

72-1
(58 FR 47222)

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February 14, 1994

Secretary of the Commission
US Nuclear Regulatory Commission
Washington, DC 20555
Attention: Docketing and Service Branch

Re: Maryland Safe Energy Coalition for Rulemaking
Docket No. PRM-72-1, 58 Fed.Reg.47222 (June 30, 1993)

Dear Secretary Chilk:

David L. Meyer, Chief of NRC Rules Review and Directives Branch forwarded to me on January 13, 1994, copies of comments in response to our above petition for rulemaking. Below is our rebuttal to comments submitted by Edison Electric Institute, by Jay E. Silberg for Baltimore Gas & Electric Co., by Entergy, by Yankee Atomic Electric Co., and by Commonwealth Edison.

The Edison Electric Institute (EEI) claims it "takes actions to ensure that safe, environmentally sound, publicly acceptable, cost-effective radioactive waste management and disposal, and nuclear materials transportation systems are maintained and developed in a timely manner" (page 1 of comments). EEI is in error because no "safe, environmentally sound, publicly acceptable, cost-effective...disposal" of high level radioactive waste has been proven to exist. The Exploratory Studies Facility at Yucca Mountain, Nevada, has not been completed much less proven to dispose of high level nuclear waste in the manner described by EEI. EEI cannot "ensure" the required disposal. Neither can the NRC, the DOE nor Congress. No one can.

I raise this point here to elaborate our basis for the first two previously petitioned rulemaking changes: 72.22(e)(2) add: "Specify the planned life of the ISFSI" and 72.22(e)(3) change from "after the removal of spent fuel and/or high-level radioactive waste" to "if the spent fuel and/or the high-level radioactive waste is removed."

EEI claims "there is no basis in current law or policy for amending Part 72 to indicate that spent fuel storage in an ISFSI may become permanent." But according to John W. Bartlett, Director of the DOE's Office of Civilian Radioactive Waste Management, the policy is in question. In a statement addressing DOE's obligation to assume custody of the fuel under the Nuclear Waste Policy Act, Bartlett wrote, "Neither the statute as a whole

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nor the Standard Contract purports to obligate the Department to begin accepting spent nuclear fuel in the absence of an operating facility at which the spent fuel can be either stored or disposed of in the fashion contemplated by the Act."¹ That is, law or no law: if there is no repository, there is no disposal. It is disingenuous for EEI to claim otherwise.

What is the basis for EEI's optimism? In 1975 the Federal government planned on having a high-level waste burial site operating by 1985. The date was moved to 1989, then to 1998, then to 2003 and now to 2010. The Government Accounting Office estimates the soonest it can open is between 2015 and 2023. Even that far-away goal now appears unrealistic. We can go on playing this game forever, but who are we fooling? The best site chosen, under Yucca Mountain, suffered an earth quake in June 1992. The Nevada governor, legislature and public are dead set against the project.

A National Academy of Sciences report in April 1992 recommended drilling deep into a paleozoic aquifer under the area and taking core samples from a steep gradient lying just north of the site to characterize the regional hydrogeology better. But DOE has chosen to "brush off" these and other suggestions, says George Thompson of Standard University, vice chairman of the NAS panel.² All eight panelists signed a letter to DOE in March 1993 saying that science is taking a back seat to engineering and budgetary considerations. The NRC's Waste Confidence Decision may have found reasonable assurance that a repository will be operational during the first quarter of the 21st century (barely), but in light of the aforementioned short-cuts, is the NRC prepared to second-guess the prestigious Academy on the safety of the repository?

Stanford University geologist Konrad Krauskopf wrote in *Science* in 1990, "No scientist or engineer can give an absolute guarantee that radioactive waste will not someday leak in dangerous quantities from even the best of repositories." One can certainly make the argument that nuclear waste might be less dangerous in dry storage on site indefinitely or even permanently. Dr. Judith Johnsrud³ and members of *Nuclear Guardianship* argue that buried containers are irretrievable but on-site dry stored canisters can be monitored and re-canned when

¹ OCRWM Bulletin, Office of Civilian Radioactive Waste Management, DOE/RW-0405, winter 1993, page 27 & 30.

² "Scientists criticize DOE work on nuclear repository site" by Tony Reichhardt, *Nature*, Vol.362, 4 March 1993.

³ Dr. Judith Johnsrud, Director, Environmental Coalition on Nuclear Power, 433 Orlando Ave., State College, PA 16803.

they leak.⁴ England has given up the idea of a national nuclear waste repository. They are now resigned to entombing nuclear waste at reactor sites for at least 130 years and possibly forever.

The Baltimore Gas & Electric Co. might be thinking along the same lines because in March 1993 the Company asked the DOE for a \$24 million refund of payments BG&E made toward the Federal repository. And by their asking other utilities to do the same, BG&E certainly is not trying hard to get a Federal repository built, to say the least.

Even the proponents of the proposed Yucca Mountain waste repository are hedging their bets. Project leader Dryfus was asked on MacNeil/Lehrer News Hour on January 13, 1994, "What do we do with the waste if the Yucca Mountain site is not feasible?" Mr. Dryfus answered, "We have the option of dry storage at many sites."

If the DOE cannot ensure disposal, how can EEI claim to ensure disposal? Given the experimental, unproven and tenuous nature of the project, it would seem irresponsible not to have a back-up strategy. On page 5, EEI claims "there is no reasonable basis for NRC to modify 72.22(e)(3) to suggest that geologic disposal will ultimately be abandoned in favor of indefinite on-site storage." On the contrary, the Maryland Safe Energy Coalition has presented a reasonable basis. The EEI has many questions to answer to have a reasonable basis for their claims.

⁴ Nuclear Guardianship Forum, 1400 Shattuck Ave., #41, Berkeley, CA 94709. ON THE RESPONSIBLE CARE OF RADIOACTIVE MATERIALS: Nuclear Guardianship is a citizen commitment to present and future generations to keep radioactive materials out of the biosphere. Recognizing the extreme damage these materials inflict on all life-forms and their genetic codes, Nuclear Guardianship requires:

- * interim containment of radioactive materials in accessible, monitored storage, so that leaks can be repaired, and future technologies for reducing and containing their radioactivity can be applied;
- * stringent limits on transport of radioactive materials, to avoid contaminating new sites, and to minimize spills and accidents;
- * cessation of the production of nuclear weapons and nuclear energy;
- * transmission to future generations of the knowledge necessary for their self-protection and ongoing guardianship through time.

On page 5 of its comments, EEI claims "it would be inappropriate for NRC to promulgate regulations that are contrary to federal statutes." However, a mandate by Congress for a repository does not prohibit a prudent back-up option. Scientific honesty on the part of technical staff is a prerequisite for future Congressional policy amendments. A courageous administrator or engineer will eventually blow the whistle on this charade and take some risks to tell the truth for the wellbeing of our precious earth. Who will the hero be? We hope it happens before irreversible decisions are made with consequences in perpetuity. Meanwhile, we can expect utility managers to put profits first and let the next generation worry about their waste. If the NRC is not the watchdog, then the fox will eat the chickens.

Is there a macho culture alive in the industry which gets a thrill playing with dangerous stuff or getting an ego trip wielding power over society? Is it the challenge of brinkmanship or difficult technical innovations? Or is it true concern for providing the energy people need? Is the money that good? Perhaps a little of each? Some soul searching is in order!

When the licensees apply in 20 years for an extension on their ISFSI licenses, what will be the NRC criterion for granting such? Do these criteria exist now or will the NRC wait until the need arises? The licensees will probably have to apply again in 40 years. Will the criteria for 40 years be the same as for 20 years? What happens in 60 years and 80 years? There is reason to believe that the ISFSI will be relicensed repeatedly until they start leaking or show signs of serious corrosion.

According to page 3 of EEI's comments, the NRC's 1990 Waste Confidence Review found "reasonable assurance that at least one mined geologic repository will be available within the first quarter of the 21st century." But this optimistic scenario is probably insufficient. According to Dr. Judith Johnsrud of the ECNP (op.cit.), Yucca Mountain will have a 70,000 metric ton limit. Another high level waste dump is already necessary because 82,000 metric tons have already been generated. By the time two underground caverns are built, which will take several decades, mounting HLW will require others to be built. Utilities are seeking reactor life extensions, even though it is not known if permanently leak-safe burial sites are even possible. Dr. Johnsrud claims the other option, retrievable canisters, while closer to atmosphere and ground water, at least can be re-canned when they leak.

This is not the first time the NRC's projections were inaccurate. EEI footnotes this on page 3 of their comments: "In its 1984 Waste Confidence Decision, the NRC found...that one or more repositories would be available by the years 1997-2009..." It seems to us that it is now time for a third "confidence" review,

hopefully more realistic and less dependent on the nuclear industry for the answers.

EEI sums up their criticisms of our idea to specify the planned life of the ISFSI on page 4 of their comments: "...the NRC has repeatedly emphasized that an ISFSI is a facility designed and intended for temporary SNF storage, not permanent disposal." But good intentions are not good enough. In spite of NRC's designs and intentions, the ISFSIs may become indefinite or permanent by default. Thousands of events happen in nuclear plants in spite of design and intentions all the time. TMI was not intended to melt down. Let's be realistic and not hide behind an ephemeral legalism. We want the ISFSI to be held to the highest of standards until they can be re-canned at a future date. We believe these six rulemaking changes will uphold higher standards of safety than presently exist.

While EEI may have confidence in the quality and timeliness of a deep repository, MSEC believes that 5 postponements -- and counting -- does not generate confidence. Although EEI claims "No purpose would be served by requiring an ISFSI licence applicant to attempt to predict the planned life of an ISFSI (p.4)," we assert the purpose is to bring planners down to reality and require better on-site storage facilities.

E EI also takes issue with the MSEC petition for rulemaking changes in 10 CFR 72.42 and 72.46(d) on page 5 of their comments. EEI does not want to give the public the opportunity for hearings after the final SER is published but before a licence is issued. If the utility has done a adequate job designing the ISFSI, what are they afraid of? Do we live in a democracy or what? One would think that plant operators would be proud of their accomplishments and would be eager to answer the questions of concerned citizens. What's the big secret? The public does not have any veto power and could not stop a utility if they wanted to. If you think we are too suspicious, it's because of the way the nuclear industry tries to hide information from the public and get licenced before peoples' questions are addressed. Is the NRC a watchdog or a co-conspirator? How this rulemaking petition fares will help to answer this question.

On page 5 of its comments, EEI cites NRC rules: "The sole focus of the hearing is on whether the application satisfied NRC regulatory requirements, rather than the adequacy of the NRC staff performance..." MSEC believes the public has the right to witness and question if the licensee satisfies all NRC requirements. This is not possible until the public can see the NRC requirements in the final SER. For instance, the MSEC believes that certain requirements were not satisfied at the Calvert Cliffs nuclear power plant and wanted an opportunity to testify at a hearing. We had many questions, including history and condition of spent fuel and site-specific hazards. Under the

present rules, this opportunity was denied us. The licence was granted to the applicant at the same time the final SER was published. We feel this procedure is appropriate to a dictatorship, not a democracy.

EEl continues on page 6: "...the licence application should include sufficient information to form a basis for contentions..." so that one need not wait to see the SER to intervene. MSEC believes that the application of Baltimore Gas & Electric Co. did not include sufficient information to form a basis for contentions. We still are waiting for answers to questions we petitioned for in 1992 (see Docket No. 72-8(50-317/318)). This is proof that the rules are inadequate.

EEl then claims (p.6) that the MSEC rule change would "...be extremely disruptive to the NRC regulatory process and grossly unfair to the applicant." Of course democratic participation is disruptive to bureaucracy. It is supposed to be. That's the price we are willing to pay for encouraging people to get involved in the decisions which effect their lives. If we train everyone to be sheep, we will be building a house on sand. Experts need to be accountable. Experts are not always right. Sometimes a dumb question is a good question. Experts can also improve by being challenged. Often experts disagree with each other and public input can break a logjam. Right now the process is grossly unfair to citizens who are concerned about nuclear power and nuclear waste.

On page 7, EEl claims "...to hold open the opportunity for a hearing and to entertain new contentions until a very late stage in the ISFSI process...would be an unreasonable and unworkable procedure." MSEC believes at worst it may slow the process down a little but the benefits would be a better informed public, which must live with the nuclear waste and pay the bill. It could also encourage better decisions because questions of waste policy ultimately depend on an informed and active citizenry. EEl is making unsubstantiated claims that the MSEC rule changes would be unreasonable and unworkable.

On page 7, EEl asserts that "...a party can always petition the NRC to modify a licence if new evidence...comes to light after the licence is issued." That is inadequate because hearings, unlike petitions, have the benefit of cross-examination, dialogue, questions and answers. Also, as in the case of the MSEC, we petitioned for hearings and for the licence to be suspended, not modified. However, we were denied both requests.

On page 7, EEl concludes that "The petition does not provide any justification for reversing this long-standing policy." On the contrary, the arguments contained herein provides reasonable justification for improving the rules. EEl does not analyze how

the disadvantages would outweigh the advantages of public involvement and responsibility.

EEI also disagrees with the MSEC petition to change 10 CFR 72.44(c)(3)(ii) to require that ISFSIs be monitored for radioactivity at the exit cooling vents. On page 7, EEI claims "This request reflects a fundamental misunderstanding of dry storage technology..." On page 8, EEI claims "the petitioner has presented no basis for incorporating a continuous monitoring requirement..."

MSEC believes it understands the ISFSI system. The NRC has allowed a maximum allowable radiation per assembly to be 4.27×10^{15} photons/sec. of gamma and 2.32×10^8 neutrons/sec. of flux. The ISFSI at Calvert Cliffs contain 24 fuel assemblies per canister, or: 1.02×10^{16} photons/sec. of gamma and 5.57×10^9 neutrons/sec. The dangerously high level of radiation in each canister is about half of the radiation in the atomic bomb fallout over Hiroshima. Some of the gamma radiation and neutron flux of the spent fuel will be shielded by a 0.625 inch thick stainless steel canister shell and an internal neutron shield. Most of the gamma radiation and neutron flux will be shielded by the 3-foot thick cement vault.

For some reason, neither the NRC or BG&E has reported exactly what amount or percentage of the radiation would penetrate the canister shell (Are they trying to hide something?) If one makes the conservative estimate that half of the radiation penetrates the steel shell, that means that the moisture, dust, insects and microbes drawn in through the convection vents will be bombarded with 5.1×10^{15} photons/sec. of gamma and 2.78×10^9 neutrons/sec. in each vault. That very high level of radiation will surely activate whatever is in the air, which in turn will leave through the exit vent. The NRC believes some of the vault cement will become radioactive⁵, so surely the internal moisture, dust, insects and microbes will also become activated. Actually, a greater potential environmental and health hazard, that of mutated spores, bacteria, fungus, mold and insects adversely

⁵ According to NRC's SER for BG&E's ISFSI at CCNPP, November 1992, page 2-12: "The BG&E decommissioning plan includes an analysis of the Residual Radioactivity and Activation of the Horizontal Storage Modules (HSM). This analysis was based upon the assumption that a portion of the HSM building materials will become activated due to the presence of neutron radiation emanating from the Dry Storage Canister. Should the HSM building materials become activated, then a portion of the HSM would have to be disposed of as radioactive waste. The Decommissioning plan calls for the removal of up to 6 inches of the inside surface of the HSM to remove the radioactive material."

effecting the external environment has not been studied by BG&E, EEI, NRC, DOE or EPA.⁶

In any event, MSEC believes there is a reasonable basis for requiring continuous radiation monitoring at the exit vents of the ISFSI. Neither BG&E nor the NRC has ever claimed that radiation at the exit vents is expected to be less than the radiation penetrating through the cement vault wall. All they said in answering a separate site-specific petition by the MSEC (Docket No.72-8,50-317/318) was that the radiation at the vent was "not representative." Representative or not, the MSEC wants to know if a monitor will give a higher reading at the vent than anywhere else outside the ISFSI. Is the NRC claiming that a monitor reading at the exit vent will always be lower than at the other monitor locations? If so, on what basis?

In addition, what if a canister springs a leak? Wouldn't a monitor at the exit vent be the earliest warning system? The required TLD monitors further away, which measure radiation penetrating the cement wall, may not be sensitive to a small leak because almost all of the radiation is shielded by the wall.

⁶ The following excerpts are from the book *Deadly Deceit - Low Level Radiation - High Level Cover-Up* by Dr. Jay M. Gould and Benjamin A. Goldman, *Four Walls Eight Windows*, New York, 1990:

"As indicated in Chapter Seven, the Japanese associated the rapid proliferation of *Candida Albicans* with a radiation-induced fungal mutation after Hiroshima. In the same period they also noted the sudden emergence of several previously extremely rare forms of cancer, such as pancreatic cancer and childhood leukemia. In this country, Lyme Disease may have suddenly become epidemic because of a sudden lethal change in a spirochete that had been carried by deer and field mice for prior generations without harm to humans. As related in the previous chapter, an outbreak of Lyme Disease began in the fall of 1975, after huge radiation releases from the nearby Millstone reactor."(page 138)

"Since Nobel Prize-winner Herman Muller began experimenting with fruit flies in the 1920s, radiation has been known to accelerate the mutation of organisms. Over the past half century, radiation may well have created many new organisms that can take advantage of weakened immune systems.(page 137)

"Among the most rapidly growing diseases today are; AIDS, Chronic Epstein Barr Virus, Lyme Disease, *Candida Albicans*, herpes, septicemia and several other immune-deficiency ailments...These may all be examples of immune system damage traceable to atmospheric fallout, and exacerbated by later accidental releases of fission products from nuclear reactors and reprocessing facilities."(page 135,137)

The closer a monitor is to a source, the higher the reading becomes and hence more accurate because the standard deviation (margin of error) is reduced. The MSEC has established a reasonable basis for vent monitoring.

The MSEC also offers a basis for requiring records of fuel history and condition in 10 CFR 72.72(a), that is, a description of defective or pinholed fuel rods. While other sections of NRC rules already require fuel histories, 72.72(a) should emphasize the need for stable fuel elements in dry cask storage. The rule amendment suggested by MSEC would make 72.72(a) consistent with the other similar rules.

The suggested amendment would specifically require descriptions of pinholes in fuel rods, that is, how large are the pinholes and how many pinholes in each rod? This specificity is important to determine how many pinholes will be allowed in dry stored fuel. Currently there is no limitation.

The EEI also opposes the MSEC petition to change 10 CFR 72.104(a). The MSEC wants the NRC to require a lower allowable radiation dose to a person at the perimeter of the ISFSI controlled area for three reasons:

- 1) there is no threshold level of radiation below which an exposed person is safe from radiation damage;
- 2) low levels of prolonged radiation exposure are more hazardous than brief high levels of exposure, the measured doses over time being the same; and
- 3) background levels of radiation are hazardous and can be lethal.

EEI's comments (page 11) refer to the National Academy of Science's Committee on the Biological Effects of Ionizing Radiation (BEIR). EEI cites the BEIR-V report on radiation exposure to a developing fetus to disprove the MSEC claim that the current radiation limits in CFR 72.104(a) are hazardous to a fetus. EEI points out that Part 72 exposure limits are consistent with 10 CFR Part 20, the NRC's standards for radiation protection. EEI claims "The Petition falls short of demonstrating that Part 20 is not based on a body of substantial, authoritative, and recent data."

The MSEC hereby cites the BEIR-V report to show that the Part 20 and Part 72 radiation limits give inadequate protection to

adults, children and to the fetus. According to the above-cited book *Deadly Deceit* by Dr. Jay Gould:⁷

The report (BEIR-V) goes on to pinpoint what we believe is the basic problem: "the discrepancies between estimates based on high-dose studies and observations made in some low-dose studies could...arise from problems of extrapolation." These extrapolations may have led to underestimates at low doses, because they assumed the dose-response curve was linear or quadratic, rather than supralinear (which rises rapidly at low doses and levels off at high doses).

A supralinear dose-response curve is suggested by the so-called "Petkau effect" (discussed below), which involves tumor promotion from free radicals created by repeated exposures at low dose-rates. Indeed, the BEIR-V report explicitly refers to the tumor-promoting effect of free radicals observed in laboratory studies of cells, and illustrates how such promoting agents can dramatically change the shape of the dose-response curves so as to increase the effect of carcinogens at the lowest doses. As a result of risk estimates based on mistaken extrapolations, government standards for environmental releases of radioactivity from nuclear facilities may be 100 to 1000 times too high, especially for infants (our emphasis).

The BEIR-V report also cites a new large-scale British study by Dr. Alice Stewart and her associates demonstrating that extremely small radiation doses in the environment are capable of effecting the future health of individuals exposed as fetuses. Dr. Stewart had established with earlier research that childhood cancers and leukemias were associated with exposures to diagnostic X-rays during pregnancy. In the latest study, her group discovered a direct correlation of childhood cancers and leukemias with background levels of gamma radiation from natural and man-made sources in England, Wales and Scotland. The cumulative outdoor doses due to this source during fetal life varied between only ten and 40 millirads, with an average of 22 millirads. After correcting for a series of socioeconomic, medical and demographic factors, the researchers found that the effect on fetuses of radioactivity on the ground was more than three times greater than that of diagnostic X-rays.

⁷ *Ibid.* page 180

These findings, based on the follow-up of some 16 million women over as long a period as 36 years, support the conclusion of Dr. Stewart and her colleagues that natural and man-made background radiation may account for a majority of childhood cancers and leukemias in our society today (page 182).

Dr. Stewart's findings would strongly indicate that the standards set for exposure of adults to low-level radiation may be thousands of times too high for the developing fetus (our emphasis)...It is unfortunate that BEIR-V did not quantify this enormous difference between the sensitivity of the developing fetus to low-level radiation and that of the adult.

The current NRC standards in 10 CFR Part 20 and Part 72 are set too high for adults as well when you consider that any amount of radiation is hazardous. According to John W. Gofman, M.D., Ph.D.,⁸ "There is no evidence at all for any safe threshold of radiation exposure." According to Dr. Jay Gould's book:⁹

Our findings of a supralinear effect also agree with similar findings for cancer mortality from exposures to low-level radiation made by four eminent authorities: Dr. John Gofman, Dr. Karl Z. Morgan, Dr. Thomas Mancuso and Dr. Alice Stewart. All four scientists worked at various times for the U.S. Atomic Energy Commission or Department of Energy. All four concluded that the dose-response relationship was supralinear, which means that there is no level of radiation low enough to be deemed "safe" (our emphasis). The government terminated the services of all four when they each, independently, came up with what Dr. Gofman has called the "wrong" answer -- that is, the opposite of what the AEC wanted to hear.

To the extent that nuclear energy was part of a Cold War contest with the Soviet Union, the rationale no longer exists to compromise public safety in the interest of national security. The military mentality which allowed radiation experiments on unsuspecting Americans also caused nuclear environmental contamination. Many nuclear engineers working for utilities and for the NRC are graduates of the navy's nuclear propulsion

⁸ Professor Emeritus in Molecular and Cell Biology, University of California at Berkeley, author of *Radiation and Human Health* (1981), *Radiation-Induced Cancer from Low-Dose Exposure* (1990), *Radiation and Chernobyl: This Generation and Beyond* (1994), *X-Rays: Health Effects of Common Exams* (1985).

⁹ *Deadly Deceit*, Op.Cit., page 8.

training. Their prior war indoctrination is obsolete. A new culture of environmental responsibility needs to be inculcated which reflects the post-Cold War reality, as Vice-President Al Gore so well articulated. As the Secretary of the DOE, Hazel O'Leary, has demonstrated, now is the time for whistle-blowing and coming clean. Now is the time for new standards. This also applies to nuclear power and the NRC.

The BEIR-V report (cited above) which recognized problems with extrapolating high-level dose-response to low-level dose standards is confirmed in studies cited in Dr. Jay Gould's book:¹⁰

We then found a statistically significant correlation between changes in infant mortality over the past two decades and regional risks of exposure to milk contaminated from civilian reactor emissions since 1974. The fourteen states in the Midwest and Mid-Atlantic regions with the greatest risk of exposure to contaminated milk also had the worst infant mortality performance. Analyzing these data, we found that while the exposure risk of eight Midwest states was 440 times greater than that of three northern New England states, the corresponding infant mortality performance was only ten percent worse. This evidence suggests that the dose-response is "supralinear" rather than linear, which means that infant mortality rises more rapidly at low doses.

Another example of the supralinear relationship was offered in the wake of Chernobyl. The June 1986 increase in infant deaths over June 1985 in the U.S. was a full ten percent of the increase in West Germany's Baden-Wurttemberg province, even though U.S. radiation levels were only one-hundredth to one-thousandth as great...The statistical probability is less than one in one million that during the summer following the Chernobyl accident the excess deaths observed in the U.S. were due to chance.

The statistical observations of suprelinearity in dose-response are related to clinical studies, according to Dr. Gould's book:¹¹

Dr. Abram Petkau is a Canadian physician and biophysicist who until recently managed the Medical Biophysics Branch of the Whiteshell Nuclear Research Establishment, located in Pinawa, Manitoba. While

¹⁰ *Deadly Deceit*, Op.Cit., page 7 and 8.

¹¹ *Ibid.*, page 172 ff.

studying the action of radiation on cell membranes in 1971, Dr. Petkau conducted an experiment never done before. He added a small amount of radioactive sodium-22 (a gamma emitter) to water containing model lipid membranes extracted from fresh beef brain. To his surprise, the membranes burst from exposure to just one "rad" (a measure of the amount of radiation absorbed) over a long period of time. Conversely, Dr. Petkau had previously found that 3,500 rads were required to break the cell membrane when X-rays were applied for only a few minutes. He concluded that the longer the exposure, the smaller the dose needed to damage cells...Subsequent research by Dr. Petkau and other scientists ultimately demonstrated that this process occurs even at background radiation levels. At high levels of radiation, Petkau found less cellular damage from free-radical production per unit of energy absorbed than at low levels of radiation.

Chronic exposure to low-level radiation produces only a few free radicals at a time. These can reach and penetrate the membranes of blood cells with great efficiency, thus damaging the integrity of the entire immune system although very little radiation has been absorbed. In contrast, short, intense exposures to radiation, as with medical X-rays, form so many free radicals that they bump into each other and become harmless ordinary oxygen molecules. Short exposures thus produce much less membrane damage than the same dose given slowly over a period of days, months, or years.

More recently, Charles Waldren¹² and co-researchers have found that when a single human chromosome is placed in a hybrid cell and irradiated, the ionizing radiation produces mutations much more efficiently at low than high doses, as in the case of cell membrane damage. They found that very low levels of ionizing radiation produce mutations two hundred times more efficiently than the conventional method of using high dose rates, or brief bursts from X-ray machines. They found that the dose-response curve exhibits a downward concavity (logarithmic or supra-linear relationship) in mammalian cells, so that the mutational efficiency of X-radiation is maximal at low doses, exactly as was found by Petkau for free radical mediated biological

¹² Charles Waldren, Laura Correll, Marguerite A. Sognier and Theodore T. Puck, "Measurement of low levels of X-ray mutagenesis in relation to human disease," *The Proceedings of the National Academy of Sciences*, Vol.83, 1986, pp. 4839-4843.

damage. Thus, their findings contradict the conventional scientific dogma that the dose-response curve is linear, and that a straight line can be used to estimate low-dose effects from studies of high doses (our emphasis).

The petitioner, MSEC, has demonstrated a body of substantial, authoritative and recent data as evidence that the current NRC radiation exposure limits are insufficient for public safety.

In February 1994, the media reported that U.S. men born after 1948 are three times more likely to get cancers unrelated to smoking as their grandfathers were.¹³ Something in our environment is killing us. Both the chemical and nuclear industries reject charges it is their fault, saying "prove it!" The symbiotic and cumulative effect of many hazards in the environment combine to cause cancers, but it may take generations of megadeaths and megatorture to prove the exact causes of the epidemic. We do know, however, that any amount of radiation increases the risk of disease.

The current allowable levels of radiation are based upon the principle that one must prove the amount of harm before the cause of such harm is restricted. If someone living near the perimeter of the ISFSI dies of cancer, it is impossible to prove it was caused by ISFSI radiation. In light of the cancer and immune deficiency epidemics, a more conservative radiation limitation would be prudent. A more protective principle needs to be instituted. The burden of proof should be on the nuclear industry to show that radiation is not the cause of disease. If society demanded the burden of proof to fall on the polluters instead of the polluted, the disease rates would no doubt decline. The MSEC challenges EEI to propose a workable policy to reduce environmentally-caused cancer.

EEI points out on page 12 of its comments that "the Petitioner should seek an amendment of Part 20" so that Part 72 will not be isolated from the rest of the regulatory scheme with different regulatory limits. MSEC thanks the EEI for this observation and hereby petitions the NRC to amend 10 CFR Part 20 accordingly to be consistent with the MSEC proposed rule change in 10 CFR 72.104(a), cited in Docket No. PRM-72-1, filed June 30, 1993. MSEC will also petition EPA for an amendment in 40 CFR Part 190 for consistency.

¹³ "Incidence of cancer on rise among baby boomers, study finds -- Environmental causes suspected", Baltimore Sun, 2/9/94, Associated Press, Chicago. The researchers reported in today's issue of the *Journal of the American Medical Association*.

The above MSEC rebuttal to the comments of the Edison Electric Institute also applies to the similar comments by Jay E. Silberg for Baltimore Gas & Electric Co., by Entergy, by Yankee Atomic Electric Co., and by Commonwealth Edison.

Submitted on (date): 2-14-94

by : Richard Ochs
Richard Ochs, Director
Maryland Safe Energy Coalition