Testimony on Nuclear Workers

Written Testimony for the Subcommittee on Immigration and Claims, Committee on the Judiciary, U.S. House of Representatives

Delivered by Lisa Ledwidge, Outreach Coordinator and Editor of *Science for Democratic Action*, representing Dr. Arjun Makhijani, President of the Institute for Energy and Environmental Research

September 21, 2000

My name is Lisa Ledwidge. I am the Outreach Coordinator of the Institute for Energy and Environmental Research and editor of its quarterly newsletter *Science for Democratic Action*. IEER is a non-profit technical institute that provides the public and policy-makers with thoughtful, clear, and sound scientific and technical studies on a wide range of issues. Our aim is to bring scientific excellence to public policy issues to promote the democratization of science and a healthier environment.

My education includes Masters' degrees in environmental science and public affairs, and a Bachelor of Science in Biology. I am here representing Arjun Makhijani, the president of IEER, who is away. Dr. Makhijani, as well as his colleague Bernd Franke, are among the authors of the studies and articles that I will be discussing in this testimony, and have worked in the radiation and health field for about 20 years each.

I prepared this testimony under Dr. Makhijani's guidance. You may have questions that I am not able answer here. I that case, I or other IEER staff will provide answers to the subcommittee for the record as soon as possible after this hearing.

Dr. Makhijani and I appreciate this opportunity to present some of the findings of the work of the Institute for Energy and Environmental Research before you.

I will be discussing 3 IEER studies of nuclear worker exposures and off-site radiation releases. I will conclude with recommendations.

USA Today Study

IEER recently completed a study for *USA Today* newspaper. We would like to request that our report of this study be made part of the record.

This study assessed internal radiation doses of workers at three nuclear materials processing facilities, two in New York and one in Ohio. The plants were selected, in part, because they all were privately owned and performed a variety of uranium processing operations during portions of the 1940s and 1950s. The study was a preliminary and partial evaluation of worker exposure. Its purpose was to perform screening-type calculations to ascertain whether the doses to workers in at least some locations or job categories were high enough to cause serious health concerns. We used government and contractor

records of workers and workplace conditions. Further details about the study's methodology used can be found in the written report.

I will describe 3 of IEER's main findings:

1. We found that working conditions at these three plants were extremely poor. Workers were severely overexposed, even for then-prevailing standards. Based on our screening calculations, doses to many workers are likely to have exceeded the dose limit which was then about 15 rem per year. This chart [slide #1] shows the cumulative lung dose per worker as it relates to the number of months exposed (i.e. on the job), and also to different multiples of the then-prevailing Maximum Allowable Concentration (MAC) of uranium in the air. It shows that the more months a worker was exposed, the higher the cumulative lung dose, and the higher the level of uranium in the workplace air (i.e. the higher the number of multiples of MAC), the higher the dose.

   The data and our calculations suggest that the highest exposed workers had a high probability of dying from cancer as a result of the exposure. The estimated mean lung dose in the highest exposure category (8,400 rem) would be equivalent to an effective dose (or "whole body" dose) of approximately 1,000 rem. Using the International Council for Radiation Protection (ICRP) cancer risk factor of 0.04%, this corresponds to about a 40% risk of dying from cancer. This is a 200 percent increase in fatal cancer risk compared to unexposed persons.

   Other types of health problems, including kidney damage, would also be likely among those workers exposed to the more soluble forms of uranium. We found that the government and the contractors seem to have completely ignored the air concentration limit established for protecting the kidney from uranium toxicity — we found no evidence that the contractors followed it, or that the government enforced it. Plant documents indicate that kidney damage among workers was in fact reported.

   We have arrived at these conclusions even though our dose calculations are partial and do not cover the entire periods of plant operation and all types of doses. It also should be noted that the amount of material processed does not necessarily correspond to individual worker exposure level. In other words, the plant that processed the smallest amount of uranium did not necessarily have the lowest worker doses.
2. IEER's study also found evidence that plant authorities and the Atomic Energy Commission (AEC), which contracted with these private companies to process material for its nuclear weapons program, were aware that workers at these plants were being overexposed over prolonged periods of time. Furthermore, there is no indication that the authorities shared this overexposure information with the plant workers. In fact, there are documents that indicate that plant authorities and AEC personnel lied to the workers about the levels of radiation to which they were being exposed. For example, in a January 1948 letter to the Vice President of Harshaw Chemical Co., Harshaw's Medical Manager wrote: "…it is obvious that concentrations considerably above the preferred level are common in Area C." (Area C is an area in the Harshaw plant.) He also wrote, "…a distinct hazard does exist in Area C." In the same letter he states that the Medical office "still believes" that the "logical method of approach" is to continue telling the employees at Area C "that all of our records indicated that no unusual hazard existed…"
3. One of the most surprising outcomes of our findings is that they call into question whether the

doses to these workers were less than their Soviet counterparts. Until now, we have assumed, based on available evidence, that worker exposures were far higher in the Soviet Union than in the United States. But the partial estimates that we have made in this study are so high that this assumption may need to be revisited for many of the workers at these nuclear weapons plants. A comparative evaluation of US and Soviet nuclear materials processing plants of that era should be done.

Fernald Worker Study

In 1994, IEER performed a study of worker doses at the Feed Materials Production Center, located in Fernald, Ohio, near Cincinnati. The Fernald plant is similar to the three facilities that IEER analyzed for *USA Today* in that uranium processing took place there. This study was completed as part of expert testimony in a class action lawsuit filed by Fernald workers against National Lead of Ohio, the Department of Energy's contractor there until 1985. The aim of the study was to examine whether then-prevailing dose limits had been violated. This study was, to our knowledge, the first independent assessment of internal radiation doses based on raw data from official DOE and contractor records of the workers. We are submitting this study and request that it be part of the record.

I'll describe 2 findings of IEER's Fernald worker study:

1. Similar to the 3 aforementioned facilities, IEER found that the working conditions at the Fernald uranium processing plant were appalling, especially in the 1950s and early 1960s. They were typified by high air concentrations of uranium in many areas of the plant. They often exceeded the Maximum Allowable Concentration (MAC) by tens, hundreds, even thousands of times. One 1960 plant document lists the air dust concentration in the breathing zone of a worker cleaning under a certain piece of equipment as 97,000 times the MAC. I am submitting this document for the record.

   This chart [slide #2] shows the proportion of workers at the Fernald plant who were exposed to more than the allowable limits due to lung burdens of uranium. It summarizes IEER's conclusions: that doses due to uranium inhaled by workers between 1952 and 1962 were above then-allowable limits (15 rem per year to the lung) in more than half the cases in every year but one. In 1955, the worst year for worker exposure, IEER estimated that almost 90 percent of workers were exposed to more than the allowable lung dose limit. As you can see, significant proportions of workers continued to suffer overexposure after 1962.
2. Similar to our analysis of worker doses at the 3 private uranium processing facilities, Fernald workers were not told about their internal radiation overexposures by AEC and its successor agencies nor by contractor officials until at least 1989. One of the most startling findings in the course of this study was that the urine and lung counting data (in other words, internal dose measurements) of the Fernald workers had never been converted into radiation dose estimates. Worker radiation dose records – that is, the records actually given to workers when they ask for them — contained only external radiation doses, such as those recorded on film badges worn by workers. Therefore, we found that the assurances given to workers by that they were, on the whole, well protected, were based on very partial information. In the case of Fernald, these assurances did not even take account of the most important route of exposure: inhalation of contaminated dust.

Just after the presentation of IEER's findings in court in 1994, the Department of Energy settled the lawsuit on behalf of National Lead of Ohio, providing workers with lifetime medical monitoring and other benefits.

Our suspicion that the situation at Fernald may not have been an exception in this regard was confirmed when, three years later, the Department of Energy finally admitted that from the beginning of the nuclear era until 1989, radiation doses from radioactive materials inhaled or ingested by workers were not calculated or included in worker dose records, even though the data had been collected and was available to the DOE and its contractors.

While there was no regulatory requirement until 1989 for DOE to actually calculate worker doses, the lack of internal radiation dose estimates in worker dose records means that the records of workers who were at risk of internal exposures are incomplete, misleading, and inaccurate. The overall result is that large numbers of workers have received information about their radiation exposures systematically understating their actual exposures.

The state of the *external* dose records is also troubling. For instance, in a 2-1/2 page document titled "Deficiencies in Reporting of Worker Exposure to Radiation and Toxic Material," the DOE admitted that:

> "The type, use, and positioning of dosimetry was poor in some cases, resulting in inaccurate determination of radiation exposures."
>
> "In some cases, occupational radiation exposure records are missing years of radiological dose data."
>
> "Radiation exposure data stored on electronic media did not accurately reflect the data on the original record."
>
> "Employee files do not contain the required information related to occupational radiation exposure and radiological working conditions."
>
> "Internal and external occupational exposure records were found to be incomplete."
>
> "Because of inadequate administrative procedures and practices employees that had lost their dosimetry badges were able to enter radiation areas before obtaining replacement dosimetry."

According to the document, this information was obtained from Technical Safety Appraisals conducted during the period 1989 to 1992. It was submitted by the Department of Energy at a hearing of the House Subcommittee on Oversight and Investigations on March 17, 1994.

This photo [slide #3] further illustrates some possible flaws in external worker dose data. This worker is stamping a label on a uranium ingot, a job that was done routinely throughout the history of the Fernald plant. The external dose to the worker's gonads, and hence the effective whole body dose equivalent that might be calculated from that, are likely to be far in excess of what was recorded on the film badge. First,

the film badge is not facing the radiation source, which allows some of the radiation to escape detection. Second, the distance between the radiation source and his gonads is shorter than that between the source and his film badge. Because radiation deposits its energy relative to distance, the dose to this worker's gonads is likely much greater than what his film badge would indicate.

Fernald Off-Site Release Study

The Fernald worker study was actually the second Fernald study performed by IEER. The first one, completed in the late 1980?s, was done as part of expert work in a lawsuit filed by neighbors of the Fernald plant. This study was the first ever independent assessment of radiation releases form a nuclear weapons plant. IEER focused its work on estimating uranium losses because uranium was the main material processed there and because data on other materials released to the air were scarce or non-existent.

IEER found that radioactive releases of uranium from Fernald were at least double the official calculations by the Department of Energy and its contractors. After the study was released, the Centers for Disease Control and Prevention commissioned an independent study of the radiation doses to the public arising from Fernald's operation. That study, done by John Till, corroborated IEER's findings in regard to uranium releases. As shown in this table [slide #4], the official sources (NLO and Westinghouse) had greatly and systematically underestimated releases.

These underestimates were largely due to scientific flaws in the estimates and in the way in which the records were kept and the measurements were made (or not made). For example, for a number of years, many entries showed zero releases when no measurements had actually been made. As another example, the plant made an assumption that scrubbers, designed to remove uranium from highly acidic exhaust, always operated within manufacturer specified efficiency, despite internal plant data to the contrary. The formula used by the contractor to calculate releases from the scrubber was wrong under conditions of variable efficiency and resulted in high release estimates when actual releases were low and low release estimates when actual releases were high. Moreover, this method was known to plant officials to be wrong, since it was described in a 1971 plant document as "inherently deceptive."

The DOE, which defended the lawsuit on behalf of the contractor, National Lead of Ohio, settled the suit for $78 million in mid-1989, but admitted no wrong-doing or even any technical problems in its own or its contractors' work. (Under the terms of its contract with the government, National Lead of Ohio was immune from all liability, including that arising from negligence or violations of regulations.)

These two Fernald studies are summarized in IEER's newsletter from October 1996, which I am submitting for the record. Information on the serious flaws in Department of Energy worker data is described in the November 1997 issue of *Science for Democratic Action*, which I am also submitting for the committee's record.

In conclusion, IEER has found that when worker exposures and off-site releases are carefully and independently studied, the results indicate that worker overexposure and environmental releases of radioactivity are larger than officially acknowledged. These, as well as other, similar findings over the past several years have been important pieces leading up to the official announcement that was made in April by Energy Secretary Bill Richardson — after decades of denial by the US government — that the

production of nuclear weapons has harmed workers.

I will conclude with 3 recommendations for your consideration:

1. First, health monitoring, treatment, and where appropriate compensation of the affected workers, is an urgent priority because many are very sick and dying. Practical recognition of the role of the government and its contractors in their suffering is long overdue.

2. It is important to not force workers to prove their exposure to the last decimal point. The burden of proof should be on the government and its contractors, which failed to keep good records, failed to make sufficient measurements, and all too often assured workers of their safety when conditions were unsafe. Where there are large uncertainties due to lack of sound data, the benefit of the doubt should be given to the sick workers.

   There also is limited understanding about the health effects of exposure to chemicals used in nuclear weapons production. Examples include fluorine gas, carbon tetrachloride, tricloroethylene (TCE), hydrofluoric acid, nitric acid, chlorine trifluoride, and beryllium. According to the Agency for Toxic Substances and Diseases Registry, high exposures to these substances, which might be expected for at least some workers, can cause lung, liver, kidney and central nervous system damage, cancer, impaired heart function, impaired fetal development, and in some cases death. Exposure to toxic substances could also aggravate the health effects of radiation exposure (and vice versa) yet there is little or no research on the possible synergisms.

3. A process should be created for fairly and responsibly addressing the Cold War health legacy. There is a lot of information out there about the harm to human health and the environment from nuclear weapons production, and this is typical of all nuclear weapons states. To its credit, the United States so far has been more forthcoming about this problem, but problems continue to fester and many are still coming to light in a haphazard fashion, through efforts of public interest groups, media stories, congressional investigations, and lawsuits. Workers should be centrally involved in creating this process, because they were, on the whole, the most exposed group of people. But it should be acknowledged that non-workers were also exposed, including workers' family members, downwinders, those downstream, and other neighbors. The process for deciding how community exposures can be fairly and responsibly addressed, without the anguish and expense of lawsuits like the one at Fernald, should begin.

Attachments

- Slide #1: Estimated Cumulative Lung Doses at Harshaw for Different Multiples of Maximum Allowable Air Concentration and Differing Times of Exposure

- Slide #2: Percent of workers with an Inferred Annual, Average Uranium Lung Burden Corresponding to a Lung Dose of 15 Rem or More (Fernald)

- Slide #3: Worker Sitting on Depleted Uranium Metal Ingot (Photograph by Robert Del Tredici)

- Slide #4: Summary of Estimates of Uranium Releases (Fernald)

Supporting documents

- Arjun Makhijani, Bernd Franke and Hisham Zerriffi, Preliminary Partial Dose Estimates from the Processing of Nuclear Materials at Three Plants during the 1940s and 1950s. Prepared by the Institute for Energy and Environmental Research under contract to USA TODAY, 6 September 2000.

- B. Franke and K.R. Gurney, *Estimates of Lung Burdens for Workers at the Feed Materials Production Center, Fernald, Ohio*, (Takoma Park, Maryland: IEER), July 1994.

- Memo from F.J. Klein to R.H. Starkey, "Subject: Cleaning Under Burnout Oxide Conveyors–Plant 5," National Lead Company of Ohio, December 7, 1960.

- Science for Democratic Action, *volume 5 number 3*, October 1996 (Takoma Park, Maryland: IEER)

- Science for Democratic Action, *volume 6 number 2*, November 1997 (Takoma Park, Maryland: IEER)