Public Comments on the U.S. Environmental Protection Agency's Draft Revisions to 40 CFR Part 197, "Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada"

(Docket Identification Number OAR-2005-0083)

Submitted by

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Submitted on November 21, 2005

NIRS/WISE is the information and networking center for citizens and environmental organizations concerned about nuclear power, radioactive waste, radiation, and sustainable energy issues. On behalf of our members across the United States and around the world, I submit the following comments regarding EPA's proposed revisions to its Yucca Mountain radiation release regulations.

To begin on a process note, EPA's 90 day public comment period is objectionably short, given the million years of consequences it portends. NIRS, as well as many other public interest and environmental organizations and concerned citizens, requested a much longer public comment period, such as 180 days, but were rebuffed by EPA. We also requested additional hearings across the U.S., especially considering the broad precedent EPA's revisions could set, for future repositories in addition to Yucca, as well as for other radioactively contaminated or even non-radioactively but toxic chemical contaminated sites across the country. Again, EPA rebuffed our modest requests. We protest EPA's disinterest in providing more widespread, reasonable, and accessible public comment opportunities for such a significant proposed regulation.

It has also been objectionable that EPA has met behind closed doors with the likes of DOE and NRC beginning very shortly after the July 9, 2004 court decision striking down EPA's original Yucca regulations. Such secretive meetings violate transparency and democratic principles, and leave the concerned public with the unmistakable impression that the federal agencies are conspiring to "cook the books" on the Yucca Mountain Project and its regulations.

EPA's proposed double standard must be withdrawn. The proposal would protect people for the first 10,000 years to currently applied standards of protection, but would then doom future generations after that time to a 1 in 36 cancer rate (or even worse, up to a 100% cancer rate, due to EPA mathematical manipulation), and a 1 in 72 fatal cancer rate (or even worse). Such proposed cancer rates and fatal cancer rates are horrifying, and EPA must withdraw such an unacceptable proposal. This is a complete violation of principles of inter-generational equity, as well as public health and environmental protection.

EPA's proposal to allow 350 millirem per year radiation doses to people living downstream from the leaking dump – the equivalent of 58 full chest x-rays per year – would not only cause cancer, but also birth defects, genetic damage, and other maladies, and at alarming rates, and must be withdrawn. Current standards of 15 millirem per year from all pathways, and 4 millirem per year from drinking water, must be applied for the full regulatory period at Yucca Mountain, extending to the period of peak radiation doses (hundreds of thousands of years into the future) and beyond (to one million years, as identified by the National Academy of Sciences as the duration of geologic stability at Yucca).

These proposed regulations allowing 350 millirem per year radiation doses are completely unacceptable and must not be allowed to set a precedent to be applied at other radioactively contaminated sites across the country because they represent a large-scale weakening of environmental and public health protection standards -- the worst such standards, by far, in the world for proposed repositories for highly radioactive waste -- in violation of international norms. This inter-generational immorality must also not be applied to other EPA jurisdictions, such as non-radioactive, toxic and hazardous chemical contaminated sites.

Disregarding all applicable, long-establisihed laws, regulations, and inter-generational morality, the EPA has proposed – as Dr. Makhijani of the Institute for Energy and Environmental Research dubs it – a "double-standard standard." EPA's proposal would, for the first 10,000 years post-burial of the wastes, retain its original Yucca regulations permitting a lifetime cancer rate of 1 in 835 people exposed to Yucca's leaking radioactivity (in other words, a 15 millirem per year permitted radiation dose). But after 10,000 years, **EPA now proposes allowing a 1 in 36 lifetime cancer rate** (this figure calculated using the recent findings presented in the National Academy of Sciences Biological Effects of Ionizing Radiation report – NAS BEIR VII) for persons downstream (a 23-fold increase in "allowable" radiation to 350 mrem/yr, equivalent to 58 chest x-rays per year!). About half of those cancers would be fatal. It should be noted that

BEIR VII has re-affirmed that any radiation dose, no matter how small, carries with it the risk of health damage. EPA's proposed rule change flies in the face of BEIR VII's recent findings.

To make matters worse, EPA's 350 mrem/yr figure is not a maximum permitted dose to the public, but rather a median dose, meaning that 50% of doses would be higher than 350 mrem/yr. Large numbers of people would, under this proposed rule, get doses far higher than 350 mrem/yr. EPA proposes changing from the mean dose (add all the individual doses and divide by the total number of doses to arrive at the average, or mean dose, thus including very high doses in the mean) after 10,000 years to a median dose (the middle dose value, with an equal number of dose values above and below it – meaning that very high doses are simply disregarded, no matter how high they are). According to Dr. Robert Gould, chair of the security committee of Physicians for Social Responsibility, "the sky's the limit" as to how high doses could go, for incredibly there is no upper limit for the half of the exposures that would be above the median. These higher doses would carry proportionately higher health risks.

In DOE's Yucca Total System Performance Assessment for Site Recommendation, at the time of peak dose (after the waste packages corrode and fail), the mean dose of the many computer simulations is about 600 mrem/yr, whereas the median dose is about 200 mrem/yr. Yucca would not meet a standard that required the mean to be less than 350 mrem/yr, but would if the median were used. EPA's use of a 350 mrem/yr median dose limit is thus a transparent attempt to keep Yucca "licensable," despite its clearly unsuitable geology. A median of 350 mrem/yr results in doses of 2,000 mrem/yr (2 rem/yr) to the 5% of people most exposed; over a lifetime of such exposures, one in five women would contract cancer from Yucca's leaking wastes. This is nightmarishly unacceptable!

EPA's proposed 350 mrem/yr dose would not just occur for a brief time and then decrease to far lower levels. Under EPA's proposal, these large doses would be permitted to occur year after year, generation after generation, forevermore into the future (well, out to a million years, after which time regulations would end, although certain radionuclides would remain hazardous and deadly even much further into the future than that). Under EPA's proposal -- given the lack of a cap on maximum doses and the hundreds of thousands of years these leaking wastes would remain harmful -- significant numbers of the people most exposed to radiation doses could suffer a statistical 100% risk of contracting cancer. The State of Nevada has noted that EPA, on page 108 of the proposed rule, holds that exposures of the magnitude associated with unmined uranium ore bodies meet the standard of "minimal justice." EPA further states that estimates of the risks from unmined ore bodies range upward to 100,000 excess cancer deaths over 10,000 years. So it follows that EPA believes ten excess deaths per year are acceptable. For a 1,000,000 year assessment period called for by the proposed Yucca rule, this means that ten million excess deaths would be acceptable to EPA. Ten million excess cancer deaths, however, is again nightmarishly unacceptable.

EPA's proposal would set a very dangerous precedent that could be applied across the U.S., not just at Yucca Mountain. EPA has for decades declared any radiation dose above 15 to 25 mrem/yr to be "non-protective of public health." Its general policy has been to regulate exposures to limit cancer rates to1 in 10,000 persons exposed, or even to 1 in 1 million persons exposed. For example, EPA limits radioactivity in drinking water to 4 mrem/yr, air emissions at 10 mrem/yr, and Superfund cleanups to the equivalent of roughly 0.03 to 3 mrem/yr. EPA has gone on record, again and again, that radiation doses of 100 mrem/yr produce unacceptable levels of risk. But EPA's 350 mrem/yr proposed standard for Yucca would be a 23-fold increase in "allowable" radiation over the 15 mrem/yr standard, and would more than triple the amount of radiation exposure EPA has repeatedly stated produces unacceptable levels of risk. If EPA gets away with this, it could set a precedent to rollback cleanup efforts at other radioactively contaminated sites across the country, including other radioactive waste dumps, nuclear power plant sites, and nuclear fuel chain facilities. There is the added danger that EPA could attempt to apply such inter-generational double standards to other polluted sites suffering non-radioactive, toxic and hazardous material contamination, allowing for much higher cancer rates (and other disease rates) to future generations. EPA is supposed to protect public health and safety and the environment, not undermine such protections to grease the skids for profit-seeking industry interests.

EPA's proposal is a shoehorn designed to weaken the standards so that the geologically unsuitable site can still be licensed, rather than requiring the site to meet public health and environmental protection standards. If the Yucca Mountain site cannot meet basic, long-established public health and environmental protection standards, as it clearly cannot, then the dump should never be opened. DOE has publicly predicted doses of 200 to 300 mrem/year at 200,000 to 300,000 years after burial of the waste, so now EPA proposes weakening the standards just enough so that Yucca could still be licensed. EPA's proposal represents raw politics, is antithetical to science-based public health and environmental protection, and would doom residents near Yucca to cancer and death at horribly high rates. All this, just so the nuclear establishment can maintain the illusion of a solution for the high-level radioactive waste dilemma, so that building new reactors and keeping the old ones running can be "justified." It must be pointed out that electricity is but the fleeting byproduct of nuclear reactors. The actual product is forever deadly radioactive waste.

Dan Hirsch of Committee to Bridge the Gap has stated "It is hard to conceive of a proposed environmental regulation or action that raises such serious questions of inter-generational immorality." The significant numbers of people who would die from Yucca's leaking wastes over the course of time would have had no say in the decision to open the dump, nor would have received any supposed benefit from it, or from the nuclear reactors that generated the HLRW in the first place. Those future generations would bear only the cost, a large human cost.

EPA explicitly admits to such deadly double standards, citing the Swedish National Council for Nuclear Waste's (KASAM) position that '…our moral responsibility diminishes on a sliding scale over the course of time," and advocating a

"Strong Principle of Justice" for the first 5 or 6 generations (roughly 150 years), a "Weak Principle of Justice" for a further 5 or 6 generations after that, and then a "Minimal Principle of Justice" beyond that. EPA's unethical and immoral proposal certainly would represent a horrible injustice for future generations. It is quite ironic, for DOE explains its rush to open the Yucca dump as a matter of inter-generational responsibility, in that current generations created the HLRW and thus should solve the problem so that future generations need not worry about it. Future generations would have much to worry about if EPA's proposal stands – very high cancer rates, and fatal cancer rates, as well as rates of other diseases and maladies. This horribly irresponsible, unethical, and immoral proposal must be withdrawn. It is painfully ironic that EPA proposes to doom future generations of residents near Yucca to catastrophic rates of cancer, cancer death, and doubtless other maladies due to the atomic waste dumps massive leakage, given that Yucca is a sacred location on the traditional Western Shoshone Indian homeland of Newe Sogobia as recognized and affirmed by the Treaty of Ruby Valley, signed by the U.S. in 1863. The Western Shoshone care about future generations as much as they care about current generations – a principle often referred to as the 7th Generation Philosophy: "In all of our deliberations, we must weigh the effects of our decisions on the next seven generations." Of course, burying high-level radioactive waste at the geologically unsuitable Yucca site would threaten not just seven generations, but many thousands of future human generations. EPA should learn from the wisdom of Western Shoshone traditional teachings such as the 7th Generation Philosophy in order to protect future generations against the dangers of high-level radioactive waste.

EPA's use of Colorado's higher level of "background radiation" in an attempt to justify allowing added doses of 350 mrem/yr to persons living downstream from Yucca's leaking radioactive wastes is twisted and unacceptable. EPA cites the national average for background radiation as 350 mrem/yr. But even this is wrong and misleading. About two-thirds of that figure is due to radon exposures within houses and buildings. Only natural radiation, such as from cosmic rays and other natural sources that people are exposed to outdoors, which is difficult to avoid or control, should be considered "natural background." EPA's proposed 350 mrem/yr dose from Yucca's leaking radioactive wastes would be ***in addition to*** the background radiation (including indoor radon) that people would already be exposed to. It should be noted that residents near Yucca are also exposed to additional radioactive contamination from the nearby Nevada Test Site's nuclear weapons explosions and "low" level radioactive waste shipments and dumping, nuclear rocket and other radioactive experiments at the Nevada Test Site, as well as additional "low" level radioactive waste dumping at a commercial facility in Beatty, Nevada. In NAS's recent BEIR VII study, it reported that about 1 in 100 Americans will contract cancer just from the non-radon component of background radiation. A full three percent of the American public can already be expected to contract cancer from their exposure to outdoor natural radiation plus indoor radon, so that a "background" radiation dose of 350 mrem/yr is far from safe. Thus, EPA is proposing that a full 6% of the public living downstream from Yucca be allowed to contract cancer, half of that from "background" (including radon) radiation, and half from the leaking dump's radioactive wastes. EPA has deceptively tried to blur the distinction between "background radiation" and Yucca's leaking wastes, both of which are harmful to human beings.

Another casualty of EPA's proposed rule is the Safe Drinking Water Act-equivalent standard limiting radiation in drinking water to 4 mrem/yr, which EPA would only enforce for the first 10,000 years, but would then replace with the 350 mrem/yr all pathway exposure limit. Water is a precious resource, especially in arid areas such as Nevada and southeast California – Yucca's watershed -- which will require more, not less, protection as time goes on. Yucca's radioactive wastes will leak into the underlying drinking water aquifer, which will become the primary pathway for harmful doses to people downstream. The Safe Drinking Water Act standard should be applied to protect Yucca's aquifer and the people downstream for as long as the high-level radioactive wastes remain hazardous, hundreds of thousands of years into the future. The 4 mrem/yr radiation dose limit for Yucca's underground drinking water supply that EPA currently proposes to end at 10,000 years should be applied all the way out to peak dose, hundreds of thousands of years into the future.

Incredibly, EPA has claimed that "the Agency does not have reason to believe the environmental health risks or safety risks addressed by this action present a disproportionate risk to children." EPA asks for evidence to the contrary. I would refer EPA to the work of Alice Stewart and George Kneale for starters (dating back to the 1950s, when Alice Stewart first proved that xray doses to the fetus in utero causes cancer, leukemia, and other maladies) which shows clearly that children are disproportionately vulnerable to radiation's harmful impacts to health. Specifically, EPA should review the following peer-reviewed scientific studies:

Med. Confl. Surviv., 1999 Jan-March, 15(1): 47-56, **A-bomb survivors: reassessment of the radiation hazard, Stewart AM, Kneale GW**. Department of Public Health and Epidemiology, University of Birmingham.

Newly released data from the Radiation Effects Research Foundation on the survivors of the Hiroshima and Nagasaki A-bombing allow a reassessment of radiation hazards. It appears that deaths from marrow damage (such as aplastic anaemia) continued after 1950. The Life Span Study cohort appears biased in favour of persons with high immunological competence**, the result of infants** and the elderly **being more likely to die before 1950 than young adults. A study of survivors of in utero exposures suggests that embryos are more sensitive to the lethal effects of radiation than more mature foetuses. Current estimates of cancer risks from radiation may only apply to young adults with high immunological competence; young children and the elderly may be at greater risk**. (emphasis added)

International Journal of Epidemiology 2000;**29**:708-714 (© International Epidemiological Association 2000), A-bomb survivors: factors that may lead to a re-assessment of the radiation hazard, **Alice M Stewart and George W Kneale,** Department of Public Health and Epidemiology, The University of Birmingham, Edgbaston, Birmingham B15 2TT, UK. See http://ije.oxfordjournals.org/cgi/content/full/29/4/708.

The British Journal of Radiology, July 1997, 70(1997) 769-771, Correspondence, Risk of childhood cancer from fetal irradiation, 1 & 2, AM Stewart & GW Kneale. See http://bjr.birjournals.org/cgi/reprint/70/835/769

However, there are undoubtedly many more studies that show that the fetus, children, pregnant women, the elderly, those with compromised immune systems, and women are more vulnerable to radiation than the "standard man" so often – perhaps exclusively – used by federal agencies. These most vulnerable, especially fetuses and children, must be provided strong protection by EPA. EPA must do an exhaustive review of the scientific literature to first educate itself about the widespread, common knowledge that fetuses and children are more vulnerable to radiation than adults. Once it has attained that basic and essential understanding, EPA must then put in place strong protections to safeguard the most vulnerable among us, fetuses and children. It is highly unreasonable for EPA to request the concerned public to do its job for it on this most critical of facets of public health protection.

EPA also states "This proposed rule does not have tribal implications…[and] does not have substantial direct effects on one or more Indian tribes, [or] on the relationship between the Federal Government and Indian tribes…" . This is preposterous. Yucca Mountain is sacred and still used as a ceremonial site by the Western Shoshone Indians, who retain rights to the land under the Treaty of Ruby Valley signed by the US government in 1863. The Western Shoshone traditional lifestyle, lived at and near Yucca since time immemorial, may again return to that area someday. In fact, the Western Shoshone Indian traditional lifestyle was lived at and near Yucca for thousands and tens of thousands of years until contact with European Americans in the late 1800s. Western Shoshone continued to hunt and gather at and near Yucca until the U.S. military and Atomic Energy Commission seized the land and established the Nevada nuclear weapons test site in 1951, just 55 years ago. How old is the "rural/residential" lifestyle near Yucca of which EPA speaks? 25 years old? The duration of the European American lifestyle as currently lived at and near Yucca is a mere blip in the history of the Western Shoshone people and their homeland. The Western Shoshone traditional lifestyle could mean far higher doses than EPA's "reasonably maximally exposed individual" living a "rural/residential" lifestyle would be exposed to. That EPA claims its proposal does not significantly impact Native American tribes clearly reveals its ignorance of the decades-long and extensive involvement of the Western Shoshone National Council, as well as other federally recognized Western Shoshone tribes and bands and other tribes and bands, in striving to protect traditional homelands and treaty-recognized lands against radioactive contamination due to nuclear waste dumping as well as other atomic activities in the Yucca Mountain area. This is a violation of the U.S. federal government's responsibility to relate with Native American tribes as sovereign governmental entities, on a government-to-government basis.

In summary, indigenous peoples and children are not expendable, and deserve the strongest of human health protections! That's EPA's job!

EPA's proposed standards would be, by far, the worst in the world in terms of proposed high-level radioactive waste dumps. The French repository program, for

instance, would limit maximum doses, estimated to occur hundreds of thousands of years in the future, to 25 mrem/yr. This proposed EPA limit beyond 10,000 years would allow radiation doses fourteen times higher than the French limit (and actually much higher doses to many victims downstream, given EPA's deceptive and manipulative use of the radiation dose median instead of the mean, as discussed elsewhere in these comments and those of many other Yucca dump critics and opponents). The Canadian program limits doses to about 10 mrem/yr for 10,000 years but does not allow a sudden increase after that point in time. The EPA proposal would allow a sudden jump from 15 mrem/yr to 350 mrem/yr median after 10,000 years, a 23-fold increase! The mean radiation dose corresponding to that median value would be around 1,000 mrem/yr. Thus, moving from a 15 mrem/yr mean dose limit for the first 10,000 years to a 1,000 mrem/yr mean dose limit after that would represent a 66.6-fold increase. This proposal is completely unacceptable and must be withdrawn.

The Yucca Mountain high-level radioactive waste repository would be by far the largest atomic waste dump, containing the radioactively hottest waste, in the entire country. For that reason alone, the strictest of standards should be applied. This is, of course, not to say that other dumpsites or contaminated sites should be subjected to weaker standards. The most protective standards should be applied across the board.

Given all that DOE has done wrong over the decades (the nightmarish radioactive contamination of Hanford, Washington; Savannah River Site, South Carolina; Paducah, Kentucky; and countless other debacles around the country), that's all the more reason that EPA should be the strong protector of public health and the environment, and should not be drastically weakening its regulations so that DOE's poor Yucca Mountain dump application stands a better chance of receiving approval from NRC!

EPA holds that "the rationale for the 350 additional millirems from 10,000 years and beyond deals with the amount of uncertainty that we're faced with in projecting out 10,000 years…" This is a quote from an Associated Press article dated October 10, 2005, attributed to EPA spokesman John Millett. My simple question is, if uncertainty increases over time, shouldn't the regulations be strengthened, not weakened, to accommodate for that?! EPA seems, in its proposed rule, to largely think that "conservatism" is a bad or dirty word. When it comes to protecting human health and human lives and the environment, the most conservative, protective standards need to be applied.

In 1999, NIRS submitted to EPA nearly 2,000 petition signatures as part of the public comment during that round of EPA's proposed Yucca Mountain radiation release regulations. The petition read:

Protect Western Shoshone Indian Land at Yucca Mountain, Nevada from a High-Level Nuclear Waste Dump!

Since high-level nuclear waste dumps are under the Environmental Protection Agency, which is mandated to protect public health and the environment, not to cave in to pressures from the nuclear establishment, we the undersigned demand:

--The Safe Drinking Water Act must be upheld, for the worst doses to communities living downstream will come from use of contaminated groundwater.

--Radioactivity is deadly for hundreds of thousands of years. EPA must protect future generations through the period of peak doses, up to 300,000 years into the future.

--EPA proposes a 20 kilometer (12 mile) nuclear sacrifice zone. Dilution is not the solution to pollution. This is unacceptable. Compliance should be met on-site, or at the site boundary.

--EPA should protect the most vulnerable persons: subsistence farmers, especially pregnant women, the unborn within their wombs, children, the infirm, and the elderly.

An unsuitable site should not be used for high-level nuclear waste disposal. If Yucca Mountain cannot meet the standards, it must be disqualified.

NIRS submits that EPA, in order to protect public health and the environment, should enact all of those petition demands. But EPA currently holds the latter two to be out of the scope of the current regulatory revisions.

EPA is also attempting to declare out of scope the first petition demand, that "**the Safe Drinking Water Act must be upheld."** EPA notes on page 49022 of the Federal Register Notice that "the provisions of the Safe Drinking Water Act do not apply at Yucca Mountain (by virtue of the Energy Policy Act statement [of 1992] that EPA's standards 'shall be the only standards applicable to the Yucca Mountain site')". Despite this, we urge that the 4 mrem/yr radiation dose limit for drinking water at Yucca be extended till the time of peak dose. But EPA has stated that it will not consider public comments to extend the 4 mrem/yr radiation dose limit for drinking water at Yucca past its arbitrary 10,000 year cut-off point. This is unacceptable, and a violation of the U.S. Court of Appeals for the D.C. Circuit's ruling that EPA's regulations cannot be terminated at 10,000 years, but must be extended to the period of peak radiation dose to people downstream, in order to be "based upon and consistent with" the recommendations of the National Academy of Sciences, as Congress required in the Nuclear Waste Policy Act, as amended. EPA deserves praise and thanks for establishing the separate 4 mrem/yr radiation dose limit for drinking water under its Yucca radiation release regulations. EPA and the Department of Justice also deserve praise and thanks for strongly defending the separate groundwater protection against a lawsuit brought by the Nuclear Energy Institute on behalf of the nuclear power industry, which was seeking to strike down this important public health and environmental protection. But EPA must not now bow down to pressures from the nuclear industry, the U.S. Department of Energy, and others to discontinue the separate drinking water protections at an arbitrary 10,000 year cut-off point. Those protections should be applied till the period of peak dose, as NAS recommended and the courts ruled.

And regarding the second petition demand – that "**Radioactivity is deadly for hundreds of thousands of years. EPA must protect future generations through the period of peak doses, up to 300,000 years into the future" –** NIRS again submits on behalf of the 2,000 petition signers in the year 1999, as well as on behalf of its members across the U.S., that EPA's fullest protections must be applied not only for the first 10,000 years at Yucca, but through the period of peak dose (to live up to NAS recommendations) and beyond (to protect all future generations to the same standard as current generations, the only ethical and moral position to take). The 15 mrem/yr standard must be applied till peak dose hundreds of thousands of years into the future to meet the legal requirements, and should extend even beyond that to meet moral and ethical requirements.

"Equal protection under the law" is a cherished American principle. EPA's proposal violates this, protecting certain generations to one standard, but other generations to a much weaker standard. The U.S. Declaration of Independence speaks of "life, liberty, and the pursuit of happiness." It goes on to say that when government becomes inimical to these, it is the right and the duty of the citizenry to alter or abolish that government. Unlike the recently indicted U.S. Representative Tom Delay, I do not call for the abolishment of the EPA. We need the EPA to protect our lives, health, and environment, that's its job. But we do call on EPA to alter its proposed Yucca Mountain rule, to make it truly protective, rather than of service to the nuclear establishment in industry and government, desperate as it is to maintain the illusion of a solution to its nuclear waste dilemma.

If EPA finalizes this unacceptable current proposal as is, this would represent EPA lowering the public safety standard bar so low that DOE would be allowed by NRC to stumble over it and claim victory – an opening of the Yucca dump – despite the fatally flawed geology, and the catastrophic health impacts the leaking radioactivity will unleash over time. For EPA to allow such an outcome should require its name to be changed from Environmental Protection Agency to Excessive Pollution Agency, Excessive Plutonium Agency, or Egregious Perfidious Atomic-Boosters.

ADDITIONAL COMMENTS ON EPA'S PROPOSED REVISIONS TO ITS YUCCA MOUNTAIN RADIATION RELEASE REGULATIONS, IN DIRECT RESPONSE TO PARTICULAR PASSAGES IN THE FEDERAL REGISTER NOTICE:

Under "Tips for Preparing Your Comments" in EPA's Federal Register Notice (Vol. 70, No. 161, Monday, August 22, 2005, Proposed Rules, page 49016), EPA suggests "Offer alternatives." Given that its appears clear that the U.S. Department of Energy had an undue influence on EPA's regulatory revisions, NIRS would like to offer to EPA as an alternative perspective on the Yucca Mountain issue that, under the Nuclear Waste Policy Act, as amended, there is a clear alternative to rushing ahead with the Yucca site despite its disastrously unsuitable geology. The alternative, as spelled out clearly in the law, is for the Energy Secretary to declare the site unsuitable and report to the Congress and the President on next steps. It is completely inappropriate that EPA, rather than protect public health and safety and the environment, bow down to pressures

from DOE, the nuclear industry, and others in the nuclear establishment to weaken regulations in order to keep a fatally flawed site "in play."

EPA's public accessibility under this rulemaking has not always been as advertised. For example, the toll-free information line advertised on page 49016, column 2 of the Federal Register Notice, contained no message – thus, was not operating, on October 3rd, 2005 – the very time frame when most needed, given the hearings taken place in Nevada that week, and the hearing to be held in Washington, D.C. just one week later.

EPA explains on page 49017 that "Since the inception of the nuclear age, the proper disposal of these wastes has been the responsibility of the Federal government." This is an unprecedented subsidy to an industry by the American people and taxpayers. Despite this undemocratic and uncompetitive "promise" made to nuclear waste generators over 50 years ago, there is no excuse for opening a high-level radioactive waste dump at a dangerously unsuitable geologic setting such as Yucca Mountain, Nevada. The rush to open Yucca despite its fatal scientific flaws is all the more outrageous in that much of the motivation comes from the effort by the nuclear establishment in industry and government to maintain the illusion that the high-level radioactive waste dilemma is not only solvable, but solved. This effort is being pushed largely through pressure to avert lawsuits against DOE (and thus, American taxpayers) by the nuclear utilities for breach of contract (DOE failing to begin taking title to irradiated fuel by Jan. 31, 1998), but also through pressure to build the first new nuclear reactors in the U.S. in over 30 years. The federal government's attempts to live up to an impossible deadline, and the industry's desire for a public relations victory on the nuclear waste front, are poor excuses for dooming future generations downstream from Yucca to horrendous rates of cancer and cancer death when the dump leaks massively at some point in the future. EPA should take no part in such ghoulish games, but should fulfill its congressional mandate to protect public health and the environment without bowing down to political or economic pressures.

If, as EPA states on page 49018, column 3, that "There are two major aquifers beneath Yucca Mountain. Regional ground water in the vicinity of Yucca Mountain is believed to flow generally in a south-southeasterly direction," then the massively leaking dump would threaten Ash Meadows National Wildlife Refuge, an internationally recognized gem of biological diversity just 25 miles or so south/southeast of Yucca Mountain, home to several species of endangered desert pupfish (such as the Devil's Hole pupfish) found nowhere else on Earth. This would be in addition to the dangers presented by massively leaking radioactivity to the Amargosa Valley agricultural community south of Yucca, which utilizes Yucca's groundwater for drinking water and irrigation water.

Re: EPA's comment on page 49019, column 3, that "The standard described above applies for a period of 10,000 years after disposal, and is to be measured against exposures to the RMEI at a location outside the controlled area (in the "accessible environment")." How does the federal government propose to control the "controlled

area" for 10,000 years, or for a million years? Will institutional controls last that long? What is to prevent humans from moving into the "controlled area" and growing crops or livestock, and drilling wells into the severely contaminated groundwater table for drinking and irrigation water?

EPA commentary on page 49021, top of column 3, moves me to remind EPA that Yucca Mountain area residents are already and will continue to be exposed to artificial radiation from a variety of sources, including Nevada Test Site nuclear weapons blasts, Nevada Test Site nuclear rocket and other radioactive experiments, "low" level radioactive waste burial at the Nevada Test Site, "low" level radioactive waste burial at a commercial dump in Beatty, Nevada (which is leaking). If the Yucca dump is opened, these residents would also be exposed to the waste shipments to Yucca, as well as to Yucca's leaking radioactivity. Of course, Yucca area residents would already be exposed to natural background radiation, as well as to radon gas in their homes. EPA should not then declare permissible another 350 mrem/yr, or more, radiation from Yucca's leaking wastes. Nevadans have already borne too high a price for this country's deadly nuclear obsessions and addictions.

EPA states in column 1, page 49021, that "realistic analyses are preferred over conservative and bounding assumptions, to the extent practicable." But how "realistic" can federal agencies be when predicting out 10,000 or 1,000,000 years into the future? Not being conservative in this case is an unacceptable retreat, and sacrifices the public's right to health and environmental protections from the one agency in the federal government charged with that mandate, the EPA.

The mention on page 49022, column 2 that "EPA might choose to establish consistent policies for managing risks from disposal of both long-lived hazardous nonradioactive materials and radioactive materials" raises the specter that EPA might try to apply the precedent of a 350 mrem/yr median dose standard at Yucca (that is, a 1 in 36 cancer rate being deemed "permissible") to other radioactively contaminated sites, or even other sites contaminated with non-radioactive hazards such as toxic chemicals. Not only should EPA not permit such horrendous health damage at Yucca, it also should not use the unacceptable proposal as a precedent anywhere else.

EPA's phrase "reasonable expectation" (page 49024, column 3) seems a retreat from strict compliance to clear standards, and is unacceptable.

EPA states on page 49025, column 1 that "it is 'reasonable' to consider approaches for uncertainties in calculations at several hundred thousand years that may differ from the approach for uncertainties considered within 10,000 years after disposal." By weakening the regulations?! Shouldn't EPA ***STRENGTHEN*** the regulations, given such large uncertainties and the long-lasting deadliness and hazard of high-level radioactive wastes?! Such uncertainties require MORE conservatism, not less!

EPA's comparison of Yucca Mountain to "the tracking of hurricanes" (page 49025 and following) is ironic, but very appropriate, given that Hurricane Katrina

devastated New Orleans, killing large numbers of people, just days after EPA published its proposed Yucca revisions in the Federal Register. The questions raised by Hurricane Katrina are instructive when applied to Yucca. Wouldn't it have been better, more protective of public health and safety, for the federal government to have been ***MORE CONSERVATIVE*** in the decades, years, and months before Katrina? Shouldn't the federal government have prepared for a category 5 hurricane, instead of just a category 3 hurricane? Shouldn't the levees have been built strong enough and tall enough to withstand a hurricane as strong as Katrina? Shouldn't federal emergency response have been orders of magnitude more prepared? Large numbers of lives could have been saved. Hundreds of thousands of people's ongoing suffering and displacement could have been prevented. These same lessons can be applied to the Yucca Mountain Project. Isn't the purpose of government to protect the lives and health and well-being of its citizens, as opposed to serving the interests of profit-driven corporations and industries such as the nuclear industry? EPA is all too ready to jettison conservatism in its Yucca revisions, but EPA should champion the highest standards of conservatism given the long-lasting deadliness of high-level radioactive waste. To do otherwise is to risk a "monster hurricane of radioactivity" inundating residents downstream of Yucca Mountain in their drinking water for thousands of generations beginning shortly after the waste burial containers fail, causing horrifying rates of cancer, fatal cancer, and other maladies.

EPA states on page 49026, column 2 that "It is self-evident and non-controversial that the engineered barrier system cannot be expected to last forever." This is a highly significant admission. DOE, on 1/25/99, in a presentation to the U.S. Nuclear Waste Technical Review Board, admitted that 99.7% of radiation isolation at Yucca would be provided by the waste package itself. An additional 0.2% would be provided by the irradiated fuel cladding, the all-too-thin and oft-failed metal sheaths enclosing the high-level radioactive waste pellets and loose solid particles, gases, and liquids. Thus, 99.9% of the radiation barrier at Yucca would be provided by the "engineered barrier system." Only 0.09% of radiation isolation would be provided by Yucca's overburden, and only 0.008% by Yucca's geology. Thus, a mere 0.098% of radiation isolation at Yucca would be provided by the geologic setting. So much for "geologic isolation"! EPA must establish the strictest of protective standards to guard against the licensing of a dump in an unsuitable geologic setting. To do otherwise would guarantee catastrophic radiation releases and the consequent public health disasters downstream.

EPA's mention on page 49026, column 2 and 3, of analogous regulatory programs such as EPA's underground injection control program, and its mention that the one million year Yucca standard is unprecedented, and thus a precedent-setter, raises the specter that EPA will try to apply this proposed Yucca rule, if finalized, to other radioactively contaminated sites, or even to sites contaminated with non-radioactive but still toxic materials (such as hazardous chemicals). A 1 in 36 cancer rate, and 1 in 72 fatal cancer rate (which EPA's 350 mrem/yr median dose standard represents – of course the corresponding 1,000 mrem/yr mean dose standards would cause an even worse cancer and fatal cancer rate!) are completely outrageous and unacceptable, violating EPA's charge to protect the public, and must not be applied at Yucca or anywhere else!

On page 49026, column 3, EPA mentions turning to international bodies for guidance on how to shape its Yucca revisions. Why, then, has EPA put forward a proposed standard that would represent, by far, the weakest in the world for high-level radioactive waste repositories? The famous American chant, "We're #1, We're #1," as raised when the U.S. Olympic hockey team upset the Soviets in the 1980 Winter Olympics, would become a pathetic "We're Dead Last! We're Dead Last!" if EPA finalizes its proposed revision. EPA's proposals violates international norms as well as its own long-established precedents and policies, and simply must be withdrawn.

On page 49026, column 3 EPA states "considerable caution is needed to avoid any suggestion or expectation that any given indicator of disposal system performance can be an accurate estimate of future reality." Given that the future 10,000 years, 100,000 years, and 1,000,000 million years is difficult or even impossible to predict, that is all the more reason that "considerable caution" be applied to the long-term management of high-level radioactive waste. It should not be allowed to be buried in a geologically unsuitable location from which it is guaranteed to eventually leak out massively. It is EPA's job to prevent such a catastrophe. The most stringent conservatisms and precautions, the strongest standards of protection, must be applied to high-level radioactive waste, among the most deadly and long-lasting hazards ever generated by human beings.

Also re: page 49026, column 3, we must say that EPA's proposal is neither reasonable nor adequate in protecting public health and safety and the environment. We urge you to withdraw the current proposal, and instead retain the 15 mrem/yr all-pathways mean radiation dose limit, as well as the 4 mrem/yr groundwater mean radiation dose limit, not only till 10,000 years but till peak dose and even to 1 million years. THAT would constitute a more reasonable and adequate public health protection, although it should be pointed out that even those dose limits would still cause cancer, cancer death, and other maladies to persons downstream, only at much lower rates than EPA's proposed 350 mrem/yr median dose limit (and corresponding 1,000 mrem/yr mean dose limit).

On page 49027, column 1, EPA states "We also recognize that there can be considerable uncertainty in measurements of current conditions." The ongoing scandal involving U.S. Geological Survey scientists falsifying hydro-geologic data and violating quality assurance and control principles at Yucca Mountain, as well as the documented instances of widespread uncalibrated or improperly calibrated scientific instruments at Yucca, raises the specter of "considerable uncertainty in measurements of current conditions" all the higher, which demands that EPA apply stringent, not loose, standards of protection and conservatisms in its regulations.

On page 49027, column 2, EPA states "we believe that the approach used to evaluate disposal system performance must take into account the fundamental limitations involved and not hold out the prospect of a greater degree of 'proof' than in reality can be obtained." But there is already plenty of disturbing "proof" that waste burial containers at Yucca could very well fail quickly, releasing catastrophic amounts of radioactivity into Yucca's drinking water in a short period of time. Please see the attached documents in

Appendix A for extensive details on the troubling record of waste cask performance in the U.S. in just the past two decades, pointing to a troubling prospect for failure over the course of upcoming centuries and millenia.

On page 49027, column 3, EPA points to "site characterization studies, laboratory testing, and expert judgement" as the analytical basis for the range of expected parameter values. But EPA must keep in mind that the falsification of data, the use of uncalibrated instruments, as well as documented corruption amongst the so-called "experts" on the Yucca Mountain Project has thrown Yucca's scientific and technical bases into extreme doubt.

On page 49027, column 3, EPA disparages "worst-case" analyses. Yet, again pointing to Hurricane Katrina (which, it should be pointed out, was "only" a category 4 hurricane when it struck and devastated New Orleans, so in that respect not even a worst case storm!), shouldn't the federal government defend against worst-case scenarios at Yucca, given the long-lasting deadliness of high-level radioactive waste, as well as Yucca's fractured and unsuitable geology? This is especially important given the large levels of uncertainty surrounding repository performance, given the waste's lethal persistence far into the future.

On page 49028, column 1, EPA notes that it "specified [to NRC] only that the mean of the dose assessments must meet the exposure limit." Why, then, has EPA now proposed abandoning the more conservative mean for the much less conservative median of the dose assessments for the time period from 10,000 years out to one million years? EPA should retain the mean to the period of peak dose, as NAS recommended. It should likewise apply the 15 mrem/yr all-pathways dose limit and 4 mrem/yr waterborne dose limit not only to the 10,000 year point, but beyond to the period of peak dose, to be "based upon and consistent with" the NAS recommendations, as required by law.

On page 49028, column 1, EPA states "We anticipate that if these very long-range performance projections (beyond 10,000 years) indicate that repository performance would degrade dramatically under a wide range of conditions at some point in time, this would become a concern in the licensing decision. If such a dramatic deterioration were projected to occur close to the regulatory time period it would be a more pressing concern for licensing decisions than if it were to occur many hundreds of thousands of years into the future…". Such a statement clearly shows that EPA still has little respect for the NAS recommendations that, under the Nuclear Waste Policy Act, as amended, EPA is supposed to base its regulations on and make its regulations consistent with. In fact, EPA seems to have little regard for the July 9, 2004 court ruling that ordered it to rewrite its regulations, to make them "based upon and consistent with" NAS recommendations. Those recommendations hold that regulations should be enforced till the period of peak dose. The court ruled that 10,000 years of enforcement is not good enough. Yet EPA's statement above indicates it still intends to violate NAS recommendations and even federal court orders. This is unacceptable. EPA must maintain its 15 mrem/yr all-pathways dose limit and 4 mrem/yr dose limit in groundwater till the period of peak dose, hundreds of thousands of years into the future.

On page 49029, EPA states "we interpret 'boundable' as referring to limits that may be placed on the scenarios so that they will represent a reasonable test of disposal system performance over the very long term, but not be driven by extreme assumptions or endless speculation." This is an Orwellian re-defining of 'boundable'! Boundable should include worst-case scenarios, as mentioned above in the comparison to the tragedy of not adequately preparing for Hurricane Katrina.

On page 49029, column 2, EPA states "…the concept of reasonable expectation underlying our standards implies that a dose limit for that very long period that is higher than the 15 mrem/yr limit that applies in the relatively 'certain' pre-10,000-year compliance period could still provide a comparable judgment of overall safety." EPA must again be reminded that the "compliance period," to be "based upon and consistent with" NAS's recommendations, as required by federal law, as well as mandated by direct court order, is not out to 10,000 years, but out to the time of peak dose, hundreds of thousands of years into the future. And again, wouldn't such high levels of uncertainty cry out for increased protections, strengthened regulations, not weakened standards?! EPA, if it proposes to alter the 15 mrem/yr all-pathways mean dose and 4 mrem/yr groundwater dose, should lower the permissible dose, not increase it to 350 mrem/yr all-pathways median dose limit (1,000 mrem/yr all-pathways mean dose limit)! EPA's current proposal employs upside-down logic appropriate for Alice in Wonderland perhaps, a Through the Looking Glass World!

On page 49029, column 2, EPA states "others might conclude that the inability to produce highly reliable performance estimates should preclude the possibility of licensing at all." We wholeheartedly concur!

EPA goes on "Such a conclusion would be inconsistent with any concept of permanent disposal, which necessarily requires examination of time frames and events that cannot be predicted with certainty." This is not true. Yucca's geology is fractured and fissured and entirely unsuitable for high-level radioactive waste burial. But other geologic settings within the United States could very well be much more geologically stable and reliable for radiation isolation than Yucca's earthquake-plagued volcanic tuff. EPA should not paint Yucca critics as complete nay-sayers to geologic disposal. This is an unfair and inaccurate characterization.

On page 49029, column 3, EPA states "Ultimately, NRC must be able to use our standards to judge whether DOE has provided sufficient evidence that the disposal system will be protective of public health and safety." But decades of bias by NRC and DOE in favor of nuclear industry wishes at the expense of public health and safety and environmental protection cannot be ignored by EPA. EPA has been charged by Congress to establish protective standards at Yucca. EPA should not cave in to pressures from DOE, NRC, and the nuclear power industry to weaken protection standards at Yucca. EPA has a legal and moral responsibility to establish strong public health and environmental protections at Yucca. In fact, given NRC's and DOE's obvious bias in favor of opening the Yucca dump, EPA has the most critical responsibility of all to

protect the public and the environment against the opening of a high-level radioactive waste dump in a geologically unsuitable location. We urge EPA to do its job by withdrawing the current, unacceptable proposal and replacing it with a truly protective one.

Re: EPA's "Multiple Dose Standards Applicable to Different Compliance Periods," (page 49030, column 1) whatever happened to the cherished American value of "equal protection under the law"?

Attachments A and B below are included to show that very real problems already exist with dry cask systems in the U.S., so EPA cannot assume that there will be no design or manufacturing problems with waste burial casks at Yucca, as it attempts to do in its proposed rule. Under its FEPs section (Frequencies, Events, Processes), EPA seems to agree with DOE's highly unrealistic assumption that no manufacturing defects will exist in Yucca waste burial containers. This flies in the face of over 20 years of U.S. experience with dry cask storage, which has seen all too many instances of cask design, manufacturing, and operational problems. As mentioned elsewhere in these comments, and by other commenters such as the State of Nevada, as soon as the waste burial containers would fail within Yucca, massive amounts of deadly and hazardous radioactivity would begin flooding into the drinking water supply below the mountain, threatening downstream communities with catastrophic health damage. Given Yucca's inability to provide geologic isolation, these attachments bode ill for the future if Yucca is actually opened and faulty waste burial casks are actually buried there.

Attachement A:

Get the Facts on High-Level Atomic Waste Storage Casks!

(8 pages long)

Get the Facts on High-Level Atomic Waste Storage Casks!

The Dangers

"Spent" nuclear fuel is a misleading term. Irradiated nuclear fuel rods discharged from commercial nuclear power plants are highly radioactive, a million times more so than when they were first loaded into a reactor core as fresh fuel. If unshielded, irradiated nuclear fuel just removed from a reactor core could deliver a lethal dose of beta, gamma and neutron radiation to a person standing three feet away in just seconds. Even after decades of radioactive decay, a few minutes unshielded exposure time would be enough to deliver a lethal dose. Certain radioactive elements (alpha emitters such as plutonium-239) in "spent" fuel will remain hazardous to humans and other living beings for hundreds of thousands of years. Military high-level radioactive wastes – the highly radioactive liquid and sludge "leftovers" from reprocessing irradiated fuel rods to extract the uranium and plutonium for making nuclear bombs – has the same hazardous characteristics as "spent" commercial fuel. Irradiated fuel rods and high-level nuclear wastes are perhaps the most hazardous poisons ever created. There is the added danger that fissile materials still present in highly radioactive wastes will form a "critical mass," causing an inadvertent nuclear chain reaction that could radiate a deadly beam of neutrons and possibly even generate enough heat to melt through the container within which it is held. Thus, these wastes must be shielded for centuries, prevented from going critical, and isolated from the living environment for hundreds of millenia.

Past and Present Storage Techniques

With every operational cycle of 18 to 24 months at a U.S. nuclear power plant, the reactor is shut down and approximately one-quarter to one-third of its now extremely radioactive fuel assemblies are removed. These thermally hot and highly radioactive fuel assemblies are then transferred into the plant's irradiated fuel storage pool. These large, indoor water-filled storage ponds shield much of the high radiation underwater, and allow the assemblies to thermally cool down from the reactor's high operational temperatures.

These pools were originally designed for temporary storage only. Nuclear utilities assumed their high-level wastes would be shipped off for reprocessing to extract fissionable uranium and plutonium for making new fuel rods, or else transported for dumping at a "permanent geologic disposal site" -- an underground national sacrifice area. However, reprocessing of commercial wastes was abandoned in the 1970's as economically unfeasible and a threat of nuclear weapons proliferation (not to mention a source of serious radioactive pollution into water and air), and geologic disposal remains mired in technical and political controversy. Consequently, high-level waste inventories at commercial U.S. nuclear reactors have dramatically mounted in storage pools. After decades of "re-racking" to cram pools as full as possible, growing numbers have filled to capacity. This has complicated continued operations and waste generation at certain reactors, while at the growing number of closed down reactors, irradiated

fuel assemblies sit in their storage pools even while the plant sites are dismantled and "decommissioned" around them.

Dry Storage Casks

As pools have filled, the nuclear industry and the U.S. Nuclear Regulatory Commission (NRC) have developed dry cask storage systems, or Independent Spent Fuel Storage Installations (ISFSI's), to expand "interim" storage of wastes both on-site at plants and away from reactors. As of March, 2003 there were 28 operating licensed ISFSI's located in 22 different States. Numerous additional potential ISFSI sites in many more States may open in the near future (see U.S. Nuclear Regulatory Commission Spent Fuel Project Office's March, 2003 map of ISFSI locations at www.nrc.gov/waste/spent-fuel-storage/locations.html, as well as its "Nuclear Fuel Pool Capacity" graph at www.nrc.gov/waste/spent-fuel-storage/nuc-fuel-pool.html, showing the growing number of pools filling to capacity, an indication of impending moves to opening ISFSI's at those reactors).

After a minimum of five years of thermal cooling in "wet" storage pools, irradiated fuel assemblies can be transferred to NRC certified "dry" storage casks made of concrete, steel alloy, and neutron shielding materials.

Resembling a giant metallic thermos (solid on one end, open on the other), inner canisters are loaded underwater (to shield workers from the high radiation). The pool water is then pumped out, multiple shield lids are welded or bolted on to seal shut the open end, and the interior of the canister is filled with inert gas (such as helium) intended to prevent deterioration of the fuel rods from oxidation with air, as well as to conduct heat away from the waste. These canisters are then transported to concrete storage pads either immediately nearby the reactor (an on-site ISFSI), or else away from the reactor at an off-site ISFSI. They are loaded into either horizontal "bunkers" or vertical silos (depending on the dry cask system design) made of concrete, which provide shielding against the gamma and neutron rays that emanate out from within the surprisingly thin metallic inner canister. Natural convection through vents in the concrete silo or "bunker" provides passive air cooling, but the inner metal canister can still reach temperatures of 400 degrees Fahrenheit or higher due to the waste's on-going radioactive decay. NRC approved ISFSI sites can accept irradiated fuel from more than one reactor.

Problems with Dry Cask Storage Surfaced Immediately: A Meltdown of Democracy, a Retreat from Regulation

Under a provision in the Nuclear Waste Policy Act of 1982, the NRC can approve ISFSI's under a nuclear plant's general operating license. This means even the nominal safeguards for protecting the environment and involving the public -- normally required for licensing a nuclear facility -- are done away with: no site-specific study is required, no environmental impact statement (EIS) is made, and no adjudicatory public hearing process is allowed. The original EIS for the reactor itself – prepared decades earlier, long before ISFSI's were even envisioned – is relied upon for licensing the dry cask storage site. An environmental assessment is issued by the NRC which automatically finds no adverse impacts on the environment based upon the earlier EIS.

Concerned citizens and community groups regard this "generic licensing process" as a meltdown of democracy. Michigan's Palisades nuclear plant was the first in the U.S. to receive the go-ahead from NRC to set up an ISFSI under the reactor's general operating license. In May, 1993 NRC allowed Consumers Energy Company to install a dry cask storage site on a sand dune identified by the Michigan Department of Natural Resources, the Army Corps of Engineers, and the University of Michigan as a "high risk erosion zone" just 150 yards uphill from the waters of Lake Michigan, the source of drinking water for tens of millions of people. Whereas the Palisades reactor itself is anchored to bedrock, its two dozen dry storage casks fully loaded with irradiated nuclear fuel (each one weighing 120 tons) sit on a three foot thick concrete storage pad, anchored to nothing but shifting sand.

In early 1994, an NRC inspector stated "it's the consequences that might occur from an earthquake that I'm concerned about. The casks can either fall into Lake Michigan or be buried in the loose sand because of liquefaction." He concluded "It is apparent to me that NMSS [NRC's office of Nuclear Materials Safety and Safeguards] doesn't realize the catastrophic consequences of their continued reliance on their current ideology," the generic licensing process. Over a decade later, these concerns have not been addressed. NRC continues to generically license IFSFI's, rubberstamping nuclear utility applications at an accelerating rate.

Cask Fabrication Before Certification: Build 'Em First, Ask Questions Later

Manufacturers of dry cask systems must go through the NRC's "certificate of compliance" (CoC) process. This covers a host of issues, including the development of the cask design technical specifications, operational limits, maximum radiation dose limits and the condition of irradiated fuel that can be stored inside. As of Feb. 5, 2003, NRC had approved 16 different dry cask storage systems for general use at or away from reactors (see www.nrc.gov/waste/spent-fuel-storage/designs.html). NRC cask certification is valid for 20 year intervals, with reviewed extensions available. NRC has stated that dry cask storage is safe and reliable for up to 100 years.

However, problems with dry casks have surfaced not after decades or a century, but almost immediately in the first few years, raising serious questions about the NRC cask certification process itself. Evidence documents that the NRC's CoC process has been taken over by cask manufacturers' and nuclear utilities' profit-driven pressure for expediency. The consequent lack of rigorous regulatory oversight has resulted in a complete lack of field testing of cask designs, NRC approval for exemptions allowing manufacturers to build casks before

receiving the certificate of compliance, and mounting evidence of poor quality assurance and quality control of cask manufacturing.

In fact, a whisteblower fired by the largest nuclear utility in the U.S. alleges major quality assurance (QA) violations involving Holtec storage/transport containers. Oscar Shirani served as a lead QA inspector for Commonwealth Edison/Exelon of Chicago for many years, earning impeccable credentials. A consortium of nuclear utilities invited Shirani to lead a QA inspection of Holtec cask design and manufacturing in 2000. Shirani identified 9 major QA violations (such as unauthorized welding, large numbers of departures from design specifications, and use of potentially shoddy materials), leading him to question the structural integrity of the containers, especially under severe transportation accident conditions. Shirani's discovery followed an NRC-led QA inspection just months earlier that had identified no problems with the Holtec casks, casting huge doubt upon the competence and credibility of NRC's QA regulatory oversight. Shirani sought a "stop work order" against the manufacture of the Holtec casks until the QA violations were rectified. Instead, Exelon harassed and ultimately fired him. Shirani has been blacklisted from the nuclear industry ever since, and his allegations have never been addressed. Frighteningly, Holtec casks are already in use at 33 U.S. nuclear reactors (see locations under "Spent Fuel Systems Division" at www.holtecinternational.com/).

Numerous technical problems with fully loaded dry casks are popping up around the country at an alarming rate, leading to charges from concerned citizens living nearby that ISFSI's (pronounced "is-IF-sees") are very "iffy," and represent "nuclear experiments" in their backyard.

Bubble, Bubble, Toil and Trouble: Cracks, Corrosion, and Explosion

A May 28, 1996 explosion at the Point Beach reactor in Wisconsin jolted public confidence in the dry cask storage program. While sealing shut a VSC-24 (a Ventilated Storage Cask built by Sierra Nuclear Corporation (SNC) holding 24 irradiated fuel assemblies; this cask design has now been taken over by British Nuclear Fuels, Ltd.), a welding torch ignited pent up hydrogen gas with enough force to dislodge the cask's 4,000 pound shield lid several inches in the air and tilt it ajar on top of the cask.

After allowing SNC to manufacture several VSC-24 units even before its CoC, NRC certified the cask design in May, 1993. The explosion was later determined to result from an electro-chemical reaction between an anti-corrosion zinc liner within the cask and the borated "spent" fuel pool water. The chemical reaction between zinc and boric acid to generate explosive hydrogen gas -- familiar to many high school chemistry students – somehow escaped the notice of all the "experts" at NRC, the cask manufacturer, and the nuclear utility company. Over a dozen VSC-24 casks had already been loaded around the country before the explosion. Utility employees had observed bubbles in the "spent" fuel pools during these loadings, yet had failed to understand that they were flammable hydrogen gas and did not report them to the NRC. In fact, a blue flame was observed burning within another VSC-24 loaded at Point Beach previous to the explosion, but had been shrugged off by employees as resulting from excess cleaning solvents and went unreported.

The explosion led to NRC inspecting SNC's cask manufacturing facility, revealing confusion, inadequate testing, and poor quality control. It also led to a three year halt on the loading of VSC-24's in the U.S. so that the NRC, nuclear utilities, and the cask manufacturer could get a grip on the situation. However, the next VSC-24 to be loaded, at Palisades in June, 1999 again experienced two separate "hydrogen ignition incidents." Again there was a breakdown in administrative controls. The NRC inspectors, thinking all was in order, had already gone home for the day before the "burns" occurred. A welder ignited a "burn" but did not report it, which led inevitably to a welder on the next shift igniting a second "burn". Days passed before NRC was notified. Just the next week later, a suspicious fire in the dry cask storage administrative office trailer at Palisades destroyed many documents, including those about the recent "burns". Concerned citizens cried foul, but NRC did not cite Palisades for any violations of regulations. In 2001, Palisades officials admitted to the NRC that the very same irradiated fuel that was involved in the hydrogen "burns" had actually cooled for less than five years in the storage pool. Loading it in dry casks had been in violation of the casks' technical design specifications, and thus federal regulations. Suspiciously, the less-than-five-years-cooled fuel had been evenly distributed between a number of casks, leading critics to charge that the "mistake" had in fact been intentional. However, records pertaining to the suspect loading procedure had been destroyed in the earlier suspicious office fire (for which fire inspectors never ruled out the possibility of arson).

Shortly thereafter, a VSC-24 cask loading at the Trojan nuclear plant in Oregon had to be suspended when so many hydrogen bubbles were generated in the fuel pool that workers could not see well enough to complete the job. In June, 2000 NRC cited the VSC-24's new owner, British Nuclear Fuels, for poor quality control and assurance in cask manufacturing and maintenance. Obviously, four years since the Point Beach explosion (1996-2000) was not long enough for NRC and industry to resolve problems with the VSC-24.

A March, 1997 NRC inspection report revealed another defect with VSC-24's: delayed cracking in welds supposed to seal shut the multiple shield lids on casks at Palisades, Point Beach, and Arkansas One nuclear plants. Such cracks can allow the inert helium gas within the cask to escape, making the irradiated fuel assemblies vulnerable to contact with air, oxidation, and deterioration. Such degradation could lead to serious irradiated fuel handling and transportation problems in the future. Again, weld failure in shield lids was unanticipated and unanalyzed by industry and the NRC.

Over the past several years, NRC has identified serious problems in other dry cask systems. Three NUHOMS casks, manufactured by VECTRA Technologies (now owned by Transnuclear, Inc., a subsidiary of the French nuclear giant COGEMA) and fully loaded at the Davis-Besse nuclear plant in Ohio, were discovered to have been built below technical specifications: the aggregate used to fabricate the casks' outer concrete shells was poor quality, and the shells themselves were ground too thin. In January, 2000 NRC reported that a TN-32 cask (manufactured by Transnuclear, containing 32 irradiated fuel assemblies) at the Surry nuclear plant in Virginia had developed six inch long cracks in its outer concrete shield, loose bolts, and a helium leak.

In late May, 2000 NRC discovered an unreported flaw with the neutron shielding material supplied to New Jersey-based cask manufacturer Holtec International by Nuclear Assurance Corporation. Holtec hopes to deploy no less than 4,000 HI-STORM dry casks for use at the proposed Private Fuel Storage, LLC high-level nuclear waste dump targeted at the tiny, impoverished Skull Valley Goshutes Indian Reservation in Utah. Transportation of irradiated fuel rods to Utah in Holtec HI-STAR containers – the first dual purpose storage/transport cask to be certified by NRC -- from Eastern, Southeastern, and Midwestern reactors would traverse dozens of States, past the homes of millions of Americans, raising unprecedented safety concerns.

In April, 2001 the Sacramento Municipal Utility District halted loading its first Transnuclear West Nuhoms dry storage cask at the Rancho Seco reactor in California due to an

unexpected mishap. A faulty O-ring leaked air underwater in the irradiated fuel storage pool during loading operations, threatening to contaminate the fuel-holding inner canister with radioactive pool water.

In Sept., 2001 an Exelon Corporation spokesman at the Dresden nuclear reactors in Illinois admitted to a visiting group of nuclear power officials touring the plant's new dry cask storage facility that the NRC had granted Dresden an exemption when its recently, poorly poured dry cask storage concrete pad did not meet specifications.

Atomic Brinksmanship

The explosion within the VSC-24 took place immediately above 24 irradiated fuel assemblies already loaded into the cask, containing the equivalent amount of long-lasting radioactivity released by 240 Hiroshima-sized atomic bombs; the nearby "spent" fuel pool held the full inventory of high-level radioactive waste generated at that plant over the course of decades. Although the NRC and utility reported that no radiation was released, no damage was done to the irradiated fuel assemblies in the cask, and no one was injured by the blast, the forceful explosion occurred near the plant's "spent" fuel pool , not a place to "play with fire" or make mistakes with objects weighing many tons.

Loaded dry storage casks, weighing more than 100 tons, are among the heaviest loads moved within a reactor during power operation. Human error and equipment failure raise issues of worker and public safety during cask handling and moving activities. Dropping either a loaded or unloaded cask inside the fuel pool building can severely damage plant safety equipment, jeopardizing reactor operation and the cooling of irradiated fuel in the storage pond.

On May 13, 1995 a loaded TN-40 cask became stuck in the hoisted position above the Prairie Island, Minnesota plant's irradiated fuel storage pool for 16 hours. This incident occurred just after NRC had granted Northern States Power (now Xcel Energy) an exemption from regulatory requirements for reviewing cask loading procedures. Over 120 tons of metal storage cask and irradiated fuel assemblies dangled precariously over 22 years' worth of the reactor's accumulated irradiated fuel assemblies in the pool below – many hundreds of tons of deadly nuclear waste. This dangling "sword of Damocles" risked dropping back into the pool, damaging irradiated fuel stored there, or punching a hole in the pool leading to a loss of coolant accident and potentially catastrophic consequences. Luckily, nothing happened – that time.

Some reactor designs, such as in G.E. boiling water reactors, have placed the irradiated fuel storage pools several stories up in the reactor building. Consequently, cask movement can place heavy loads up to ten stories high inside the reactor building. A cask drop would send the heavy load crashing down through several floors of the building which house vital safety systems, with untold consequences.

When in Doubt, Rush Full Speed Ahead Anyway

These widespread problems make clear that NRC's high-level waste storage and handling regulations are dangerously inadequate and in need of comprehensive review. Despite this, NRC continues to expedite ISFSI licenses: there are scores of nuclear power reactors in dozens of states planning to open ISFSI's in the next several years due to the fact that their indoor storage pools are completely filling up. In addition, NRC continues to allow vendors to manufacture casks before they have received their certificates of compliance. Once casks are already built, the

pressure is on NRC to help “fix” any problems that surface via an “efficient and effective” (i.e., quick, cheap and easy) CoC amendment process, which again locks out involvement of concerned citizens, and leads to changes on the casks that leave NRC itself unsure that its “Safety Evaluation Report” still applies. The nuclear industry has even pushed for NRC permission to “fix” cask problems without even notifying the federal agency charged with protecting public health and safety and the environment!

As more and more utilities quickly run out of pool space and seek to store fuel in dry casks or even to transport fuel off-site, NRC certification of cask designs is accelerating: in February, 2000 alone, NRC was engaged in certifying five new cask designs, and beginning review of an additional three applications for cask certification. As Bill Brach, director of the NRC’s Spent Fuel Project Office (which is in charge of cask certification) cheerfully reported to the NRC Commissioners in February, 2000, “We've been extremely busy.” Given the history of past mistakes and the current rush job, future certification, manufacturing, and operational mistakes are inevitable.

The First Rule of Holes: When You’re in One, Stop Digging

Incredibly, not a single dry storage cask, once loaded, has ever been unloaded in the U.S. This has led critics to charge that no safe unloading procedure exists.

In May, 1993 local environmental groups and the State of Michigan filed for an injunction in federal court against the loading of VSC-24’s at Palisades, alleging that there was no proven safe method for unloading the casks. The NRC and Consumers Energy assured the court that in an emergency, casks could be safely unloaded simply by reversing the loading procedure. The court denied the injunction and allowed the casks to be loaded. Just over a year later, in August, 1994 Consumers Energy discovered that its fourth loaded VSC-24 dry cask had weld flaws. To demonstrate its commitment to public safety and the environment, as well as to live up to its promise to the court, Consumers announced it would unload the irradiated fuel in the cask back into the storage pool. Only then were the difficulties discovered.

Reintroducing the 400 degree Fahrenheit fuel assemblies back into the 100 degree fuel pool water would result in a radioactive steam flash hazardous to workers, and would thermally shock the fuel assemblies threatening to further degrade them. Also, the welded-shut inner canister would have to be cut open in a timeframe of less than 50 hours, for the cooling process could not be maintained during the unloading procedure and the fuel within would begin to overheat. In addition, there was no procedure yet developed to remove steel shims that were pressure fit inside the cask lid. Rather than leading to a pause for reflection, however, Consumers rushed to immediately load nine more VSC-24’s, a move taken by local concerned citizens to be in very bad faith. Ten years after Consumers announced it would unload the defective cask #4, it still sits fully loaded on the Lake Michigan shoreline, alongside two dozen more fully loaded VSC-24’s of questionable structural integrity.

The failure to safely unload dry casks has concerned other neighbors next to reactors. The Prairie Island Mdewakanton Dakota Tribe in Minnesota petitioned the NRC to prohibit Northern States Power from loading any more TN-40 casks until a safe unloading procedure had been demonstrated, but to no avail. 17 dry casks sit fully loaded just several hundred yards from the nearest homes and a tribal child care center on this tiny island on a flood plain in the middle of the Mississippi River. Recently, Xcel Energy pressured the Minnesota state legislature to permit

it to load scores more casks at Prairie Island, violating an agreement made in 1994 to limit the number of casks to 17.

Adding further to worries about cask unloading, corrosion between the metallic inner canister and the metallic lining of the outer shell of VSC-24's could cause a bonding together that would be very difficult to pry apart. Even if the casks were to malfunction, or the waste to leak, or a repository to open that could accept the wastes, it remains unclear whether dry casks could be safely unloaded back into fuel storage pools or into transport casks for shipment off-site.

So What's To Be Done?! Leave it in the pools? Ship it away to be buried? Stop making it!

High-level nuclear waste presents us with an unprecedented dilemma – poisons that remain deadly for hundreds of thousands of years. If dry cask storage is so problematic, why not keep the wastes in wet storage pools? Wastes are dangerous there too, for cooling pumps must operate 24 hours per day, 7 days per week, for decades. Without pumps circulating cooling water, the thermally hot waste could boil away the pool water in a matter of hours. A recent NRC report admitted that even decades-cooled irradiated fuel could spontaneously combust if overheated or put in contact with air. A pool fire could release disastrous amounts of radioactivity to the environment. A puncture of a pool and consequent loss of water could lead to similar catastrophic consequences. So could a simple loss of power, causing the cooling and water circulation pumps to stop working. A raccoon at the Fermi reactor in Michigan once caused such a loss of power to the cooling pumps. For these reasons, many see dry cask storage as safer than wet pool storage. Dry casks have no moving parts, and individually contain smaller amounts of high-level waste than cram-packed pools. The word "safer" is relative, for high-level nuclear waste is dangerous no matter how or where it is stored.

The terrorist threat to nuclear power reactors -- brought home so clearly by the attacks of Sept. 11, 2001 as well as the U.S. federal government's admission that nuclear reactors are high on al-Qaida's list of potentially catastrophic terrorist targets – also raises concern about waste stored on-site at reactors. Pool fires caused by terrorist attacks could release massive amounts of radioactivity into the environment for hundreds of miles downwind, risking death and injury to hundreds of thousands of people. But dry casks, stored in concentrated rows (not unlike bowling pins) in clearly visible outdoor locations, are also very vulnerable to terrorist attack. Some concerned citizens groups have advocated "hardening" at-reactor waste storage, fortifying it against terrorist attack, such as by emptying vulnerable pools and dispersing and bunkering dry storage casks behind thick concrete, steel, and earthen shields to defend against attacks by high explosives or missiles (see www.nukebusters.org/issues/hoss).

If irradiated fuel rods are dangerous in pools and dry casks, then why not ship them to the proposed Yucca Mountain site in Nevada for burial? For one thing, Yucca Mountain is not a scientifically suitable site. Yucca Mountain is an active earthquake zone, prone to volcanic activity. Yucca leaks water like a sieve into the aquifer below, the sole source of drinking water for nearby farming communities. If waste were buried there, it would eventually leak into that drinking water, harming people downstream. In addition, shipping many tens of thousands of irradiated fuel casks cross country through 45 states plus

Washington, D.C. (according to the U.S. Energy Dept.'s 2002 Final EIS for Yucca Mountain), through major metropolitan areas and America's breadbasket, past the homes of 50 million Americans carries unprecedented risks. The transport containers have been inadequately safety tested, most emergency responders are poorly trained and equipped for dealing with a radiation accident, and the health and economic impacts of a radiation release would be immense. Going forward with Yucca Mountain and such cross country transportation is ill-conceived and would make the nuclear waste dilemma worse, not better.

An ounce of prevention is worth a pound of cure. The U.S. must stop generating radioactive waste. NRC estimates that 52,000 metric tons of irradiated nuclear fuel will be stored at commercial reactors in the U.S. by 2005. If currently operating reactors continue generating waste until the end of their 40 year licenses, the mountain of waste will more than double in size. If NRC continues to allow old reactors to extend their operating lifetimes from 40 to 60 years, the amount of waste will increase still more. If new nuclear reactors are built, yet more waste would be produced. Nuclear power must be phased out and replaced with safer, cheaper, cleaner ways to meet our electricity needs: conservation, efficiency, and renewable sources such as wind, solar, and fuel cells.

Prepared by Kevin Kamps, Nuclear Waste Specialist. Updated on July 15, 2004. References and documentation available upon request.

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Attachment B:

Summary of Oscar Shirani's Allegations of
Quality Assurance Violations Against Holtec Storage/Transport Casks

Prepared by Kevin Kamps, NIRS, July 22, 2004

(3 pages long)

It should be noted that Holtec casks are currently used at 33 U.S. nuclear reactors (according to a map posted at www.holtecinternational.com), making it perhaps the most widely used dry cask system in the U.S. This is very troubling, given the following allegations of design and manufacturing problems. Such problems could very well haunt the Yucca Mountain proposal over time.

Summary of Oscar Shirani's Allegations of Quality Assurance Violations Against Holtec Storage/Transport Casks

Holtec storage/transport casks are the first dual purpose container for irradiated nuclear fuel certified by the U.S. Nuclear Regulatory Commission (NRC). According to Holtec International's website (http://www.holtecinternational.com), Holtec casks are already deployed at 33 U.S. nuclear power plants. Up to 4,000 rail-sized Holtec storage/transport casks would also be used at the proposed Private Fuel Storage interim storage facility in Utah. Given the U.S. Department of Energy's (DOE) recent decision to use "mostly rail" transport to the proposed Yucca Mountain repository, Holtec casks could very well become among the most used shipping containers for highly radioactive waste.

Exelon, the largest nuclear utility in U.S., uses Holtec casks for irradiated fuel storage at its reactor sites. In 1999 and 2000, Oscar Shirani, as a lead quality assurance (QA) auditor for Exelon, identified numerous "major design and fabrication issues" during a QA inspection of Holtec International (the cask designer), Omni Fabrication, and U.S. Tool & Die (the subcontractors responsible for manufacturing the casks). In fact, he identified a "major breakdown" in the QA program itself. The problems were so severe that Shirani sought a Stop Work Order against the manufacturer of the casks until the problems were addressed. Instead, he was run out of Exelon. According to Shirani, these design and manufacturing flaws mean that the structural integrity of the Holtec casks is indeterminate and unreliable, especially under heat-related stress such as during a severe transportation accident.

Although NRC has dismissed Shirani's concerns, NRC Region III (Chicago office) dry cask inspector Ross Landsman refused to sign and approve the NRC's resolution of Shirani's concerns, concluding that this same kind of thinking led to NASA's Space Shuttle disasters.[1] He stated in September 2003, "Holtec, as far as I'm concerned, has a non-effective QA program, and U.S. Tool & Die has no QA program whatsoever."[2] Landsman added that NRC's Nuclear Reactor Regulation division did a poor follow-up on the significant issues identified, and pre-maturely closed them.

Shirani alleges that all existing Holtec casks, some of which are already loaded with highly radioactive waste, as well as the casks under construction now, still flagrantly violate engineering codes (such as those of the American Society of Mechanical Engineers [ASME] and American National Standards Institute [ANSI]), as well as

[1] Elizabeth Brackett, "Nuclear Controversy," "Chicago Tonight," WTTW Channel 11 Television, Chicago, Illinois, January 29, 2004.
[2] J.A. Savage, "Whistleblower Alleges PG&E Proposed Dry Casks Slipshod," California Energy Circuit, Vol. 1, No. 1, Berkeley, California, September 5, 2003.

NRC regulations. He concludes that the Holtec casks are "nothing but garbage cans" if they are not made in accordance with government specifications.[3]

Specific examples of the QA violations and related problems alleged by Shirani include:

- Welding problems, such improper "fast cooling" of hot cask welds and metal using fans and air conditioning equipment, which are in violation of ASME and ANSI codes and risk tearing and cracking of the unevenly cooling welds and metal, in order to meet production goals. Welds on the casks were also performed by unqualified welders. Even NRC has acknowledged that "weld quality records are not in agreement with the code requirements."[4]
- Inadequate controls on the quality of materials used in the manufacturing process, risking brittleness and weakness in the casks.
- Holtec's failure to report holes in neutron shielding material (neutrons are especially hazardous emissions from highly radioactive waste).
- US Tool & Die's failure to use coupon (a small physical sample of metal) testing, and Post Weld Heat Treatment on a regular basis, as required by ASME code and in violation of the codes that were part of the license agreement with NRC.
- Holtec and U.S. Tool & Die quality control inspectors' bypass of hundreds of non-conforming conditions, departures from the original design during cask manufacture. The departures from the original design amount to design changes that require revised analysis to guarantee that manufactured casks actually live up to the structural integrity of the original design. The fact that this revised analysis was never done is in violation of ASME and ANSI codes, and thus NRC regulations, and means the actual manufactured casks' structural integrity is questionable, according to Shirani.
- Holtec's consent to allow U.S. Tool & Die to make design decisions and changes, despite the fact that U.S. Tool & Die does not have design control capability under its QA program.
- Failure to conduct a "root cause investigation" of Holtec's QA program, even though root causes are the main reason for repeated deficiencies.
- Exelon's obstruction of Shirani from performing any follow-up of the audit to confirm that problems had been solved, despite knowing that the fabrication issues identified would have a detrimental impact on the design.
- Exelon's falsified quality-assurance documents and the misleading of the NRC investigation, stating that Shirani's allegations of QA violations were resolved when in fact they were not.
- Lack of understanding in the NRC of the design control process and Holtec's QA program, relating to flaws in welding, design, manufacturing, and materials

[3] *Ibid*.
[4] April 2002 NRC review panel memo, cited in J.A. Savage, "Whistleblower Alleges PG&E Proposed Dry Casks Slipshod," California Energy Circuit, Vol. 1, No. 1, Berkeley, California, September 5, 2003.

procurement control. NRC lacks a corrective action mechanism for repeated findings. Shirani alleges his audit findings embarrassed NRC because it had also audited the Holtec casks just a few months previously but found no problems whatsoever.

Shirani concludes that these numerous design and manufacturing flaws call into question the structural integrity of the Holtec casks, especially under heat-related stress such as during severe transportation accidents. He also warns that his eight-day audit showed him only a snap shot of problems, and that there could in fact be additional ones yet to be identified.