving radioactive cargo do occur. A leak of uranyl nitrate, a liquid uranium compound, occurred on I-26 south of Asheville in 2004. This was a comparatively minor spill. The potential disaster zone for worst-case scenarios involving some nuclear loads can extend outward in years as well as miles.

The Uranyl Nitrate Cleanup

Jerry VeHaun, Buncombe County Director of Emergency Management, told one of the authors that he is satisfied that Buncombe County is well prepared for incidents involving radioactive substances. The Asheville Fire Department hosts HAZMAT Regional Response Team 6. This unit, housed at City Station #2, is tasked to assist with hazardous leaks and accidents in North Carolina’s twenty western counties. More than a dozen other state, federal, and private response teams can also be brought to bear as needed. The gaggle of acronyms is daunting.

The Regional Response Team was notified but not needed on-site for the I-26 uranyl nitrate spill. After the tanker was pulled over at the weigh station, the driver patched a leaky seal and identified his cargo to authorities as uranyl nitrate. Emergency responders, including VeHaun, began to converge on the scene. “Something less than a pint” of uranyl nitrate leaked out at the weigh station.[2] Tony Treadway, spokesman for the shipper, Nuclear Fuel Services, told one of us that the total quantity lost in the entire event was approximately a gallon.

VeHaun described the scene as “hurry up and wait.” Grant Mills, a health physicist

with the NC Department of Environment and Natural Resources, was one of the state officials to appear on-site that day. He remembers calls coming from the Regional Office of the U.S. Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the National Response Center. A cleanup crew was dispatched from Erwin, TN, by Nuclear Fuel Services. Treadway said that radiation readings around the truck and in the few hundred yards behind it didn't exceed background levels. The weigh station cleanup was completed after about eight hours. No attempt was made to clean I-26. The tires of passing vehicles would long since have dispersed the uranium there.

Regional Response Team 6 was not the only component of the response system to sit this one out. Christina Atwood, Regional Response Coordinator for the federal Radiological Assistance Program based in Aiken, SC, said she was unaware of the I-26 spill until told about it in the course of a telephone interview for this report.

Certain aspects of this spill, the manner of its detection, questions about how many similar spills go undetected, and the potential risks to motorists from coming into contact with this weakly radioactive uranium compound should give one pause. The cleanup itself, however, appears to have been well managed.

Preparedness

Like the first responder at the Riceville Volunteer Fire Department, Battalion Commander Mike Knisely of Regional Response Team 6 is less concerned about radioactive cargoes than he is about many non-nuclear hazardous substances. But that isn't to say he's unconcerned. To him, radioactive materials are the "X-factor," the unknown. Small commercial or medical packages can be the riskiest for first responders. "The big shipments are placarded (posted with external signage identifying the load). But you never know what's in a UPS or FedEx truck." And lack of knowledge is one of his chief concerns about the big shipments as well. "I know why they don't want to tell us, but I'd sure like to know what's coming through and when." He wishes state and local officials would exert more pressure on shippers to disclose their activities. He'd also like to see reductions in the number of such hazardous cargoes on mountain roadways and tighter controls on the sale and possession of weapons capable of turning a radioactive shipment into a dirty bomb.

First responders in North Carolina receive classroom training on radiological emergencies. But that seems to be about the extent of recent HAZMAT preparedness training on radiologicals. Scott Galbraith of the NC Division of Emergency Management said that, with the possible exception of exercises conducted in the vicinity of nuclear power stations, it has been years since a training scenario involved a highway event and radioactive cargo. Christina Atwood of the federal Radiological Assistance Program said she didn't recall any requests for this type of training exercise in North Carolina. Lt. Mark Dalton, Hazardous Materials Coordinator for the NC Highway Patrol, added, "Most of the training lately has been about WMD."

Periodic exercises would seem reasonable, if only because of the boatload of agencies potentially involved in a response. But the omission might be justified if the safety record for nuclear shipments is so good that the probability of incidents is remote. Is it? What's the national HAZMAT experience with radiological cargoes?

Nobody seems to know. None of the numerous local, state, or federal HAZMAT, emergency response, and transportation officials consulted for this report receives statistical information capable of answering the question. David McIntyre, Public Affairs Officer for the NRC, responded to our inquiry about a relevant database on highway accidents with, "I'm informed that we don't have a requirement for reporting traffic accidents — any event reports we have on them are because the incident triggered other criteria for filing a report with us. Therefore, we would not have any systematic record." He suggested we file a Freedom of Information Act request for whatever data may be found suitable for release from the restricted Nuclear Material Events Database.

Publicly available NRC reports don't reference our uranyl nitrate spill. This despite Grant Mills' recollection that the NRC was informed. One of us did discover NRC reports of the two highway crashes in 2003, mentioned in Chapter 1, involving shipments of uranium hexafluoride. Armed with knowledge of these three incidents, we went looking elsewhere.

A pre-publication version of a 2006 National Research Council[3] report tells us that the Department of Transportation instituted the current Hazardous Materials Incident Reporting System in 1971. It doesn't characterize or distinguish radiological incidents from other HAZMAT categories. Interestingly, incidents involving an "unintentional release" from a package are supposed to be noted. We could not find any reference to our uranyl nitrate spill.

Statistics kept by the National Highway Traffic Safety Administration track fatal crashes involving "hazardous materials." The National Response Center maintains another incomplete database. According to Kevin Misenheimer, On-Scene Coordinator for the EPA in our region, only incidents involving hazardous releases in excess of specified amounts are entered into the National Response Center list. None of the three events we searched for apparently qualified.

North Carolina maintains a record of accidents that occur in the state but doesn't specially flag those with HAZMAT implications. These reports are archived after 1 year to 18 months. As of January 2006, the uranyl nitrate spill report wasn't readily accessible to either of the two state response offices we called to check on it.

Nuclear industry and some federal agency Web sites do supply accident stats, but most are so poorly characterized or referenced that it isn't possible to determine what sorts of shipments are covered or the time period involved. One exception is a statement that there were eight highway accidents involving spent nuclear fuel casks (containers) between 1971–1995.[4] Of these, four involved empty casks. There was no reported release of radiation from any of the eight. This information originated in a no-longer-available NRC report and was based on data supplied by carriers. No comparable

overview of accidents since 1995 appears to be available.

Package Safety

Such a scattered, mismatched, and incomplete assortment of data can't do much to assist regulatory or emergency-training decision makers. But we might still be justified in dismissing concerns about radiological HAZMAT issues if it could be shown that such materials are only moved in containers proven to withstand expectable hazards. We know that isn't always the case with commercial shipments of uranyl nitrate. Commander Knisely's concern about unexpected radiation sources in mixed loads of goods is also applicable here. But what about the most dangerous loads, the cylinders of uranium hexafluoride, shipments of tritium, weapons-grade materials, nuclear weapons themselves, and spent nuclear fuel rods? Hurricane Katrina reminds us that an absence of recent disaster can be a lousy excuse for complacence. Apart from the available accident/spill history, what evidence do we have that shipments of fuel rods and other high-grade nuclear materials are impervious to road hazards?

These loads travel in heavily shielded "Type B" casks, weighing 25–100 tons each, depending on whether the container is designed for highway or rail shipment. NRC certification requirements stipulate that a single Type B cask must be shown to survive a series of adverse events. These include high-speed impact, a thirty-foot drop, engulfment by fire, and immersion in water. The sequential tests would simulate an accident in which a cask hits something and is further stressed by fire, a fall from an overpass, or a fall into a body of water.

Because the NRC accepts scale model and computer simulation testing, none of the dozens of models of the Type B cask in use have undergone this sequential testing in the real world. Few seem to have had a real-world test for compliance with even one of the standards. The exceptions occurred at the Sandia National Laboratory during the 1970s and '80s.[5] Tests included high-speed front and side impact crashes, a drop from an airplane onto hard ground, and exposure to fire. The casks remained radiologically intact.

Public concern about nuclear transportation safety led the NRC to reassess the adequacy of its cask-certification practices within the past 10 years. In February 2003, the commission released the Package Performance Study Test Protocols Report (NUREG-1768)[6] for public comment. The report recommended testing actual casks, but implementation of the recommendations remains uncertain. A March 28, 2005, update to the NRC commissioners[7] indicates that the testing proposal has been reduced to a single-rail cask of unspecified manufacture being hit at a 90° angle by a train traveling at 60 miles per hour. Barring any delays, the test could be conducted in about 3 years.

Testing to failure is another potentially useful measure of container sturdiness. A cask could be exposed to fire, for example, with fire temperature and duration increasing until the cask fails. This would determine what margin of safety, if any, exists above NRC specifications. The publicly available U.S. literature contains no report of any Type B cask being tested to failure for impact, fire, or immersion.

Bob Halstead of the State of Nevada Agency for Nuclear Projects has been an advocate of both sequential testing and testing to failure on actual casks. During the Clinton era, U.S. Department of Energy (DOE) estimates of latent (eventual) fatalities from a "maximum reasonably foreseeable rail accident in [sic] urban area" totaled 31 deaths. Under President Bush, the estimate was refigured downward to 5. In a 2003 presentation to the National Academy of Sciences,[8] Halstead reported that State of Nevada projections of latent fatalities from an urban rail accident involving a shipment of spent fuel could be far higher. Subjected to a fire similar to one that occurred in a Baltimore rail tunnel in 2001, a cask meeting NRC requirements was projected to rupture. Fatalities over a 50-year period were estimated at 4000–28,000. The area contaminated would be 32 square miles, and the cleanup price tag would exceed $13 billion.

How well are Type B casks expected to withstand terrorist weaponry? Once again, public reports of simulated or actual testing have been few. In 1982, Sandia National Laboratory subjected a 25-ton spent fuel cask (highway size) to an Army-issue shaped charge explosion.[9] The cask was holed through and through with release of radioactive material. More recent tests on simulated casks reported by J. L. Alvarez had similar results.[10] In 1998, a portable TOW anti-tank missile punched a grapefruit-sized hole in the 15-inch thick iron wall of a top-of-the-line CASTOR V/21 spent-fuel storage cask. A TOW missile cracked but didn't penetrate another V/21 cask jacketed in concrete.[11] While this particular cask is not licensed for transport in the United States, it is used for that purpose in other countries.

Trust Me; I'm From The Government

The United States has not experienced a catastrophic radiological HAZMAT incident on the highways or rails. There are significant security and package-design safeguards in place to protect against at least some predictable accident and spill scenarios involving high-grade nuclear loads. The safety record for lesser grades of radiological materials is less clear and perhaps not knowable given current reporting and record keeping requirements.

In the context of heightened security concerns and rejuvenated nuclear industries, are current laxities in incident monitoring and an absence of real-world testing for nuclear materials shipping containers justified? Are government and industry safety claims more reliable now than they were prior to Three Mile Island? Unless federal policies change, only the occurrence of a catastrophe will let us know whether we've been whistling in the dark about another low-frequency but high-impact type of predictable accident waiting to happen.

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Back of the same truck shown in photo on page 11. Photo taken by an NC WARN member on I-40 near Durham early in 2006. Courtesy of NC WARN.

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Chapter 4.

How and Why Western North Carolina Fits into the Big Nuclear Picture*

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Mobile Chernobyl Is Headed Our Way!

Simply put, this is a wake-up call. Under a new federal plan called the Global Nuclear Energy Partnership (GNEP, see Box #1), high-level radioactive waste from nuclear power reactors across the country would soon be sent to South Carolina, and as much as one-half of it could come through North Carolina on the way. This waste is slated to go to a federal dump, planned for Yucca Mountain in Nevada;[13] GNEP would create a stopover in South Carolina where plutonium would be stripped from the waste for reuse in a venture called *reprocessing*.[14]

Potential Impacts

Western North Carolina (WNC) currently has two interstate highway projects—the I-26 connector through Asheville, which would complete I-26 from Eastern Tennessee to Charleston, SC; and the proposed Interstate 3 (I-3)[15] that would cut through areas of the Great Smoky Mountains, linking Oak Ridge, TN, with Savannah, GA. If either or both of these interstate highways are completed, federal routing regulations for nuclear shipments make it very likely that WNC would be the funnel for highway shipments of waste traveling from reactors located in both the Midwest and Northeast to the federal nuclear weapons facility, the Savannah River Site (SRS), near Aiken, SC. Using I-26 and I-3 would avoid sending shipments through population centers in Charlotte and Atlanta.

GNEP could roughly *double* the number of radioactive shipments traveling through WNC. It is too early—this new plan was just announced in January 2006—to know exactly what routes would be used and what the distribution of trucks versus trains would be. A rough projection: if all the waste is moved by truck and if I-3 and/or I-26 are used preferentially as the shipping corridor, a low estimate would be 30,000 trucks of high-level nuclear waste traveling in WNC. This number describes the waste from the nuclear reactors we have today, with no extension of licenses (22 reactors have received 20-year extensions on the original 40-year operating license). It will take 2–3 decades to move this material, and the shipments would be ongoing during this time.

Today, it is not known to what degree rail shipments would be used for GNEP. When the shipments were projected to travel to Nevada, the emphasis was on using rail. The condition of the rail system in this region, however, mediates toward trucks, as does the relative urgency of this new program. This report focuses on highway transport. A subsequent report to be released later this year will include an analysis of both truck and rail routes.

Numbers of shipments (or volume of material) is not the only concern. Intensity of the radioactivity in the cargo is key because radiation exposure is the potential hazard. A very large amount of radioactivity can be carried in a small volume, if it is highly concentrated. In fact, the 63,000 tons of high-level waste from nuclear power reactors, a relatively small mass when it comes to industrial waste, contains 95% of all the radioactivity in all of the nuclear waste generated in this country to date. Nuclear weapons production and all other industrial applications,

*** Note:** in this chapter, endnotes begin with boxed text. After the last box (#5) the reference sequence continues in the body text.

Box # 1

Global Nuclear Energy Partnership (GNEP)[1]

Promoted as a way to "accelerate" the expansion of nuclear power worldwide, GNEP is a program designed to keep "enrichment" technology for nuclear fuel (or nuclear weapons) production in the hands of certain countries and away from others. Unfortunately, this effort to prevent nuclear weapons is fraught with irony: the GNEP plan would initiate unparalleled opportunity for nuclear weapons development because the new fuel that would be supplied to client countries would be made from plutonium—the bomb-maker's dream![2]

GNEP sponsors claim that plutonium fuel could be made "proliferation resistant." Using such new fuel would require building experimental high-temperature gas-cooled reactors (more commonly known as breeder reactors).[3] Given a breeder reactor, some depleted uranium, and a little bit of expertise, it is possible to make lots more plutonium. Harvesting plutonium—a process called "reprocessing"—does not rely on sophisticated equipment. India demonstrated this in 1972 when it tested its first nuclear bomb, made from plutonium from reactor waste.[4] It was this event that caused President Ford, and then President Carter, to ban reprocessing in the U.S.; both presidents asserted at that time that this country must do as it asks other countries to do; not so now under the new plan. President Reagan lifted the reprocessing ban, but the nuclear industry never pursued reprocessing because uranium fuel is much cheaper than plutonium.

Reprocessing is a simple, though messy, operation. Irradiated fuel rods are chopped up and dissolved in acid, and the uranium and plutonium are then separated. The bulk of the fission products (cesium, strontium, etc.) remains in the acid, resulting in a caustic, highly radioactive liquid waste form that is very hard to handle. Millions of gallons of liquid high-level waste are stored in metal tanks (many leaking) at the Savannah River Site, South Carolina, left over from the reprocessing of plutonium for Cold War nuclear weapons production.

Reprocessing is falsely described as "recycling," and magical claims that it is a means to "reduce waste" are made. In reality, the process multiplies the volume of the waste, spreading it upon surfaces and equipment. The only "magic" is the trick of reclassifying the new waste as so-called "low-level"[5] waste. GNEP would make the U.S. the world's nuclear dump; high-level waste from client nations would be transported here ("Global Mobile Chernobyl"?) for reprocessing.

plus nuclear research and medicine, account for only 5% of the total 100% radioactivity.[16]

High-level radioactive waste—or irradiated nuclear reactor fuel— is far more intensely radioactive and concentrated than any other nuclear shipment type (see Box #2). The radioactivity in one shipment of high-level waste could exceed the total of all the so-called "low-level" waste shipments that travel through this area in one year. It is important to note, however, that all other wastes from a nuclear power plant except the fuel are considered "low-level" even though some of this waste is so intensely radioactive it may deliver a lethal dose as well. The name is misleading.

Nonetheless, one rail car of irradiated fuel —or 6 trucks—would hold as much radioactivity as the total, cumulative curie count (a curie is a measure of radioactivity)[17] that was buried at the Barnwell low-level radioactive waste dump in South Carolina as of 2002.[18] All the shipments originally projected to go to Nevada add up to 10,000 "Barnwells." This new program, if implemented, represents an enormous quantum change in the potential impact of nuclear shipments in this region.

This waste is thermally hot, in addition to radiologically hot. The heat is generated by the decay of the radioactivity inside the fuel and is one factor that limits how much material can be packed into a shipping container, thereby increasing the number of shipments. Accident rates and shipment miles are directly linked, so the heat of this waste is an issue.[19] It is estimated that if the waste were cooled for 50 years instead of 5 years, the number of shipments could be cut in half, or more.[20]

The majority of the nation's high-level

nuclear waste comes from using uranium to make electric power.[21] Most of this waste sits on the nuclear reactor sites where it was made and has never been moved, and for good reason. Unshielded, irradiated fuel delivers a lethal dose in less than 3 minutes. Totally effective shielding would make each container too heavy to move, so federal regulations allow even a perfect container to emit a specified level of radiation.

These official allowable radiation levels are cause for worry; a perfect container is allowed to emit 100 millirems,[22] or about 10 chest X-rays at the surface, per hour. Because air itself offers some shielding, this drops to about 10 millirems (one chest X-ray) per hour at 6 feet. One image is that these containers are like diffuse X-ray machines in the "on position" traveling down the road. The incidental exposure to members of the public will not be trivial. Traffic tie-ups that last for several hours are not common, but they do occur in this region; an individual in a car in the next lane would be within 6 feet and would likely receive a measurable radiation dose. The drivers of these shipments, while better shielded than others, will also receive considerable exposure due in part to the regular inspections that are required of the tractor and trailer.

Imagine a federal program bringing 30,000 diffuse X-ray machines on wheels through our mountains during a couple of decades, and more coming after that because the estimates are based on old numbers that do not include subsequent license extensions on nuclear power plants or new nuclear reactors. Even with perfect containers and no accidents, this program would have a substantial impact on WNC communities, Asheville in particular.

In the event of malicious attack, or a bad accident, each truck container carries 50 times more persistent radioactivity than the bomb that destroyed Hiroshima.[23] Even a partial release of this inventory could have devastating consequences. The Chernobyl reactor accident of 1986 spread irradiated reactor fuel around the Northern Hemisphere.[24] This is the same material that would be on the roads and the rails under this new program. The worst-case scenarios for a transport accident would be similar to Chernobyl in impact, though on a somewhat smaller scale. When communities were organizing to stop the westward shipment of this same waste to Nevada, the campaign was dubbed "Stop Mobile Chernobyl" as a play on words and a reminder of what level of impact that this deadly waste could have if it escaped its container.

These worst-case scenarios for an accident involve crushing forces sufficient to breach the container combined with a flammable substance that ignites. The high-level waste itself is not flammable, but if it is engulfed in fire, particles of the waste would be lifted into the smoke, affecting not only the immediate area but also creating a plume that could affect areas some distance from the accident. Radioactivity that was mobilized high enough would remain in the atmosphere and become "fall out" in rain, possibly hundreds of miles away. The same impacts are possible in the event of a malicious attack. Essentially, each truck or rail car could become an enormous "dirty bomb."

That security is an overriding issue in any movement of this waste anywhere is tacitly acknowledged in last year's National Academy of Science report, *Going the Distance*,[25] when the panel essentially stated that potential terrorism (or other malicious attack) was such an enormous issue that it would not be addressed in their report (see Box #4).

Box # 2

What Is Civilian High-Level Nuclear Waste?

Uranium fuel rods power a nuclear reactor for about 3 years; after that they are waste—highly radioactive waste. While in the reactor, uranium atoms (U -235) inside the fuel rods split. Tiny fragments of what was once uranium, highly radioactive elements, build inside the rods. Known as fission products, the inventory includes the very biologically active cesium, strontium and iodine, as well as a whole "alphabet soup" of other elements. Initially the waste is 6–7 million times more radioactive than the uranium it comes from. In addition to splitting uranium-235, inside a reactor core the more common U-238 undergoes a different reaction—transmutation—into plutonium. Irradiated fuel (waste) is about 1% plutonium.

High-level waste is also thermally hot due to the decay of radioactivity inside the rods. The heat is so intense that for the first 5 years the waste must be stored in liquid to cool it, or risk spontaneous combustion of the metal sheath on the outside of the rod and melting. After 5 years of cooling in liquid, the waste is still 2–3 million times more radioactive than uranium. Radiation at this level, if not shielded, delivers a lethal dose in less than 3 minutes.[6]

There are 103 operable reactors in the U.S. today; each makes about 30,000 pounds of high-level waste every year. This is the persistent product, hazardous for more than 12,000 human generations. The electricity, on the other hand, is used up as it is made. Today there are about 60,000 tons of civilian high-level waste in the U.S., containing about 600 tons of plutonium.

A credible accident is one that has actually happened; the terrible July 2001 fire in the Baltimore rail tunnel did not, thankfully, include high-level radioactive waste. If it had, estimates for the cost of clean-up reach $14 billion.[26] These financial estimates speak only to remediation and property loss and cannot cover the real costs in disease, death, and suffering due to loss of family, home, livelihood or business. The same analysis projected that if clean-up were not done and people lived in the contaminated area, over a 50-year period there would have been 30,000 latent cancer fatalities. These numbers do not reflect the full range of possible health impacts including infertility, miscarriage, birth defects, genetically heritable defects, loss of proper immune function and increases in a host of other illnesses including one non-fatal cancer for every fatal cancer, and heart disease.[27] In this region, even a relatively small event could change the perceived value of visiting the mountains for health, retreat and relaxation.

At the very least, maybe all of this explains the hundreds of millions of dollars[28] being spent on I-26 and the additional tens of billions that I-3 would cost.[29]

Why South Carolina?

The simple answer is that the business communities near the Savannah River nuclear bomb factory, primarily in North Augusta, SC, and Augusta, GA, are very excited about federal tax dollars flowing into their immediate area because the end of nuclear weapons production in the early 1990s substantially lowered the area's employment base.[30] GNEP is the new name for the federal nuclear waste policy. This new plan, originally added to the Energy and Water

Box # 3

Routes and Shipment Numbers

Federal regulations do not designate "high-level nuclear waste shipping routes." Requirements are arranged in a decision tree. The goal, of course, is safety. Requirement #1 is the shortest distance—this reduces accidents, but #2 requires interstate highways rather than other roads, though no road is barred from use in order to meet the next requirement, #3, continuous travel—no unnecessary or unplanned stops. Number 4, avoiding large population centers, justifies modifications in requirements #1, #2 and #3.

That the I-26 "connector" is not yet complete may provide some prophylaxis against ongoing shipments of high-level waste through Asheville. Maps that factor in federal regulations applied to existing interstate highways show waste from reactors in the Northeast traveling I-81 to I-77 through Charlotte to I-20, on to SRS. Shipments from the Midwest are shown to travel through Atlanta to I-20, on to SRS. Nonetheless, when alternate routes are considered, both the Atlanta-bound waste and the Charlotte-bound waste are shown traveling through Asheville. There is no prohibition on using a U.S. route like 19/23 through Asheville.

A contrary view comes from a local activist who sees potential new meaning in the official delays that have been announced in the I-26 connector construction, pushing the start-date back to 2012. She wonders whether these delays could, in fact, facilitate speedy transport of the waste before road construction, because during construction shipments would be severely impeded.

Numbers of Shipments—1995 Projection of Total Shipments by Truck and Rail to Yucca Mountain, NV[7]

- 6,217 truck casks (one per truck)
- 9,421 rail casks (one per rail car; each rail container equals 6 trucks)

These numbers assume rail would be used wherever possible. Converted to 100% trucking, the total is 62,743 trucks.

Rough Estimate of Shipment Numbers in Western North Carolina (WNC) Under New GNEP Plan

If I-26/I-40 is/are used as the preferred route(s), it is likely that at least half of the waste would travel in WNC:

- 3,108 truck casks
- 4,710 rail casks (each equals 6 trucks)
- If *all shipments are by truck*, the total is 31,368 trucks.

Both projections assume there are no new reactors and no reactor license renewals. About one-third of the U.S. reactor fleet have extended their operating licenses by 20 years. Expanded operations means more waste, and eventually, more shipments. These estimates are very conservative—but do assume that I-26 is completed.

Projected high-level nuclear waste shipping routes to Savannah River Site, South Carolina

See inside front cover for full page image and caption.

Source of map: Nuclear Information and Resource Service, Southeast office.

Appropriations Bill of 2005, calls for a competition among communities that "host" DOE nuclear weapons production sites. The "winner" would become the host for this new nuclear waste processing factory. By January 2006, it became fairly clear from national news stories that only the South Carolina site is under consideration.[31] A Tuesday, March 28, 2006, trade press article[32] reported that DOE had sent to SRS operations a letter indicating that they should proceed.

To people in many other communities where nuclear activities have caused disease, death, loss of property value and diminished prospects, South Carolina is no winner. In fact, viewing the nation's high-level waste as "economic development" could be a strong indication of how uninformed the population there is.

A Radical Shift in Policy

Behind the local nuclear booster groups around SRS, a radical shift in U.S. nuclear policy is driving changes in the federal plan for this deadly waste. Congress and the current federal administration are reversing 30 years of nuclear-nonproliferation policy in a sweeping new plan to merge the civilian and military nuclear programs in the U.S., effectively nationalizing the expansion of nuclear power and the return to the failed policy of reprocessing waste. Such enormous change comes in a series of steps, and it is important to track these steps in order to understand the "big picture" in which Asheville has become a major crossroads.

Box # 4

I am now a regional staff member of Nuclear Information and Resource Service — I used to work in Washington, DC. In 1997, I was privileged to attend a week-long briefing by the Department of Energy (DOE) on high-level nuclear waste transport. This opportunity to learn about DOE's plans was also a chance for DOE to sample our response.

On the third day we were told about worst-case scenarios for accidents, including contamination of potentially large areas with particles of high-level waste, involving both immediate and long-term injury and death. I asked how many such accidents were projected. The reply was five or six over the course of the program (this assumed that the destination is Nevada). I was shocked, not by the number, which seemed low, but by DOE's admission that there would be any accidents. DOE documents have repeatedly stated that there would be "no significant radiological impact from the transport of the waste to a repository at Yucca Mountain."

After the presentation, I asked the speaker how DOE could state that there could be five or six major accidents and still maintain that there would be "no significant radiological impact." The representative could not look me in the eye while he admitted that they average the victims of such accidents over the entire U.S. population! He said they did this because it was a federal program. I pointed out that statistical dilution would do nothing to reduce the radiation doses to victims. For them, the radiological impact of these accidents might be highly significant. The man was deeply embarrassed; I never saw him again. I have wondered if he realized he was not following his true calling and moved on. — April 2006

A Recent History:

- August 2005. The Energy Policy Act[33] was signed into law, marking the first time that a massive infusion of U.S. tax dollars would be used to help nuclear corporations build new nuclear reactors. Although $14 billion in taxpayer support is a defibrillator for an industry that has been virtually dead (the last order placed for a new reactor that was completed, rather than cancelled, was in 1983), support from Wall Street is still a necessary ingredient in order to re-establish nuclear power in the U.S.
- October 2005. Standard and Poors, a major Wall Street credit analyst, issued a report stating that nuclear energy was a "risky business practice," and without significant "progress" in traditional problem areas, including the matter of the waste, credit approval for building new nuclear power plants, and overall investor participation in the project, reviving the moribund nuclear industry would be unlikely.[34] Standard and Poors did affirm that the most viable place to build new reactors is in areas where the electric utility market has not been deregulated, thus offering some explanation for why the South is the only region of the United States with significant nuclear development already underway.
- November 2005. The Energy and Water Appropriations Committee of the U.S. House inserts $50 million into the DOE budget, directing the agency to develop a plan to reprocess the civilian high-level waste to start in 2010 and to hold the "contest" to pick a site and begin construction in 2007.
- January 2006. National news media cover this new nuclear waste policy.

Box # 5

Comments on the 2005 National Academy of Science (NAS) Report: *Going the Distance*

A book-length report on the transport of high-level nuclear waste was issued by the NAS in February 2006.[9] The report was based on the assumption that Yucca Mountain would be the destination for this waste. Because the report claims to find "no technical barriers" to moving high-level nuclear waste,[10] it is important to unravel some of the assumptions behind that statement.

First and foremost, security is not viewed as a *technical* issue and is laid aside from consideration in the report. Therefore, any of the operational factors that might be employed as a response to a lax security climate are not considered from a technical standpoint. Further, the question of whether the risk from moving the waste is "acceptable" is not assessed because there is no technical definition for what is "acceptable."

Secondly, like many engineering analyses, it is assumed that all regulations and protocols are followed to the "T" by all players in the system. Human error, malfeasance and "multiple failure modes" are not considered.

These restrictions on applicability of the report render its conclusions thin, but there are recommendations worth noting, including a call for more federal openness about information and early announcement of prospective shipping routes. NAS also recommends that security be studied by a team that does not have financial conflicts of interest.[11] The team that wrote the present report included several representatives working for the nuclear industry at the time.
The NAS panel assumes that rail would be the primary mode of transport, but again they assumed that Yucca was the destination. The new plan to take waste to South Carolina would involve sending many, many heavy shipments on fragile Appalachian rail beds or taking a very long way around for the bulk of the waste. Prior observers have held that a Southern route would most likely mediate toward more trucks because there is more flexibility, and the weather would permit highway travel year-round.[12]

Amazingly, NAS suggests that nuclear reactor owners would be anxious to move new, hotter waste, rather than waste that has already cooled for some time. The report references the possibility that refrigerated containers could be used for the hotter waste. One wonders about the potential for catastrophe if the coolant used, or the energy supply for cooling, were lost in transit!
The topics covered in the report are extensive; however, there is little or no analysis of any previous government findings, and even less of any critique of those findings from independent analysts. The State of Nevada has, since 1986, retained independent experts to examine nuclear waste transport and disposal. The Nevada documents and findings are publicly available, unlike many government documents today. Any reader of the NAS report is encouraged to look at the resources available from Nevada as well. They are posted at http://www.state.nv.us/nucwaste/.

—Mike Hopping contributed reporting and analysis for these comments.

- February 2006. President Bush goes to India; the showcase of his visit is establishing a new nuclear deal for India that would involve the U.S. supplying India with nuclear fuel *and taking the waste*. The same week, DOE features the GNEP in the roll out of the federal budget briefings.
- March 2006. Greenwire reports that the DOE has sent a letter to the SRS stating it will be the reprocessing site (see footnote 32).

This string of events begins with the announcement that the taxpayers are going to invest in new nuclear power reactors. The same nuclear power reactor sites where the very worst waste in the world is currently sitting are also the top picks for building new reactors. In most cases, adding new reactor units at existing sites appears less controversial than building them "fresh" on new "green field" sites. It makes sense that investors, a.k.a. the corporations that own the reactors, would want the waste to be relocated because, under law, as long as the federal government moves it, when high-level waste leaves the reactor gates title and liability for the waste are transferred from the corporation that produced it to the taxpayer. Just as important to the new plan: the taxpayers would also own the plutonium in the waste.[35]

For the past two decades, movement of the waste by the federal government, eventually to a permanent site for burial, has been national policy.[36] Centralized interim (or temporary) storage of the waste was initially part of the policy but was blocked by states that were targeted to receive it. A secondary effort targeted Native American Reservations (27 in all) in a bid to go around the states' legal recourse, calling nuclear waste storage "economic development." This plan targeting Native People was eventually de-funded by congress.[37] One of these sites, on the Skull Valley Goshute Reservation in Utah, has been developed as a "temporary storage site" by a consortium of corporations and is regularly used as a bargaining chip in nuclear waste policy; no waste has yet been moved there.

Yucca Mountain is also Native American land, part of the traditional land of the Western Shoshone people who have never agreed to give up that land.[38] Neither the Shoshones nor the State of Nevada wants this waste.

From 1995 to 2000, the nuclear industry made annual attempts to win legislation mandating centralized interim storage at the planned permanent dump—Yucca Mountain—in Nevada. This plan for a "parking-lot" dump that would have triggered the same nuclear waste shipping campaign, only westbound, was blocked every year by a nationwide campaign to "Stop Mobile Chernobyl," supported by President Clinton's veto of the plan.[39] Thus the waste has not moved but continues to be generated.

As for Yucca as a permanent burial site, it would have been disqualified by any honest, scientifically based assessment. Fortunately, in 2005, the story broke: government contractors had not only "tweaked" the numbers but appear to have *fabricated* massive amounts of data[40] because the site was so incredibly poor for isolation of the waste. The fundamental issue is that the rock is soft and fractured, allowing in-flow, as well as out-flow, of water. As evidenced by the study, Yucca could not meet the government's own generic requirements for ground water travel time. In 1998, this finding prompted more than 200 non-government organizations to petition DOE to disqualify the site from further consideration. The official opening date has been pushed back repeatedly

from the original contracted date of 1998 to 2020.[41]

Under the new waste plan, the Yucca Mountain site has not been cancelled; rather it is slated to take some of the post-reprocessing waste. Unfortunately, any supposed reduction in waste is simply the result of waste reclassification to the so-called "low-level" category. Low-level waste would likely be buried in shallow, unlined trenches in South Carolina. Recent changes in regulations also allow some residues of high-level waste in the tanks, to be mixed with grout, and left, likely to leak over time.[42]

It is important to note that while there are large—global—plans for new nuclear programs, much of the technology that would be implemented is speculative—it has not been demonstrated at all, let alone shown to be commercially viable. Energy is not a service that an economy can afford to subsidize and remain sustainable; rather energy is the base of the economy. It is confusion on this point that has lead to resource and environmental bankruptcy.[43] It is entirely possible that all that will happen is the high-level waste will be moved to a "parking-lot dump" in South Carolina, where it, a hazard rated to last for hundreds of thousands of years, will sit in containers rated to last for decades. Worse, it will be in one congressional district. How will that community muster the political might to ensure that there is ever a real solution?

Who is The Winner?

This major change in policy originates with the plan to build new nuclear power reactors using our tax dollars. Corporations that 10 years ago were on the ropes—any nuclear reactor owners sold off nuclear reactors for dimes on the dollar--are now about to receive billions from the taxpayers. This new subsidy is being justified on two scores: first, as a form of energy security; and second, as a response to climate change. Certainly people in WNC can support both of these goals as worthy of our investment. Unfortunately, nuclear power is not qualified to deliver either goal in a cost-effective manner.

No nuclear corporation is risking its own money to get involved in reviving nuclear power. The reason is simple: nuclear power is not a cost-effective way to make electric power. Wind generation produces 2 times more power per dollar invested. This means that wind can also reduce greenhouse gas emissions 2 times more cost effectively. Energy efficiency is even more cost effective, delivering greenhouse gas reductions at a rate 7 times cheaper than investment in new nuclear power reactors.[44]

When it comes to security, nuclear reactors are enormous sitting ducks—re-deployed nuclear weapons in the event that someone decides to blow one up. No nuclear corporation is ready to accept the liability for their own operations, and, indeed, the commercial insurance industry has never underwritten any nuclear power reactors. All liability coverage is offered by a federally administered "self-insurance" program that requires the entire industry to pay if any one reactor has an accident or undergoes terrorist attack. The liability is capped at a fraction of the true costs of catastrophe by the legislation that created this program. Interestingly, an act of *war* nullifies the whole program.

It is difficult to see how anyone is a winner in this picture, especially Asheville.[45] Nonetheless, if the waste is moved off the reactor sites, billions of dollars will begin to flow to corporations which, at the moment, can only gain additional profits if they produce additional

energy.[46] More than one analyst has noted that our society uses twice as much energy as it needs in order to deliver products and services: it is not at all clear that we need new power plants. A top priority at this moment in history is to establish a means whereby energy providers could profit from the more efficient use of their product, rather than only from its sale. If this were the case, it might be possible to move more quickly toward preventing the *need* for new power plants, and even phase out some that we have today.

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36. Note: there is not consensus on burial as the goal. The fact is that with best available technology, the waste will leak long before it is no longer a hazard. Keeping the waste where it can be monitored and re-containerized is advocated by some. Others cite the assumption humans will be here to do that job, so the issue turns on how long the containers will last. Estimates for container failure are less than 10,000 years in the warm, moist, corrosive conditions inside Yucca Mountain. See Grove, Benjamin. (2001, May 1). DOE faces unresolved Yucca issues. *Las Vegas Sun.* Retrieved May 27, 2006, from http://www.lasvegassun.com/sunbin/stories/special/2001/may/10/511805919.html

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Chapter 5.

High Level Nuclear Waste Shipments: Radioactive and Deadly

Louis Zeller, Campaign Coordinator, Blue Ridge Environmental Defense League

The "mock" nuclear waste cask in this photo is made of fiberglass and used as an educational tool to help communities understand the prospect of high-level nuclear waste traveling on our roads and rails.
Photo courtesy of Blue Ridge Environmental Defense League.

Nuclear waste transportation suffers from three fatal flaws: inadequate emergency response, the risk of terrorism and sabotage, and radiation exposure from routine shipments, all of which endanger public health and safety.

Nuclear power reactor operators remove and replace uranium fuel rods after they become contaminated by the atomic fission process. These contaminants include radioactive cesium, strontium, and plutonium. Also, large quantities of uranium remain in the so-called spent fuel which is unusable for power generation because of the contaminating radionuclides. These waste fuel rods are intensely radioactive; a person standing nearby without protection would receive a lethal dose within minutes.

The common end point for nuclear waste is storage at reactors or shipment off-site. On-site storage is not without risks, but nuclear waste shipments present the greater hazard because transport cannot be done safely. Nuclear waste containers do not completely protect the public from radiation.

> *The surface dose rate of spent fuel is so great (10,000 rem/hour or more) that shipping containers with enough shielding to completely contain all emissions are too heavy to transport economically. Consequently, NRC regulations allow a certain amount of neutron and gamma radiation to be emitted from shipping casks during routine operations and transport.*[1]

To allow nuclear waste to be transported, the U.S. Nuclear Regulatory Commission (NRC) set standards for exposing the public to nuclear radiation: 1,000 millirem (=1 rem) per hour at the cask surface, and 10 millirem per hour 6 feet from the cask surface. So, even without a transport accident, people are exposed to ionizing radiation from nuclear waste shipments. Although federal regulations allow a maximum 10 millirem per hour at 6 feet, traffic gridlock incidents can result in individual exposures of 30–40 millirem per person.[2]

Six Nuclear Waste Transport Casks

Shipping Cask Shell Materials and Thicknesses in Inches[3]

Shell Materials	NSF-4	GA-4	GA-9	NAC-TSC	Large MPC	Small
Containment: Stainless steel	1.73	2	2.13	4.1	5.25	4.38
Gamma shield: Lead	6.6			3.7	0.5	0.5
Gamma shield: Depleted uranium		2.63	2.45		1.5	1.5
Neutron shield: Borated water	4.5					
Neutron shield: Borated polypropylene		4.5	3.5	5.5	6	4
Total	12.86	9.13	8.08	13.3	13.25	10.38

The danger from nuclear waste transports would be increased by the consequences of deliberate attacks. The history of terrorist incidents serve as a warning. For example, on October 9, 1995, a 10-car Amtrak train with 248 passengers was derailed near Hyder, Arizona. Spikes had been removed from the rail bed, a metal bar connecting the rails had been removed, and the missing section wired to circumvent the electronic warning system. A terrorist group, Sons of the Gestapo, left a note at the scene claiming credit and criticizing law enforcement agencies, citing the Waco and Ruby Ridge incidents. The attacks on the World Trade Center underscore the ongoing danger.

Incidents of rail and highway sabotage reveal that (a) terrorist attacks are designed to inflict maximum human injury; (b) electronic warning systems designed to alert officials and prevent accidents can be defeated by technical countermeasures; (c) effective attacks using home-made explosives are possible, avoiding the need for exotic military weapons to breach transport containers; and (d) saboteurs have the ability to create damage which exceeds the structural standards of federally approved shipping containers.

Capture and control of a cask by terrorist agents would allow the cask to be breached with a variety of devices including commercially available conical-shaped charges and cutting charges, or a massive diesel fuel-fertilizer truck bomb. Attackers may use transport personnel as hostages to retain control of the cask for hours. With the time gained, attackers could increase the effect of explosives by removing barriers and applying them to the most vulnerable part of the cask. The table on the previous page details the shielding thickness for nuclear waste transport casks.

least 10 other nations.[3]

A GA-4 truck cask with four nuclear fuel assemblies would contain 850,000 curies. The NAC-TSC rail cask with 26 assembles would hold 5.5 million curies.[3]

The release of toxic radioactive poisons would cause fatalities immediately following an incident. Lindsay Audin analyzed fuel rod behavior during incidents involving sabotage and explained how fine particles and vapors would be released from a standard nuclear waste cask. Audin states:

Sandia Full-Scale Test Results[4]

Hole diameter	6.0 inches (15.2 cm)	
Fuel rods damaged	111 of 223	50%
Fuel mass fractured	45.8 pounds (20.82 kg)	10%
Fuel mass released	5.6 pounds (2.55 kg)	1%
Released as aerosol	1/10 ounce (2.94 grams)	

Full scale tests by Sandia National Laboratory published in 1983 utilized a military-shaped charge (U.S. Army M3A1) on a GE IF-200 truck cask. Even this outdated test demonstrated that the cask could be breached and that radioactive materials would be released.

Currently available weapons are powerful and can penetrate armor plate. These weapons were used by the U.S. in Operation Desert Storm and are used by at

An attempt to disperse the fuel would likely involve a high explosive device that must first penetrate a transport cask. Such a device would penetrate one or both sides of the cask, shatter the fuel rods and pellets in its path, and heat the area along that path. The shock and heat involved would...initiate several processes not normally experienced by uranium dioxide and

> *zirconium alloy. At high temperatures in the presence of oxygen, both materials will change form. Uranium dioxide UO2 will "reoxidize" and become U3O8...expanding and forming a very fine powder in the process. Zirconium will literally ignite, vaporizing itself.... The fuel pellets may also shatter back to the consistency of the uranium powder involved in their manufacture. Ruthenium will vaporize and combine with oxygen to form minute particles, while other elements, such as iodine, will be released as gases.*[5]

Delays in response to accidents which involve the release of radioactive material would expose unknown numbers of people to negative health effects. In 1996, a Department of Energy (DOE) Transport and Safeguards Division Safe Secure Transport (SST) trailer carrying nuclear weapons slid off the road and rolled over in rural Nebraska. Four hours elapsed before DOE headquarters staff were notified.

The Georgia Environmental Protection Division performed vehicular tests of powdered materials deposited on roadways. These tests revealed a fundamental problem with radioactive fuel that is in an oxide or powdered form. Their conclusion:

> *After passage of about 100 cars only a small fraction of the original contamination remained on the road surface. Unless emergency officials promptly close the accident scene to vehicle traffic (an unlikely situation), emergency responders may face an incident scene that is, unknown to them, extremely hazardous due to respirable plutonium. Post emergency actions may also be complicated due to the enhanced spread of contamination by vehicle traffic.*[6]

A delay in response to an irradiated fuel accident could make effective emergency response more dangerous and clean-up next to impossible.

The Blue Ridge Environmental Defense League was founded in 1984 in response to the federal plan to construct a high-level nuclear waste dump. In 1987, the Crystalline Repository Project, which would have sited a dump in the eastern United States, came to an effective end when Congress selected Yucca Mountain, Nevada, as the site for all the nation's high-level nuclear waste. However, nuclear waste shipments to Nevada would unnecessarily place millions of people at risk from accidents, sabotage, and routine exposures.

Our campaign continues.

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Chapter 6.

If Not Nuclear, What? The Sustainable Solution

Ned Ryan Doyle, Director, Southern Energy & Environment Expo (SEE Expo)

Introduction

It is tempting to address the problem of, and solution to, nuclear materials transportation as an independent issue. However, the most appropriate approach is a comprehensive one because the issue is inextricably intertwined with larger issues of energy policy, the environment, economics and social justice.

As evidenced by previous information in this report and confirmed by many other sources, the risks associated with the transportation of nuclear materials are real. The existing and potential environmental and human health consequences of current and proposed nuclear systems, weapons and energy policies are unacceptable by any moral, spiritual, or religious standards. The economic costs and national security challenges are unacceptable to any patriotic citizen or person viewing themselves as a member of the world community.

There are no positive benefits for the human race or future generations in continuing on our present course, only short term, extreme economic benefit to a very small number of people and, to a still smaller number of people, satisfying the lust for personal power. This is clear to any reasonably competent person who objectively examines the facts.

The following summarizes the challenges detailed so effectively in this transport report and identifies the solutions, not with technical jargon, a mass of statistics or theoretical proposals, but with common sense. Those with narrow, self serving motivations and incomplete facts will, predictably, argue that these are oversimplified answers to complex, technical issues. I argue that these solutions are common-sense solutions based on established science, proven facts and available resources.

We have no choice but to deal with our present nuclear legacy and the environmental damage from fossil fuels far into the future, but we do have choices to prevent making our problems worse and solutions to make things better. We owe it to future generations to make responsible choices today. Perhaps it will help them forgive us for our current collective madness in harming the planet they will inherit.

Common Sense:

Nuclear Transportation

Expanding nuclear systems with no waste storage or management solution is even more irrational than transporting it with no functional safeguards. This will only increase the total volume of hazardous materials being produced and the risks associated with transport.

The latest proposal from our current federal administration is to transport and consolidate existing nuclear waste at the Savannah River Site (SRS) in South Carolina. However, the fact is there is no feasible solution at hand for the many tons of

deadly nuclear waste already held in storage sites, irrelevant of location. Combining many smaller piles of waste into one massive pile of waste to make room for more waste is no solution and, in fact, creates more problems, in addition to the transportation hazards.

The Interim Solution

There is a remarkably simple solution that addresses the specific risks we face from the transportation of hazardous nuclear materials. Leave them in place at current holding sites until a rational, proven waste management strategy is identified. This is a common-sense solution, based on the facts.

We may someday discover an eventual answer to nuclear waste issues, but until that day comes, suspending shipments and securing existing materials at existing sites is the only common sense, achievable and affordable solution available. One result of suspending nuclear shipments, beyond safeguarding ourselves and the environment, will be the need for increased security and containment at current waste holding sites.

Fortunately, increasing security at the more than 100 nuclear reactor sites where high-level waste has built up[1] is both technologically feasible and far less economically painful than providing even minimal safeguards for the thousands of communities along the thousands of miles of current and projected routes.

It's common sense not throw good money after bad. Nonetheless, the current administration's plan of donating $14,000,000,000 (billion) dollars of tax-payer dollars[2] to the nuclear industry to revive a failed technology does just that and will inevitably create greater problems. This money would be far better invested in securing existing nuclear sites. It would be an investment that addresses the transportation hazards in the interim, increases national security from terrorism and responsibly buys us time while we search for a solution to existing nuclear waste. Many radioactive materials will be a hazard for an estimated 25,000 years, so it's common sense to develop a long term decommissioning and containment policy.

Because it is questionable at best that government or industry will demonstrate common sense and make the right choice to suspend shipments until such time as the public demands it, and because it's equally improbable that "safe" transit containment is possible, as detailed in this report, and because it's not feasible to escort and protect every current and proposed nuclear shipment, it is appropriate to consider a remaining proposal often discussed for protecting ourselves and the environment from nuclear transport events.

This proposal is to prepare and equip local and regional first responders in the event of a nuclear transport incident. In fact, the cost and lead time needed to adequately train, equip and employ emergency first responders and post-event remediation workers in the aftermath of nuclear transit accidents or terrorist attacks is currently unknown.

What is known is that our existing first responders are under funded, short on equipment, lacking intensive training and understaffed to respond to a radiological incident. They are competing for scarce

dollars for conventional emergencies, making funding for nuclear mishaps even more difficult to obtain, despite the dire and long-term consequences of such incidents.

The present policy of most first responders discovering hazardous transit accidents, especially those involving suspected nuclear materials quoting a WNC first responder who wishes to remain anonymous is to "run like hell the other way" and call for help. If anyone demonstrates common sense on a daily basis, it's our first responders. They deserve far more support for risking their lives on our behalf than to be told their best option is to "run like hell." Yet even with expanded support for radiological incidents, they are at great risk, which are fully avoidable risks with suspended shipments. We should increase support for first responders across the board, without question, but we cannot expect them to be fully prepared for a radiological incident.

Because these will be, by definition, accidents or random terrorist events, there is no way to predict where the emergencies will occur. Who will decide which communities to protect and which to leave vulnerable? How can we afford to protect everyone? Common sense and limited resources dictate the obvious conclusion that we cannot adequately protect ourselves from a 'Mobile Chernobyl" at all locations along the transport routes.

The only currently available, effective, affordable and common-sense solution is to suspend shipments and secure the existing sites.

Common Sense: Sustainable Energy

When someone digs a hole so deep they can't climb out, the first common-sense solution is to stop digging. We have dug a deep hole with existing nuclear systems and our addiction to fossil fuels. We must stop digging and begin climbing out by choosing sustainable energy options, not by building more nuclear facilities or continuing our fossil-fuel dependency. Suspending nuclear transportation is a common-sense interim solution but not a comprehensive solution. There must be an alternative to nuclear and fossil fuels that addresses our problems. Sustainable energy is that solution.

The primary argument in favor of new nuclear- and fossil-fueled power plants put forth by government, utilities and related corporations is an assumed "projected demand" for more power. The second is that nuclear power plants do not contribute to global warming. At first glance, these appear to be reasonable positions, so long as one ignores the economic, environmental, health and social consequences. However, on closer examination, there are three fatal flaws.

First, "projected-demand" calculations fail to incorporate energy efficiency, emerging technological advances or sustainable energy contributions. These omissions from the calculations are not oversights but deliberate and central to their openly stated objective of making a profit by selling energy, irrespective of the collateral human and environmental damage.

Second, the assumption of continued growth and increased consumption is irrational. It fails because fossil fuels and

uranium are non-renewable sources of energy and eventually will be gone, even assuming Earth's environment can absorb the damage long enough for us to finish it all. Only cancer cells thrive on uncontrolled growth, and cancer cells die only when they kill the host. It is not inevitable, but humans currently represent a textbook definition of a cancer on Earth.

Third, with very few exceptions like those aligned with fossil-fuel and nuclear-power advocates, the scientific community is now united on the question of global warming. It exists and will exert increasingly deleterious effects on the global environment over time. Human activity, notably the increase in greenhouse gases, is evidently the primary factor responsible. Advocates of nuclear power claim that nuclear is "clean energy" that doesn't add to the atmospheric load of greenhouse gases. This is true if we consider only the carbon emissions by a nuclear power plant under narrow operating conditions.

However, we have no genie that makes functioning nuclear plants appear from thin air or disappear into thin air when they are shut down. In an extensive study of the energy costs associated with nuclear power generation, Storm and Smith demonstrate that in the best-case scenario high-grade and easily milled uranium ore, and all electrical processes powered with electricity from nuclear plants—the electricity produced by nuclear power still entails between one-fifth and one-third of the atmospheric carbon load typical of a gas-fired power plant. In scenarios with less rich ore, the carbon cost of nuclear power escalates. With low-grade ore, which is the logical likely scenario as non-renewable uranium sources dwindle, gas-fired plants may actually be cleaner than nuclear, in the confined discussion of greenhouse gas emissions.[3]

As a result of current energy policy, the greatest challenge we face now is human and environmental survival, not economic or social justice. This statement may well distress those dedicated to addressing the undeniable injustices we face today. However, we are killing ourselves and the biosphere we depend on with current short-sighted energy policies. What is the greater tragedy: to lay waste to civilization and God's greatest creation by our own hand, or to prioritize our dreams of life, liberty and justice until we achieve a sustainable future? Which would our children's grandchildren have us choose?

To date, no arguments regarding national security, environmental devastation, economic impacts, human health, human rights or social responsibility have had any notable effect on energy policy by government or the corporate obsession with profit. There is no reason to expect that the self-serving individuals in these pivotal positions can be persuaded by logic or facts, an unfortunate but reasonable conclusion given the course of human nature throughout history.

Pathway to the Comprehensive Solution

Fortunately, and ironically, this obsession with profit offers a pathway to the solution, albeit with a moral compromise for the present. Common sense dictates that we offer an equally profitable alternative opportunity,

one that does not threaten our lives and life itself on Earth.

An old adage says, " A dog with a bone cannot bite." Simply stated, we must allow, for now, power companies and corporations to generate profits through the continued manipulation of utility-rate structures to their advantage, their expanding control over sustainable energy technologies, the existing monopoly of centralized production and transmission networks, their entry into deployment of energy efficiency strategies and technologies, and the unfair and unbalanced tax structures and economic policies of government.

Power companies and related corporations will continue to accumulate vast profits, with one critical difference: they will retreat from fossil fuels and nuclear options much sooner because of the available profits. In 2005, General Electric alone reported revenues of $10.1 billion dollars for energy efficiency technologies and applications, with approximately $5 billion generated from China.[4] Now you know why the computer animated, endangered elephant is dancing in the rain. It's the profit margin. Both governments and industry already recognize that fossil fuels and nuclear power are not sustainable, but this is where the profits are currently being reaped.

This pathway does not mean an end to individual efforts at independent power production, in fact they will be a part of the overall energy picture. It does not mean we give up on transitioning to decentralized power. It does not mean we abdicate our human rights or civil liberties to corporations or government. It only means we focus on the goal of energy and environmental sustainability first and foremost.

So, for now, common sense says we must give the dangerous dog a fresh bone. And when the day comes that we, or our children, are reasonably assured of a sustainable environment and economic future, it will be a new opportunity to address with vigor the underlying greed, selfishness and amoral behavior that drives the influential and powerful few.

The Common-Sense Comprehensive Solution

There is a bright ray of light and hope for the future, a common-sense solution. Every day more energy reaches Earth from its sun than we use in six months to a year, depending on which calculations you accept. Working from the lowest end, every day approximately 150 times more energy arrives on Earth than we currently consume.[5] [6] One hundred fifty times more energy and all of it is free. The sun has a proven history of reliability over an estimated 3.5 billion years and, in another touch of irony, is the only safe source of nuclear power. The bottom line is that we do not need to "discover" new sources or to pay for any energy at all. We need to efficiently utilize the available energy we already get from the sun. Once this sinks in conceptually, the solutions become clear.

While all the energy we need is free, the mechanisms and technology to harness it are not. This fact is also a source of great hope, because this simple, basic shift in our understanding of free energy, and the requirement of technology to harness the free energy, provides the basis for a legitimately sustainable environmental, energy and

economic infrastructure.

We already have the established technological capacity to harness the free energy of the sun. Direct solar for space heating, hot water, biomass fuels, and wind power for transportation date back several thousand years. Wind electric systems are over one hundred years old. Solar photovoltaic cells for direct conversion of sunlight to electricity were developed over fifty years ago. There is a legitimate need for continued research and development; however, all these technologies are immediately deployable, cost effective, environmentally sound, and offer a sustainable economy framework while strengthening national security.[7]

Economics of the Sustainable-Energy Solution

Shifting our investments to energy efficiency and sustainable energy technologies will create secure jobs on a national and local level with minimal retraining needed. Existing jobs skills such as plumbing, electrical, heating and air conditioning, carpentry, building construction, and engineering are the basis for a sustainable energy economy. Instead of billions of dollars wasted building a single nuclear facility and temporary employment for a few hundred workers, the same money will provide the foundation for literally tens of thousands of permanent, good-paying, industrial-service-sector jobs.

For example, the evolution from wasteful, inefficient housing toward "green" building is already underway in many communities, with startling results in the reduction of energy consumption, while at the same time improving the health and quality of life for the occupants. Both new and existing buildings can be "greened," opening up a huge market and employment security for builders, contractors, architects and engineers that is far less influenced by erratic housing trends.

Conventional commercial and residential plumbers and electricians can be trained as solar-photovoltaic and solar-thermal installers in a very short time. This is critical to timely large-scale deployment of direct solar technologies, because, for all practical purposes, a work force can be immediately mobilized. These applications for electricity and thermal production will play a key role in reducing the demand (demand-side management) for more electricity, and hence, nuclear- and fossil-fuel plants, plus they will do so in a fraction of the time it takes to bring plants on line.

Manufacturing of hardware and systems to harness free sustainable-energy sources will create more employment opportunities. Manufacturing and deployment of solar systems, wind turbines and energy-efficiency technologies is skyrocketing around the world, with the notable exception of the United States. Instead of watching idly as our manufacturing jobs go overseas, sustainable energy is a solution that will create new jobs.

In North Carolina alone, the economy loses approximately $10 billion each year out-of-state for energy costs, according to the North Carolina Department Of Administrations State Energy Office. This money lost today can be kept in our state and local communities at an increasing rate

commensurate with the implementation of sustainable energy technologies. The misleading and inaccurate information from utilities and corporations that a transition to sustainable energy will be costly and unaffordable is perhaps their most bold-faced falsehood. On the contrary, no single greater opportunity is available to strengthen our economy, locally or nationally.

Action Steps: What We Can Do

Common sense tells us it's an increasingly unacceptable risk to continue shipping nuclear materials through WNC by rail or highway, even more so if shipment numbers increase. Common sense tells us the overall nuclear problem cannot be addressed by commissioning more nuclear reactors and shipping more radioactive material to the American Southwest or to SRS or by building more nuclear bombs. It's all the same irrational, expensive, suicidal and amoral problem. Some with narrow agendas may say that this transport report is another example of "not in my back yard," as, indeed, commonly happens. If so, a strong argument is that they didn't read this report in it's entirety. We are clearly saying: *Not in anybody's back yard!*

Even with the problems identified and common-sense solutions apparent, when it comes to seemingly intractable problems, like nuclear accidents in our own back yard or world energy policies, it's easy to give up. What can one person do?

The Good News

The good news is that a sustainable, affordable, profitable and moral pathway to the future is available and that many people are already following it today.

More good news: Communities and regions around the U.S. are working together for the first time in many years as they recognize the challenges we all share. Whether by design or default, the federal leadership on these problems is, at best, non-existent. As a result, from the community level on up, a common-sense approach, a pathway, is emerging from citizens.

At the local and state levels in North Carolina, we can impress upon our community leaders and legislative representatives, by means of our business and community organizations, faith-based organizations, and most importantly, individual action, the need to:

1. Support increased funding for first responders in general, with additional targeted funding for emergency planning, personnel training, and resources for hazardous transportation-incident management.

This does not contradict the fact that it's impractical and unaffordable to adequately protect all of the nuclear-shipment routes across America. It recognizes that WNC is at the "nuclear crossroads" for shipments and is exceptionally vulnerable today while facing a greater risk if shipment numbers increase. Our regional first responders have the talent and skills, but more resources are needed to protect them and the public. The cost of adequate preparedness will be a fraction of the cost incurred if a serious accident occurs.

This is an investment, not an expense.

It's better to be prepared for a nuclear accident and not deploy than to deploy and not be prepared. First responders risk their lives every day for us. Call *and* write your legislators to support increased funding for first responders and urge others to do so.

2. Support proven energy-efficiency and sustainable-energy options in North Carolina instead of allowing even more coal and nuclear power plants to be commissioned.

We currently have a democratic choice and process in determining whether new nuclear power plants will be built. We are at a crossroads. We have a responsibility to make our voices heard.

Share the information in this transport report with your neighbors and friends. Talk about it; do your own local research and be informed. Just changing to energy-efficient light bulbs in North Carolina will displace the projected demand for power to be produced by the proposed nuclear plants. Imagine what we can do with green building, sustainable energy and new technologies! We do not need new coal and nuclear power plants. They will increase nuclear shipments through our communities, increase our economic burden, increase environmental destruction and human health problems, and further threaten national security.

The North Carolina Utilities Commission is mandated by law to regulate utilities *in the public interest*. It is no longer in the public interest to commission new coal or nuclear plants. Call *and* write the North Carolina Utilities Commission and your legislators to oppose new coal and nuclear power plants. Support organizations that oppose building new coal and nuclear plants with contributions of your time, or money, or both. The coal and nuclear lobbyists representing the utilities in Raleigh are powerful and rich; however, they have demonstrated time after time that they are interested only in corporate profits, not the best interests of the people, the environment, or the future.

3. Invest on a personal and community level in energy efficiency and sustainable energy.

"A penny saved, is a penny earned." Ben Franklin's words are still true. Whether one family or a state or a nation, the best investment today is in saving energy and using it wisely, not foolishly spending more money for more unsafe energy.

Some examples: (a) do a home energy audit to determine where to add more insulation or how other conservation measures can be applied; (b) buy energy efficient appliances; (c) install solar hot-water systems or on-demand water heaters; (d) change your light bulbs to efficient compact fluorescents; (e) or even add a solar greenhouse to your home. All of these measures will begin saving energy immediately and pay for themselves with the savings.

Investing in sustainable energy sources means investing in the technology and work force, not the energy itself, because that's free. We have an abundance of wind energy, direct solar and biomass in North Carolina, sustainable energy sources at our fingertips. Solar photovoltaic systems and small wind turbines can produce electric power personally or locally and be sold to utilities or used independently in homes and businesses.

We can support sustainable energy by investing in the NC Green Power Program. This program allows us to support and encourage the development of wind and solar and biomass energy by offering a fair price and an assured market.

With sustainable energy sources, more money stays in the regional economy, more jobs are created, and we strengthen our regional and national security. Nuclear shipments will not be increased, environmental damage will be reduced, dependence on both foreign and domestic oil supplies will be reduced, and impacts on global weather change will be reduced. Everyone wins (except for a very, very small number of people).

This pathway to a solution can work for North Carolina and the region, while supporting and encouraging the ongoing efforts of other citizens and regions around the country. It is a pathway that invests in both today and the future, instead of creating greater problems for future generations.

References Chapter 6

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Contact Information for WNC's U.S. Congressional Delegation and NC State Legislators

1. You can reach the Web site of your federal legislators at the following Web address:

http://www.webslingerz.com/jhoffman/congress-email.html

Simply type his/her name into the box as indicated. His/her name will appear on the next Web page. Click on the name, and you will be taken to his/her Web site where you can link to an email form-letter that will go to the legislator's staff.

2. Please note the following if you wish to use postal mail, or telephone or visit your federal legislator's office.

Representative Charles H. Taylor

Washington Office

339 Cannon House Office Building, Washington, DC 20515

Phone: (202) 225-6401, Fax: (202) 226-6422

Asheville Office

22 South Pack Sq., Suite 330, Asheville, NC 28801

Phone: (828) 251-1988, Fax: (828) 251-0794

Hendersonville Office

211-C 7th Avenue West, Hendersonville, NC 28791; Phone: (828) 697-8539

Murphy Office

75 Peachtree St., PO Box 1271, Murphy, NC 28906; Phone: (828) 837-3249

Waynesville Office

515 South Haywood Street, Suite 118, Waynesville, NC 28786; Phone: (828) 456-7559

Sylva Office: 26 Ridgeway Street, Suite 3, Sylva, NC 28779; Phone: (828) 586-6100

Franklin Office: 5 West Main Street, Room 35, Franklin, NC 28734; Phone: (828) 349-9856

Spindale Office: 303 Fairground Road, Spindale, NC 28160; Phone: (828) 286-8750

Senator Elizabeth Dole

Washington Office

555 Dirksen Office Building, Washington, DC 20510

Phone: (202) 224-6342, Fax: (202) 224-1100

Western Office

401 North Main Street, Suite 200, Hendersonville, NC 28792

Phone: (828) 698-3747, Fax: (828) 698-1267

Senator Richard Burr

Washington Office

217 Russell Senate Office Building, Washington, DC 20510

Phone: (202) 224-3154, Fax: (202) 228-2981

Asheville Office

Federal Building, 151 Patton Avenue, Suite 204, Asheville, NC 28801

Phone: (828) 350-2437, Fax: (828) 350-2439

3. You can find your North Carolina state legislators and obtain their contact information at the Web site addresses below.

For the North Carolina Senate: http://www.ncga.state.nc.us/gascripts/members/reports/room-phone.pl?Chamber=Senate&viewType=normal

For the North Carolina House: http://www.ncga.state.nc.us/gascripts/members/reports/room-phone.pl?Chamber=House&viewType=normal

Resources

For more information on nuclear transports, please see:

http://www.nirs.org Nuclear Information and Resource Service

http://www.ieer.org Institute for Energy and Environmental Research

http://www.BREDL.org Blue Ridge Environmental Defense League

http://www.carolinapeace.org Carolina Peace Resource Center

http://www.wncpsr.org Physicians for Social Responsibility, WNC Chapter (links to a Web page for CSNC)

http://www.stopi3.org/ Stop Interstate 3 Coalition

http://www.citizen.org/cmep Public Citizen

http://www.texasradiation.org Texas Radiation Online

http://www.stopthebombs.org Stop the Bombs Campaign

http://www.ananuclear.org Alliance for Nuclear Accountability

http://www.state.nv.us/nucwaste/trans.htm State of Nevada Nuclear Waste Project Office

http://www.cleanenergy.org/ Southern Alliance for Clean Energy

http://www.ncsustainableenergy.org/ North Carolina Sustainable Energy Association

http://www.seeexpo.com Southern Energy & Environment Expo

Common Sense at the Nuclear Crossroads

is a citizen campaign composed of individuals and informally affiliated organizations based in Asheville, North Carolina. This report is a collaborative effort of the authors, editor, and a committee of dedicated individuals including: Anne Craig, Jack Saye, Bette Jackson, Sara May, Mary Cherney, Nancy Herman and Lew Patrie. Thanks to John Sticpewich for the map of projected high-level waste shipping routes to South Carolina.

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