

News of Science

Congressional Atomic Energy Group Studies Waste Disposal Problem

In public hearings that ended early this month the Joint Committee on Atomic Energy of Congress examined the problem of disposal of industrial radioactive wastes. The hearings were part of a series on radiation hazards begun by the Joint Committee in 1957; previous inquiries have been held on reactor hazards and fallout.

In his opening statement Representative Chet Holifield (D-Calif.), chairman of the subcommittee on radiation, explained the origins of the recent hearings.

"The subcommittee and staff became particularly interested in the problem of waste disposal during the hearing in 1957 on fallout from weapons tests. Several of the experts who testified stated that the hazards of radioactive wastes from the peacetime atomic power industry will be far greater than fallout from weapons tests. While radioactive wastes from atomic reactors are obviously much more subject to control than fallout from weapons tests once released, we want to see what the nature and magnitude of the production of radioactive wastes will be, and how good the methods of waste disposal are and will be.

"Indeed, the 'waste disposal' problem may be just as neglected, from a public standpoint, as fallout was in 1954. I hope that we will not require a series of incidents such as the contamination of the Japanese fishing boat, the Lucky Dragon, from the Marshall Islands test, to focus public attention on the waste disposal problem."

The public sessions, which ran for 5 days, were held in the Capitol in the old Supreme Court Chamber, an ornate room with a sculptured ceiling that curved down from the high wall in front of which the committee's chairs were placed. Witnesses from government, industry, and the universities offered testimony on the six major aspects of the waste disposal problem that the subcommittee had outlined. The first three aspects discussed (i) sources, quantities, and characteristics; (ii) current operational procedures and methods utilized in the collection, handling, and process-

ing and disposal of waste material; and (iii) past and current work on the disposition of wastes. During the fourth and fifth days papers were presented on three other areas of the problem. These were (iv) problems of future quantities of waste and the effect of these, from the point of view of economics, on the future development of atomic energy; (v) activities of federal and state agencies in regulating disposal of radioactive wastes; and (vi) international aspects.

The report of the committee, which, according to J. A. Lieberman of the Atomic Energy Commission, will be the most complete compilation ever made of information on the waste-disposal problem, will be published by the Government Printing Office sometime in the latter half of March. Papers from individuals and organizations will be accepted by the committee until 15 February.

Public Safety

During the first two days of the hearings a number of points were made that received support from all of the persons offering testimony. The first of these was concerned with the interagency cooperation that has characterized the work done on the problem. Witnesses from the various atomic energy facilities referred again and again to the close working relationships that have been developed between plant personnel and the various municipal, state, and governmental agencies with which they have had contact. Safety of the public—for example, in communities downstream from a plant such as Hanford, Wash., on the Columbia River—has been the primary concern of the agencies dealing with waste disposal. Jurisdictional matters, as one witness said, were discussed after the work of protecting the public had been done.

A second point was the general praise given by the witnesses to the Atomic Energy Commission for its handling of a very difficult and new problem. Almost every witness who had not mentioned this in his presentation was interrogated on this point by the committee. The testi-

mony was to the general effect that the commission had done an excellent, responsible job, both in the matter of protecting the public from the hazards associated with the waste problem and in disseminating information on waste disposal to all agencies working with the problem.

A third general point, again one specifically drawn out by the questions of committee members, concerned public safety. There was agreement that there had been no hazard to the public from industrial radioactive wastes since the inception of the atomic energy program in this country. One committee member, trying to conceive of a possible weak point in the current disposal system, brought up a case in which some external force might destroy one of the storage tanks containing radioactive waste. The witness agreed that this would cause a great hazard. The point that became clear during the testimony was that, given the fact that to date there is no perfect solution, the measures that have been taken are the best and most reliable that can be devised.

A last point, an overriding consideration, is that despite the safety record and the techniques that are now in use, the problem of waste disposal has not been solved. Rather, it has been handled as well as it could have been, given the present state of knowledge and experience. In conjunction with this, the further point was made that the problem will take on increasing seriousness as the use of atomic energy increases. Representative Holifield, quoting an article by Wallace de Laguna, dramatized the problem in this way: "... the quantity of the single isotope of strontium-90 produced will be so large by the year 2000 that roughly 16 million cubic miles of water would be needed to safely dilute it. That's more fresh water than there is in the world, including the polar ice-caps."

Testimony

The amount of testimony given before the subcommittee on radiation precludes full presentation here. However, the nature and general outline of the hearings can be indicated by the four points given above and by selection of certain passages from the papers presented by witnesses. Of particular value here is the paper of the first witness, Abel Wolman, of Johns Hopkins University. Like the other speakers, he had been requested to present his testimony in terms understandable to the laymen and Congressmen.

"Up to the present time the management of radioactive waste materials, under the continuing and careful scrutiny of the Atomic Energy Commission, has followed two general precepts for the protection of man and his environment

in their ecological associations. The safe application of both of these precepts still remains the central theme of the Atomic Energy Commission policy. These precepts are: with high-level radioactive wastes, concentrate and contain; with low- and intermediate-level radioactive wastes, dilute and disperse to nature."

"Additional significant differences from more orthodox industrial wastes are the long half-lives and the damaging properties to human tissues of certain of the materials produced. The supervision and control of some of these wastes, therefore, must be viewed, not from the standpoint of temporary expediency, but from the necessity of guaranteed supervision and control, in some instances for hundreds of years. It is obvious that such a contingency, arising from this novel industry, places a major responsibility upon and challenge to all the public and private agencies dealing with the problem.

"The protection of the public health and of the total natural resources of this and of every country entails a greater depth of continuing responsibility than for any other industrial waste hitherto confronting society."

"Various estimates have been made of high-level wastes which will result from future nuclear power generation, based on estimates of the extent of such future nuclear power production, fuel irradiation levels, and unit volumes of waste per unit of fuel processed. Without attempting the role of a prophet, and on the assumption that nuclear power generating capacity may attain in 1980 something of the order of 1.1×10^5 megawatts of heat, the accumulated waste volume in gallons will be of the order of 10^8 . The total fission product activity in curies will then be approximately 10^{11} ."

"All of these figures simply demonstrate that the industry will be confronted increasingly with a waste-disposal and management problem, which one is unlikely to escape in the present state of the art. Although a great deal of attention is now being paid to this problem, to many industrialists the problem of waste disposal appears to be nonexistent. The reason for this happy state of mind lies in the fact that under present procedures the Atomic Energy Commission holds itself responsible for the handling of these most difficult materials."

Prospects for the Future

"The technical feasibility of direct disposal of high-level wastes into specific geologic formations is sufficiently clear to drive one toward at least limited application of such a procedure, either in salt domes or salt beds, in deep, isolated basins, in shale formations or even in

porous formations. It would certainly be inadvisable to move to these presumed solutions to the problem without far more extensive exploration and pilot-plant application than are yet at hand. The engineering and economic issues involved are still in the very preliminary stages."

"The disposal of high-level wastes in the ocean has had much discussion. It is not unfair to conclude in the present state of understanding of the ocean that such a procedure is unlikely to be sanctioned for some years to come. So many unknowns and unpredictables with respect to oceanic behavior still remain that management and government will be driven to the safer practice of keeping high-level radioactive materials under more obvious scrutiny and control than would be provided by most ocean disposal procedures.

"Sufficient has already been said in this presentation to make clear that the rapid development of the atomic energy industry is in no small measure contingent upon more prompt and more complete answers to the waste-disposal problem. If the situation is somewhat pessimistic, it is only because sufficient energies have not yet been expended in developing economic and safe improvements in waste handling and disposal processes. Progress in this field is unlikely to occur if the problems are not realistically confronted. It is a tribute to the Atomic Energy Commission operations that so many *ad hoc* solutions have been provided which have safeguarded the public during the last 10 to 15 years."

"Much thought will be required in the foreseeable immediate future as to the best way of continuing long-term responsibility for disposal of radioactive materials. It is not inevitable that in this responsibility government will always have to play a dominant role, except in a supervisory capacity. Industry must increasingly assume responsibility for the physical operation of waste-disposal plants under the criteria to be established promptly by government. The selection of sites for nuclear energy facilities is closely related to waste-handling and -disposal operations. The recognition of this close relationship is not yet dramatically obvious to many individuals concerned with the development of this industry."

Science in the U.S.S.R.

The Soviet Union continues to play a leading role in science, although occasionally the government's actions in the field are puzzling. One piece of impressive news is the confirmation of the recent report that there is activity on the moon.

Lunar Eruption

Last fall Nikolai A. Kozyrev of the Crimean Astrophysical Observatory at Partizanskoye announced that he had seen what he believed to be a lunar volcanic eruption. But Western scientists were skeptical. The moon has long been considered a dead body, both biologically and volcanically, and in the 350 years that astronomers have been making telescopic studies, there has been no real evidence to the contrary.

Now Kozyrev has published an account of his observations, accompanied by supporting spectrograms, in the February issue of *Sky and Telescope*, a journal edited at Harvard College Observatory in Cambridge, Mass. According to the editors of the journal, which is not an official organ of the observatory, Kozyrev's findings "seem incontrovertible." The paper was translated for publication by Luigi G. Jacchia, an observatory staff member.

Kozyrev saw the lunar activity while watching a crater known as Alphonsus. His interest in Alphonsus had been stirred by some photographs taken by an American astronomer, Dinsmore Alter, which had suggested the presence of a gas cloud covering the floor of the crater.

On 3 November at about 8 P.M., Kozyrev noticed that the 4300-foot peak in the center of Alphonsus had become blurred and taken on "an unusual reddish hue." He thought this was caused by a change in the earth's atmosphere, and after making a spectrogram, he swung his 50-inch reflector telescope away. At 10 P.M. he returned to Alphonsus and made a 30-minute exposure. This time the central peak was extraordinarily bright and white, but as he looked through the eyepiece he noticed a marked drop in the brightness, and the peak resumed its normal appearance. He then halted the exposure and made a third one. The first spectrogram, when developed, proved to be normal; the second showed the bright light characteristic of an incandescent cloud containing carbon, such as is typical in volcanic eruptions on earth. This light ended abruptly in the spectrogram and was absent in the last exposure. In his article Kozyrev says:

"It is possible that the observations [of volcanic activity] just described will be unique for some time to come. But the existence today of internal energy and the possibility of orogenic [mountain-building] processes on the moon seem to have been established.

"The coincidence of the observed phenomenon with the position of the central peak can hardly have been accidental, and may indicate that the basic relief of the moon originated from within rather