Marketing Fear: Nuclear Issues in Public Policy

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Nuclear Issues in Public Policy

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This article tries to determine the political payoffs of marketing nuclear fear. Three subjects are selected for analysis: radiation, plutonium, and nuclear waste disposal. Predicted dangers of low-level radiation use a concept called "collective dose"; however, collective dose is not a predictor of radiation health or injury, let alone cancer or death. Plutonium, commonly referred to as "the most toxic element known to man," is the material nations manufacture for nuclear weapons. It is also the inevitable by-product of nuclear power production and incites public fears of nuclear weapons proliferation and dangers of underground disposal. Finally, the article looks at nuclear waste disposal—Can it be done at all? Is the "nuclear industry" afraid to do it? Or are they and the government unwilling to do it because it costs too much? There is serious political payoff from raising nuclear issues. There is more than science to be considered. How an issue is marketed to the public becomes critically important.

Keywords: *nuclear; fear; radiation; plutonium; proliferation*

The vote in the U.S. Senate on Yucca Mountain was the week that I had set aside for editing and completing this article. The 1982 Nuclear Waste Act requires that the Department of Energy (DOE) research a site, determine if it is suitable as the site for the repository of some 100,000 metric tons of spent fuel from America's commercial nuclear power reactors and some more from the nuclear weapons laboratories (some dating back to WW-II), and prepare the case for submittal of the site to the president. If he accepts it, the governor of the state in which the site is located can then veto the choice. And then, unless the Senate and the House each vote to override the governor by a simple majority, the site and the entire program are terminated with no recourse.

Yucca Mountain, Nevada, was identified as the first site for high-level nuclear waste disposal. Nevada's political leaders cried "Foul!" despite its desert terrain, its history of government projects and funding, and that more than 100 nuclear weapons had been exploded under Nevada's surface leaving radioactivity in the ground without engineered containers. Nevada had never tried to use state's rights to stop any of these activities at all.

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DOE conducted extensive studies and submitted Yucca Mountain to President Bush. As expected, the governor of Nevada cast his veto. The House voted to override the governor of Nevada's veto by about 3 to 1. The purpose of this July 2002 vote was to see if the Senate would override as well. And unlike the House, it was destined to be close. The Senate is divided 49-49 with one independent who has committed to vote with the Democratic leadership and Jesse Helms (R-NC) too sick to vote. Senator Harry Reid of Nevada built his legislative career on stopping Yucca Mountain, and Reid was now the Democratic Whip, the No. 2 man in the Senate.

The Waste Act was deliberately structured to force a once-and-for-all binding answer on the nation on the choice of its first high-level nuclear waste disposal site. If the governor's veto were to stand, Yucca Mountain is dead; the $6 billion-plus that has already been spent on it is gone. And that site could never be proposed again. The DOE and the nuclear industry wanted a clear decision to go ahead that would not be nibbled at year after year, and they were confident that the need to provide final waste disposal would carry the Congress. Opponents figured that they might be able to pull an upset and win their dream: show that nuclear waste cannot be disposed of and then see the demise of nuclear power.

So this vote had huge implications for nuclear power. Without a final waste site, critics of nuclear power will claim (as they have consistently claimed for years) that there is no safe way of disposing of nuclear waste, that no new plants be can licensed for construction, and that existing plants should be either phased out or promptly shut down.

The debate was filled with statements of concern about safety and counterarguments offering data and experience to support the safety of the site and the waste disposal plan. But it was hard to avoid the fact that this debate was totally political. The various arguments were window dressing: All familiar, hashed over time and again, and objective analysis confirmed that the case for the project was indeed sound.

Senator Reid said in his wrap-up before the vote that 300 environmental organizations were opposed to Yucca Mountain. He said it was not needed now, that transportation of spent fuel was too dangerous, and that the government had changed environmental standards in response to lobbying by wealthy corporate types in $700 suits and Gucci loafers.

But where was the science? Some of the objections that were raised were simply wrong on the science. The research had been done and published. The results were favorable for the project, but critics misrepresented them. The need was specified by the Waste Act, spent fuel has been shipped all over the world safely for decades, and the Environmental Protection Agency (EPA) had changed groundwater standards in 1994 in an attempt to stop Yucca mountain! Do we know every bit of science we would like to know? No, not yet, and that is clearly explained in the project plan. Some comes earlier, some later. And some will not be proven until hundreds or thousands of years of experience prove them. The issue is now, and always has been, political.

I watched the Senate debate and the vote on C-SPAN2. The governor's veto was overridden by the Senate by voice vote. But it was certainly not that simple! The strategy of Senators Reid and Daschle was not to let the override get to a vote on the floor at all. And if the vote did not take place, Yucca Mountain would die. The procedural vote came first. It won, 60-39. With 60 supporters, it was "game over" and Yucca Mountain survived, to begin its arduous licensing process before the Nuclear Regulatory Commission, where all the arguments will be heard again.

It was the Yucca Mountain debate that led to the suggestion that I submit this article. My subject is how misinformation and manipulated interpretations of science are used to create fear and suspicion, thereby to influence public policy decisions.

How does information about nuclear issues enter the public arena? How is it reported? What does the public actually learn? Do people really care? And what are the political payoffs of marketing nuclear fear? These questions have been addressed in academic and policy circles. In 2002, a new dimension was introduced. How did the terrorist attacks of September 11 get into it? Terrorist attacks used to be subjects for hypothetical studies. Now they are realities that must be dealt with. And now they can be used for marketing fear—especially about anything nuclear.

Three key subjects are selected here as examples for analysis and discussion: radiation, plutonium, and nuclear waste disposal. The discussion shows how science and policy clashed on radiation and plutonium and how these issues have played out in the battle over nuclear waste disposal. In particular, it is important to look at "concerns" that, on even simplistic examination, prove to be false. Some of these are so blatantly misleading that "contrived" would be a more accurate descriptor for so-called concerns.

RADIATION

No subject seems to attract more media attention than fears of nuclear radiation. The news is of numbers of deaths from nuclear applications, such as power reactors, x-ray machines, transportation or storage of radioactive waste, and, of course, attempts to dispose of radioactive waste by burying it. These predicted dangers of low-level radiation use a concept called "collective dose." One adds up large numbers of very small doses. Each individual exposure may be of the order of the annual variation in natural background radiation that people live with all the time. The model that says that each additional increment of radiation exposure adds the same amount of cancer risk is called the Linear Non-Threshold Theory (LNT). Many scientists point out that doses well below natural background levels cannot really cause a detectable cancer. They suggest that one should not count cancers unless an individual receives a significant dose, a

threshold below which the calculated numbers of cancers would be meaningless. But the non-threshold concept says that you count everything.

The collective dose is divided by an amount of radiation that is predicted to cause a cancer in an individual, based on animal experiments, Hiroshima, and so forth, that could lead to a death later in life. The concept was developed to set conservative standards for safety studies and worker exposure. But these predicted cancers are reported without telling the public that collective dose is not a predictor of radiation health or injury, let alone cancer or death.

The most effective exploiter of this theory was Dr. John Gofman, a former division director at the Lawrence Berkeley Lab. Gofman (1981) published several books[1] based on LNT predictions. He said that if every individual absorbed the radiation allowed by the U.S. Atomic Energy Commission's (AEC's) radiation standards, a huge collective dose would result, and therefore, the AEC was approving hundreds of thousands of cancers per year. Gofman did the talk show circuit, addressed environmental groups, and testified before friendly congressional committees.

But if editors or even congressmen took a closer look a couple of questions might occur to them, even if they did not know that the LNT gave meaningless numbers. How would every person get the same radiation dose as the allowable limit for a nuclear laboratory worker? Of the hundred thousand people working in radiation jobs, only a handful reached this limit in a year, and those resulted from mistakes, inadequate planning, and a very small number of minor accidents.

In America, about 20% of all people actually die of cancer, and almost none of these have ever been attributed to radiation. There must be some disconnect here.

How is the LNT used today by nuclear critics? Scenarios include terrorist attacks on trains or trucks carrying spent nuclear fuel, safety reports that analyze extreme reactor accidents, and even chest X-rays and mammograms. Although it is physically impossible, critics warn of a Chernobyl-type disaster in a licensed U.S. reactor. Doses to millions of people 20 miles away from the plant are calculated to receive radiation equal to 1% of natural background radiation. The collective dose is divided by a dose that would likely cause a cancer in an individual, similar to if a patient were blasted with a cancer therapy dose over his entire body. A small fraction of a few million would be a lot of people! It makes a scary headline.

The transportation story is simpler. Critics call transportation of nuclear waste the "mobile Chernobyl." A truck rolls past a city on a nearby interstate. Only a very sensitive detector can measure radiation on the outside of the massive spent fuel container on the truck. They multiply a tiny amount of calculated radiation by millions of people and say that truckloads of radioactive waste would cause a hundred cancers. It is the LNT carried to absurdity.

I used to use a simplistic story to illustrate the LNT: Twelve lawyers stop at a bar in the commuter train station and each has a martini in the 1/2 hour before the

train leaves. If 1 lawyer drank 12 martinis in a 1/2 hour, he might die, and he surely would get sick and pass out. The LNT says that 1 of the 12 lawyers is just as likely to die as the drunk. (Do any of the others get a little buzz?)

Actually, the formulation of the LNT says that the calculated number is somewhere between the Gofman number and zero, with the greatest likelihood being zero. Even this is hugely conservative, but this definition of the LNT is never mentioned by nuclear critics.

PLUTONIUM

The "most toxic element known to man" phrase generally shows up in any article about this strange metal. Plutonium is the material that nations produce for manufacturing nuclear weapons. It is also an inevitable by-product of nuclear power production. It can be recycled to make more power or it can be buried. Either way, plutonium incites public fears of nuclear weapons proliferation and long-term dangers of underground waste disposal. The facts are just complicated enough that the public rarely is told any of them!

Plutonium has a long half-life: 24,000 years. The longer the half-life, the smaller the rate of radiation release. Experience shows that plutonium can be safely managed, but the specter of stolen plutonium, or a "dirty bomb" made from it, can scare every TV viewer. We and other nations have managed plutonium very safely. Its radiation can be stopped by a sheet of paper. Plutonium dissolved in water can be drunk and it will pass harmlessly though a person's system.

Finely divided particles of plutonium oxide, if inhaled, can lodge in the lungs, and this is the threat of plutonium. It is handled in sealed cells, and in clean-up situations, workers wear filter masks. The image of plutonium is frightening. But imagine it leaking from shielded containers buried 2/3 of a mile deep in rock, somehow dispersing itself, and reaching drinking water in 10,000 years. This is an improbable scenario. But this is the stuff from which safety studies about nuclear waste disposal are made.

President Carter announced a policy in April 1977 that the United States would indefinitely defer its plans to reprocess used nuclear power plant fuel, concentrate the wastes for disposal, and separate the plutonium for recycle in new fuel. With that decision went the dreams of breeder reactors that might supply electricity for hundreds or even thousands of years into the future.

Why? Carter was looking for a comprehensive policy that would prevent other nations from making nuclear weapons. He saw reprocessing as a source of weapons material. Although theoretically possible, this was known to be impractical for any nation that hoped to protect itself or threaten anyone else. But Carter knew little of the practical aspects of weapons, and he was afraid to trust real experts in his weapons labs or anyone in the nuclear power industry. Environmental groups and even the National Council of Churches

recommended the policy Carter chose. Carter believed he was right and that by showing his personal commitment, other nations would follow his lead. They did not.

The arguments used to stop recycling of plutonium early in the Carter administration offer a valuable case study. Under the banner of the National Council of Churches, a little red booklet was circulated all over the country: *The Plutonium Economy.* Any reader would come away scared. Any politician would shy away from such a dreaded future. Jimmy Carter made nonproliferation a campaign issue. At the urging of environmental groups, he made stopping plutonium recycling and the breeder reactor one of his "promises" to the people in his speeches and satisfied his activist supporters. (After he was elected, he tried to deliver on all of the "promises" he had made during the campaign! He succeeded with only a few. Unfortunately for the nation and the world's energy, this was one of them.)

Since 1977, the image of civil plutonium as the path to proliferation has become ingrained in our national policy, even though international experience shows it was never the real issue. Plutonium remains feared. Nuclear waste disposal research and development were set back several decades; no new nuclear plants were ordered and many were canceled. Carter had been told by environmental groups that nuclear power would go ahead just fine under his policy. It did not.

NUCLEAR WASTE DISPOSAL

Can it be done at all? Is there really no way to dispose of nuclear waste? Is the "nuclear industry" afraid to do it? Or are they and the government unwilling to do it because it costs too much? Because radiation and plutonium are involved, these perennial issues are used to raise fears about whatever is done (or not done) with radioactive nuclear waste.

There is real political payoff from raising nuclear issues. A number of people have become very accomplished at doing so. Some have made careers of it. Senator Harry Reid owes his powerful position as Whip of the Republican Party in the Senate to opposition to Yucca Mountain, the site in Nevada that has been selected for waste disposal if it can survive the Senate and the U.S. Nuclear Regulatory Commission (NRC) licensing process. Every argument raises the issues of radiation, plutonium, and nuclear waste itself (and they throw in others like generational equity and Indian rights).

In a seminar at Stanford in 1997, Senator Pete Domenici of New Mexico said,

> The nation's handling of nuclear waste issues is a disgrace and blocks our progress on nuclear energy. The path we've been following towards a permanent repository at Yucca Mountain has not led anywhere to date. The explorations and geological studies have been stretched out and delayed by opportunistic tactics of interest groups. With funds that ratepayers provide, DOE has extended these efforts in the

> name of "being conservative." It is strongly in the interest of all citizens to dispose of radioactive waste so as to ensure minimal risk to current and future generations.
>
> The applicable legislation requires a 10,000 year horizon, but even this has no scientific meaning. The whole idea is to dispose of wastes permanently. That is why radioactive wastes will be placed deep in the Earth in dry rock that has not moved for a million years.
>
> The idea of long radioactive half-lives has been used very effectively to frighten people. But if the half-life is long, the amount of radiation is much less and it is also less dangerous, not more! If we apply nuclear waste standards to ordinary chemicals that we dispose of in landfills, after a few hundred years they would be more toxic than the radioactive waste![2]

These are words that Senator Domenici has used in more than 100 speeches about energy and nuclear power since he first stepped out in front on these issues in a speech at Harvard in early 1997. He pointed out that some nuclear power plants might run out of space to store spent fuel on site. Without confidence that there will be a permanent repository, state governors and legislatures have battled against allowing plants to expand on-site storage. One governor (Hodges of South Carolina) announced his own theory: "Once put somewhere, nuclear waste stays there forever!" (He was talking politically, not technologically!) Therefore, he stated, "no more spent fuel should be stored in my state" even if they called it "temporary storage," and no other governor should be caught in this trap either.

There are no physical or scientific reasons why this should be the case. But politics is every bit as real as physics when it comes to nuclear power policy. The "Not In My Backyard" (or NIMBY) syndrome was at work full-time!

The problem for a nuclear power plant is that used fuel must be unloaded in order to load new fuel and continue to operate. As Senator Domenici put it,

> The alternative is that some nuclear plants will he forced to shut down as they run out of storage space, a fact that is not lost on some of the antinuclear groups. For every nuclear plant that is shut down prematurely, its energy will be made up by burning more natural gas, and not by more conservation or more as yet unnamed alternative energy sources.
>
> As for Yucca Mountain, I propose we start interim storage now, while we continue to actively advance the required studies and excavations toward the permanent repository. This is hardly an original thought! 65 Senators and 307 Representatives agreed with the importance of interim storage. So far, the Clinton Administration has only threatened to veto any such progress and has shown no willingness to discuss any alternatives.

The record of the Clinton administration is clear on this issue. No progress was made by the DOE on resolving several subtle but critical issues that may be showstoppers in the licensing process. One is the use of collective dose to estimate cancer deaths from hypothetical leakage from the repository or transport of spent fuel casks in 10,000 years.

Another is the groundwater standard: a limit on radioactivity in groundwater below the repository after thousands of years. EPA chose to set the groundwater standard deep in the earth to be the same as that for public drinking water! Leakage from this repository may never occur, but if it has to be assumed for analysis purposes, some numbers will be calculated. But where are the people who would subsist on this water? And how foolish or technologically inept are they supposed to be? In addition, the background radioactivity of groundwater deep in the earth is measurable now and generally exceeds levels in our drinking water and the EPA's standard.

As the Senate override vote approached, it became a media issue. Critics told the media that DOE's plans for transportation of spent fuel across the country to Yucca Mountain were "incomplete." Really? No shipments will be made until specific plans are made, and that is years away. Actually, the Department of Transportation adopted regulations for such shipments in 1975, and they have been successfully and safely carried out for decades, before and after that rule. (It says to use the interstate highway system wherever practicable and to file reports of radiation surveys before and after shipment.) A state would violate the Interstate Commerce clause of the Constitution if it arbitrarily restricted a shipment.

But with help from the LNT and dire predictions of cancers from passing trucks or incredible accidents, the "mobile Chernobyl" stories got legs. *TomPaine.common sense*, a public interest journal, bought a 7" × 12" ad in the *New York Times* alerting people to its Web site map of every nuclear waste shipment route in the nation ("Mobile Chernobyl," 2002).[3] It warned that one in seven Americans (38 million people) "live within one mile of a proposed route," including 14,500 schools and the White House.

Jim Hall (2002), a former Chairman of the National Transportation Safety Board, said in a *New York Times* op-ed that the large number of waste shipments would be likely targets for Al Qaeda terrorists. Perhaps terrorists could steal radioactive material from a shipment and make a dirty bomb! His recommendation? Stop the vote; stop everything, then test everything about security of shipments (which has been done and Hall should have known all about it), and do all this in an open process that includes input from state officials, and so forth. Of course, delaying the vote past July 25 would kill Yucca Mountain. (Hall is also a consultant to the State of Nevada.)

By the time the Senate's 10 hours of scheduled debate on Yucca Mountain ended, Senator Harry Reid knew that the vote count would go against him. A procedural vote was called for which would clearly indicate the will of the Senate. In his wrap-up, Senator Reid rattled through all the familiar arguments. He quoted extensively from the lead editorial the previous day in the *Seattle Post-Intelligencer* ("Yucca Mountain," 2002). It dealt with "the monster we have created" and the "resting place for this radioactive Frankenstein."

The editorial pointed out that Hanford, Washington, almost became the nations' waste site, and "We didn't want it any more than the citizens of Nevada

do." And Washington also wants to get rid of the wastes now stored at Hanford. Reid said that the editorial called for more testing, making the standards rigorous enough, making the site as safe as possible, and for the Senate to be cautious. Reid did not mention the downside risks of failing to approve Yucca Mountain.

RESPONSIBILITY

Every real issue has many potential impacts. All too often in America and other Western democracies, environmental concerns are reported in terms of risks imposed on plants, animals, and the ecosystem. But on more thoughtful examination, actions or restraints demanded for mitigating environmental impacts carry downside risks on society, future options, and even other aspects of the environment.

A historical example might illustrate the meaning of downside risks: In the 1970s, the National Environmental Policy Act and citizen participation resulted in delays and even cancellation of many nuclear power plants. One downside risk was the increased substitution of coal, oil, and gas to generate electricity. Another was the weakened financial condition of utility companies to meet their obligations, resulting in short-term actions when careful long-term planning would have been better for all. Even more chilling: The prospect of utilities not being able to meet the legitimate demand of consumers and employers in the region they served resulted in cutbacks in new industrial plants and community infrastructures that weakened the region in the years to come.

In Germany, the Greens have made ending nuclear power a key part of their platform, regardless of the implications for Germany, Europe, and the environment. These three popular issues are used to make their case. Governments of France, the United Kingdom, Japan, and South Korea warned the United States of dire political repercussions on their energy supply plans if the United States were to lose Yucca Mountain.

Another downside risk is that the political appeal of NIMBY politics could strangle all kinds of necessary but unappealing projects. Waste disposal may only be the most obvious. Many believe that the United States really should be one nation, indivisible . . . with justice for all.

There is more than science to be considered. How an issue is marketed to the public becomes critically important. Carter raised a subject that barely made the screen of a few people, but he felt it could grow into headlines.

The point is that nothing in this world is really risk free. Scientists and engineers have done a poor job of educating society to this simple fact. But soft scientists and professional communicators also need to raise their levels of comprehension of science, statistics, and economics.

Both reporting in the public media and input to Congress have changed over the past several decades, and change is accelerating today. Credibility has become a commodity that is marketed to an audience: the people who might

vote. Analyses of examples can offer some understanding of political moves but do not promise any simple ways to obtain better public policy.

NOTES

1. Gofman also published several other books in hard cover and paperback, all with the same theme.

2. These excerpts are from an audio transcript and prerelease text. Senator Domenici gave many speeches containing these thoughts, starting with one at MIT in 1997.

3. Sites listed as information sources are TomPaine.com, MapScience.org, and Pogo.org. The advertisement sponsor is listed as The Florence Fund, Washington, DC 20009.

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