Perspective

Reexamining low-level radiation health effects

BY SEN. PETE V. DOMENICI

Senator Domenici has encouraged the creation of a DOE research program to study molecular and cellular responses to low-dose radiation.

I'VE BEEN SPEAKING out on the issue of low-level radiation health effects for some time now. I'm concerned that our poor understanding of these effects may be leading us to use radiation protection standards that incorrectly represent risks.

Radiation standards are now determined with the linear no-threshold (LNT) model. That model is based only on linear extrapolations from a small set of very high dose and dose-rate exposures, like those from atomic bomb victims. For a whole host of reasons, American taxpayers deserve to know whether that model is accurate. The applications and implications of the LNT model, and the uncertainties inherent in it, are just far too large for it to continue to be applied without more complete understanding.

The current model forces us to regulate radiation to levels approaching 1 percent of natural background, despite the fact that natural background can vary by far more than 50 percent within the United States. We now use standards that severely restrict exposure to low-dose radiation, even to the point that we expect all work to be done such that the absolute minimum possible dose is delivered with virtually no reference to the costs involved. We spend more than $5 billion each year to clean contaminated Department of Energy sites to levels below 5 percent of background.

If these standards overestimate risks, they force us to divert funds from other, potentially more worthy, national goals. Alternatively, if the standards underestimate risks, we need to invest still more in cleanup activities. Many companies' profits from these cleanup contracts are enhanced by the use of the LNT model, which unfortunately tends to build a constituency with a vested interest in maintaining the LNT model.

The LNT model is also used to infer that minuscule doses, decades below natural background levels, applied to large populations through mechanisms like transportation of radioactive materials accumulate to lead to some number of fatalities. Such inferences then lead to headlines trumpeting the terrible risks to which the public is being exposed. Rarely, if ever, are these risks placed in perspective against other risk sources. And the gigantic uncertainties in the LNT model and significant evidence contradicting the LNT model are almost never discussed. Thus, many of the antinuclear groups have a vested interest in using the LNT model.

The role of many antinuclear groups has especially puzzled me. On the one hand, many of these groups express great concern over emission of pollutants from fossil fuel plants, both from the perspective of fouling the air and from concerns over global warming. But the simple fact that must be obvious to them is that nuclear energy is the only source of completely clean energy that is available today to have a serious impact on these pollution issues.

Maybe the renewable energy sources that these groups favor will make the impact that they hope in decades to come, but the economics are not correct now. If these groups would direct some of their effort into finding good solutions for nuclear waste, addressing potential proliferation issues with nuclear technologies, and seriously reassessing and updating the LNT model, I would find it far easier to believe the sincerity of their stated goals. In short, if they would balance their concerns about the risks of nuclear with serious discussion of its benefits, and then direct some effort to address the risks, the nation might be able to make real progress in this area.

Unfortunately, the Environmental Protection Agency only reinforces these fears by publishing documents that claim to calculate, to several significant figures, the radionuclide risk coefficients for specific organs from specific isotopes. Given the uncertainties in the validity of the fundamental model, I don't understand how the EPA can claim to have enough detailed understanding of the effects of low doses of radiation to publish such a document.

A great many scientists seriously question whether the LNT model is appropriate. Many suggest that data would support a model wherein benefits are derived from moderate doses of radiation, perhaps by stimulating cellular repair mechanisms within the body. Many suggest that the constant exposure to natural backgrounds has required the body to develop a suite of repair mechanisms.

Some scientists have asked that I play roles as extensive as convening Congressional hearings to explore the basis of the LNT model, or that I legislate radiation protection standards. I've not called for such hearings, despite my interest in this problem. A Senate hearing is not an appropriate place for the evaluation of complex scientific questions. Senators are not the ones with the special knowledge to make these judgments. Many of you in this audience should be the ones involved in these decisions.

Instead, I've encouraged creation of a new research program within the DOE, devoted to serious study of molecular and cellular responses to low-dose radiation. This program was funded at $12 million in fiscal year 1999 and is now funded at $18 million in FY 2000.

I am very hopeful that this program, over a period of a few years, can couple new experimental capabilities with information from ongoing programs, like the human genome project, to provide us with real understanding on which to base intelligent standards for radiation protection. Whether the answer is that the LNT model overestimates or underestimates risks, the information is vitally needed so that cleanup and regulatory activities can be appropriately adjusted.

I understand that the DOE has constructed a program plan for this study that offers the opportunity to develop a scientific, not philosophical, basis for credible radiation protection standards.

In addition to the DOE research program, I've also asked for a special investigation by the General Accounting Office. I've asked them to assess the cost impact of the LNT hypothesis, on projects as diverse as high-level waste disposal, low-level waste disposal, nuclear power plant decommissioning and decontamination, and environ-

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This article is based on prepared remarks (slightly edited and adapted for Nuclear News*) by U.S. Sen. Pete V. Domenici (R., N.M.) and delivered by his science advisor, Pete Lyons, at the conference "Bridging Radiation Policy and Science," held December 1–5, in Warrenton, Va. Senator Domenici is chair of the Senate Budget Committee, chair of the Energy and Water Development Subcommittee of the Appropriations Committee, and is a member of the Appropriations Committee, the Energy and Natural Resources Committee, the Governmental Affairs Committee, and the Select Committee on Indian Affairs.*

mental cleanup projects. The GAO study is to be completed by June 2000.

I've asked the GAO to assess whether a consensus among agencies is being reached on these standards—and as far as I know, we are just as far from a consensus as we were when the GAO did its last report in 1994. The fact that two agencies (the Nuclear Regulatory Commission and the EPA) have different standards should be of great concern to taxpayers; it forces companies to plan for multiple targets without confidence in either. That only leads to waste.

Just recently, several senators have taken action in S. 1287, the Nuclear Waste Policy Amendments Act of 1999, to rectify this situation. Our concerns with the EPA were sufficiently strong that this legislation mandates that the NRC, not the EPA, be empowered to set the radiation protection regulations for Yucca Mountain and any early receipt facility for spent fuel nearby. While some of our colleagues argued with this position, most of us feel that the EPA is too driven by political agendas to be relied upon for standards in an area where there is substantial room for political pressure to influence standards. The NRC not only has the technical expertise, it also is a bipartisan body, free of direct political influence, that can best protect taxpayers' interests in this vital area. This bill was reported out of the Energy and Natural Resources Committee by a healthy 14–6 margin, and will be awaiting placement on the Senate calendar in the next session of the 106th Congress.

I also asked the GAO to review the experimental bases for setting radiation protection standards and to document the variances in background radiation among locations in the United States and around the world. I asked them to assess whether cancer rates measured at these various locations show a dependence on radiation levels. And of greatest importance, I asked them to assess the costs of compliance with the standards based on the LNT model. Perhaps from these GAO analyses, Congress can make a more informed decision about the guidance that we provide to standard-setting agencies.

Until recently, I had high hopes for the Biological Effects of Ionizing Radiation, or BEIR VII, study under the auspices of the National Research Council. Maybe this study will deliver credible outputs, but it surely is off to a terrible start. I was very disappointed that national experts in this field were first named to the proposed committee, only to be summarily dismissed later when antinuclear groups protested. These people are experts with world class reputations, even if some have expressed views that may not favor the LNT model. Such attacks by the antinuclear groups again call into question their own interests in seeking the scientifically correct answer. This episode clouds the entire undertaking, in my view.

I understand that one effect of the waffling on the BEIR VII panel is that the entire Health Physics Society isn't even represented, which seems totally inappropriate. The Council needs to question seriously the impact that its actions have had on the reputations of these outstanding research scientists, and to question whether their resulting committee can now have credibility independent of who is on it. Furthermore, even after succeeding in their quest to dump experts from the panel, the antinuclear groups are still expressing concerns about the makeup of the BEIR VII panel. This is even harder to understand when many of the people on the panel have served on groups that previously endorsed the LNT model.

I've indicated some actions that I'm not comfortable recommending for the Congress. Let me close with a few thoughts on what actions might be appropriate for Congress, along with the general comment that Congress should focus on broad policy directives, not specific numbers in standards. Just as possibilities, we might mandate that no standards be more stringent than the variation in natural levels within the United States for any substance or phenomenon, unless specific health studies support the need for a departure. Or we might mandate that standard-setting bodies take the economic impact of their actions into account, in order to inject some degree of economic reality into the standard-setting process.

The membership of the American Nuclear Society should be very interested in final decisions on these standards, with their major impact on every aspect of the society's interests. I hope that your society, either as a whole or as individual members, will continue to weigh in with your informed views on these important issues. NN