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Academic Education Committee
Health Physics Society Annual Meeting
Boston, Massachusetts

July 26, 1995

Radiation Protection: A DOE Program In Need Of Leadership

What I have to say here today is a legacy from Dr. Robley Evans of MIT, Fermi Award winner, under whom I studied the principles of ionizing radiation and AEC Commissioner Thomas E. Murray, vigorous advocate of radiation research, who ever demonstrated enlightened leadership in radiation protection matters.

My purpose today is to acquaint you with the Defense Nuclear Facilities Safety Board (Board), what it does and how it operates. It is then to portray radiation protection problems that exist within the Department of Energy (DOE), and what the Board has recommended to correct them. Finally, it is to suggest some actions which your Society might wish to consider taking, actions that would be mutually advantageous to DOE, to your profession, and most importantly, to the public.

The function of the Board is to provide independent, external oversight of the defense nuclear facilities of the Department of Energy to assure protection of public health and safety. The Board reports to the President. Congress established the Board in 1988 because of well-justified dissatisfaction with the performance of DOE in matters of safety at defense nuclear facilities.

* These remarks are my own views; they should not be viewed or interpreted as representing the views of the Board or its other Members.

Fundamental to everything that the Board has accomplished is the assembling of an outstanding staff, preeminently strong in technical qualifications. Using this staff to assess health and safety matters at defense nuclear facilities, it then makes formal recommendations to the Secretary of Energy about actions that need to be taken. During almost six years of Board operation, the Secretary has accepted each and every recommendation. The Board also provides written reports to DOE on the results of safety assessments the staff makes at DOE sites.

It is most important to note that each recommendation made by the Board concerns a serious problem which DOE line managers ought long since to have identified and corrected. Moreover, these problems ought also to have been identified by DOE's large independent internal safety organization, operating in a back-up capacity. Far, far too often they were not, and are not, identified by either line or back-up. One major and very simple reason is that the DOE organizations involved just do not have sufficient numbers of technically qualified personnel who are competent to do so. And this weakness is pervasive at all management levels. It is a weakness of very long standing. From earliest days, basic agency policy and practice has been that the labs and contractors would provide the technical competence for the vast enterprise and the government would restrict itself to providing general program guidance and devote most of its attention and personnel resources to contract administration.

Throughout most of its history, DOE has neither wanted to acquire a strong in-house technical management capability nor really been convinced it could be acquired. As a matter of deliberate policy, DOE has chosen not to become a demanding customer, that is, a customer technically qualified to define objectives, establish standards, and insist upon performance. This fundamentally unsound policy is what lies at the root of the difficulties in which DOE finds itself today. It certainly is at the heart of DOE's radiation protection problems.

There are two exceptions to what I have said. Secretary Watkins tried very hard to turn DOE into a demanding customer and instituted many reforms directed toward that end. Key ones were either jettisoned or abandoned when he left; DOE as an agency reverted to type. The second exception is the naval nuclear propulsion program, which is a joint program of DOE and the Navy. This program operates on the bed-rock principle of the government's being a very demanding customer, eliciting results through in-house technical competence and exacting standards, rigorously applied.

Shortly after the Board was established, it quickly identified serious radiation protection problems at several sites, like Savannah River, Rocky Flats, and other sites to which it was giving priority attention. Written reports of these problems were sent to DOE with the not unreasonable expectation that the agency would both correct the specific problem and then take more wide-ranging action where indicated. Very little improvement was noted; instead, increased evidence of widespread radiation protection problems continued to mount.

Thus, in late 1991, the Board issued Recommendation 91-6. It recommended, among other things that:

- The Secretary issue a formal statement of radiological health and safety policy, and that DOE
- Review existing programs and implement a plan for expanded training,
- Delineate qualification requirements for radiation protection personnel, including interaction with your Health Physics Society and the American Board of Health Physics,
- Critically examine DOE existing infrastructure to determine if resource, organizational, or managerial changes are needed, and
- Compare procedures, practices, and standards with those other government commercial, and professional organizations.

Having accepted this recommendation, DOE set about developing the required implementation plan. After rejecting several drafts, the Board concluded that DOE needed help to produce an acceptable plan. Only by assigning two of its most experienced staff to help DOE was the Board able to elicit, by mid-1993, a plan that was acceptable.

Still, the problems persist. Just as it requires personnel who are qualified, technically and managerially, to prepare a plan, it requires them in even greater numbers and at more locations to implement the plan. DOE just does not have those needed numbers. The result was, perhaps, inevitable. DOE has not been effective in carrying out the plan on schedule.

For example, implementation of knowledge, skills, abilities, and qualifications for key radiation personnel, both in DOE and contractor organizations, have not yet begun and are approximately a year behind schedule. Then too, DOE is having great difficulty evaluating the adequacy of its infrastructure. At this time, completion of the evaluation is over a year behind schedule.

Lack of knowledge, training, and disciplined conduct of operations has led to many lapses at DOE sites. Let me cite three and refer you to the appendix of my written remarks for others.

1. At a plutonium separations facility, a line supervisor encouraged and a radiological control technician allowed a worker to enter a ventilation system duct containing plutonium without a radiological work permit or procedure. The worker opened the fan housing and had an uptake of plutonium from the resulting puff.

2. During waste removal from a glove box in a plutonium processing line, a radiological control technician helped remove the plutonium-contaminated waste because an inadequate number of operators was present. The work was allowed to continue

resulting in pressurization of the containment and release of airborne radioactivity into the room.

3. At one facility, a lunch room was located inside a radiologically controlled area. When the Board's staff called attention to the matter, management removed the lunch room; however, no action was taken on several other lunch rooms located within similar areas.

How can DOE cope with its problems? I suggest that we analyze the matter in terms of the three pillars of safety: personnel, standards, and organization. As regards personnel, it is instructive to look for background at the Society to which you belong. Review of its rolls, as published in the Radiation Protection Professional's Directory & Handbook 1994-1995, reveals that nearly 25 percent of the working membership are employed by various agencies of government, both federal and state; another 10 percent work at the National Laboratories; and 20 percent are employed in the commercial sector, in significant part for contractors to the DOE. Of the Society's professional membership, more than one in six is certified by the American Board of Health Physics.

With that in mind, lets take a look at the numbers and quality of personnel in DOE's radiation protection program, beginning with the numbers. The defense nuclear complex consists of at least 10 major and numerous minor sites around the country. To protect their workers and the public at these sites, DOE contractors employ over 3400 radiation protection personnel, more than 1300 of them at the managerial level. Yet DOE itself is attempting to manage this program with just 44 full-time positions at these 10 sites. Even the DOE recognizes this as unrealistic; a report recently issued by the Senior Radiological Protection Officer of DOE's Office of Oversight, flatly states that these 44 positions "represent an insufficient Federal resource . . ."

This small radiation protection staff would be overwhelmed, even were it comprised only of those most qualified in this Society. But, when one looks at the matter of quality, another dimension of difficulty emerges. DOE reports that only four of its 44-man site radiation protection staff has been certified by the American Board of Health Physics. Four! DOE's contractors have nearly 100. These four focus their activities at three DOE sites; most sites, therefore, have no certified radiation protection professionals among the federal ranks. By contrast, DOE's contractors have several certified radiation professionals at each major site, averaging about 10 per site. Delving deeper into the qualifications of the 44 people discloses an even bleaker picture: A sampling indicates that 17 percent of the DOE professional radiation protection staff do not even have a college degree; another 17 percent have a bachelors degree, but in a non-technical major. Thus, the sampling suggests that about one-third of the DOE radiation protection program staff has been thrown into battle without the strong educational background needed to cope effectively with the agency's problems.
The remedy for lack of qualified people in DOE is two-fold: education and hiring from outside DOE. However, the agency has a proclivity for hiring from within. But from what has been said of the lack of quality inside, strengthening from that source alone is clearly not the answer. Many qualified individuals must be brought in from outside DOE.

Much greater attention must also be given to educating DOE personnel as a means of strengthening DOE capability. And by education, I mean education based on courses with solid academic content. In this instance, I emphatically do not mean training, essential as training is in its own proper sphere. DOE has great difficulty distinguishing between education and training when it comes to upgrading its own personnel. It tends to think of training devoid of academic content as the remedy for almost all of its own internal personnel problems, both in radiation protection and elsewhere.

To meet the personnel needs of contractors, on the other hand, DOE has traditionally taken a more enlightened and rational approach. I refer, for example, to the AEC Fellowship Program, begun in 1948, which educated as many as seventy or so fellows a year until it was phased out in 1973. Although it was resumed in 1988, the numbers educated have been relatively small.

It should be noted that less than one percent of these Fellows have been hired by the sponsoring agency. This, of course, is in consonance with the policy: technical competence from agency contractors, business management, and administration from DOE. It is unfortunate that so few AEC Fellows have been employed by the agency and its successors. Had this been done, DOE might now find its radiation protection programs under their enlightened leadership. One could then have reason for confidence that education in radiation protection disciplines would be viewed as the very foundation, the sine qua non, of a sound program.

DOE ought to be embarking, right now, on a program of education for many of its radiation protection personnel. Even as we discuss the problem, and pursuant to Board recommendation, DOE is about to begin making assessments of the qualifications of each individual against the requirements of the job. One may expect that the gaps so-determined will disclose the need for much up-grading through education. The Board will be following this very closely.

Of course, there is another dimension of education which is essential to radiation protection. I mean research in the scientific disciplines, which add to the fund of knowledge about the biological effects of radiation. DOE recently announced new programs in this regard. But, essential as research is for the future, it does not answer DOE's present, urgent need for radiation protection practitioners. We know enough today to achieve highly effective radiation protection programs, if only we educate sufficient numbers to apply what we know in effectively organized and managed efforts.

Second only to qualified personnel, the most important element in an effective radiation protection program is the rigorous application of standards. The DOE radiation protection program is currently defined by a variety of DOE standards, which include: policy statements, Orders, the Radiological Control Manual, rules, and guides. These standards, when implemented by effective and competent management, furnish the bases for a program that could provide adequate protection.

Presently, DOE standards are being reconfigured into a new system. This effort is intended to reduce the number of requirements and relocate many of them in guidance. For example, requirements such as those found in the Radiological Control Manual are at risk of being relegated to guidance. As of now, the full ramifications of this activity are not clear. However, there is a real danger that it will jeopardize the objective of achieving a radiological control program of the highest quality. Because of the extensive restructuring of the Order system, it is not even clear that all radiological control requirements needed for an adequate radiation protection program will be preserved. What is apparent is that the revision effort is both poorly organized and weakly managed.

This brings us to organization, the third pillar of safety. Instead of relying on my own observations, let me cite, and endorse as valid, some views of the Infrastructure Evaluation Team. This Team was chartered by the Secretary, pursuant to Board Recommendation 91-6, to examine the infrastructure and resources dedicated to radiation protection at defense nuclear facilities within the DOE. Headed by Dr. John W. Poston, and comprised of other professionals with preeminent qualifications, the Team issued its report early this year.

Here are some of its observations:

- "The present organizational structure within the Department is far too complex to effectively administer a radiation protection program."

- ". . . it is too complex to be responsive to expansive changes such as creating a new emphasis in radiation protection and worker health and safety."

- "There is seemingly continual reorganization throughout the Department."

- "Effective radiation protection management is lacking throughout the Department."

- "Cognizant secretarial officers at Headquarters . . . have not established a structured institutionalized framework for discharging their line responsibility."

- The Department must designate a single individual with the accountability and responsibility for insuring radiation protection policies and standards are appropriate and effectively implemented throughout the DOE."

I urge you to read this report in its entirety. The Secretary has not yet informed the Board as to DOE's views on the report and what actions will be taken on its recommendations. In any event, I anticipate that some Secretarial actions may be deferred pending completion of further reorganization of the Department. As the Team observed, "there is seemingly continual reorganization throughout the Department."

It may be asked whether it is possible for DOE to manage an effective radiation protection program. Of course it is. The naval nuclear propulsion program, which DOE conducts jointly with the Navy, provides an excellent model and irrefutable evidence that it is possible.

During more than 4500 reactor years of experience, over 250,000 civilian and military personnel have been trained to do nuclear work in that program. In the past 25 years, no one has ever exceeded 3 rem per quarter or 5 rem per year of exposure. No one has ever received more than one-tenth the Federal annual occupational internal exposure limit.

These impressive results have been achieved because the program is managed by an exceptionally well-educated and carefully selected group of individuals who comprise the government's "in-house" capability. Their efforts are directed toward extensive training of personnel, comprehensive planning of all radiological work, strict compliance with detailed written procedures, and rigorous oversight. Thus, if DOE is to upgrade its other radiological protection programs, it must begin by upgrading the educational and technical qualifications of its "in-house" cadres responsible for them.

Now, you may ask, what can the Health Physics Society do to alter this state of affairs? First, you might begin by addressing the following questions:

- Has the Society sent a report to the Secretary describing the radiation protection problems which confront DOE, your profession, and the public; and proposed remedies for them?

- Has the Society asked the Secretary for a meeting to discuss this report and what will be done to correct the problems cited?

- Has the Society made its views known to the Congressional committees on whom the Department relies for program approval and funding?

- What actions has the Society taken to keep the public informed?

Second, the Society can resolve to take a more aggressive public stance in protecting public health and safety in matters relating to radiation protection. This is a never-ending challenge. It entails as a minimum, forceful, continuing interactions between your Society and top management of DOE, the Congress, and - most importantly - the public.

Third, you can keep yourselves fully informed of all that the Board is trying to do, especially in your domain of interest. Information can be found in the Federal Register, in repositories of Board documents, which are conveniently located near DOE sites, in our public reading room, on the internet, and to those who ask to be placed on the Board's list to receive information.

Bringing about the changes needed in DOE's radiation protection program will be difficult. Machiavelli tells us reasons why:

> "There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things because the

> innovator has for enemies all those who have done well under the old conditions and lukewarm defenders in those who may do well under the new."

I am confident that you will not let these difficulties deter you. As Admiral Rickover used to remind us, "It may take God-like qualities; but you can try."

APPENDIX I

Examples of Lapses in Radiological Protection at DOE Defense Nuclear Facilities

1. At a plutonium separations facility, a line supervisor encouraged and a radiological control technician allowed a worker to enter a ventilation system duct containing plutonium without a radiological work permit or procedure. The worker opened the fan housing and had an uptake of plutonium from the resulting puff.

2. Airborne radioactive plutonium was released when residual nitric acid from the equipment being bagged, contacted and destroyed the polyvinyl chloride bag being used for containment. Nitric acid had not been recognized as a problem.

3. During waste removal from a glove box in a plutonium processing line, a radiological control technician helped remove the plutonium-contaminated waste because an inadequate number of operators was present. The work was allowed to continue resulting in pressurization of the containment and release of airborne radioactivity into the room.

4. At one major defense nuclear facility, 50 percent of the radiological control technicians failed the practical examination for radiation workers.

5. At one nuclear weapons facility, a security area entry point was located inside a contamination area. Entry into the secure area required the workers to remove their anti-contamination clothing inside the contamination area in order to remove metal objects such as watches, rings and keys.

6. At one facility, a lunch room was located inside a radiologically controlled area. When the Board's staff called attention to the matter, management removed the lunch room; however, no action was taken on several other lunch rooms located within similar areas.

7. At a high level waste tank farm, a technical consultant was escorted into the tank farms to look at continuous air monitors. After entry he was allowed free access to the tank farm. He was later found inside a posted contamination area without protective clothing. To gain access to this area he had crossed at least one other posted radiological boundary.