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Dear Wendy Dixon:

Within the coming year, Congress is expected to vote on whether or not to approve the Department of Energy's proposal that Yucca Mountain be made a long-term nuclear waste repository. We are five students currently attending Deep Springs, a college located in California about 80 miles away from Yucca Mountain. After doing extensive research into the safety and feasibility of the Yucca Mountain Project, as well as researching potential alternatives, we are unanimous in agreeing that the Potential Site *should definitely be approved.* The following is a summary of our research, as well as seven recommendations that we feel Congress and the Department of Energy should consider.

1

Options for Disposal of Nuclear Waste

In the past, radioactive wastes have been poured directly into lakes, oceans, rivers, and the ground. Russia has been most careless in this regard, but U.S. facilities at Rocky Flats, Colorado, and Hanford, Washington have also admitted to using this kind of direct disposal over the course of the last fifty years. Common sense tells us that the environment and health risks arising from such practices are completely unacceptable. Thus, most nations that rely on nuclear material for energy, defense, or medicine have tried to recycle the radioactive waste produced by these industries or to carefully warehouse them until a permanent disposal strategy has been put into action. The U.S. has opted for the latter option and is now storing all of its waste at temporary sites scattered around the country, most of them in populated areas and close to major bodies

conditions, potentially harming the surrounding environment and posing a larger and unacceptable threat to human health.

Japan and most of Europe are currently focusing on reprocessing their nuclear waste. This process decreases the pressure on temporary waste storage facilities, but by itself is not a permanent solution. Several highly radiotoxic byproducts of nuclear fission cannot be effectively reprocessed and must be isolated from the environment and stored until a final disposal strategy is put into action. In addition, reprocessing is quite expensive compared with storage methods used in the U.S., and would require much more transportation and handling, thereby greatly increasing the risk of accidents and inadvertent exposures to radiation by workers and the public.

The scientific community has suggested a number of possible methods for effective disposal of radioactive waste. These have included placing secure casks containing radioactive waste in stable geologic structures beneath the ocean floor and burial in glacial ice. These options, however, would require a very improbable degree of international cooperation, and could pose serious risks to the environment. In addition, it has been proposed that nuclear waste be disposed of by shooting it into space. This option is prohibitively expensive, potentially dangerous, and leaves no way in which to monitor wastes once they have been disposed of.

The most promising option is found in the research currently underway on possible methods for transmuting radioactive waste into less toxic materials with vastly shorter half-lives. Transmutation, however, has yet to prove feasible, and funding for vital research in this area is lacking. Accelerator-Driven Transmutation of Waste (ATW) is currently being researched at the Los Alamos National Laboratory, and other DOE sites. An ATW system would theoretically allow highly radioactive wastes with long half-lives to be transmuted into less hazardous materials with shorter half-lives. However, these less hazardous materials would still need to be placed in a secure repository for the remaining duration of their critical radiotoxicity.

A survey of the alternatives currently available for the disposal of radioactive materials has led scientists and governments around the world to conclude that deep geologic disposal facilities, such as the proposed Yucca Mountain site, are the most reasonable and responsible means for the disposal of hazardous radioactive wastes. On these grounds, Sweden and Germany, among other nations, have decided to construct deep geologic disposal facilities much like the proposed Yucca Mountain repository.

2 In addition to creating a permanent repository for nuclear materials at Yucca Mountain, the federal government should continue to generously fund research into alternative methods of dealing with radioactive waste. The storage facilities at Yucca Mountain are currently projected to hold only the amount of waste that the U.S. will produce by 2015. If alternative methods for dealing with this waste are not found by then, more permanent deep geologic repositories will need to be constructed. It is very much in the interest of the American people and the federal government to do everything necessary to see that such an alternative or alternatives are found.

Safety of the Potential Repository:

There are two major mechanisms by which radioactive heavy metals from the Yucca Mountain sight could reach local communities—through the ground water and in the air.

1 continued Extensive studies published in the Yucca Mountain EIS demonstrate that neither groundwater nor airborne contaminants pose a statistically relevant effect on the health of individuals living near the Yucca Mountain site.

Groundwater:

In the EIS, the Department of Energy analysis of groundwater hazards considered nine radionuclides (listed on attached Table 5-7). The reasoning behind this simplification of the radioactive inventory involves three factors. First, some radioactive elements in the Yucca Mountain waste inventory decay extremely rapidly, becoming stable (and therefore harmless) before the projected failure of any nuclear waste holding casks.

Second, some longer-lived radionuclides have chemical absorption rates such that the time required for these wastes to diffuse through Yucca Mountain to the water table is long enough to dampen severely the radioactive qualities of the element. The final reason for exemption from the list is that some less health-hazardous materials behave identically to those more dangerous radionuclides already included on the list. By simply increasing the quantity of representative materials, the DOE takes into account less hazardous radionuclides.

1 continued

EIS projections of health hazards for over a ten thousand year period are extremely small. Radionucleotide movement will occur when rainwater is absorbed by the mountain and drips on the disposal canisters until a breach is created, picking up radioactive material and transporting it to the groundwater level (about 1000 feet down). Because Yucca Mountain is located in a desert area, an average of about 1/3'' of rain per year is absorbed by the mountain. Additionally, the DOE has designed water resistant steel and copper alloy canisters to store the waste. Rainwater will have to breach the outside of this canister (4 ¾'' thick) before any threat of groundwater contamination is possible.

Attached Table 5-4 predicts the chances of latent cancer fatalities at certain radial distance from the Yucca Mountain site. The table expresses the probability of the individual who receives the maximum possible radiation dose at a given location developing cancer because of the exposure. By taking into account a mean percentile and a ninety-five percent consequence, the table predicts variable levels of emission from the Yucca Mountain Site. The easiest way to explain these statistics is to look at the percent of water used annually in Amargosa Valley, the nearest population center, that has passes through Yucca Mountain. Geological evidence points to 7 millions gallons as the maximum annual diffusion rate through Yucca Mountain. Each year, Amargosa Valley uses 4.6 trillion gallons of water. Even if every gallon of water to pass through Yucca Mountain were entirely contaminated and all of this water were used in Amargosa Valley that specific year, the dose of contaminated water consumed would be diluted by a factor of more than one five-hundredth. When looking at the one million-year period for groundwater toxicity, DOE figures predict a higher degree of contamination (Table 5-6).

When looking at the mean consequence, however, only at a distance of five kilometers will the received dosage exceed the average yearly dose of radiation currently received by the American public from all sources. At the discharge location of the groundwater, *the mean radiation dose will be less than the average radiation dose received by the average American each year for medical care.* Although these figures do point to a higher health hazard for those living in the area, the one million year predictions cover a period of time that exceeds the span of human civilization by 250 times. Any scientific calculations of Yucca Mountain's performance over that time period are likely to be eclipsed by factors entirely independent of repository quality.

Concerns about air-quality are even less severe than groundwater quality considerations. In the filling, monitoring, and closure stages of the repository, the DOE analyzed release of Krypton-85 and Radon-222 and concluded no significant health risks to the local population. On the long term, the DOE evaluated the gradual release of Carbon-14 from the repository as storage casks begin to fail. According to DOE figures, the dose from Carbon-14 would result in 1.1x10^-13 latent cancer fatalities per year, a number too small to be statistically relevant. Neither during the construction, emplacement, monitoring, and closing stages, nor during the long-term storage of wastes do airborne radioactive particles pose a significant threat to the local population.

1 continued

Further Safety Concerns:

Earthquakes do not appear to be a valid safety concern, as the fault lines located near Yucca Mountain are small. The chance of a volcano erupting in any given year from any of the seven cinder cones near Yucca Mountain is one in seventy million, and as such a negligible safety concern. In the "Viability Assessment of a Repository at Yucca Mountain Overview," published in December 1998, the DOE makes the following statement: "Based upon what is known about the site, disruption of a repository at Yucca Mountain by volcanoes, earthquakes, erosion, or other geologic processes and events appears to be highly unlikely."

1 continued

Transportation is a major concern that has been expressed in regards to the project, but has often been lost behind worries about the site itself. Depending on the primary mode of transportation, between 20,000 and 50,000 trips by truck, train, and barge over 24 years will be required to move the wastes from their current storage sites around the country.

The DOE has developed transportation casks with a 7-inch-thick outer layer in which the nuclear waste will be put. The DOE has put these casks in trucks and run them into walls at 70 miles per hour; dropped them from helicopters; set them on fire for three minutes with airplane fuel, all without serious damage. Using mathematical formulas, the Department has estimated the damage that would be done in various accidents. In the worst-case scenario, an airplane would go down on a truck or train. The DOE predicts that a commercial airline shaft falling at a rate of 180ft per second would penetrate the cask *six centimeters (*Appendix J.3.3.1*)*.

Due to the nature of the waste, radiation will be emitted from the casks even if no accidents occur. The DOE estimates that the latent cancer deaths (due to incident-free transportation in a truck-based scenario) occurring in the population living within 800 meters of shipping lines are one out of 400,000 (Table 6.5). Outside of 800 meters, the risk is negligible. In a rail-based scenario, the figure is 1.6 to 2.5 fatalities out of 13 million people (Table 6.8). The greater latent cancer fatality risk of truck-based transportation suggests that the DOE use rail transportation as frequently as possible. 11

Risk of Non-Action:

1 continued The longer that we postpone finding a permanent storage facility for our nuclear waste, the larger the chance that there will be an accident at one of the 78 current short-term storage facilities spanning 35 states. Over twenty of these sites are currently operational power plants. As we have seen from past experiences, the United States is not exempt from nuclear accidents. An accident of large magnitude could potentially be catastrophic

to the surrounding populated areas. In the short run, non-action only increases the risk of potential radioactive exposure in the surrounding populated environment. In the long run, non-action is not a feasible option. The Yucca Mountain site, if approved, would solve both short and long-term ethical concerns.

Recommendations for the Yucca Mountain Project:

1 continued We endorse the Yucca Mountain project while also making several suggestions.

We recommend that:

3 #1: *Yucca Mountain should not be made a permanently closed site. After the proposed one-hundred year open period, the site should continue to be monitored indefinitely to ensure the safety of surrounding communities and to provide access to waste should a better alternative to a repository solution arise.* Because safety predictions on the long-term can be problematic, the DOE should always be in a position to make an emergency retrieval of waste from the Yucca Mountain site. Long-term monitoring, although more costly on the long-term than permanent closure, helps insure the safety of local communities and would be less costly than permanent monitoring for the long-term at the nation's commercial reactor sites. The shift to a permanently open site would have implications for issues of air quality, and in order to assess these potential hazards, the DOE should consider as a part of the final EIS the health issues involved in a permanently accessible repository.

#2: *Yucca Mountain should not be used as a temporary repository for nuclear waste until it has been approved for use as a permanent storage facility.* Despite the obligation of
4 the United States Government to provide a storage facility for commercial nuclear waste in the Nuclear Waste Policy Act (1982), keeping the waste at the 78 sites where it is currently stored would be (in the very short run) safe and more cost effective. According to the Nuclear Waste Technical Review Board, there are "no compelling technical or safety reasons for moving spent fuel to a centralized storage facility for the next few

years." Doing so might be perceived as unfair pressure to approve the site, and if the site were not approved the costs of moving the waste would be incurred for a second time.

5 #3: *The transportation routes for nuclear waste to Yucca Mountain should be firmly established, Environmental Impact Statements (EIS) should be prepared and released for each, and the public should be informed of these routes.* One of the most persistent criticisms of the Yucca Mountain EIS encountered in our research is that there are no firmly established transportation routes mentioned in the document. Critics of Yucca Mountain feel that such information has been deliberately left out to avoid the disapproval of those living along the transportation routes. This information should be made available to the public as soon as possible in the interests of openness and good public relations, and to address any potential problems that might arise.

6 #4: *Local safety teams should be established along these transportation routes and federal funding should be appropriated for establishment, training, and support of these local teams.* As stated above, the risk of damage to the casks is low. However, the longer a cask is delayed during shipment, the more radiation will be emitted into the surrounding area. The DOE is currently planning to satellite-track all shipments. This precautionary measure should be coupled with the training of sufficient numbers of local teams capable of getting to possible accidents scenes in a timely manner. A training program like this would keep the amount of radiation emitted into the surrounding area to a minimum and protect the residents of the area.

7 #5: *DOE money should be approved to launch an increased school and community education program about the benefits and potential dangers of the Yucca Mountain Repository.* Given the technical suitability of the Yucca Mountain site, the major problem facing its approval is public opinion, based for the most part on emotional reactions to the prospect of a nuclear waste "dump" nearby. The scientific evidence is overwhelmingly in favor of putting the waste at Yucca Mountain. Therefore, we believe that the best course of action is not only complete openness with the public but also an aggressive campaign to educate people through schools and community organizations

about the potential benefits and risks involved with the Yucca Mountain Project, as well as the risks involved with not finding a permanent repository for the waste. Especially in the areas surrounding Yucca Mountain, opposition to the proposed repository is very strong and an education initiative could do a great deal to allay unwarranted fears about the project.

8 #6: *Substantial funds should be dedicated to research and development of new nuclear waste treatment and disposal technologies, with special emphasis placed on the promising Accelerator-driven Transmutation of Waste (ATW) technology already under development at Los Alamos.* It is estimated that waste treated with an ATW system would have less residual radiotoxicity in 300 years than un-transmuted wastes would have in 100,000 years. The ATW process uses nuclear burners, which operate at sub-critical levels, thereby greatly reducing the risk of serious accidents and at the same time producing significant quantities of emissions-free electricity as a byproduct.

9 #7: *Special consideration should be granted to the potential economic effects of Yucca Mountain on the tourism industry surrounding Death Valley National Park, and funds should be set aside to counter any economic downturn caused by the Yucca Mountain Repository.* At the Yucca Mountain town hall meeting in Lone Pine, California on November 4, 1999, Richard Martin, superintendent of Death Valley National Park expressed concerns about the economic effects of the Yucca Mountain site on Death Valley tourism. There is the definite potential that public apprehension about the safety of the Yucca Mountain area will cause a decrease in visitors to the region. Because the local economies on both the Nevada and California sides of Death Valley are so dependent on tourism, the Federal government should have funding prepared to assuage the economic consequences of Yucca Mountain.

Summary:

10 Our nuclear waste is currently being stored at 78 separate sites around the nation, in 35 states. Many of these sites are located near population centers, and all of them are near

and to the environment resulting from an accident at any one of these locations is huge. Two, these are short-term facilities, and a more permanent and low-risk solution to the disposal of these wastes must be found in the near future. Our research convinces us that Yucca Mountain is the safest alternative available. Decisive political action is crucial, since site development and use lead-times are immense. To assay irrational fears and local resistance, the DOE must educate the public as to the benefits of Yucca Mountain as compared to the alternatives for nuclear waste disposal, and address local concerns such as safe transportation, tourism, etc.

We understand that the Congressional vote on the Yucca Mountain Project may be divided along party lines, as nuclear waste disposal is a very sensitive and emotional issue among certain constituents and the populace. *However, this issue is one of risk management, a scientific issue, and votes must be cast on the basis of the scientific evidence presented by the DOE and independent scientists.*

The safe disposal of our nation's nuclear waste is too critical an issue to allow unwarranted fears to sway rational decision-making. *A NO vote may, in the long run, be extremely detrimental to the environment and to the safety of future generations of American citizens. We cannot stress enough the importance of this vote. The long-term public interest must be chosen over local and short-term interests.*
We urge you to vote YES when the Yucca Mountain Project comes before Congress for approval this coming year.

Sincerely,

Nicholas Gossen(NY), Jacob Hundt(WI), Mark Kirby(PA),
Edward Moser(VA), Michael Thoms(NY)